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INDIA

SURVEY OF THE TEXTILE MACHINERY INDUSTRY

(With a note on the Indian
Cotton Textile Industry)

A Background Report prepared in connection with the
Appraisal of the Eleventh Industrial Imports Credit.

December 1975

Industrial Projects Department

CURRENCY EQUIVALENTS
(as at October 15, 1975)

US$1.00	=	Rs. 8.89
Rs. 1.00	=	US$0.1125

Prior to September 24, 1975, the Rupee was officially valued at a fixed Pound Sterling rate. Since then, it has been fixed relative to a "basket" of currencies consisting of the U.S. Dollar, the Pound Sterling, the Deutschmark and the Japanese Yen. As all of these currencies are now floating, the U.S. Dollar/Rupee exchange rate is subject to change. Conversions in this report were made at US$1 to Rs. 8, which was the short-term average at the time of appraisal.

FISCAL YEAR

April 1 - March 31

Time Spans

The Indian Government financial year runs from April 1 to March 31. In this report the financial years are written as, for example, 1972/73 designating the financial year from April 1, 1972 to March 31, 1973

Longer intervals of time are written as, e.g., 1970-72 (two year interval), 1970-78 (8 year interval).

Abbreviations and Acronyms

Calico	-	Calico Industrial Engineers
CIMMCO	-	Central India Machinery Manufacturers Co. Ltd.
CSIR	-	Council for Scientific and Industrial Research
ECGC	-	Export Credit Guarantee Corporation
GOI	-	Government of India
ICICI	-	Industrial Credit and Investment Corporation of India
IDBI	-	Industrial Development Bank of India
IFCI	-	Industrial Finance Corporation of India
LCC	-	Lakshmi Card Clothing Manufacturers Co.
LMW	-	Lakshmi Machine Works
MMC	-	Machinery Manufacturers Corporation Ltd.
NMM	-	National Machinery Manufacturers Ltd.
NSE	-	New Standard Engineering Co. Ltd.
NTC	-	National Textile Corporation
RBI	-	Reserve Bank of India
REPs	-	Import Replenishment Licenses
STC	-	State Trading Corporation
STE	-	Star Textile Engineering Works Ltd.
TMI	-	Textile Machinery Industry
TMMA	-	Textile Machinery Manufacturers' Association

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SURVEY OF THE TEXTILE MACHINERY INDUSTRY

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This report was prepared by Messrs. M. Iskander (Industrial Projects Department), H. Catling, U. Hartmann, and E. Kerfoot (Consultants).

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FOREWORD

Industrial Imports Credits to India occupy an important place in the Bank Group's operations. They began in mid-1964 and during the subsequent 11 years, 10 credits for the total amount of US$1,130 million were approved. Of these, 9 credits for US$930 million are fully disbursed. In the face of large foreign exchange gaps these credits were used to finance imports of critical raw materials, spare parts and components for high priority industries.

In view of its concern that the proceeds of these credits be utilized efficiently and that these credits support specific developmental objectives, the Association since the Eighth Industrial Imports Credit has undertaken (in close cooperation with Government) a series of special studies examining the measures required in the short and long term for improving both structure and performance of these industries. Four studies have already been completed in connection with the Eighth and Ninth Imports Credits. These are the commercial vehicles, tractors, foundries and forgings. Similarly, a project to improve capacity utilization of existing fertilizer plants, which have absorbed 35% of these credits, has recently (December 16, 1975) been approved by the Executive Directors.

For the proposed Eleventh Industrial Imports Credit, it was decided to review the textile machinery industry, with a view towards meeting the modernization and expansion requirements of the textile industry which is potentially India's largest foreign exchange earner. A Bank mission composed of Messrs. M. Iskander (Chief), H. Catling (Consultant, Textile Industry), and U. Hartmann and E. Kerfoot (Consultants, Textile Machinery Industry), and C. Taylor (Economist) visited India from May 27 to July 4, 1975. It visited 20 textile machinery firms accounting for 90% of the textile machinery output and 23 textile mills. It also had discussions with Government officials in the Ministries of Commerce and Industry, the Textile Machinery Manufacturing Association, the Indian Cotton Mills Federation, leading textile industry research associations and financial institutions. The excellent cooperation extended to the Mission by all concerned is highly appreciated; without it a meaningful report could not have been prepared.

This report also includes a comprehensive background note on the Indian textile industry. This note reviews major aspects of the structure and performance of the cotton textile industry, the major constraints facing it, and the structural changes needed to achieve the triple objective of increasing the supply of low cost durable cloth for domestic consumption, and substantially expanding exports and employment.

With the completion of this study, the Bank will have carried out in-depth studies of over 60% of the organized Indian engineering industries. These industries exhibit similar structural problems and, accordingly, the policy recommendations suggested in this study to improve the international competitiveness of the textile and textile machinery industries apply equally to the other engineering industries.

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SURVEY OF THE TEXTILE MACHINERY INDUSTRY

SUMMARY OF CONCLUSIONS AND PRINCIPAL RECOMMENDATIONS

i. The textile machinery industry has recovered from its long recession of 1964-71. Over the last three years its output has grown at an average rate of 12% per year compared to only 1-2% during the sixties. The current value of the output is estimated at Rs. 125 crores (US$156 million equivalent) — Rs. 80 crores for textile machinery and Rs. 45 crores for spare parts and accessories -- and represents over 90% of the domestic requirements.

ii. The reason for the lackluster performance in the last decade is that domestic demand for textile machinery has been stagnant, and once the initial process of import substitution came to end in the mid-sixties the fortune of the textile machinery industry became closely tied to that of the stagnant domestic textile industry. Indeed, a good part (70-85%) of the last three years' recovery can be attributed to exports. The industry has taken advantage of its large excess capacity (about 50%), low prices (40% below international prices) and short delivery dates to increase its exports from Rs. 1.1 crores in 1971 to Rs. 15.5 crores in 1974 in competition with overbooked international firms. In 1973/74, direct exports accounted for 15% of total output (compared to an average of 3% for the engineering industries) corresponding to 25-30% of the output growth. An additional 40-60% of the growth was attributable to indirect exports as 80% of the growth of the textile industry during the same period was directed to exports. The recovery was not evenly divided among the three major segments of the industry. Spinning machinery, which is more acceptable on the export market than both weaving and finishing machinery on account of more current design, has grown at an average annual rate of 15%, while the other types of machinery have remained stagnant.

iii. By international standards the Indian textile machinery industry has a number of structural weaknesses. Its total output is smaller than that of some of the larger international firms, and its production is fragmented among many firms producing similar machinery. With few exceptions its products were acquired through foreign collaboration agreements in the fifties and sixties; they are still suitable for the domestic market but have limited long term export prospects. Again with few exceptions, plants were built in the fifties and early sixties to produce low speed machinery and have not been updated to keep pace with the rapid technological change that has taken place in the sixties and which has elsewhere converted the textile machinery industry into a precision industry producing high speed machinery. Very few firms have developed research and design capabilities to substitute for expiring collaboration agreements and most firms are too small to sustain any meaningful

R & D programs. Except for one or two firms, the industry has not developed a strong supplier base or effective after sales service either at home or abroad. Moreover, generally poor quality, non-adherence to delivery schedules, and inefficient after sales service have tarnished the reputation of the Indian textile machinery industry in export markets.

iv. The Mission visited 20 firms accounting for about 90% of the industry's output. Of these only 3 or 4 firms, accounting for 25-30% of output are internationally competitive in quality and price; their order backlog extends from 2 to 5 years. These operations are based on relatively modern designs and manufacturing methods; rigorous training; strict quality control; and active participation of the foreign collaborators, who also have a significant financial stake in the firms, in labor and management training, in production planning and in quality control. Another 6-7 firms, accounting for 35% of the industry output could become internationally competitive in 3-4 years if effective action programs to upgrade machinery design, manufacturing methods, training and marketing are carried out. The remaining 10 firms could not have survived in a competitive environment and will require substantially more time and effort to overcome major structural deficiencies.

v. The major problem facing the textile machinery industry is the erratic and stagnant demand of the financially weak textile industry which in turn depends on the sluggish agricultural sector for the bulk of its raw materials and for a significant part of its sales. On the supply side, the Indian textile industry is still almost entirely cotton based, and a good deal of the local cotton is of extremely poor quality. On the demand side, the per capita textile consumption has consistently declined by 1.5% per year over the last ten years because the increase in food prices has left the rural and urban poor, who account for more than 80% of the population and 60% of consumption, with less money for clothing. Textile exports fared somewhat better; they grew at a rate of 12% per year in current value terms albeit from a very low level. But exports consist primarily of cloth at the lower end of the quality spectrum (mostly grey cloth) for which demand is contracting, and hence cannot provide a basis for long-term export growth.

vi. This lack of growth meant that the modern and more efficient sector of the textile industry could not have expanded its output without infringing on the market of the "decentralized" labor intensive sector (hand loom and power loom) which employs roughly 7 million people and accounts for 48% of the domestic market. The Government took a number of steps to protect the decentralized sector by restricting the growth of the organized sector. But, in the absence of vigorous export incentive programs to divert the output of the organized sector from the domestic market to exports, these measures have led to a weak textile industry. Profitability has been quite low (about 6.5% return on capital) compared to other industries (10-18%), and thus a significant part of the industry profit has been diverted to other industries. Consequently, even in the best year the demand for textile machinery accounted for only 50-60% of the textile machinery industry's installed capacity.

vii. The major targets of the Fifth Five Year Plan (1973-78) in the textile sector are: (i) to increase the per capita cloth consumption from 14.6 to 17.5 meters/year; and (ii) expand exports from 500 to 1,300 million meters by 1978. About Rs. 1,400 crores of machinery would be required to meet these targets (Rs. 500 crores for rehabilitation and Rs. 900 crores for expansion). But beyond specifying these targets, very little has been done to evaluate the costs and benefits of alternative programs. Furthermore, the Plan targets were drawn up on a need basis and do not reflect the capacity of the textile industry to finance this investment or sell the cloth produced. A major reassessment of the Plan is therefore needed to determine the structural changes required to achieve the dual objective of increasing the supply of low cost durable cloth for domestic consumption and substantially increasing exports.

viii. Given the size and complexity of the Indian textile industry it is obviously difficult to reach at this stage any firm conclusions about those changes. Nevertheless, a number of tentative conclusions appear justified. On the raw material side, the quality of Indian cotton is by far the worst of the handicaps under which the textile industry labors. Most Indian cotton is excessively dirty, variable in staple length and contains a great deal of immature fibers; a quantum improvement in productivity of the textile industry (about 30%) can be achieved by upgrading the quality of Indian cotton. The increased use of viscose and synthetic fibers, particularly to clothe the masses, also warrants serious consideration in view of the increased durability and lower cost of the cloth produced. On the production side, there is much scope for improving the use of existing capacity. Indeed, even the more optimistic projection of demand could be met by rehabilitation and better utilization and management of existing capacity. As regards exports, there are limited opportunities for Indian specialty fabrics (e.g. hand woven saris) but substantial opportunity exists for the export of international fabrics to developed countries. The demand in international markets is increasingly for fabrics having a number of attributes not generally possessed by Indian-made textiles. If exports are to be increased, it will be necessary to specially develop a segment of the industry that could meet that market's quality requirements.

ix. On the basis of both the likely demand for textiles and the financial capability of the textile industry, the Mission estimates the domestic demand for textiles over the next five years to be of the order of Rs. 370 crores at 1974/75 prices. Although this figure is only 28% of Plan estimates it still represents a 10% annual real growth rate over the boom year of 1973; and could be easily met by the textile machinery industry provided its production capacity of drafting systems (required for rehabilitation of the textile industry) and weaving preparatory machinery is expanded and the necessary raw materials and power are available. But this projected domestic demand is only 50-60% of what is required to induce the structural changes necessary for international competitiveness. Since the prospect of increasing domestic sales is limited by domestic demand for textiles, the extent and pace of these changes will hinge on expanding exports. Three major export options are discernible, namely: (i) continued reliance on the domestic market with marginal expansion; (ii) modernization of the textile machinery industry to double exports in four years; and (iii) modernization of the textile machinery industry coupled with the development of an export oriented textile industry.

x. The prospects for substantially expanding exports within the existing inward looking textile machinery industry structure (Option I) are not encouraging, particularly since the factors that the textile machinery industry capitalized on to expand exports in 1973-74, namely lower prices and short delivery dates, have been considerably eroded with the decline in world trade in textile machinery and the relative decline in international prices of steel compared to Indian steel prices. Accordingly, direct exports are only likely to increase from Rs. 16 crores in 1975 to Rs. 22 crores in 1979. An increasing share of exports is likely to be in the form of equity participation of Indian entrepreneurs in joint ventures in South and East Asia, rather than orders obtained in competition with international firms. They are also likely to be concentrated in a few efficient firms.

xi. But this marginal export expansion of textile machinery will not provide the base necessary to support a meaningful modernization program. Such a program will require that the textile machinery industry at least double its exports, to about Rs. 30 crores in four years, i.e. to 25-30% of its projected output (Option II). This export expansion would help the industry to overcome the difficulties arising from frequent fluctuations in domestic demand. It will require concerted action between industry and Government. At the individual firm level this will mean upgrading machinery design, replacing machine tools, improving manufacturing methods, instituting training programs and developing marketing organizations. At the industry level it will mean developing effective ancillary suppliers and radically improving the operation of the export consortium organized by the State Trading Corporation. At the government level it will require that Government not unduly fragment the industry by granting licenses to a large number of manufacturers to produce the same item. It will also mean more liberal allocation of foreign exchange for raw materials, spare parts and precision machine tools, and more liberal approval of collaboration agreements to ensure a continuous flow of technical know-how in design and manufacture for firms with a definite modernization and export program.

xii. But the substantial change in industry structure that is necessary to provide sustained long term exports for major segments of the industry cannot be developed without a strong domestic base. This could only be done if the Government actually encourages the development of an export oriented textile industry which would also supply an export oriented garments industry (Option III). Without such a determined program, it is unlikely that the Indian textile industry can maintain its exports at the 1975 level of 500-600 million meters, much less expand it. The development of this export oriented textile industry could well raise the direct and indirect export of textile machinery to about Rs. 50 crores by 1979 or 55% of total output; and this figure could be easily doubled or tripled in the following four to five years.

xiii. The result will be a more capital intensive segment of the textile industry with marginal capital/labor ratio of US$10-15,000 per job compared to US$6-9,000 per additional job created in textile mills producing for the domestic market. But this lower employment per unit of investment will be

far outweighed by the employment generated due to increased output and by the indirect employment generated in the textile machinery and garments industry. This is clearly borne out by the experience of large textile exporting countries. By contrast employment in the domestic oriented labor intensive Indian organized textile industry has remained stagnant at 970,000 over the last ten years.

xiv. But a substantial and rapid reorientation of the textile industry, and for that matter most other industries, towards exports will require much more than marginal changes in existing export policies which merely attempt to compensate exporters for disadvantages arising from the Government's fiscal and foreign exchange policies and as such do not provide the stimulus to restructure and revitalize an industrial sector which has been drained of vitality and resources for the last decade and has fallen way out of step with international trends. What is needed instead, are policies that unmistakably signal industry the Government's unwavering long-term commitment to make production for exports more profitable than for the domestic market. Indeed, in cases where India has a comparative advantage one could go as far as making access to the protected domestic market contingent on export performance.

xv. On the basis of this as well as previous in-depth studies undertaken by the Bank over the last three years which cover about 60% of the organized Indian engineering industry, a number of changes in government policies are suggested to improve the international competitiveness and export performance of the industry. An analysis of Indian exporting firms indicates that exports are concentrated in a relatively small number of efficient firms. These firms have a large domestic order book position and despite relatively rapid expansion are barely keeping up with the growing domestic demand, thus leaving little additional surplus capacity for exports. A more rapid export drive will require a much faster capacity expansion as well as upgrading technological and marketing capabilities which will undoubtedly strain the firms' financial capabilities. There seems, therefore, to be a need to complement the existing export incentive system by positive measures that aim at fast injection of capital and technology in firms that undertake to export a substantial part of their additional capacity. One such policy instrument could be preferential access of exporting firms to long term credit at terms concessional enough to compensate firms for the effort and risk associated with rapid reorientation from a protected domestic market to a competitive export market. Part of the hesitation firms have shown to expand production for exports can be explained by the undertainty they have faced about frequent and unpredictable changes in export policies and incentives. By providing an ex-ante predetermined export incentive this measure would have an encouraging effect on export oriented investments.

xvi. This approach could be criticized as leading to capital intensive operations. But, the experience of the better Indian firms suggests that modernization will pay off handsomely in terms of savings on raw materials which constitute about 50% of total production cost on account of lower rejection rates, increased direct employment resulting from larger sales of quality machinery and increased indirect employment in related industries.

xvii. Similarly, priority for approving foreign collaboration agreements should be given to firms that undertake to export a significant part of their output. This selectivity would weed out those firms that are either incapable or unwilling to export and would additionally consolidate production in a few firms that are capable of digesting and building on the expensive imported know-how and thus enlarge their domestic market base so essential for a sustained export drive. Foreign firms are generally reluctant to transfer know-how to enable Indian firms to export unless such foreign firms can obtain a reasonable share of the export profits in compensation for their potential market loss. The foreign investment regulations recognize this need but their application has often resulted in delays and other difficulties which have discouraged foreign firms from investing in India.

xviii. Finally, import licensing policy could be further exploited to favor exporters. GOI should examine arrangements which will favor firms in industries with export potential to expand production for exports, improve quality, and increase export sales using policy instruments which minimize bureaucratic processes. The role of additional import replenishment licenses (REPs) and improvement in the flexibility of their use, in particular elimination of indigenous angle clearance should be analyzed in quantitative terms for both Actual User's Licenses and REPs.

xix. In summation, the thrust of the suggested changes is (i) to make exports more profitable than production for the domestic market; (ii) to relate access to the domestic market to export performance when this is appropriate; and (iii) to enable certain industries in which India has a comparative advantage to establish a sufficiently large production base to compete in export markets, if necessary at the expense of non-exporting units. The experience of the last 20 years has clearly demonstrated that Indian firms have responded positively to government policies that affect their profitability. This should be no exception. Ultimately, the changes would lead to larger exports, better quality products for both the domestic and export markets, larger employment and a stronger industrial structure with potential for further growth.

xx. Of the three options outlined for the development of the textile machinery industry, namely, (i) continued reliance on the domestic market with marginal export expansion, (ii) modernization program of the manufacturing capabilities to double exports in four years, and (iii) modernization of the textile machinery industry coupled with the development of an export oriented textile industry only the third makes long term economic sense. But it will require fundamental policy changes that are likely to require considerable time to take effect. In the next two years it will therefore be practical to adopt the second option to pave the way for a longer range development program moving towards the third option.

I. INTRODUCTION

1.01 The Textile Machinery Industry (TMI) can be divided into three distinct segments depending on the end users of the machinery produced. These are: spinning, weaving and finishing machinery. Spinning machinery includes the machinery required right from the process of segregating foreign particles from cotton in blow rooms to the spinning of the yarn. Important spinning machinery consists of blow room lines, cards, combers, draw frames, speed frames, ring frames and doubling frames. The weaving machinery includes preparatory machines such as warping, winding and sizing machines to prepare the yarn for weaving, looms -- both plain and automatic --, mending and folding machines. The processing equipment consists of machines involved in different processes such as bleaching, dyeing, mercerizing, printing and finishing.

1.02 The first significant effort to establish the Indian TMI was made in the early '40s with the manufacture of spindles, ring frames, plain (non-automatic) looms and some simple processing equipment. In 1952 the Government encouraged the industry by providing tariff protection and foreign exchange to import capital goods for manufacturing textile machinery. This protection was further extended in the late '50s and early '60s by restricting imports of machinery produced in India irrespective of quality or price.

1.03 This strong protection stimulated indigenous production of both textile machinery and their components and accessories. A large number of Indian firms, some of which with considerable equity participation from the leading Indian textile mills, started manufacture of a wide range of textile machinery in collaboration with leading British, German, Swiss and Japanese manufacturers.

1.04 The current value of the textile machinery produced in India has grown from Rs. 13 crores in 1961/62 to Rs. 80 crores in 1974/75. Production of accessories and parts has also increased from Rs. 24 crores in 1964/65 to Rs. 45 crores in 1974/75. Currently the TMI produces a wide range of products and satisfies over 90% of domestic requirement compared to only 50% in 1960/61. The industry has also taken advantage of the boom period of 1972-74 in international trade and made a good export start because of its low prices and short delivery dates. Exports grew from Rs. 1.1 crores in 1971/72 to Rs. 15 crores in 1974/75 and now account for 19% of the output of textile machinery and 15% of the combined output of the textile machinery and spare parts produced in India. This compares favorably with an average of 3% for the Indian engineering industry.

1.05 The growth in real terms has nevertheless been disappointing as the output has barely increased by 1.3% per year over the last decade. The simple story as presented in Table 1 is that domestic demand for textile machinery has, with the exception of a few years, been stagnant. Thus the only possibility for growth of the TMI came from import substitution. But once this process came to an end in the mid-sixties the fortune of the TMI became closely linked

TABLE 1

Production, Imports, Exports and Domestic Availability of Textile Machinery
(Rs. Million)

Year	Indigenous Production (at 1960 Rs.)	Indigenous Production (at current Rs.)	Imports (at current Rs.)	Exports (at current Rs.)	Total Availability (at current Rs.)	Imports as Percentage of Total Availability	Exports as Percentage of Indigenous Production
1961	107	129	189	2	317	59.7	1.4
1962	96	144	174	1	317	54.9	0.9
1963	97	175	177	1	351	50.4	0.6
1964	123	265	183	1	447	40.9	0.2
1965	90	285	172	1	456	37.8	0.4
1966	77	227	155	2	380	40.9	0.9
1967	59	177	131	4	304	43.0	2.2
1968	58	169	73	7	235	31.0	4.2
1969	69	242	45	41	263	17.1	9.8
1970	93	343	41	40	342	11.9	11.7
1971	107	400	68	54	414	16.4	13.5
1972	91	367	58	49	376	15.4	13.3
1973	107	488	55	54	489	11.2	11.0
1974 1/	127	800	60	155	705	8.5	19.4

1/ Estimate.

Source: Textile Machinery Manufacturers' Association (TMMA)

to that of the stagnant textile industry. 1/ And it was not until 1974 that the TMI recovered from its long slump and barely exceeded its 1964 output. This is clearly illustrated by production of ring frames, the most important textile machinery produced in India (Figure 1). Even then, a good part of the recovery of the last three years during which the TMI grew at an average rate of 12% per year can be attributed to exports. Direct exports accounted for 25-30% of the growth; and 80% of the growth of the domestic textile industry which accounted for the remaining 70-75% was directed towards exports. 2/

1.06 The recovery was not evenly divided among the three major segments of the TMI. Spinning machinery has gained the ground it lost to weaving and finishing machinery during the import substitution phase of the '60s and grew at an average rate of 15% over the last five years while the other segments stagnated; spinning machinery now accounts for 66% of output compared to 15% and 19% for weaving and processing machinery respectively (Table 2). The impetus for the recent growth of the spinning machinery, which is relatively more current in design than weaving and processing machinery, came from exports (50% of output increase) indicating that the revival of the TMI has originated from those segments and, as will be shown later, from firms that are internationally competitive.

TABLE 2

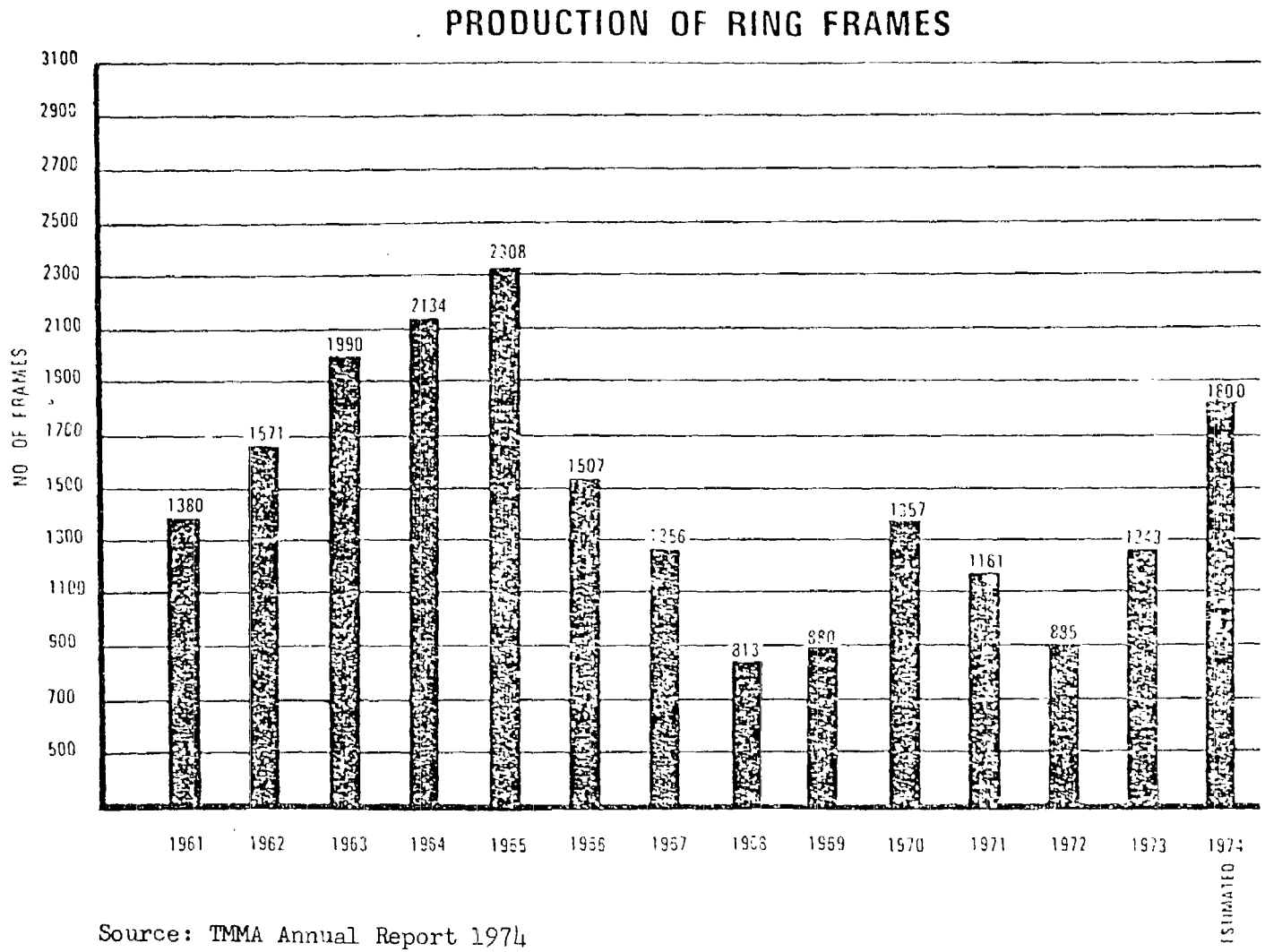
Production of Textile Machinery in India (at 1960 prices)
(Sales in Rs. crores)

	Spinning Machinery		Weaving Machinery		Processing Machinery		Total
	Sales	%	Sales	%	Sales	%	
1961/62	7.25	68	1.29	12	2.14	20	10.68
1965/66	6.46	72	1.15	13	1.40	16	9.01
1970/71	4.89	53	1.95	21	2.43	27	9.27
1971/72	5.43	51	2.27	21	3.04	28	10.74
1972/73	4.58	50	1.89	21	2.63	29	9.10
1973/74	5.99	56	1.96	18	2.77	26	10.72
1974/75	8.35	66	1.95	15	2:40	19	12.70

1/ The problems and prospects of the Indian textile industry, and their implication for the textile machinery industry are described in Annex 1.

2/ Cloth production increased by 316 million meters from 1969 to 1973 of which 250 million meters was due to exports growth.

FIGURE 1



Source: TMMA Annual Report 1974

II. INDUSTRY STRUCTURE AND PERFORMANCE

2.01 There are over 300 units in India manufacturing textile machinery, spares and accessories. About 85-90% of these units operate in the small scale sector producing spares and accessories and the balance are in the organized medium and large scale private sector producing complete machinery and their critical components. Most of the industry is located in major textile industry centers namely: Bombay, Ahmadabad, Coimbatore, Calcutta and Baroda. In terms of value of annual production, the total licensed and installed capacity of the TMI in the organized sector is estimated at Rs. 128 crores and Rs. 117 crores respectively at 1973 prices. The corresponding figures in 1974 prices are of the order of Rs. 153 and 143 crores respectively. About 68% of the installed capacity is in spinning machinery; 17% in weaving machinery and 18% in processing machinery (Annex 2).

2.02 As is the international norm in the TMI, the bulk of the production of complete textile machinery is concentrated in few firms. About 12 firms account for over 80% of the total output of textile machinery and the top 5 account for over 55% of total sales. Even then the sales volume of the largest Indian textile firm did not exceed Rs. 13 crores which is quite small by international standards. Indeed, some of the largest European firms have sales exceeding the combined total of the Indian textile machinery makers.

A. Spinning Machinery

2.03 Licensed and installed capacity for spinning machinery which accounts for two-thirds of the textile machinery is given in Table 3. This segment of the industry is reasonably well-balanced: 60% of the installed capacity is for ring frames spinning machinery, 22% for cards, 11% for blow room and speed frames; this is roughly in line with market demand and world spinning machinery production capacity.

TABLE 3

Licensed and Installed Capacity of Spinning Machinery

Machinery	Annual Capacity Licensed	Annual Capacity Installed	Value of Installed Capacity
	(Units)		(Rs. million)
Blowroom machinery	66	66	52.8
Carding Engines	2,980	2,400	180.0
Combers	60	60	12.0
Silver Lap M/c	15	-	-
Ribbon Lap M/c	15	-	-
High Speed Draw Frames	577	395	31.6
Speed Frames	631	439	52.6
Ring Frames	4,630	4,500	450.0
		Total	779.0

Source: Report of the Working Group, Task Force for the FFYP.

Based on these statistics, India has an annual capacity to produce 1.8 million spindles. Production, however, over the last decade has fluctuated between 350,000 and 700,000 spindles per year (Figure 1). The latter figure reached in 1974/75 — the best year since 1965/66 -- corresponds roughly to 11.3% of world production, and makes India the fourth largest producer of conventional ring frames after Japan, China and Italy; and ahead of the Federal Republic of Germany, Switzerland, USSR, USA and UK in that order (Annex 3). But unlike most of these countries where production is concentrated in one or two or maybe three manufacturers, production in India is fragmented among a large number of firms.

2.04 At present there are six major manufacturers which account for about 90-95% of installed capacity (Table 4). All firms have acquired their designs through collaboration agreements with leading international machinery manufacturers (Annex 4). With the exception of Lakshmi Machine Works (LMW), which started operations in 1965 as a joint venture with the Swiss firm Rieter A.G., a world leader in spinning machinery, all the Indian spinning machinery manufacturers commenced operation over a decade ago before the major changes in design and production methods in the world textile industry took place and did not substantially upgrade production methods or machinery which is still of late '50s and early '60s vintage. Nevertheless, given the differences in relative factor prices between developed and developing countries most of the machinery is acceptable only in the domestic market and some developing countries. 1/ Some spinning machinery firms also produce weaving machinery. By contrast, large international firms who are at the cutting edge of technology tend to concentrate on either spinning, weaving or finishing machinery since they involve different technologies.

2.05 Three of the leading firms which commenced before 1965 were developed by the major textile mills as part of their diversification effort into the engineering and chemical industries. This diversification was induced by the Government's positive incentive to develop these new industries as well as by the lower priority given to the organized textile industry compared to the more labor intensive handloom and powerloom segments of the industry. This strong association between the two industries assured the leading textile mills of a continuous supply of machinery whose importation was becoming increasingly difficult; and it also reduced the risk to textile machinery

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1/ A rating of the major textile machinery produced in India is given in Annex 5. The equipment is broadly classified as follows:

(i) comparable in design and quality with machinery produced in Europe and acceptable in both domestic and all export markets;

(ii) reasonably modern in design (early to mid-sixties) and of acceptable quality for the domestic market and limited export markets;

(iii) obsolete and only marginally acceptable in the domestic market.

A comparison of major design differences between major Indian and West European models as well as the Indian textile machinery industry effort to bridge these gaps is given in Annex 6.

TABLE 4

Installed Capacity of Leading Spinning and Weaving Machinery Manufacturers
(Units/Year)

Machinery	1965 Lakshmi	1958 NMM	1958 MMC	1946 Texmaco	1946 Textool	1962 Indequip	NSE	CIMMCO	Cooper Eng.	Sub-Total	Percent of total Installed Capacity
Card	-	600	3200		300					4100	91
Drawing Frame	150	120	200		96					566	95
Comber + Prep	60									60	100
Speed Frame	120	60	96	168	96					540	100
Ring Frame	480	1500		900	900	300				4080	98
Double Winder					60					60	n.a.
Cone Winder					96			60		156	n.a.
Pirn Winder	60									60	n.a.
Warper						60		60		120	80
Sizing M/C						40				40	63
Loom Auto		3000				-		1500	600	5100	77
Loom Plain								2400	1200	3600	35

Source: IDA questionnaires

manufacturers by securing sufficient orders from their associated textile mills to keep them busy for the critical first few years of operation. Unfortunately, the ready availability of orders did not force the textile machinery manufacturers to plan beyond this initial period of simple assembly of largely imported knocked down machinery. Little effort was made to develop ancillary producers, train plant personnel, or develop a strong sales organization. Consequently, as domestic content was increased, quality deteriorated and buyers' resistance compounded a depressed market. This obviously led to lower capacity utilization, meager returns and inability to upgrade product and machinery to keep pace with the rapid technological change that has taken place from the early '60s in textile machinery design and manufacturing and that has converted a large segment of the textile industry in the world into a precision industry.

2.06 Unsatisfied demand for quality machinery encouraged additional firms, most notably LMW, to enter the field despite the fact that existing firms were operating at between 30-50% of capacity. Unlike the other firms, however, LMW was based on up-to-date product and manufacturing methods that were tailored to the Indian conditions without sacrificing precision, and above all, on a dedication by both the Indian and Swiss partners to rigorous training, high quality product, effective cost control and aggressive marketing. The latter was handled by an independent company, Voltas Ltd., a leading Indian engineering firm which had sold and serviced imported Rieter machinery for many years before the same machinery was produced domestically. LMW has consistently expanded its output at the expense of other firms and at present has 25% of the market (Table 5). Its market share is particularly striking for individual pieces of machinery such as combers (100%), draw frames (67%) and speed frames (63%) (Table 6). With the manufacture of high production cards in 1976, LMW will be the only firm producing the complete range of spinning machinery of late '60s and early '70s vintage. This will obviously strengthen its position both as a leader in the domestic market and in exports where the capability to undertake projects on a turnkey basis is a great asset.

2.07 The presence of LMW, a strong competitor, has stimulated some other firms to improve their production methods and redirect their effort towards exports. The most notable example is Machinery Manufacturers Corporation Ltd. (MMC) which was taken over two to three years ago by new management. This firm doubled its production of draw frames in which it has concentrated and has exported over one-third of its output. With the exception of LMW, progressive drafting system manufacturers and components, most firms only managed to operate at 50% capacity in the boom year of 1974/75 (Annex 7); and two of them are at the point of bankruptcy. The outlook for 1975/76 is not much brighter than the recent year of 1972/73 when the industry was operating at 40% of capacity. It should be pointed out, however, that these capacity utilization figures are misleading for two reasons. First, capacities relate to figures stated in the industrial licenses where they are given in terms of the maximum number of each type of machinery that can be produced by the firm in any one year. Most firms, however, produce more than one type (or model of machinery) and more often than not part of the production facilities has to be shared for

TABLE 5

Relative Share of Spinning, Weaving and Processing M/C Market 1972-74
(Sales in Rs. million, and Share in %)

		SPINNING M/C						WEAVING M/C						PROCESSING M/C					
		1972		1973		1974		1972		1973		1974		1972		1973		1974	
	Company	Sales	%	Sales	%	Sales	%	Sales	%	Sales	%	Sales	%	Sales	%	Sales	%	Sales	%
1.	Lakshmi	59.4	23	62.2	20	123.3	24												
2.	NMM	66.7	26	77.3	24	104.7	22	17.9	24	15.6	18	25.2	20						
3.	MMC	33.2	13	44.6	13	77.9	15												
4.	Texmaco	46.7	18	53.5	18	60.4	12												
5.	Textool	5.3	2	9.8	3	17.5	4	8.4	10	9.3	11	14.8	12						
6.	Indequip			9.5	3	13.3	3												
7.	Other spinning	33.6	18	54.7	19	104.0	20												
8.	CIMMCO							19.9	25	21.0	24	21.2	17						
9.	Other Weaving							30.0	41	43.3	47	63.8	51						
10.	Maneklal													43.0	41	41.5	39	49.4	42
11.	Swastik													10.0	10	12.7	12	18.7	16
12.	Calico													12.9	12	12.6	12	13.6	12
13.	Famatex													17.5	16	16.9	16	12.6	11
14.	Other processing													22.5	21	22.2	21	20.6	19
	TOTAL	244.9	100	311.6	100	5 1.1	100	76.2	100	89.2	100	125.0	100	105.9	100	105.9	100	114.9	100

Source: IDA questionnaires

TABLE 6

Domestic Market Shares for Major Spinning and Weaving Machinery (1974)

Company \ Market Share %	Spinning								Weaving				
	Blow Room	Cards	Draw Frames	Comber	Speed Frames	Ring Frames	Cone Winder	Pirn Winder	Warper	Sizing M/c	Auto Loom	Plain Loom	Remarks
LAKSHMI	34		67	100	57	27		10					
NMM		5	13			35					50		
MMC		95	20		34								
TEXMACO						22							
TEXTOOL					9	8	79						
INDEQUIP						3			50	65			
NSE	66												
CIMMCO							12		50		44	60	
SEN								90					
ZELLATE										35			
COOPER											6	40	
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	

Source: IDA questionnaires

the production of different types of machinery, such as foundries, forges, and machine shops, and these can seldom simultaneously produce all types at the stated capacity. As such, the reported capacity usually overstates the actual production capacity. If one uses the value of machinery that can be produced instead of the quantity of machinery as a measure of capacity, most plants producing more than one product would therefore only be able to produce between 60-80% of the value of their stated capacity depending on the product mix. Secondly, it is doubtful that much of the installed capacity which has only been marginally updated since its establishment about 20 years ago, could produce quality machinery without substantial new investment.

B. Weaving Machinery

2.08 The structure and performance of the weaving machinery segment of the industry is weaker than the spinning machinery segment. According to official statistics, the industry has a capacity to produce 6,600 automatic looms and 10,200 plain looms per year. Two firms account for 70% of the more expensive automatic looms and 55% of plain loom capacity. The largest one is National Machinery Manufacturers Ltd. (NMM), which is also the second largest spinning machinery manufacturer. It has an annual capacity to produce 3,000 Ruti "B" (Swiss) type looms which was one of the best looms in the '50s and early '60s; but production has never exceeded 850 looms per year. The second manufacturer is Central India Machinery Manufacturers Co. Ltd. (CIMMCO), a diversified engineering firm, which has a capacity to produce 1,500 automatic looms and 2,400 plain looms per year based on a Japanese design (Sacomoto) of 1950 vintage. It, too, has seldom exceeded 60% of capacity. These two firms are comparable in size with medium size manufacturers in Europe and Japan (Annex 8). But as in the case of spinning machinery it is doubtful that these firms could produce at their stated capacity without major investment.

2.09 Figure 2, which gives the production of automatic and non-automatic looms, clearly shows the distinct advantages enjoyed by plain looms over automatic looms, whose production has been more or less stagnant for the last decade. This obviously reflects government policy of selectively encouraging the more labor intensive power loom industry over the more capital intensive automatic looms used by the organized sector. It also reflects the economic attractiveness of plain looms which, in 1974, cost Rs. 9,000 per piece compared to Rs. 25,000 for automatic looms, particularly given the shortage of good quality yarn that is necessary to take advantage of the labor saving characteristics of automatic looms. But if the increased demand for quality spinning machinery even during the depressed period of 1968 is any indication, the low demand for automatic looms could also reflect textile mills' resistance to purchase of unreliable looms.

2.10 The two leading loom manufacturers have made some effort to enhance the competitiveness of their automatic looms by increasing their speed and versatility (e.g. to produce canvas and terry towels). These firms recognize, however, that this is a rear guard operation, and that a meaningful increase in

speed and versatility will require extensive redesign effort for which they lack sufficient expertise. Indeed, both are seeking collaboration agreements to produce the more advanced shuttleless looms whose economic viability in capital scarce labor surplus countries is dubious. 1/ It should also be noted, that the manufacturing methods of these two firms are not suited for producing the precision required in more advanced high speed automatic looms or shuttleless looms. To capitalize on this seemingly unmet need a third firm, Lakshmi Automatic Looms, a sister firm of the successful spinning machinery firm LMW, is planning to produce annually 2,000 high speed automatic looms "Ruti C" in collaboration with Ruti AG, one of the world's leading loom manufacturers as it feels that this loom could compete effectively with both the cheaper power looms and the much more expensive shuttleless looms. Half of the production is expected to be sold locally and the rest exported through Ruti AG.

C. Processing Machinery

2.11 The value of processing machinery produced in India has grown in real terms at an average annual rate of 3% over the period 1964-75. Output grew by about 10% per year from 1964-70 to substitute for imports and to satisfy the growing demand for colorful fancy textiles. But with the process of import substitution largely completed, stagnating domestic demand and the difficulty of exporting out-of-date machinery in competition with international firms, production of processing machinery declined by 10% per year from 1971-75. Production in 1974/75 is estimated at Rs. 12 crores compared to an installed capacity of Rs. 20 crores.

2.12 Four major manufacturers account for 80% of total production, all of them located in the Bombay/Ahmadabad area. The largest one is Maneklal which produces a wide range of dry and wet processing machinery and accounts for about 40% of the total output (Table 5). It is followed by Swastik & Co. which has increased its share of total output in the last few years from 10 to 16% and exports have accounted for over one-third of this increase. The share of Famatex, India, the only manufacturer which specializes in dry processing machinery, has declined from 16 to 11%, primarily because of declining exports, showing once more that export orientation is vital, particularly in view of a stagnating domestic market.

2.13 The processing machinery industry produces a broad range of dry and wet processing machinery mostly based on design provided by the foreign collaborators. The technologies and design vary widely from maker to maker and within the product range of the individual maker. 2/ On the whole most processing machinery is suitable for the domestic and limited export markets. Only a few machines can compare in design and performance to European and Japanese machinery. This is not a wholly unsatisfactory situation because

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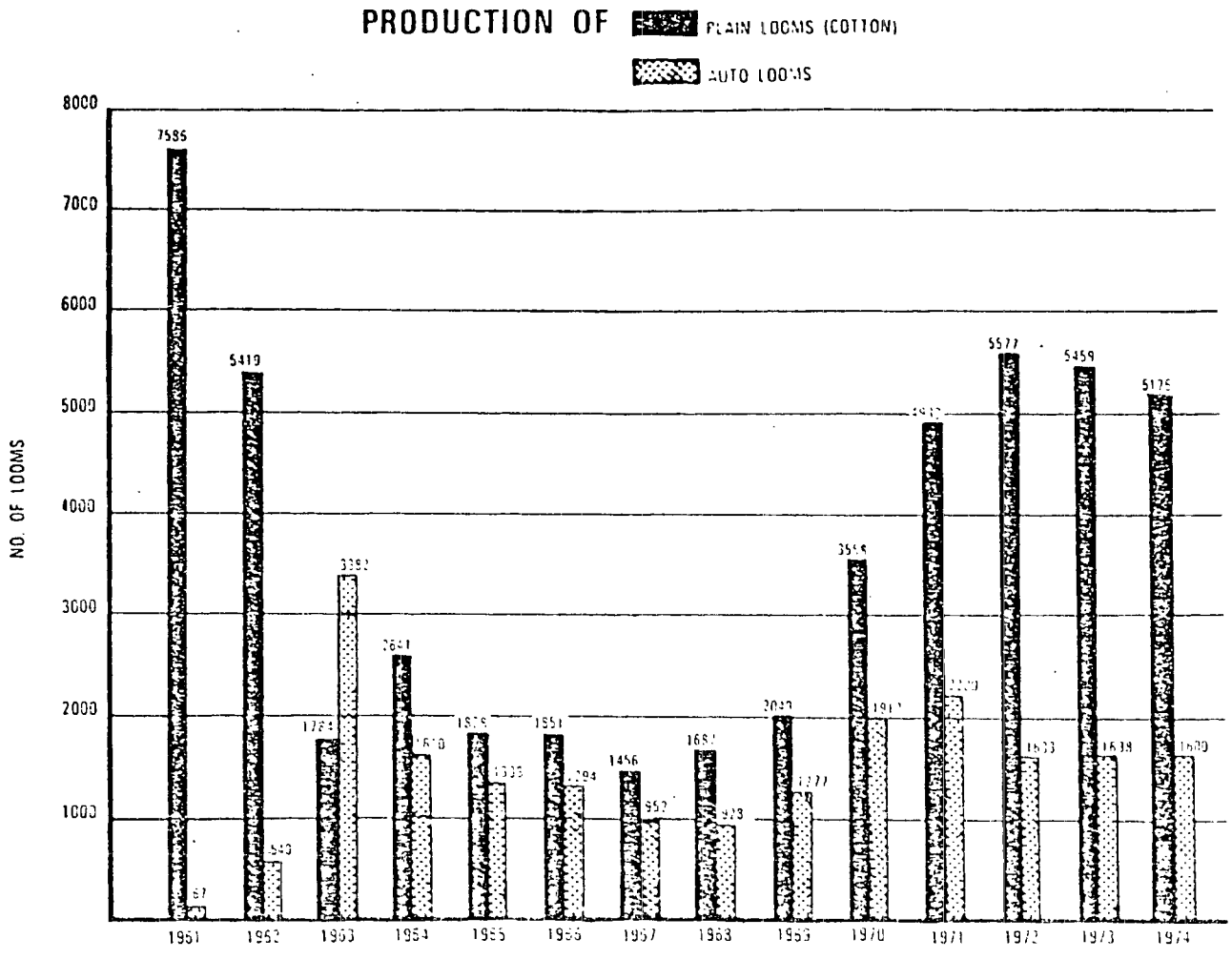
1/ A detailed discussion of appropriateness of shuttleless looms over conventional looms for Indian conditions is contained in Annex 1, paras 48-52.

2/ A list of machinery produced by each maker, the source and date of design, and suitability for export or domestic market is given in Annex 5.



Source: TMMA Annual Report 1974

FIGURE 2

many Western developments have been primarily of a labor saving nature and there are no pressing needs for such development in India. As regards the composition of output, the share of more expensive machinery such as printing and curing has grown from about 40% in 1964 to a peak of 61% in 1969 at the expense of bleaching, dyeing and mercerizing machinery which declined from 50 to 29% over the same period. This trend indicates the popularity of the colorful and fancy textiles and the gradual introduction of automation in printing and curing. This trend has, however, been partially reversed over the last few years as a result of stagnating domestic demand and the credit squeeze; printing and curing machinery account for only half of the output.

D. Ancillary Suppliers

2.14 The development of TMI ancillary suppliers (Annex 9) has lagged behind that of the TMI and consequently the TMI has suffered from inconsistent quality components and frequent interruptions of supplies. Part of the responsibility for this shortcoming rests with the TMI, which unlike international firms or even the Indian commercial vehicle industry, has not developed a strong supplier base. Instead, it relies on in-house production of a large number of components. This, plus the need to maintain large amounts of raw materials and components as a hedge against interruption of supplies, substantially increases the working capital requirement of the industry.

2.15 Of the 250-280 components suppliers - only about 10 produce components of acceptable quality in collaboration with world leaders. These include Suessen, ABC (SKF) for high drafting components and bearings, spindle inserts and jockey pulleys; Star Textile Engineering for fluted rollers; Kunal Engineering for spindles and Lakshmi Card Clothing for card clothing. But despite their rapid growth and high capacity utilization (80-100%) these firms have barely kept up with demand from both the original equipment manufacturers and the textile industry's requirements for modernization programs and spare parts. This was clearly evident during the boom year of 1973/74 when textile machinery manufacturers shipped machinery with large numbers of parts missing.

2.16 There is also a critical shortage of simple but important quality components such as rings, ring travellers, flyers, healds, reeds, shuttles and pickers. Manufacture of these items is fragmented in several small scale manufacturers using inferior quality raw materials, obsolete manufacturing methods and little quality control. The original equipment manufacturers can play an important role in developing those suppliers by providing technical and possibly financial assistance.

2.17 But there are other technologically more demanding areas whose development will require import of technical know how such as for thin walled large nodular cast iron needed in the production of high speed looms, and electronic instrumentation. Only a handful of firms are producing instruments and testing equipment which are assuming an increasingly important and critical role in improving the precision of textile machinery and the quality

of yarn and cloth; and there is still a very long way for Indian manufacturers to produce specialized instruments. In the meantime a more liberal allocation of foreign exchange to import these instruments is needed to improve the quality and utilization of Indian machinery.

E. Major Constraints.

2.18 The above discussions suggest that by international standards the Indian TMI suffers from a number of structural weaknesses. By and large, the TMI consists of small firms operating generally at 30-60% of capacity to produce machinery of 1950/60 vintage with little prospect of sustained long term growth. Few firms have developed R & D capabilities to substitute for expiring collaboration agreements. Except in a few cases the industry has not developed a strong supplier base or effective after sales service.

2.19 The basic reason for these lackluster performances is that the industry did not grow fast enough to induce the structural improvements necessary for international competitiveness. The TMI was developed primarily to cater to the local textile industry but the performance of the textile industry has been distressingly poor. 1/ Cloth output has grown at only 1% per year; accordingly per capita consumption declined by about 1% per year from 14.7 meters per year in 1963, to 12.1 meters per year in 1974. Exports fared somewhat better; they grew at an average rate of 3% per year but from a very low level. The reasons for the poor performance of the textile industry are many. Among them is the heavy dependence of the textile industry on the sluggish agricultural sector for the bulk of its raw materials and for a significant part of its sales. The Indian textile industry is still almost entirely cotton based, and a good deal of the local cotton is of extremely poor quality. 2/ The per capita consumption has consistently declined because the increase in food prices has left the rural and urban poor, who account for more than 80% of the population and 60% of consumption, with less money for clothing. The combined increase in consumption of the richer segment of the population and exports has in quantitative terms offset the decline in demand from the poorer segments, but did not provide stimulus for growth.

2.20 This lack of growth meant that the modern and more efficient segment of the textile industry could not have expanded its output without infringing on the market of the decentralized sector (hand loom and power loom) which according to official statistics accounts for 48% of the domestic market and

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1/ Annex 1 discusses the major structural characteristics of the Indian textile industry as well as the changes required to expand cloth output for both the domestic and export markets.

2/ A discussion of the effect of cotton quality of productivity of the Indian textile industry is given in Annex 1 paras. 19-26.

employs about 7 million people. 1/ The Government took a number of steps to protect the decentralized sector by restricting the growth of the organized sector, particularly in the more profitable medium and fine cloth range. But, in the absence of vigorous export incentive programs to divert the output of the organized sector from the domestic market to exports, these measures have led to a financially weak textile industry. Profitability has been quite low (about 6.5% return on capital) compared to other industries (10-18%); a significant part of the industry profit has been diverted to other industries, and its own financial structure has deteriorated with time. The debt:equity ratio, which was at 60:40 in 1963 increased to 67:33 by 1972 and about 108 private sector mills accounting for 20-25% of the output and employment of the organized sector closed down. To provide employment for roughly 200,000 displaced workers, the Government set up a public sector firm - the National Textile Corporation - to run most (103) of these "sick" mills.

2.21 The performance of the TMI would have been even worse were it not for the Industrial Development Bank of India's (IDBI) rediscount scheme which was initiated in 1965 to stimulate local industrial machinery production by providing medium term suppliers credit (5-7 years) at preferential interest rates (3-5% below commercial bank rates) up to a maximum of Rs. 5 million per year. 2/ Under this scheme machinery manufacturers discount with their bankers bills and promissory notes drawn in their favor to cover their sales to textile mills on deferred terms on the guarantee of the buyers' bankers. The machinery manufacturers' bankers, in turn, discount these bills with IDBI. In May 1975 the effective interest rate paid by the final user (textile mill) was 13.8% per year compared to commercial bank rates of 18-20% per year on medium term loans.

2.22 In the early years of the credit (1965-67) over 95% of the IDBI rediscounting facilities was used by the TMI. Gradually, other machinery producing industries began to take advantage of the scheme so that the percentage of the rediscount bills used by the textile industry fell to an average of 55% in 1968-72 and then further to an average of 40% during the last three years. Nonetheless the proportion of textile machinery purchased under the scheme has consistently increased over the years from 31% in 1967/68 to 66% in 1972/73 (Annex 10). The balance of the machinery is primarily financed by long term debt provided by IDBI and Industrial Finance Corporation of India (IFCI), and to a much lesser extent, Industrial Credit and Investment Corporation of India (ICICI). Apart from the fact that it is the cheapest financial instrument, the IDBI scheme has the added advantage of insulating textile mills from the convertibility clause included in large loans obtained from financial institutions. This clause, which was legislated in 1970 to dilute equity in large enterprises, empowers nationalized financial institutions

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1/ The credibility of the employment figure is in question. If this figure is true, then handloom weavers work only 10 minutes per day. See Annex 1 paras. 108-113 for a detailed analysis.

2/ The Rs. 5 million limit applies to the sum of the principal and interest. For 12% interest and loan maturity of five years, the principal is roughly Rs. 3.5 million.

to convert into equity up to 25% of their loans that exceed Rs. 5 million to public limited companies. This obviously inhibited firms from direct borrowings from financial institutions and made indirect borrowing from the rediscount scheme that much more attractive. But the effectiveness of the rediscount scheme has been eroded as the price of machinery has tripled and the interest rates increased by 50% from 1965 to 1974, while the limit on the amount of machinery that could be purchased in any one year (Rs. 5 million including both principal and interest) has not changed.

2.23 In addition to the restricted demand from the textile industry, the TMI has been laboring under a number of handicaps. Shortage as well as erratic supply of power has been the major constraint over the last three years and has particularly affected southern states where 75-100% power cuts were not uncommon in 1972-74. Most firms have modified their processes to conserve electricity and have set up their own generating capacities, but the cost of power internally generated is three to four times higher than the price of grid power.

2.24 For at least the time being, raw material availability is no longer the acute problem it was for the last few years but inconsistent quality and an erratic supply of primary raw materials such as coke, pig iron and some alloy steels persists. 1/ Among the products that were in short supply from 1969-74 were stainless steel, mild steel, pig iron, coke, free cutting steel, and other raw materials and components such as ball bearings, ball bearing steel, nickel magnesium, alloy aluminum rods and spindles, drafting materials, electronic relays, resistance switches for control panels, tin sheets, argon, and tubes of required size and specifications. Recent liberalization of the import licensing system which enables firms to import up to 5% of their Actual User's License and 10% of the Import Replenishment License without restrictions has considerably eased the difficulties associated with temporary shortfalls in domestic supply. Currently, the major industry import requirements consist of stainless steel and special alloy steel. The foreign exchange requirements for these items are around Rs. 12 crores or 10-12% of the value of the machinery produced.

F. Plant Operations.

2.25 The mission visited 20 of the leading textile machinery manufacturers. (Annex 11). These include, (i) 10 plants producing spinning and weaving machinery which account for 90% of the spinning and 60% of weaving machinery produced in India, (ii) 5 manufacturers producing 80% of the processing machinery, and (iii) 5 manufacturers producing critical ancillary components such as drafting systems, fluted rollers, spindles and card clothing.

1/ Problems associated with availability, quality, allocation and distribution of these raw materials and recommendations to alleviate resulting difficulties have been discussed in two earlier reports on the Indian forging and foundry industries (Reports 432-IN and 433-IN respectively - April 25, 1974).

2.26 The most striking observation is the wide difference in performance among individual firms. Of the 20 firms visited about 3-4 firms are internationally competitive quality and price wise; 6-7 could become internationally competitive in 2-3 years if an effective action program to upgrade machine design, manufacturing methods and marketing is implemented; while the remaining 10 firms could not have survived in a competitive environment and will require substantially more time and effort to overcome major structural deficiencies. Indeed, it might be preferable if some of these firms discontinue production of textile machinery and concentrate on their other products instead; that should reduce the fragmentation of the industry and reinforce the other firms by providing them with a much needed larger domestic market base to sustain their modernization and export expansion plans.

2.27 Of the spinning machinery manufacturers only LMW, which accounts for 25% of total sales, produces and markets a complete range of internationally competitive machinery and supports its products with an effective after sales organization; a second manufacturer, NMM, accounting for another 25% of the market has drawn up a program to upgrade its manufacturing, and could become internationally competitive provided it implements its program and supports it with an effective marketing organization; two other manufacturers will require a much larger effort over a longer period of time to revamp and reorganize their production facilities, upgrade products and develop sales and after sales services. The remaining two weakest firms are experiencing considerable difficulty to stay afloat even in the heavily protected domestic market.

2.28 The major gap in TMI lies in weaving machinery particularly weaving preparatory machinery and looms. Existing machinery are adequate for the domestic market, but have very little export potential, and it is doubtful that existing manufacturers could produce more sophisticated equipment such as shuttleless looms using the existing manufacturing facilities and management systems, particularly as exports will be absolutely essential to support the small domestic market.

2.29 For processing machinery, only Maneklal has the manufacturing capability to produce a wide range of quality machinery; but generally out-of-date designs are likely to inhibit export growth particularly in view of the intense international competition. The other processing machinery manufacturers will continue to play an important role in the domestic market but it is unlikely, given their size and product range, that they can export on a sustained basis. Most of the ancillary producers visited are small to medium in size, and by and large, well managed firms with considerable potential for growth both in the domestic and export markets.

2.30 In the next paragraphs the principal features of plant operations are briefly reviewed. By necessity, a summary of this type can only touch on the major factors affecting the firms' competitiveness. Evaluation of major manufacturers' operation and recommendation to improve them are given in the consultant report which was sent to the firms concerned.

1. Product Range, Design and Planning:

2.31 With the exception of the three leading spinning equipment manufacturers (LMW and NMM in short staple fiber and Lagan in jute) and the ancillary producers which specialize in textile machinery all firms visited produce a wide range of industrial machinery. This obviously has the advantage of insulating the firms from the cyclical demand of textile machinery. But in most cases it has overstretched already thin managerial capabilities to the point where it has adversely affected the textile machinery operations. Indeed, the firms that have specialized in textile machinery have the highest capacity utilization and higher return on capital.

2.32 As regards product design, most products were based on design acquired from leading international firms in the '50s and '60s. A stagnant and protected domestic market, difficulty in developing local ancillary suppliers and a strict import licensing system provided little incentive for firms to upgrade design at a time when the textile machinery in the world was undergoing very rapid technological change which has lead to greatly sophisticated machines running at greatly enhanced speed and production. The result was that most Indian firms which commenced in the '50s and early '60s produce machinery that has limited export potential. The entry of LMW with a competitive product range in 1965, plus the realization that exporting is essential for growth, has stimulated the other firms to upgrade their designs. Most of this effort (detailed by firm in Annex 12) was directed at redesigning components to meet Indian conditions, marginally increasing the speed of existing machines and adapting machines for other than their original purpose, i.e. cotton ring frame for worsted spinning or doubling; and copying the design of an imported machine with some modification to suit the Indian market or the manufacturers' machine tools.

2.33 Most Indian firms, however, lack the expertise and the finance to support a sustained R & D program. Only one Indian firm has spent more than 1% on sales in R & D compared to 2-5% spent by much larger international firms. Indeed, the pace of technological change is such that it is taxing the capabilities of the world's largest textile machinery manufacturers. For example, it is estimated that it took 500 Russian and Czech scientists and engineers seven years to produce the first commercial open-end spinning machine. Even the three largest Western European spinning machinery manufacturers (Platts in UK, Rieter AG in Switzerland and Ingolstadt AG in Germany) could not individually support an R & D program to compete with this new spinning machinery and have joined together, with the financial support of their respective governments, in a collaborative R & D program to build on the license purchased from the Eastern European industry.

2.34 In early 1975 the Indian industry started an R & D program and will contribute Rs. 600,000 per year to research institutions that can support the development of the TMI. The Textile Machinery Manufacturers Association (TMMA) has started a dialogue with the textile industry research associations and the Council for Scientific and Industrial Research (CSIR) to lay down the guidelines for allocating this sum as well as a matching

grant from the CSIR. Initially, the research fund will go to develop the infrastructure of these research institutions. Later on, a program for R & D will be formulated jointly. An initial program is expected late in 1975. The experience of developed countries suggests that research institutions have been most effective in solving specific problems or designing specific components such as hydraulics, metallurgy, air bearings as well as adapting certain areas of machinery such as drafting systems to different fiber uses. But this effort should only complement and not substitute for developing the capabilities of the individual machinery manufacturers which have to retain responsibility for machine and system design.

2.35 In view of the small size of Indian firms, limited finance and design and engineering capabilities, as well as the vast technological gap that separate them from international firms, the most economic alternative would still be to import designs. But this arrangement will be of little value in broadening the industry's technological base unless it is coupled with upgrading manufacturing capabilities, training programs and marketing organization. Only then can the Indian firms increase their exports and grow to the extent where they can acquire the base to continuously upgrade their machinery either on their own or in collaboration with international firms.

2. Manufacturing

2.36 With three or four exceptions, manufacturing lags behind similar activities in Western Europe and Japan. Plant sites and buildings are generally good and in many cases excellent. But plant engineering leaves much to be desired. Ten of the 20 firms visited had their own foundries. With one exception, they are in poor condition with old and ill-maintained melting, molding handling and fettling equipment. Pattern making and core making were of slightly better standards, but pattern storage was usually poor. This obviously led to high rejection rates and poor quality castings.

2.37 Machine shop layouts in the newer plants are generally good. This is not the case of the older plants, especially the sections producing specialized products such as spindles, rings and fluted rollers where the installation of the infrequently modern machine tool or alternation of processes necessitated by indigenous substitution of raw materials has thrown original layouts out of pattern. With few exceptions, machine tools and equipment are 10-25 years old and in poor condition due to both difficulty of importing spare parts and bad maintenance. This is particularly so in the heavy machine tool sections where little if any replacement has taken place. Single purpose, non-automatic light machine tools dominate throughout, with consequently variable operator workmanship. In the early 1950s, when most Indian firms commenced manufacture, machinery was of low speed simple construction and had remained virtually unchanged for the previous 50 years. For these models, and with abundant cheap labor, the original machine tools were adequate. In the early 1960s there was a revolution in textile machinery design leading to machines 3-4 times faster than the 1950 models. Within a few years this sophistication in design had outmoded all existing machine tools, as tolerances became critical, and extensive investment in re-tooling became the order of the

machinery has become so sophisticated that, as an example, the world leader in shuttleless loom manufacture insists that textile mills buying their machinery set up training schools for its operatives. It is therefore advisable that Indian supervisory personnel be sent for regular training abroad. Close liaison and training is also necessary between TMI companies and their respective sub-contractors or ancillary suppliers of components. It is impossible for the original machinery maker to produce quality products if bought-out components are of inferior quality. Continued two way visits between suppliers and original machinery manufacturers, on an organized basis, are highly desirable.

2.46 In many factories, the working conditions in foundries and machine shops are very poor with overcrowded conditions, poor ventilation, excessive heat and lack of adequate lighting. Power cuts are in some cases responsible for lack of lighting and air movement by fans. Labor safety is generally even worse. There is a short supply of protective helmets, eye goggles, and some workers work without shoes in dangerous areas. Simple aids for handling heavy components reducing worker fatigue are scarce.

5. Marketing

2.47 Marketing, which consists of market research, sales, erection, commission and after-sales service, ranks with product design and product quality as the most important determinant of performance in capital goods industries. It is precisely the consistent integration of these three functions that has enabled Swiss and German textile machinery manufacturers to compete with the much lower priced Japanese machinery in East Asia. In India, only about 40% of the textile machinery is marketed by similarly well equipped firms or agencies. These include Voltas Ltd., Star Marketing & Services and Associated Textile Engineers. The most notable among them being Voltas Ltd. which was entrusted by LMW to perform its marketing function. In addition to erection and commissioning, Voltas Ltd. trains operators and undertakes periodic maintenance under contract from textile mills. Spare parts are also equitably priced to induce textile mills to purchase original equipment parts rather than using cheaper but inferior quality spare parts that adversely affect machine performance and hence the manufacturer's reputation. This forward looking marketing strategy has paid off handsomely as witnessed by the order backlog of several years production, of which 18 months is for exports and this despite the fact that firms have to pay 10% down payment on order. The present position is expected to be further strengthened by completing the range of spinning machinery by starting to produce carding engines in late 1976. This will enable LMW to independently supply, erect, commission and maintain projects on a turnkey basis; this is particularly important for its major export markets in developing countries.

2.48 Most of the other large textile machinery manufacturers have their own marketing organizations but unfortunately their performance leaves much to be desired. Often, their marketing function is substantially terminated with the sale of machinery. Machines are frequently shipped with a large number of parts missing. To reduce prices, erection and commissioning is left to the textile mills, irrespective of whether mills can competently do this or not. Moreover, because of antiquated, and sometimes ill-maintained, machine

tools the manufacturers cannot enforce strict standards and textile mills have no assurance that spare parts will fit original equipment. Hence there is a distinct disincentive on the part of textile mills to undertake preventive maintenance programs as it is easier to wait for parts to fail and then replace them with generally low priced components produced by independent suppliers using low quality raw materials. This laxity in enforcing quality control, plus the inordinate delays in delivering spare parts has been particularly detrimental to Indian textile machinery makers in export markets. A number of firms have taken steps to correct these deficiencies but this effort needs to be intensified. The inspection wing of the Textile Committee 1/ has been empowered to enforce quality standards for 18 critical items but persistent complaints suggest that this function needs to be considerably expanded and strengthened.

6. Finance

2.49 The financial performance of the TMI has substantially improved as a result of the two very good years of 1973 and 1974. The largest beneficiaries were the weaker firms that were able to substantially increase their output because the better firms were already operating at full capacity. This should give a hefty cushion to weather the difficult years ahead. The most profitable firms in the industry remain the producers of critical components (spindles, ball bearings, drafting systems etc.), with profit and sales ranging from 10-20% and a return on capital of 15-18% compared to 0-50% for the integrated machinery manufacturers (Table 7). This reflects the recent spurt in import substitution in those items as well as the fact that this segment of the industry is less prone to frequent fluctuation in demand. It supplies the original equipment manufacturers during the boom periods and supplies textile mills with spare parts for their less expensive conversion and rehabilitation programs during the lean years.

2.50 As would be expected there is wide variation in performance among individual machinery manufacturers. The best performer was once more LMW with a return on capital of 32% in 1973 and 50% in 1974. The fact that this took place with lower profit margin on sales reflects both the increase in labor and capital productivity (capital/output ratio dropped from 3 in 1972 to 2 in 1974). But because of heavy corporate tax and large interest payments on debt incurred in connection with continued expansion the return on equity improved only marginally from 11 to 13%.

2.51 Despite the large increase in raw material and component prices during the last three years most firms maintain a healthy liquidity with current ratios seldom dropping below two. But the debt/equity position of weaker firms is precarious and averages about 75:25 which casts doubts on their ability to undertake without a substantial infusion of capital, the

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1/ This committee was constituted by the Government under the aegis of The Textile Commissioner's Office to set and enforce quality standards on textiles and textile machinery produced in India.

TABLE 7

Financial Ratios for the Textile Machinery Manufacturing Industry

	Firms	Rate of Return on Capital 1/		Rate of Return on Equity 2/		Current Ratio		Debt/Equity Ratio		Financial Year 3/	
		Year 1	Year 2	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
1.	LMW	32	50	11	13	2.28	1.85	46/54	51/49	1972/3	1973/4
2.	NMM	8	6	5	1	2.20	2.11	58/42	63/37	1972/3	1973/4
3.	MMC	3	8	0	0	2.88	1.98	83/17	83/17	1972/3	1973/4
4.	Texmaco	9	11	18	17	2.78	2.21	80/20	77/23	1972/3	1973/4
5.	N.S.E.	12	18	5	59	1.89	1.67	55/45	49/51	1971/2	1972/3
6.	CIMMCO	6	11	11	23	3.18	2.75	77/23	73/27	1972/3	1973/4
7.	T. Maneklal	24	20	12	10	1.67	1.66	46/54	49/51	1972/3	1973/4
8.	Famatex	46	27	20	55	1.84	1.41	78/22	73/27	1971/2	1972/3
9.	Star	19	27	13	20	2.54	2.02	73/27	67/23	1972/3	1973/4
10.	Suessen	13	20	11	15	2.63	1.97	51/49	54/46	1972/3	1973/4
11.	LCC	21	83	10	34	6.75	3.00	56/44	50/50	1972/3	1973/4
12.	M.K. Spindle	144	50	25	20	1.60	1.07	67/33	58/42	1971/2	1972/3

1/ Defined as (Profits Before Tax plus Interest) divided by (Working Capital plus Net Fixed Assets)
2/ Defined as (Profits After Tax) divided by (Paid Up Capital plus Reserves and Surplus)
3/ Most recent years for which data is available.

Source: Firms' Annual Reports

large scale modernization programs that are needed to upgrade product design and manufacturing methods to compete on the domestic and export markets.

G. Prices, Cost Structure and Cost Competitiveness

2.52 Prices of Indian textile machinery have sharply increased over the last two years as they have all over the world. Over the last two years price increases have ranged from 35% for automatic looms to 233% for plain looms, (Table 8); on the average prices have increased by 65% (roughly 2% per month). It is difficult to identify the reason for the wide variation in price increases for different types of machinery. Difference in raw material requirements explain part of the variations but discriminatory pricing policies in some areas also contribute. It is noteworthy that the presence of competition, particularly from LMW, which prices its products on a cost-plus basis rather than on what the market will bear, has had a salutory effect on prices (Table 9) Given the rapid price increases machinery manufacturers did not conclude any fixed price contracts with textile mills. The latter, on the other hand, were particularly reluctant to purchase machinery without firm prices, since in some cases prices were arbitrarily determined and bore little relation to cost increases. To reconcile these two positions the TMMA and the Indian Cotton Mill Federation have evolved price escalation formulae relating price of machinery to increases in prices of raw materials, power, interest rates, and wages.

TABLE 8

Price Trends of Major Indian-made Machinery
(Rs.)

	1973	1974	1975	Increase in price 1973-1975 (%)
Blow Room	n.a.	1,100,000	1,300,000	18 /1
Carding Engines	43,400	58,000	81,000	86
Draw Frames	57,000	70,100	85,800	51
Combers	230,000	263,000	317,400	38
Speed Frames (108 spindles)	150,000	186,000	258,100	72
Ring Frames (440 spindles)	106,000	126,600	196,000	85
Automatic Loom Ruti B	24,300	29,300	37,000	35
Automatic Loom CIMMCO	11,900	12,900	23,900	200
Plain Loom CIMMCO	3,600	5,200	8,400	233

/1 1974/75.

Source: IDA questionnaire.

2.53 The determination of prices and cost competitiveness of capital goods is normally a difficult exercise since international prices are usually influenced by the size of the manufacturer's domestic market, marginal cost

TABLE 9

Machine Prices 1975

Machine	LAKSHMI in Rs.	N.M.M. in Rs.	M.M.C in Rs.	TEXMACO in Rs.	TEXTOOL in Rs.	N.S.E. in Rs.	CIMMCO in Rs.	PLATT SACO-LOWELL in US $	PLATT SACO-LOWELL in Rs	RIETER Sfr.	RIETER in Rs.
Blowroom	1,300,000					1,400,000		371,665	2,960,000		
Cards		81,000 S.H.P. (96,000) 1/	CVHP 94,900 HP 110,400 (160,000) SHP 73,100 (120,150)					35,993	287,944		
Drawframe	85,800	77,500 (96,000)	85,200 (115,000)					24,586	196,688	50,000	150,000
Sliverlap	182,000									80,000	240,000
Ribbonlap	209,000									100,000	300,000
Comber	317,400									120,000	360,000
	258,100										
Speedframe (108 Spindles)	240,600	260,000 (300,000)	244,000 (330,000)		168,000			78,536	628,288 (96 Spi)	180,000	540,000
Ringframe	196,000	216,000		150,000	152,700			57,486	459,888	115,000	345,000
Doubler				110,000	108,350						
Loom Auto**		32,700 (38,920)					23,900				
Loom Plain***		-					8,400				
Winder					131,700		151,000				
-Doublewinder					152,700		195,000				
Warper							195,000				

1/ Parenthesis denotes f.o.b. export prices

Remarks:

* Blowroom comprising: 3 - 442 blenders 1-4432 blender 1 distributor 2 delivery wheels 1 - fan 1 - conveyor belt 1.520 ultra and fans 2 - 462 hopper feeders cleaner 1 delivery wheel and fan 2 - 560 scutchers with 581 lap doffers 1 - 521 ultra cleaner 1 air steam cleaner necessary control panels and filters

**64" Reedspace Platt Rovematic speedframe

*** 48" Reedspace Platt Ring-frame 3" Gauge 408 Spindles

pricing of exports, and by the fact that machinery is seldom identical in design and performance. This is particularly true of textile machinery where a substantial part of the machinery is sold as part of turnkey projects or where machinery quality, reputation for effective after-sales service, and terms of supplier's credit are important considerations in evaluating prices.

2.54 The Mission's analysis of competitiveness of the Indian TMI is carried out in two steps. The first step involves a comparison of machines produced by the leading Indian textile machinery firm, LMW, and the same machines produced by its Swiss collaborator Rieter with a view to identifying the sources and extent of Indian comparative advantage. The second step involves a comparison between LMW and other Indian manufacturers to determine the effect of modern manufacturing methods, training, and sales and after-sales service on the cost structure and profitability.

2.55 There is a large difference between domestic prices of Indian machinery and the prices of equivalent Swiss machinery (Table 9). In 1974 prices of Indian machinery were roughly half those of Swiss machinery for ring frames, speed frames and draw frames which are being produced in India in a sufficiently large production run to take advantage of economies of scale. Combers, however, which have only recently been produced in small quantity in India and still have a large import content on which the manufacturer has to pay 40-220% duties on imported components are only 20% cheaper than Swiss machinery.

2.56 A more realistic view of price and cost competitiveness can be obtained by comparing the f.o.b. prices of Indian exports and those of the Swiss manufacturer which exports over 75% of its output. Export prices for Indian machinery are about 20% higher than domestic prices on account of higher import content to replace off quality Indian components, more rigorous quality control, packaging, internal transportation and more expensive marketing effort. Even on this basis Indian prices are still 40% cheaper than Swiss prices for ring frames, speed frames and draw frames, and 5% cheaper for combers.

TABLE 10

Comparison Between Indian and Foreign Cost Structure
(1974/75)

	Foreign	Indian 1/	Difference	
			Absolute	Relative
				%
Sales Price	100.0	60.0	40.0	40
Raw Material	40.0	28.0	12.0	30
Labor	11.0	2.2	8.8	80
Overhead & Salaries	18.0	7.3	10.7	55
Sales and Royalties	7.0	6.0	1.0	12
Depreciation	7.0	3.0	4.0	55
Interest	4.0	1.5	2.5	63
Profit before tax	15.0	12.0	3.0	20

1/ Most efficient Indian manufacturer

2.57 Comparison of the top Indian and foreign manufacturers' cost structure (Table 10) suggests that the Indian manufacturers have a substantial advantage in all factors of production. Raw materials which normally make up 40-55% of the cost of machinery account for 30% of this difference which stems from the fact that in 1974/75 Indian steel was 30-40% cheaper than European steel and 10% cheaper than Japanese. This advantage has been cut by half in recent months as steel prices in developed countries have declined due to the recession. The largest Indian advantage, however, lies in labor input (both direct and indirect) and overheads, which together account for half the price differential between Indian machinery and its European counterpart. This is in spite of the fact that Indian plants are, by design, less capital intensive and require 50-70% more labor than Swiss plants producing equivalent machinery. But lower wages (one-tenth to one-fifteenth of European wages) and high productivity resulting from intensive training, more than make up for the larger labor input. The lower capital intensity in Indian plants is also reflected in lower depreciation and interest charges and enables Indian manufacturers to combine both capital and labor advantage.

2.58 Given the substantial price and cost competitiveness enjoyed by Indian manufacturers one would have expected them to use their excess capacity to capture a larger share of the growing African, Asian and Middle Eastern markets. The leading Indian manufacturer which has been expanding at a rate of 15-20% per year has a large domestic order backlog and usually comes under severe pressure from the Indian textile industry if it does not give the domestic market first priority. The other manufacturers on the other hand cannot produce quality machinery because of obsolete equipment and production methods, ill-trained labor and ineffective after sales service.

TABLE 11

Comparison of Cost Structure of Three Classes of Manufacturers
(1974)

	Efficient	Intermediate	Inefficient
Prices	100.0	100.0	100.0
Raw materials and Components	46.1	56.1	51.7
Labor	3.7	12.0	27.2
Manufacturing expenses and overheads	12.4	13.3	12.1
Sales Expenses	9.8	6.0	1.6
Depreciation	5.1	2.6	0.8
Interest	2.5	4.0	5.3
Profit before Taxes	20.4	6.0	1.3
	100.0	100.0	100.0

2.59 This is clearly reflected in the above comparison of three types of Indian manufacturers namely: (i) an efficient firm producing up to date

machinery using modern manufacturing methods; (ii) an intermediate firm producing relatively modern equipment using 1940s and 1950s production methods; and (iii) manufacturers using 1940 production methods to produce 1950 machinery. A number of observations are fairly striking. First, that the high capital charges that the modern manufacturer has to pay are far outweighed by its lower labor costs and lower rejection rates as reflected in lower raw material costs. Second, despite lower prices, higher royalties and sales expenses, the efficient firm still manages to make a profit before tax of 20% over sales compared to 1.5% for the inefficient producer and 6% for the intermediate one. The conclusion is fairly obvious. Modernization programs covering improved designs, plant machinery, and training programs are urgently needed and will pay off handsomely. But these programs will be fairly expensive and might be beyond the financial resources of some of the inefficient firms whose financial structure is already strained and where management methods are not suited for production and sales of precision machinery. Fortunately these firms produce machinery other than textile machinery and should concentrate on such other machinery. Their exit from the textile machinery market could in fact improve the prospects of intermediate firms by enlarging their markets and making their modernization programs that much more easy to accomplish. It would, therefore, be counterproductive, in the long run, for the Government to bale them out or take them over as it is currently doing.

III. EXPORTS

A. Export Record

3.01 The TMI has one of the best export records among the Indian engineering industries. Exports have increased from Rs. 1.1 crores in 1968/69 to Rs. 15.5 crores in 1974/75 and now account for 17% of the total TMI output compared to 3-4% for the other engineering industries (Table 1). Most of the increase took place in 1974/75 where exports increased by Rs. 10 crores. The world demand for textile machinery in 1973/74 had fast surpassed capacities of international firms and delivery dates of up to three years at prices that were increasing by 30-50% per year were common.

3.02 The Indian TMI took advantage of its short delivery dates (six months to one year) and low prices (20-30% below international prices) to penetrate this difficult market where manufacturers' reputations fetch a high premium. Indian manufacturers consider this price differential as the initial price to pay to penetrate a market dominated by large international firms with a reputation for high quality products delivered on time and supported by efficient erection, commissioning, and after-sales service.

3.03 One of the most encouraging aspects of the TMI's export record has been its expanding base. Over 25 firms exported in 1974 compared to only 10 in 1968, and whereas only one firm had exported 10% of its output in 1970, 6 of the leading firms surpassed that level in 1974 and one firm, MMC, has

exported over one-third of its output (Table 12). The latter performance is particularly remarkable since MMC has only recently been acquired by one of the leading engineering groups in India after a very weak performance and is in the process of modernizing its facilities and management systems. The industry has also considerably expanded its markets. In the early years exports went primarily to countries with which India had bilateral trade agreements, such as Egypt, Poland, Czechoslavakia and USSR. In 1973/74 most of the machinery was sold either in Korea, Taiwan and Hong Kong in competition with international firms, or to provide equity participation to Indian entrepreneurs in new textile mills in Malaysia, Singapore and Indonesia. Some of the better firms have even exported machinery and parts to the F.R. of Germany, Switzerland and Japan.

TABLE 12

Exports of Leading Textile Machinery Manufacturers (1972-75)
(Sales in Rs. million)

Company	1972/73			1973/74			1974/75		
	Total Sales	Export Sales	%	Total Sales	Export Sales	%	Total Sales	Export Sales	%
1. LMW	59.4	2.4	4.0	62.2	2.8	4.2	123.3	23.2	18.8
2. NMM	84.6	2.2	2.6	92.9	5.1	5.5	129.9	29.2	22.4
3. MMC	33.2	3.1	9.3	44.6	.3	0.7	77.9	26.8	34.4
4. Texmaco	46.7	2.2	4.7	53.5	na	na	60.4	10.3	17.0
5. Textool	13.7	0.3	2.1	19.1	na	na	32.3	2.9	9.0
6. CIMMCO	19.9	0.3	1.5	21.0	.1	0.4	21.2	0.4	1.8
7. Maneklal	43.0	4.5	10.4	41.5	.2	0.4	49.4	0.3	0.6
8. Swastik	10.0	0.1	1.0	12.7	.2	1.5	18.7	3.0	16.0
9. Famatex	17.5	3.3	18.8	16.9	2.0	11.8	12.6	0.2	1.6
10. Calico	12.9	0.1	0.7	12.6	1.0	8.0	13.6	0.1	0.7

Source: IDA questionnaire.

B. Export Prices, Incentives and Profitability

3.04 Unlike the industries the Bank has previously surveyed (commercial vehicles, tractors, foundries and forgings) the f.o.b. export price of Indian textile machinery of relatively modern design is 15-25% (and sometimes 50%) higher than domestic prices (Table 9). On the other hand, export prices of older models are roughly 10% lower than domestic cost. The relatively higher export price should not, however, be construed as windfall profit for Indian manufacturers. First, the need to maintain quality forces manufacturers to substitute more expensive imported components for low quality local components. Second, packaging and inland transportation adds 5% to manufacturing costs and the export marketing effort adds another 5%. Of more significance, however, are the terms of payment. Unlike domestic sales prices which are based on a cost escalation formula agreed upon by the TMI and the textile industry and which takes into account price increases in raw materials, power

and wages, export sales are based on fixed prices. This was obviously a major attraction to foreign buyers in 1973, since few international firms quoted fixed prices because of long delivery dates and rampant inflation. This meant, however, that Indian manufacturers had to absorb the cost increases which in 1973/74 were of the order of 10-20% over the six to nine months in which machinery had to be delivered. In total, manufacturing cost of exports are generally 20-30% higher than for the domestic market compared to only 10-20% price surcharge on exports.

TABLE 13

Comparison of Profitability of Domestic and Export Sales
(%)

	Domestic Sales	Export Sales
Sales Price	100	120
Cash Assistance (10% of f.o.b. price)	-	12
Duty Drawback	-	6
Total Realization	100	138
Production Cost for domestic version	85	85
Additional cost of imported components	-	10
Additional marketing cost	-	5
Packaging and Inner Transport	-	5
Price Escalation	-	15
	85	120
Profit	15	18

3.05 The difference between these two figures is supposed to be covered by the export incentive system which consists of: (i) duty drawback of import duty and excise duty paid on raw materials and components used to produce the machinery, (ii) cash assistance equal to 10% of the f.o.b. export price of machinery to compensate manufacturers for taxes paid on local inputs, and (iii) import replenishment entitlements in free foreign exchange amounting to 20% of the f.o.b. value of exports to cover the import content of the machinery. The relative flexibility associated with the use of import replenishment licenses makes them highly attractive and they therefore command a premium of 10-20% of the nominal value when sold. Translated into monetary terms the total incentive package is equivalent to 20-25% of the f.o.b. value of exports as shown in the table below, thus making exports marginally more attractive than domestic sales for the efficient firms (Table 13).

C. Export Credit

3.06 The Government also provides medium to long term export credit through the IDBI and commercial banks (which rediscount their export loans with IDBI with a 1.5% spread) at a preferential interest rate of 7.5-8%. Loan maturity ranges from 3-10 years depending on the size of the loans and competition from alternative sources of supply, the average being about 7-8 years (Annex 13). Advance downpayment is expected to cover the foreign exchange content of exports and is usually of the order of 15% of the f.o.b. value of exports. Supplier's credit is guaranteed by the Export Credit Guarantee Corporation (ECGC) which insures exporters against political and commercial risks. But the exporters carry the foreign exchange risks; which worked to their advantage in the last few years, and should not pose an adverse risk in the foreseeable future. The total value of all export credit sanctioned up to June 1975 was about Rs. 150 crores, of which the textile machinery was the largest single recipient (Rs. 30 crores) and accounted for 20% of total export finance (Annex 13). This financed roughly 60% of total textile machinery export; the balance consisting of down payments or export order financed largely under bilateral trade agreements. In total, the export package, though less competitive than credit terms offered by OECD countries in general, and Japan in particular, seems reasonable in view of India's price competitiveness.

D. Export Consortium

3.07 An important consideration in selling textile machinery, particularly in developing countries is the ability to supply complete plants on a turnkey basis, since textile mills in developing countries generally prefer to have one principal source of supply. With the planned production of carding engines in 1976, LMW will be the only Indian textile machinery firm capable of supplying complete spinning mills. Other manufacturers participate in an export consortium under the aegis of the Project Engineering Corporation, a division of the public sector import and export company, the State Trading Corporation (STC). This consortium negotiates export prices, arranges for export finance and divides the export orders among Indian manufacturers. STC has secured a number of large export orders, notably in Egypt and Korea. But a number of functions remain unfulfilled. Most notably, there has been a lack of follow up on sales to ensure that quality and delivery dates are adhered to and that erection, commission, and after-sales service are adequately carried out. These weaknesses have led to a number of costly errors that have tarnished the reputations of Indian manufacturers. Indeed there are several instances where customers would on no account purchase Indian machinery however cheap prices are offered. And presumably it is for this reason that the leading Indian manufacturer who is justifiably jealous of its reputation has refused to participate in the export consortia for Korea and Bangladesh after a sad experience in Egypt.

3.08 Prime responsibility for correcting these deficiencies and restoring the reputation of the Indian industry rests with the individual firms concerned. Their task has been simplified by the recently liberalized and streamlined

procedures for export of spare parts and service personnel so that personnel and spare parts could be flown to foreign customers on a day's notice. Previously, delays of 3-4 weeks were common.

E. Prospects and Problems

3.09 The export prospects for 1975/76 are good. As on April 1, 1975 industries had orders for Rs. 24 crores of which Rs. 18 crores are expected to be fulfilled in 1975/76. The prospects for significantly increasing exports during the next two years are, however, not bright due to intense competition from international firms that are operating at only 60% of capacity. Furthermore, the decline of Japanese and European steel prices relative to Indian prices has shaved off half the 20-30% price advantage enjoyed by the Indian manufacturers during 1974.

3.10 The longer term potential is nevertheless encouraging. The world trade in textile machinery has been growing rapidly and will continue to do so, though at a slower rate. Textile machinery exports of OECD countries have grown from US$2,460 million in 1971 to US$3,400 million in 1972 and US$4,200 million in 1973, of which roughly 50% was imported by developing countries (Annex 14). Indian exports have thus hardly scratched the surface (0.3% of total developing countries' imports) and could considerably expand, particularly in South Asian countries where Indian exports are not restricted by their collaborators. 1/ A doubling of exports from Rs. 15 to Rs. 30 crores in a period of three to four years should be a meaningful target. This corresponds to roughly 20-25% of planned production which the leading firms have suggested as a reasonable figure to counteract the adverse affect of the frequent fluctuation in domestic demand. In addition to geographical location and lower prices, India has the added advantage of being able to supply a large number of qualified personnel to help erect, commission and run textile mills at a fraction of Japanese and West European costs. For example, Star Trading Co. -- the export marketing arm of the Star Group of textile machinery firms -- has executed, in its capacity as prime contractor, large turnkey projects in Libya and Sudan that have generated a total of Rs. 43 million over the last three years. Furthermore, there is an active Indian community in South Asian countries and a number of Indian entrepreneurs are setting up textile mills in these countries and using Indian machinery as their equity participation.

3.11 The conversion of these opportunities into orders will require important structural changes. Manufacturers have to upgrade their design and modernize their facilities to bring about badly needed improvement in performance. Similarly, efficient erection, commission and after-sales service must be meticulously executed; only then can damaged reputations be repaired and initial markets consolidated and expanded. This will also require careful market research and planning. So far only LMW has any clear marketing strategy. To demonstrate its capabilities it is planning to build

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1/ European firms usually do not allow their Indian licensees to export to Europe, Africa, the Middle East and Latin America without their prior approval unless exports are made under bilateral trade agreements.

one complete textile mill in each of the potential importing countries and provide first class after-sales service. This is similar to the policy it has successfully pursued in increasing its market share in the domestic market. On the other hand, other Indian firms being in a less competitive situation take up whatever order is negotiated by STC without developing prerequisite marketing and sales staff.

3.12 The Government has also taken a number of steps to further encourage exports. Until recently manufacturers were apprehensive of frequent changes in the export incentive systems, particularly the cash assistance schemes which the Government changed from year to year. Based on the recommendations of the Sondhi Commission that examined the export incentive system for engineering industries, 1/ the cash assistance level prevailing at the time of receipt of export orders will henceforth apply until the export order is carried out. The Government is also considering increasing the cash assistance by 25% to compensate the manufacturers for the disadvantages incurred in the total average cost of production. Currently, the cash assistance level is calculated on the basis of marginal production costs. The Government has also increased the funds allocated to pre and post-shipment credit provided to manufacturers and has streamlined the long term suppliers' credit provided by Indian manufacturers to their foreign customers.

3.13 But the major Government contribution lies in assisting exporters in improving their competitiveness by upgrading their machine design and improving their quality. As regards the latter, exporters definitely have a strong case for obtaining import licenses for precision machine tools that are needed to maintain the precision required for machinery and spare parts production. It seems that in spite of official pronouncements firms still have some difficulty obtaining import licenses for machinery, and the better firms that have been straining at full capacity for the last eight years have started machinery reconditioning programs. But these programs can only be in the nature of a holding operation. The savings in rejection rates in raw materials (which account for about half of the price of the machinery) would more than make up for the foreign exchange expenditure, not to mention the loss of export orders on account of damaged reputation.

3.14 As regards machinery design, most of these designs were acquired from foreign collaborators 10-20 years ago and only a few of them are competitive with Japanese and European machinery. The Indian firms are still too small and do not have the capabilities to upgrade their textile machinery and it is unlikely that they can develop their capabilities within the next 5-10 years. As mentioned earlier, even the leading West European firms have formed cooperative programs to compete with the design consortium formed by the Eastern European countries. Accordingly, new designs will have to be imported from foreign firms. On the basis of the Mission's contacts these collaborators are, however, reluctant to transfer the latest technology to India without export restrictions since they think that efficient Indian manufacturers could be strong competitors. They also consider India's foreign collaboration regulations restrictive in terms of equity participation and capital and profit repatriation for them to establish manufacturing facilities in India.

1/ The recommendations of the Sondhi Committee are given in Annex 15.

3.15 Nevertheless, it might be financially attractive for a number of technologically advanced firms to transfer some of their manufacturing capabilities for some of the machinery for which prospects in the developed countries are no longer very promising but for which there is a substantial market in labor surplus economies. An excellent example is that of the high speed shuttle loom which a sister company of LMW and Ruti AG, the leading Swiss loom manufacturer, plan to manufacture in India as a joint venture for both the domestic and export markets. The possibilities of producing more up-to-date machinery such as shuttleless looms and open end spinning for both domestic and unrestricted export markets is, however, quite limited within the existing framework of collaboration agreements as foreign firms would obviously want to have substantial equity participation and control over manufacturing operations to ensure the quality of their product, as well as less restrictive repatriation of both capital and profit to compensate them for the loss of their export markets in their prime manufacturing activity.

IV. DEVELOPMENT STRATEGY

A. Fifth Five Year Plan Targets and Requirements

1. The Textile Industry

4.01 The target for annual cloth production for the Fourth Five-Year Plan (1968-73) was 11,050 million square meters of which 1,000 million square meters were to be exported. By comparison, annual production at the end of the fourth Plan was 9,270 million square meters of which 464 million square meters were exported, resulting in a shortfall against Plan targets of 17% and 54% for production and export respectively. In terms of expected growth, the shortfall is even more dramatic. Production increased by only 0.5% per year during the Plan period compared to the Plan target of 4.7%. As a result per capita cloth availability declined from 16.5 to 15.6 square meters compared to a target of 18.0 square meters (Table 14).

TABLE 14

Production, Exports, and Per Capita Availability (1968-74)

	Cloth Production					Domestic	Per Capita
	Cotton	ManMade	Blends	Total	Exports	Availability	Availability
	(million square meters)						square meters/year
1968/69	7,896	1019	108	9,023	511	8,512	16.52
1969/70	7,706	927	127	8,760	466	8,294	15.70
1970/71	7,849	975	195	9,019	464	8,555	15.90
1971/72	7,356	1019	336	8,711	446	8,265	15.03
1972/73	8,022	972	272	9,266	482	8,787	15.60
1973/74	7,794	968	314	9,076	716	8,360	14.54
1974/75	7,800	970	300	9,070	490	8,470	14.45
Five Year Plan Targets							
Fourth Plan (1968-73)							
	9,350	1,500	300	11,150	1,000	10,150	18.0
Fifth Plan (1973-78)							
	10,400	1,600	800	12,800	1,500	11,300	17.5
Mission's Projection for Fifth FYP							
	8,800	1,150	350	10,900	600	10,300	16.1

Source: Report of the Task Force on Textile Industries, 1973.

4.02 The targets for the Fifth Five-Year Plan (1973-78) are also optimistic. Per capita availability is targeted to increase by 2.5% per year during 1974-79 from 15.6 to 17.5 square meters per year. The decentralized sector is expected to increase its share of the domestic market from 47% to 53%, while most of the exports will originate in the organized sector. First priority in the organized sector is given to the rehabilitation of the public sector mills (NTC); followed by the cooperative spinning mills which are either formed by cotton growers or hand loom and power loom weavers, or both; and finally the private sector which is expected to account for two-thirds of the exports.

2. The Textile Machinery Industry

4.03 To achieve those targets, the Plan envisages a large scale program for modernization and rehabilitation of existing mills and expansion of existing capacity. The major elements of this program are shown below:

TABLE 15

Modernization/Replacement and Expansion Program for the Fifth FYP

	Spindles (million)	Automatic Looms (Unit)	Processing (million meters)
Replacement	2.280	25,200	90
Expansion	5.720	85,510	500
	8.000	110,710	590

Source: Report of the Task Force on Textile Industries, 1973.

4.04 The cost of the program is estimated at Rs. 1,400 crores at 1972 prices of which Rs. 490 crores equivalent would be foreign exchange (Table 16).

TABLE 16

Cost of Modernization/Replacement and Expansion Programs (at 1972 prices)
(Rs crores)

	Local	Foreign	Total
Replacement	325	65	390
Expansion	575	425	1,000
	900	490	1,390

Source: Report of the Task Force on Textile Industries, 1973.

4.05 The report of the task force on the textile industries has also determined the total numbers of major machinery required for the modernization and expansion programs. But it has not phased these requirements over the planning period. Using the average annual investment figure as a rough order of magnitude for machinery requirements and comparing them with the installed capacity and production forecasts of the TMI, one concludes that there will be a short fall in blowrooms, carding engines, speed frames, automatic looms and weaving preparatory machinery (Annex 16). As regards processing machinery, the Fifth Five-Year Plan requirements are only indicated by one total value figure and thus it is difficult to compare the demand/supply situation for specific pieces of equipment. From our discussions with industry representatives it appears, however, that with the exception of a few types of machinery not manufactured in India, such as jet dyeing and rotary screen printing, manufacturers could meet the requirements for the balance of the machinery.

B. Domestic Demand Forecasts

1. Textiles

4.06 It should be noted that beyond specifying targets and broad priorities, the planning documents provide little guidance on the structural changes required in the textile industry to achieve the objectives of the Plan and little has been done to evaluate the costs and benefits of alternative programs to bring about those structural changes. Furthermore, the Plan targets are need-based and do not indicate whether demand for the cloth produced will materialize or whether the textile industry can generate the resources to undertake the investment required. Demand targets for cloth are based on the assumption that per capita income in real terms will grow at a rate of 2.5% per year during the Plan period and that the income elasticity of demand is unity. This, however, is contrary to historical trends in India as well as in other countries at the same income level where income elasticity of demand for textiles has been of the order of 0.2 to 0.4 1/. If anything, per capita availability over the first two years of the Plan (1973-75) has declined from 15.60 to 14.45 meters, primarily because the relative increase in food prices has left the poor with less money to spend on clothing. If one assumes an average annual GDP growth rate of 4.5%, a population growth rate of 2.3% per year, an income elasticity of demand of 0.25 for cotton cloth, and an income elasticity of demand of 1 for synthetic fibers and blends which because of the very high excise tax are mainly consumed by the richer segment of the population, then the per capita cloth consumption would grow at a rate of 2% per year and would be only about 16.1 meters per year (13.6 meters for cotton cloth, 0.55 for blends and 1.8 for synthetics) at the end of the Fifth FYP. This target is only slightly higher than the industry's projections of 15.8 meters by 1979 and implies an average sales growth rate of 4.7% per year compared to the Fifth Five-Year Plan target of 12.5% per year.

4.07 To determine the requirements of the textile industry to meet this growth the Mission has briefly reviewed both the structure and performance of the textile industry and the structural changes required to achieve those targets. These are detailed in Annex 1. Given the size and complexity of the Indian textile industry it is obviously difficult to reach any firm conclusions about those changes at this time. Nevertheless, a number of tentative conclusions appear justified. On the raw material side, the quality of cotton is by far the worst of the handicaps under which the Indian textile industry labors, and a quantum increase in productivity (about 30%) could be achieved by improvement there. Most Indian cotton is excessively dirty, variable in staple length and contains a great deal of immature fibers. This situation is further aggravated by the practice of Indian mills of grossly overspinning cotton to save on raw materials. But against the saving in raw materials, if any, one has to weigh the disadvantage of reduced capital and labor productivity and increased power consumption. A quantitative revaluation of this practice seems, therefore, warranted. The increased use of viscose and synthetic fibers,

1/ Income elasticity of demand increase to about 0.8-1.0 for countries with a per capita income of $600-$800 per year, and then falls to 0.6 in richer countries such as the USA.

particularly to clothe the masses, would also warrant serious consideration in view of the increased durability and lower cost of the cloth produced. On the production side, there is much scope for improving the use of existing capacity. In terms of number of spindles and looms the industry is larger than is necessary even to meet the most optimistic target of the Fifth Five-Year Plan. Much of the equipment is appropriate to labor surplus economies, except that in most parts it is in very bad condition. Much of it could, however, be updated to give about 80-90% of the performance of new machinery at 40% of the cost of new machinery as had been demonstrated by a number of mills. But this updating will have to be coupled with improved working conditions and technical supervision to bring about a badly needed improvement in the appallingly low labor production. As regards exports, there are limited opportunities for Indian specialty fabrics (e.g. hand woven saris) but substantial opportunity exists for the export of international fabrics to developed countries. The demand in international markets is increasingly for fabrics having a number of attributes not generally possessed by Indian-made textiles. If exports are to be increased, it will be necessary to develop a segment of the industry specially to meet the quality requirements of the export market.

2. Textile Machinery

4.08 The longer term implications of these changes for the TMI are difficult to assess since they will require policy changes that have a substantial bearing on employment, income distribution and exports. In the next three to five years, however, the demand for textile machinery will be largely determined by three major factors, namely the demand for domestic cloth which has already been discussed in para. 4.06, the capacity of the textile industry to generate resources to buy equipment, and government export incentive policies to induce the development of an export oriented textile industry.

4.09 A complete set of consistent statistics on the textile industry's financial structure and performance as well as its sources and uses of funds is not available in India. But a reasonable picture was pieced together from the Annual Survey of Companies' Finances conducted by the Reserve Bank of India (RBI) and from commitment and disbursement figures from the main financial institutions (IDBI, IFCI, and ICICI). On the basis of the RBI data which covers 260 textile mills, accounting for two-thirds of the industry's output, the gross fixed assets formation has consistently declined over the years from an average of 4.9% of sales in 1963-67 to 2.3% of sales for 1968-73 compared to 8-12% internationally. About 80% of this investment was in machinery of which 15% was for imported machinery financed by ICICI and IFCI. About 60% of the domestic machinery was financed by the IDBI rediscounting scheme and the rest was financed by long term debt and equity at a marginal debt/equity ratio of 66/34.

4.10 The amount of capital likely to be generated by the textile industry in the next few years is difficult to assess. The investment in the textile industry in any one year has been strongly related to profitability, which in turn has been fluctuating widely, largely in step with the monsoon. A bad monsoon invariably leads to higher food prices which leaves about 60%

of the population, accounting for over two-thirds of the textile industry sales, with less money to buy cloth. Investment is also related to the profitability of other industries, whose financial performance over the last five years has been superior to the textile industry and have hence attracted resources away from it. Even the use of the average investment performance over the last five years for purposes of forecasting investment in the next few years could be misleading because of the substantial change in ownership of the textile industry following GOI takeover of the 103 "sick" mills which account for 20-25% of the textile industry's output. Unlike the previous owners who diverted their profit to other activities, the public sector holding company in charge of these mills, NTC, has formulated a five to seven year rehabilitation program at a cost of Rs. 120 crores at 1973/74 prices. Already Rs. 13 crores have been used for the rehabilitation of about 25-30 mills. If one excludes the sick mills from the RBI sample, then the average investment undertaken by the industry in machinery over the last five years would be of the order of 3.5 - 4% of sales or one-third of their estimated return of investment.

4.11 If we further assume that the textile industry will grow at 4.7% per year over the next five years as forecast in para. 4.06 then it would be in a position to invest 3.5 to 4% of its sales for machinery, provided that sufficient institutional financing is available to maintain a marginal debt/equity ratio of 66/34. On this basis, the amount of investment in machinery over the next five years would be about Rs. 370 crores at 1973/74 prices including Rs. 100 crores for the rehabilitation of the NTC mills (Table 17). Although this investment figure represents only 28% of the demand projections of the Fifth Five Year Plan it still represents a hefty increase of 10% per year over the boom year of 1973/74.

TABLE 17

Domestic Demand Projections for Textile Machinery at 1974 Prices
(Rs. crores)

	1975/76	1976/77	1977/78	1978/79	1979/80	Total (1975-80)
Textile Mills (other than NTC)	45	49	53	58	64	270
NTC mills	15	17	20	23	35	100
	60	66	73	81	89	370

4.12 But this growth will not be evenly distributed among the various segments of the industry (Table 18). The largest growth is expected to be in spinning machinery (12% per year) to satisfy the modernization requirements of the NTC mills, the expected modest expansion of the better private mills, and the cooperative spinning mills. The lowest growth is expected to be in weaving machinery (7%) reflecting GOI continued preferential treatment of power and hand loom sectors over the organized sector.

TABLE 18

Domestic Demand for Machinery at 1974 prices

	1975/76 (est.) (Rs. crores)	1979/80 (Rs. crores)	Average Annual Growth Rate (%) (1975-79)
Spinning Machinery	40	62	12
Weaving Machinery	10	13	7
Processing Machinery	10	14	9
	60	89	10

4.13 The IDBI rediscount scheme will remain a major source of finance for textile machinery sales. In 1974/75 the value of rediscounted bills sanctioned under the scheme reached Rs. 115 crores; a 50% increase over the 1973/74 figure of Rs. 76.3 crores. Preliminary figures indicate that the value of sanctioned bills will grow by another 25% in 1975/76 and roughly 10% for the next three to four years (Table 18). If one makes the reasonable assumption that the share of textile machinery in the IDBI scheme will be maintained at the 1970-73 average of 40%, then the IDBI rediscount scheme will finance between 50-60% of the machinery sold domestically. The balance could very well be financed either from equity (retained profit or increase share capital) or from long term debt without adversely affecting the industry's financial structure. It might be desirable, however, to restore, at least selectively for the exporting mills, the effectiveness of the IDBI rediscounting scheme by raising the present limit of Rs. 5 million (including principal and interest) on the amount of bills discounted by any textile firm in any one year. This limit was set in 1965 and its usefulness has been eroded by the two to three fold increase in the price of machinery and the increase in interest rates.

TABLE 19

Mission's Projection of the Textile Machinery Financed by the IDBI Rediscounting Scheme

	Total Bills Sanctioned by IDBI (Rs. crores)	Total Value of Rediscounted Bills Utilized1/ (Rs. crores)	Bills Utilized by TMI2/ (Rs. crores)	Domestic Sales of Textile Machinery (Rs. crores) 1974 prices	Current prices /3	% of Machinery Sales Financed by the Scheme
1974/75	115.0	92.0	36.5	60	60	60
1975/76 (est.)	130.5	111.3	44.0	60	66	66
1976/77 (proj)	144.0	122.4	49.0	66	78	63
1977/78 (proj)	157.0	133.5	57.0	73	93	61
1978/79 (proj)	174.0	148.0	62.0	81	110	57
1979/80 (proj)	192.0	163.2	67.0	89	130	52

1/ Historically equal 0.85% of bills sanctioned in the year (Annex 8).

2/ Have ranged between 40-50% of total bills utilized in the year between (1971-74) and 50-63% between 1966-71 (Annex 8).

3/ Current prices are based on the assumption that marketing prices would increase by 8-10% per year.

C. Development Options

4.14 Although the 10% growth rate in domestic machinery sales projected by the Mission is 50% higher than the average rate for the last five years and equal to that of the last three very good years, it is still only 50-60% of what is required to induce the structural changes necessary for international competitiveness. These changes, which would cost about Rs. 20-25 crores over the next four years, can only be supported by an increase in sales of Rs. 35-40 crores at 1974 prices. Since the prospect of increasing domestic sales is limited by domestic demand for textiles, the extent and pace of these changes will hinge on expanding exports. Three major export options are discernible; namely (i) continued reliance on the domestic market with marginal expansion (Table 20, Case I); (ii) modernization of the TMI to double exports in four years (Table 20, Case II); and (iii) modernization of the TMI coupled with the development of an export oriented textile industry (Table 20, Case III). The following sections discuss these options, their implication for the structure of both the textile and textile machinery industries and the policy changes required to support them.

TABLE 20

Projections of Production, Exports and Growth of the Textile Machinery Industry (1975-1979)

	Production (in 1975 Rs. crores)							Average Annual Growth Rate (1975-79) %		
	1975/76			1979/80						
	Domestic	Export	Total	Domestic	Export		Total	Domestic	Export	Total
CASE I: Existing Structure										
Spinning Machinery	40	12	52	62	16		78	12	8	11
Weaving Machinery	10	2	12	13	3		16	7	11	9
Processing Machinery	10	2	12	14	3		17	9	11	10
	60	16	76	89	22		111	11	9	10
CASE II: Modernization of TMI										
Spinning Machinery	40	12	52	62	25		87	12	20	14
Weaving Machinery	10	2	12	13	3		16	7	10	8
Processing Machinery	10	2	12	14	3		17	9	10	8
	60	16	76	89	31		120	11	19	12
				Domestic	Export		Total			
					Direct	Indirect	Total			
CASE III: Modernization of the TMI plus Development of an Export Oriented Textile Industry										
Spinning Machinery	40	12	52	62	25	10	35	97	13	30	17
Weaving Machinery	10	2	12	13	3	6	9	22	5	45	16
Processing Machinery	10	2	12	14	3	4	7	21	9	37	16
	60	16	76	89	31	20	51	140	11	34	17

1. Option I - Inward Looking Strategy

4.15 As mentioned earlier, the prospects for substantially expanding exports within the existing inward looking TMI industry structure are not encouraging, particularly since the factors that the TMI capitalized on to expand exports in 1973-74, namely lower prices and short delivery dates, have been considerably eroded with the decline in world trade in textile machinery and the relative decline in international prices of steel compared to Indian steel prices. Even the few good firms whose reputations have not been tarnished by non adherence to quality and delivery dates might not be able to substantially expand their exports since their domestic orderbook position extends from three to five years and they would, as they have in the past, come under severe pressure from the textile mills if they expand their more profitable exports at the expense of the domestic market. Furthermore, it might be difficult for efficient firms to sustain the growth rate of 15-20% experienced over the last four to five years partly on account of the difficulty of training sufficient labor and supervisors in a short period of time and partly because of the large sums of capital needed for such expansion. This is particularly so since industry generally shies away from borrowing from financial institutions on account of the convertibility clause that entitles nationalized financial institutions to convert up to 25% of their loans into equity. 1/ Efficient firms are also concerned that they might become vulnerable to the strong fluctuations in domestic demand if they substantially increase their domestic market share, particularly because in times of difficulty textile mills usually place their order for machinery with their associated textile machinery manufacturers irrespective of quality and price. On the other hand GOI's intentions of promoting exports have only been recently backed by positive, if still insufficient, actions. 2/

4.16 Thus unless a major modernization program is undertaken to raise the standard of a large segment of the industry exports are not likely to increase to more than an average rate of 9% per year from Rs. 16 crores in 1975 to Rs. 22 crores in 1979; and an increasing part of the additional exports is also likely to be in the form of equity participation of Indian entrepreneurs in joint venture in South Asia, rather than orders obtained in competition with international firms. The combined effect of the growth in domestic and export markets would then be translated into an overall annual growth rate of about 10%.

1/ Even though this clause has not yet been exercised, it seems to inhibit efficient firms from borrowing and limits their expansion to their ability to generate internal resources. The cascading effect, in terms of inhibiting the induced growth of suppliers further increases the cost of such a policy.

2/ See Annex 15.

4.17 But this increase will not be evenly divided among segments and firms of the TMI. Most of the exports are likely to remain in spinning machinery and LMW will continue to expand its share of production and sales in both domestic and export markets at the expense of the weaker firms particularly Textool and Indequip in the ring frame and NSE in blowrooms. NMM and MMC are likely to grow at roughly 8-10% and will maintain their market share. But Texmaco is likely to grow at only 5% and then only as a result of its affiliation with a large number of textile mills in the Calcutta region, as well as with entrepreneurs who are likely to invest abroad; its market share is expected to fall to 10% (Table 21).

TABLE 21

Projected Market Share 1/ of Major Spinning Machinery Manufacturers
(Production in 1974 Rs. crores)

	1974		1979		Average Annual Growth Rate (1974 - 79)
	Production	Market Share %	Production	Market Share %	%
LMW	12.4	24	23.4	30	15
NMM	10.5	20	15.6	20	8
MMC	7.8	15	11.7	15	8
Texmaco	6.0	12	7.8	10	4
Others	15.3	27	19.5	25	5
	52.0	100	111.0	100	10

1/ Domestic and Export Sales

Source: IDA questionnaire

4.18 A differential growth rate is also expected between different types of spinning machinery. The largest growth is expected in high speed drafting conversion equipment (20% per year) that will be required for the rehabilitation of the NTC mills. This will require a 30-50% increase in the capacity of existing manufacturers which are, by and large, quite efficient and compare favorably with European manufacturers. Combers, which are currently being only produced by LMW, are also expected to grow at a rate of 15-20% per year for the next four to five years as a substitute for imports. The expected start of production of high production cards by LMW and NMM in 1976 will complete the range of spinning machinery produced in India. High production cards currently produced in India will require additional enclosure to reduce the amount of dust and short fiber released to the atmosphere. This is now usual in high production cards in Europe and there is no technical difficulty in the application of similar enclosure to cards of Indian manufacture.

4.19 Processing machinery manufacturing is expected to be the second fastest growing segment of the TMI (10% per year). The bulk of the production will still be sold domestically with little change in market shares of the major firms.

4.20 For the weaving machinery, the largest growth is expected for modern weaving preparatory machinery, whose manufacture has been only recently taken up in India such as the high speed pirn winding machines produced by LMW. The prospects for a large increase in loom manufacture are not very encouraging since over half of the expected increase in textile production is expected to originate in the power and hand loom sector and over 50% of the second half of the increase could well be achieved by a modest improvement (10%) in utilization of existing capacity of the organized textile industry sector. Accordingly the number of additional looms required in the next four to five years would only be of the order of 25-30,000 plain looms and 12-15,000 automatic looms corresponding to a rate of growth of 5 - 6% per year.

4.21 The implications of such a small growth on the loom manufacturing structure and performance is difficult to assess, particularly for automatic loom production, because of the uncertainties associated with both demand and supply. First, it is quite possible that the stagnant demand for automatic looms reflects consumer dissatisfaction with the slower and lower quality automatic looms currently produced in India as much as Government policy of encouraging the power and hand loom sector at the expense of the more capital intensive organized sector using expensive automatic looms. Thus, it is quite possible that Lakshmi Automatic Looms which plans to produce 1,800 Ruti looms by 1980-81 (of which 900 would be exported) could repeat the performance of its sister company, LMW, when the latter captured a large part of the spinning machinery market even in a time of recession. There is also some uncertainty on the supply side as the two major loom manufacturers (NMM and CIMMCO) have applied for licenses to produce sophisticated shuttleless looms, primarily for the domestic market, even though this makes very little economic and technical sense in India (except possibly for color woven suitings and wide sheeting). The major advantage of shuttleless looms over conventional high speed automatic looms is the reduction in labor cost and this feature has little to commend it in labor surplus economies such as India. 1/ It is also doubtful that firms that still have difficulty producing low speed looms of good quality will be in a position to manufacture high speed precision machinery such as the shuttleless loom without a complete reorientation of manufacturing and management systems. Moreover, the production of precision equipment will require a major effort in locating and developing ancillary suppliers and most TMI firms in India have yet to develop efficient ancillary units for their low speed machinery.

1/ A discussion of the suitability of weaving machinery to Indian conditions and factor endowment is given in Annex 1, paras. 48-52, and paras. 100-107.

4.22 In view of these difficulties as well as poor yarn quality and lower wage rate, automatic and conventional automatic looms will be adequate for a large part of the trade. If yarn quality is improved during the next few years the case for using some conventional automatics will be greatly strengthened but it will not provide a case for the widespread use of shuttleless looms, unless the textile machinery firms substantially reorient themselves towards export markets.

2. Option II. Modernization of the TMI

4.23 The second development option would be to modernize the TMI and double exports over the next four years to enlarge the industry production base and reduce the disruptive effects of the frequent fluctuations in domestic demand (Table 20, Case II). The possibility of, and the requirements for, restructuring the TMI into an export oriented industry have been discussed in various sections of this report. They can be summarized as follows. At the individual firm level this will require upgrading machinery design, replacing machine tools, improving manufacturing methods, instituting training programs and developing marketing organizations. At the industry level it will mean development of effective ancillary suppliers and radically improving the operations of the export consortium organized by the STC. At the government level this will require that Government not unduly fragment the industry by granting licenses to a large number of manufacturers to produce the same item. It will also mean more liberal allocation of foreign exchange for raw materials, spare parts and machinery, further streamlining and liberalization of the export incentive system, as well as more selective approval of collaboration agreements for firms with definite modernization and export programs, particularly when the collaborator undertakes to purchase a large part of the output. The existing terms of export finance are adequate but the amount of export finance will also have to be increased to accommodate the increase in exports.

4.24 The major textile machinery manufacturers have already formulated modernization and expansion programs at a cost of Rs. 20-25 crores for the next four to five years of which 25-30% would be in foreign exchange. The programs would enable the firms to double their exports in the next four years to Rs. 31 crores which corresponds to 25% of the total industry output. For some firms (NMM, MMC) the resulting increase in cost would be compensated by economies of scale that would result from spreading existing labor and capital cost over a large output. Most rehabilitation programs involve improvement in manufacturing facilities and methods and some marginal change in product mix, and these can be supported by increased exports. This is clearly apparent for the spinning machinery where the largest three manufacturers already have a large domestic market and do not need to make substantial changes in design to expand exports.

3. Option III - Modernization of the TMI and Developing an export oriented textile industry

4.25 The substantial change in product mix (such as high speed automatic loom, shuttleless loom, knitting machinery, drawtwisters, sophisticated processing machinery) that is necessary to provide sustained long term exports for all segments of the industry cannot be developed without a strong domestic market base. This could only be developed if the Government actually encourages the development of an export oriented textile industry both for direct export of textile as well as indirect export through an export oriented garment industry (Table 20, Case III). The experience of Hong Kong, Taiwan, and Korea suggests that this could be done in a relatively short period of time provided positive and determined export oriented policies are pursued. Indeed, India can have a substantial advantage since it can supply its domestic export industry with machinery at half the price paid by its East Asian competitors. Labor wages are also 20% lower; but its productivity will have to be substantially increased. In the operation of export oriented industry it will, therefore, be necessary to limit the size of direct labor force and concentrate on spinning with very low end breakage rates and with a minimum of loom stops.

4.26 Thus an export oriented textile industry will be a more capital intensive industry than the existing domestic oriented industry with a marginal capital/labor ratio of US$10-15,000 per job, compared to US$6-9,000 per additional job created in textile mills oriented towards the domestic market. 1/ But even then, the capital intensity of export oriented mills would be far less than the Indian public sector firms which accounted for over 60% of total investment, but only 22% of the output, of the industrial sector. Furthermore, the development of an export oriented textile industry will have a useful spinoff in that it will tend to raise the standard of the textile machinery industry, and more importantly assist in the development of a labor intensive garment industry. This is clearly borne out by a comparison of India's and Korea's export and employment performance in the textile and garment industries (Table 22) which shows that while India's domestic oriented textile industry base expanded its export in current terms from US$116 million in 1964 to US$391 million in 1974 with a negligible increase in employment, Korea's industry which has started from an export base half as large (US$58 million in 1964) and had a capital labor ratio 2-3 times that of India's has expanded its export to US$1.67 billion in 1974 and has more than tripled its employment from 110,000 in 1964 to 340,000 in 1974. And the latter employment figures could further be magnified if one takes into account both employment generated elsewhere in the economy as a result of relaxing the foreign exchange constraint, and to a much lesser extent the employment induced by the multiplier effect of increased domestic income.

1/ The raw materials and technological requirements for an export oriented textile and garment industry are discussed in Annex 1, paras. 124-164.

TABLE 22

EMPLOYMENT AND EXPORT PERFORMANCE OF INDIA'S AND KOREA'S TEXTILE INDUSTRIES

	India		Korea	
	Employment (Thousand)	Exports (US$ million)	Employment (Thousand)	Exports (US$ million)
1964	970	116	110	58
1970	927	173	220	331
1971	941	163	244	519
1972	972	215	279	707
1973	n.a.	235	317	1,243
1974	n.a.	391	340	1,670

Source: Handbook of Statistics on The Indian Cotton Textile Industry, (Bombay); and Economic Planning Board (Seoul).

4.27 The development of this export oriented textile industry could easily raise the direct and indirect export of textile machinery to about Rs. 50 crores by 1979 or 55% of total output; and this figure could well be doubled or tripled in the following three to four years. This will require further expansion of selected textile machinery units at an additional cost of roughly Rs. 10-15 crores in the next five to six years. But this will be beyond the financial capabilities of existing units particularly since the recent rapid price increase in equipment, depreciation allowances no longer cover the replacement value of machinery.

4.28 But a substantial and rapid reorientation of the textile and textile machinery industries, and for that matter most other industries, towards exports will require much more than marginal changes in existing export policies which merely attempt to compensate exporters for disadvantages arising from the Government's fiscal and foreign exchange policies and as such do not provide the stimulus to restructure and revitalize an industrial sector which has been drained of vitality and resources for the last decade and has fallen way out of step with international trends. What is needed instead, are policies that unmistakably signal industry the Government's unwavering long-term commitment to make production for exports more profitable than domestic production. These policies should aim at energetically solving the basic weaknesses of the industrial sector - lack of capital; finance; quality raw materials, and precision machinery; technical know-how to design, produce and market quality products; and basic utilities and infrastructure. Indeed, given India's acute foreign exchange situation and declining export markets

for its traditional exports, one could, in cases when India has a comparative advantage, go as far as making accessibility of the industry to the protected domestic market contingent on export performance. This is the essence of the successful export policy followed by large exporting countries. Indeed it is unlikely that without such a determined program the Indian textile industry can maintain its exports at the 1975 level of 500 - 600 million meters, much less expand it.

4.29 An analysis of exporting firms in the textile machinery, as well as of other engineering industries, indicates that exports are concentrated in a relatively small number of firms. 1/ These firms have a large domestic order book position and despite relatively rapid expansion are barely keeping up with the growing domestic demand, thus leaving little surplus capacity for exports. A more rapid export drive will require a much faster capacity expansion as well as upgrading technological and marketing capabilities which will undoubtedly strain the firms' financial positions. As such there seems to be a need to complement the existing export incentive system by more positive export incentives that aim at fast injection of capital and technology in firms that undertake to export a substantial part of their additional capacity. One such policy instrument could be preferential access to long term credit at terms concessional enough to compensate firms for the effort and risk associated with rapid reorientation from a protected domestic market to a competitive export market. Part of the hesitancy firms have shown to expand production for exports can be explained by the uncertainty they have faced about frequent and unpredictable changes in export policies and incentives. By providing an ex-ante predetermined export incentive this measure would have an encouraging effect on export oriented investments.

4.30 This approach could be criticized as leading to capital intensive operations. But as was clearly demonstrated above in Table 11 where we compared the cost structures of three operations at different levels of capital intensity, modernization will pay off handsomely in terms of savings on raw materials which constitute about 50% of total production cost on account of lower rejection rates. More importantly, however, it will lead to better quality machinery and much larger export sales. A rough analysis of employment in the textile machinery industry (as well as most other Indian industries) indicated that most of the additional employment generated during the last decade originated in efficient firms, and this despite the fact that they were using relatively more capital intensive methods. In other words the employment generated as a result of expanding production more than compensated for the lower employment generated per unit of output. This is in addition to the indirect employment generated in related raw material and component suppliers as well as increased employment

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1/ Between 1972-1974 ten firms accounted for about 25% of engineering exports, 50 firms accounted for about 50%, 100 firms for about 60% and 150 firms for about 75% of total engineering exports. The same observation applies to textiles exports.

elsewhere in the economy due to expanding production made possible by the rise in foreign exchange receipts. Furthermore, the discrimination in favor of efficient firms would enable better utilization of the managerial and technological know-how that these firms have painstakingly developed over a long period of time. If anything, technological and managerial know-how are as scarce in India, if not scarcer, than capital. In any case, given India's limited financial resources any increase in funds directed towards the export sector will have to be coupled with a corresponding decrease in funds for the domestic market, preferably through more stringent lending terms for long term loans and supplier's credit. This would ensure that capital intensive methods are only used where they are absolutely needed.

4.31 An important conclusion of this study is that the textile machinery produced domestically is quite suitable for Indian conditions but the expansion of exports of machinery and the development of an export oriented textile industry will require more sophisticated machinery whose design will have to be imported. But it would be a waste of resources to indiscriminately grant foreign collaboration agreements to inefficient firms that would be incapable of producing quality machinery. Consequently, priority for granting foreign collaboration agreements should be given to firms that undertake to export a significant part of their output. This selectivity would weed out those firms that are either incapable or unwilling to export and would additionally consolidate production in a few firms that are capable of digesting and building on the expensive imported know-how and thus enlarge their domestic market base so essential for a sustained export drive. But, as mentioned earlier, foreign firms are generally reluctant to transfer know-how to enable Indian firms to export unless such foreign firms can obtain a reasonable share of the export profits in compensation for their potential market loss. The foreign investment regulations recognize this need but their application has often resulted in delays and other difficulties which have discouraged foreign firms from investing in India. The analysis of over 100 Indian firms' operations over the last four years clearly indicates that foreign collaborators, who have a significant financial stake in Indian firms actively participate in management and labor training, have been instrumental in rapid transfer of technological and managerial know-how, and have strengthened export capability.

4.32 Finally, import licensing policy could be further exploited to favor exporters. GOI should examine arrangements which will favor firms in industries with export potential to expand production for exports, improve quality, and increase export sales using policy instruments which minimize bureaucratic processes. The role of additional import replenishment licenses (REPs) and improvement in the flexibility of their use, in particular elimination of indigenous angle clearance should be analyzed in quantitative terms for both Actual User's Licenses and REPs.

4.33 In summation, the thrust of the suggested changes in investment incentives, industrial licensing, foreign collaboration agreements and import license policies is (i) to make exports more profitable than production for the domestic market; (ii) to relate access to the domestic market to export performance when this is appropriate; and (iii) to enable certain industries, again where this is appropriate, to establish a sufficiently large production base to compete in export markets, if necessary at the expense of non-exporting units.

Only then would the latter improve their operation. The experience of the last 20 years has clearly shown that Indian firms have responded positively to Government policies that affect their profitability. This should be no exception. Ultimately, the policy changes would lead to larger exports, better quality products for both the domestic and export markets, larger employment and a stronger industrial structure with potential for further growth.

V. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

5.01 The basic conclusion, is that despite the rapid growth of the last few years the TMI still has a number of structural weaknesses. Most firms are quite small by international standards and, with few exceptions, machinery are of the 1950 and early 1960 vintage produced by old, and sometimes ill-maintained machine tools at the expense of precision. Very few firms have developed R & D capabilities to substitute for expiring collaboration agreements; and, except in one or two cases, the industry has not developed a strong supplier base or effective after-sales service. The prospects for the TMI are not particularly bright in its present structure, now that the process of import substitution has been largely completed. The domestic textile industry which accounts for almost 85% of the TMI's total sales is likely to remain sluggish, and the increasingly competitive export market for textile machinery can only provide partial relief to the best firms. Modernization programs can increase exports of existing machinery but cannot provide a long term basis for sustained export of quality machinery unless the domestic market base is enlarged. This can be done by developing an export oriented textile industry. The machinery needed for it would provide a base for a modern and progressive TMI and, more importantly, stimulate an export oriented labor intensive garment industry. This will, however, require a basic re-orientation of the content and administration of the export incentive system to assure the industry of long term incentive that would not only make exports more attractive than the domestic market but make access to the protected and profitable domestic market contingent on export performance.

B. Recommendations

5.02 Three options have been discussed for the development of the TMI. These are: (i) continued reliance on the domestic market with marginal export expansion, (ii) modernization program of the manufacturing capabilities to double exports in four years, and (iii) modernization of the TMI coupled with the development of an export oriented textile industry. Of these three options the third is the only one that makes long term economic sense. But, it will require basic policy changes that are likely to require considerable time to take effect. Accordingly it would be practical to start with the second option to pave the way for the longer range development program. This will require concerted action between Government and industry.

1. Role of Government

It-is recommended that Government:

(i) Re-evaluate the Fifth Five Year Plan targets and priorities for the textile industry and formulate, on the basis of a detailed cost benefit analysis of alternatives, comprehensive and realistic development programs and policies integrating critical factors of production such as raw material, machinery, finance, with a view towards restructuring the textile industry to produce low cost durable cloth for the majority of the population and considerably expand exports of both cloth and garments (paras. 4.07, 4.28). The outcome of this re-evaluation should serve as a basis for estimating the magnitude and composition of machinery needed for the next five years.

(ii) Review the industrial licensing, import licensing, export incentives and foreign investment systems and procedures not only to make production for exports more profitable than the domestic market but also to enable exporters to expand their domestic market base even at the expense of non-exports (paras. 4.29-4.33).

(iii) Strengthen, or at least avoid further fragmentation of the textile machinery industry into a large number of small firms by limiting issuance of industrial licenses to a small number of efficient firms (para. 4.23). This is particularly so for sophisticated machinery - such as high speed shuttle looms, shuttleless looms and rotary screen printers, for which the small domestic market cannot support economic size production (para. 4.21, 4.22). In granting licenses for these items priority should be given to firms that undertake to export a significant share of their capacity (para. 4.31).

(iv) Encourage marginal textile machinery manufacturers to concentrate on their other activities rather than bailing them out (para. 2.59). Their exit from the industry should improve the prospects of other firms that will need a larger market base to support their modernization expenditure.

(v) Assist the industry upgrade the design by favorably considering purchase of design or collaboration agreements for firms that have definite modernization and export programs (paras. 2.35, 4.31).

(vi) Review foreign investment regulations to stimulate joint ventures with leading international textile machinery firms willing to make India their export base (paras. 3.14, 4.31).

(vii) Increase allocation of foreign exchange for the purchase of capital goods, spare parts, and components, particularly for exporting firms that formulate modernization programs to increase their exports (paras. 2.38, 3.13, 4.23).

(viii) Improve the operations of the export consortium formed by STC to ensure that previous deficiencies are corrected and that, in the future, quality and delivery dates are strictly adhered to and that erection, commissioning and after-sales service are meticulously executed (para. 3.07). Poor performers should be excluded from the consortium as they tarnish reputations of better firms.

(ix) Reinforce and expand the quality control function of the Textile Committee to ensure that machinery and spare parts specifications are strictly adhered to (para. 2.48).

(x) Consider increasing the limit of Rs. 5 million/year imposed on the amount of rediscounting facilities that could be used by any one firm to restore to exporting firms the effectiveness of the IDBI rediscounting scheme which has been eroded by increases in machinery price and interest rates (paras. 4.13, 4.30).

2. Role of Industry

The recommendations presented under this heading are primarily designed to help improve plant operations and expand exports. Specific recommendations for individual manufacturers are contained in the confidential consultants' reports which are to be made available to the firms which would prepare and implement an action program covering:

(i) Product Planning and Engineering - Review products designed to increase reliability and reduce manufacturing costs and negotiate where appropriate foreign collaboration and/or technical assistance to improve and modernize machinery and rationalize product mix (para. 2.32, 2.34, 2.35). Contract negotiated should provide for compensation through increased exports (para. 4.31).

(ii) Manufacturing - Review and modernize where necessary production methods to reduce costs. Special attention is needed to process engineering, preventive maintenance and tooling (paras. 2.37, 2.38).

(iii) Materials Management - Review materials management procedures to reduce inventories. Review materials handling methods to reduce work-in-process inventories and workers fatigue (para. 2.40) and provide technical assistance to develop reliable suppliers (paras. 2.16, 2.45).

(iv) Industrial Relations - Develop effective training programs for labor, supervisory personnel and middle management. Improve working conditions and enforce safety regulations (paras. 2.43-2.47).

(v) Marketing - Correct previous deficiencies in exports sales and develop a sound marketing organization capable of aggressive sales and efficient erection, commissioning and after-sales service (paras. 2.48, 3.08, 3.11).

Industrial Projects Department
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BACKGROUND PAPER ON THE INDIAN COTTON TEXTILE INDUSTRY

SUMMARY OF MAJOR FINDINGS

i. The performance of the textile industry over the last ten years has been distressingly poor. Cotton cloth output has grown at only 1% per year; accordingly per capita consumption declined by about 1.5% per year from 14.7 meters/year to 12.1 meters/year between 1963 and 1974. Exports fared somewhat better; they grew at a rate of 12% per year in current value terms albeit from a very low level. But these exports consist primarily of cloth at the lower end of the quality spectrum (mostly grey cloth) for which demand is contracting, and hence cannot provide a basis for long-term export growth.

ii. The reasons for this lackluster performance are many. Among them is the heavy dependence of the textile industry on the sluggish agricultural sector for the bulk of its raw material, and for a significant part of its sales. The Indian textile industry is still almost entirely cotton based, and a good deal of the local cotton is of extremely poor quality. The per capita textile consumption has consistently declined because the increase in food prices has left the rural and urban poor, who account for more than 80% of the population and 60% of consumption, with less money for clothing. The combined increase in consumption of the richer segment of the population and exports has in quantitative terms offset the decline in demand from the poorer segments, but did not provide any real stimulus for growth.

iii. This lack of growth meant that the modern and more efficient sector of the industry could not have expanded its output without infringing on the market of the Decentralized Sector (hand loom and power loom) which according to official statistics employs roughly 7 million people. The Government took a number of steps to protect the Decentralized Sector (which accounts for 48% of the domestic market) by restricting the growth of the organized sector, particularly in more profitable medium and fine cloth range. But, in the absence of vigorous export incentive programs to divert the output of the organized sector from the domestic market to exports, these measures have led to a weak textile industry. Profitability has been quite low (about 6.5% return on capital) compared to other industries (10-18%), and thus a significant part of the industry profit has been diverted to other industries. By 1974, the government set up a public sector firm--National Textile Corporation (NTC)--to run 103 mills (accounting for 20-25% of the output of the organized sector) most of which had closed down when under private ownership.

iv. The major targets of the Fifth Five-Year Plan are: (i) to increase per capita consumption of cloth from 12 to 17.5 meters/year, and (ii) to expand exports from 500 to 1,300 million meters by 1979. The investment requirement of such a program is about Rs. 1,400 crores at 1972 prices to increase existing capacity by 5.7 million spindles and 85,000 looms and replace 2.7 million spindles and 25,000 looms. The Decentralized Sector is expected to increase its share of the domestic market from 48 to 53%, while most of the exports will originate in the organized sector. First priority in the organized sector is given to public sector (NTC) mills, followed by the cooperative spinning mills which are formed either by cotton growers or weavers, or both; and finally

the private sector which is expected to account for two-thirds of exports. Beyond specifying these broad objectives and priorities, very little has been done to evaluate the costs and benefits of alternative programs. Furthermore, the Plan targets were drawn on a need basis and do not reflect the capacity of the textile industry to finance this investment or sell the cloth produced. A major reassessment of the plan is therefore needed to determine the structural changes needed to achieve the dual objective of increasing the supply of low cost durable cloth for domestic consumption and substantially increasing exports.

v. In terms of number of spindles and looms the industry is larger than is necessary even to meet the most optimistic target of the Fifth Five-Year Plan. Much of the equipment is appropriate to labor surplus economies, except that in most parts it is in very bad condition. Much of it could, however, be updated to give about 80-90% of the performance of new machinery at 40% of the cost of new machinery as had been demonstrated by a number of mills. But this updating will have to be coupled with improved working conditions and technical supervision to bring about a badly needed improvement in the appallingly low labor production.

vi. The quality of cotton is by far the worst of the handicaps under which the Indian textile industry labors, and a quantum increase in productivity (about 30%) could be achieved by improvement there. Most Indian cotton is excessively dirty, variable in staple length and contains a great deal of immature fibers. This situation is further aggravated by the practice of Indian mills of grossly overspinning cotton to save on raw materials. But against the saving in raw materials, if any, one has to weight the disadvantage of reduced capital and labor productivity and increased power consumption. A quantitative revaluation of this practice seems, therefore, warranted. The increased use of viscose which could be produced from home produced pulp and polyester fibers would also warrant serious consideration in view of the increased durability and lower economic cost of cloth produced.

vii. Lack of specialization is a serious weakness of the industry as it leads to under-utilization of capacity and lower machine and labor productivity. Most firms in the Mill Sector and, to a lesser extent, to co-operatives of the Decentralized Sector, aspire to manufacture every product over the whole of the very wide spectrum of counts and cloth constructions which constitute the Indian domestic market for textiles, and companies generally feel that product flexibility is essential for the maintenance of commercial viability. The soundness of the commerical grounds on which companies have their practice of having a very wide product range may be arguable but there can be no doubt about the merits of specialization from the point of view of reducing manufacturing costs. With regard to vertical integration (i.e. having spinning, weaving and finishing in one plant or under common management) the situation is less clear. There are some economies to be gained from horizontal specialization but in regard to spinning and weaving these economies are easily lost by increased handling costs and technical process-interface difficulties. In this respect the present industry structure is probably near the optimum. Finishing is however a different matter. The productive capacity of modern finishing machines is too great to permit efficient plant

utilization where a finishing unit is linked to one integrated fabric production unit and is required to cope with the wide variety of goods now made by the typical company. There is a case for reorganising a substantial part of finishing into independent units charged with providing services to manufacturers purely on a commission basis.

viii. In the conditions obtaining in India today there is a general case for the use of labor intensive processing carried on in cottage industries or in co-operatives. So far as spinning is concerned there are serious difficulties in the operation of a labor intensive process. Handloom weaving is certainly economic for the production of some speciality cloths but it is unlikely that, in the long term, it can be justified for the simple cloths which can be made so well on Lancashire type non-automatic power looms. These non-automatic looms are installed in quite small sheds under conditions which are technically good and under which high machine and operative efficiency should be possible. The production statistics however suggest that efficiency is very low indeed. So low in fact as to arouse real doubts as to the soundness of the statistics. The present system of differential excise duties between hand and power loom fabrics provides an incentive to inaccuracy in making returns. In particular it can be financially rewarding to understate the amount of cloth actually produced on power looms. It is probable that the power looms are in fact working very efficiently.

ix. As regards exports, there are limited opportunities for Indian specialty fabrics (e.g. hand woven saris) but substantial opportunity exists for the export of international fabrics to developed countries. The demand in international markets is increasingly for fabrics having a number of attributes not generally possessed by Indian-made textiles. If exports are to be increased, it will be necessary to develop a sector of the industry specially to meet the quality requirements of the export market. It is expected that the fostering of this sector will have a useful spin-off in that it will tend to raise the standards of the established textile industry and the textile machinery industry, and more importantly, assist in the development of a labor intensive garments industry into a major export industry. Initially it would be possible to establish this garment industry on imported cloth. Indeed this could well be the best way to enter the mass market for made-up textiles, either as a commission garment maker or as a principal. Once established the new industry could begin to commission the manufacture of suitable fabrics in India. These two approaches are mutually complementary and offer an effective solution to the serious unemployment problem facing India.

INTRODUCTION

1. The purpose of this annex is to review the performance of the Indian textile industry, the major constraints facing it, the structural changes needed to achieve the dual objective of increasing the supply of low cost durable cloth for domestic consumption and substantially increasing exports, as well as the implication of such changes for the textile machinery industry. The Annex explores a number of alternatives to restructure the industry but does not evaluate the very difficult policy decisions that need to be made to carry these out as they were outside the Mission's terms of reference and need considerable more time and effort.

2. The performance of the textile industry over the last ten years has been distressingly poor. Cotton cloth output has grown at only 1% per year; accordingly per capita consumption declined by about 1.5% per year from 14.7 to 12.1 meters/year between 1963 and 1974. Exports fared somewhat better; they grew at a rate of 12% per year in current value terms (from a very low level). But these exports consist primarily of cloth at the lower end of the quality spectrum (mostly grey cloth) for which demand is contracting, and hence cannot provide a basis for long-term export growth.

3. The reasons for this lackluster performance are many. Among them is the heavy dependence of the textile industry on the sluggish agricultural sector for the bulk of its raw material, and for a significant part of its sales. The Indian textile industry is still almost entirely cotton based, and a good deal of the local cotton is of extremely poor quality. The per capita textile consumption has consistently declined because the increase in food prices has left the rural and urban poor, who account for more than 80% of the population and 60% of consumption, with less money for clothing. The combined increase in consumption of the richer segment of the population and exports has in quantitative terms offset the decline in demand from the poorer segments, but did not provide any real stimulus for growth.

4. This lack of growth meant that the modern and more efficient sector of the industry could not have expanded its output without infringing on the market of the Decentralized Sector (hand loom and power loom) which, according to official statistics, employs anywhere between 7-10 million people. The Government took a number of steps to protect the Decentralized Sector (which accounts for 48% of the domestic market) by restricting the growth of the organized sector, particularly in the more profitable medium and fine cloth range. But, in the absence of vigorous export incentive programs to divert the output of the organized sector from the domestic market to exports, these measures have led to a weak textile industry. Profitability has been quite low (about 6.5% return on capital) compared to other industries (10-18%), and thus a significant part of the industry profit has been diverted to other industries. Accordingly,

the vast majority of the Indian textile mills has poor equipment, and produces low quality cloth from the cheapest and poorest quality cotton possible. By 1974, the Government set up a public sector firm--National Textile Corporation (NTC)--to run 103 mills (accounting for 20-25% of the output of the organized sector) most of which had closed down when under private ownership.

5. The major targets of the Fifth Five Year Plan (FFYP) are: (i) to increase per capita consumption of cloth from 12.1 to 17.5 meters/year, and (ii) to expand exports from 500 to 1,300 million meters by 1979. The Decentralized Sector is expected to increase its share of the domestic market from 48 to 53%, while most of the exports will originate in the organized sector. First priority in the organized sector is given to public sector (NTC) mills, followed by the cooperative spinning mills which are formed either by cotton growers or weavers, or both; and finally the private sector which is expected to account for two-thirds of exports. Beyond specifying these broad objectives and priorities, very little has been done in the way of planning, e.g. to evaluate the costs and benefits of alternative programs, as well as ways and means of carrying them out. The consensus of opinion in both industry and Government appears to be that by 1979 per capita consumption is not likely to exceed 13.5 meters/year and that exports will be of the order of 700-800 million meters by 1979. A major reassessment of the Plan is therefore needed.

6. This annex is in two parts. The first part is concerned with the manufacture of cotton and allied textiles to meet domestic requirements. Here, despite the introduction of much new machinery, the productivity per installed unit of capacity has been falling for some years. It is clear that shortage of plant and machinery is not a major constraint of the industry and this Annex identifies and examines the real constraints and discusses means by which the situation could be improved while continuing to use indigenous resources. The second part is concerned with the export of cotton and allied textiles, taking the view that this is potentially India's greatest earner of foreign currency. Except for a very limited market for handwoven speciality fabrics, international trade in textiles is increasingly demanding cloths of very high quality and very low incidence of minor blemishes. As the cloths produced for the home trade are quite unsuitable for this market, and there are no good prospects why this situation should change in the near future, it follows that a segment of the industry specializing in the production of international quality textiles is needed if a substantial export trade is to be established.

COTTON TEXTILES FOR DOMESTIC CONSUMPTION

A. Performance of the Industry

7. India's per capita consumption of cloth is very low. During the period 1963 to 1973 the per capita consumption of cloth fell by 17-1/2% (from

14.7 to 12.1 meters). In this situation the 5th Five-Year Plan target of 17-1/2 meters per capita in three years from now must seem a difficult achievement. The simple story of the last decade is that the population has increased by nearly 27% but the annual production of fabric by the cotton textiles industry has increased by only 9.3%.

8. Almost all spinning capacity is in the Mill Sector. Cooperative spinning mills producing yarn for the decentralized industry have about 5% of the present total capacity of 18.5 million spindles. From 1963 to 1973 the installed spinning capacity increased steadily from 14.1 to 18.4 million spindles and over the same period the rate of yarn production increased from 865 to 994 million kg per annum. Thus an increase in the total number of spindles of 30.5% produced an increase in yarn output of only 14.9%. In other words the annual production of yarn per installed spindle has fallen from 61.3 kg to 50.0 kg.

9. The explanation for this substantial reduction in productivity per spindle does not lie in a changed average count. The average count spun was only fractionally finer in 1973 than in 1963. Nor does the explanation lie in reduced speed potential of the installed spindles. International Federation of Cotton and Allied Textile Industries (IFCATI) estimates put the proportion of the 1973 spindle population being less than 10 years old (i.e. new within the period) at 33%. As the new spindles will have an operating speed potential some 25% higher than that of the average spindle in place in 1963, and as much as 50% higher than the older spindles scrapped during the period, an increase in average potential operating speed of the order of 7-1/2% will have been achieved in the course of this expansion of capacity.

10. Taking this factor into account it would have been reasonable to expect the total amount of yarn spun per annum to increase by 40.3% over the decade. Sufficient, despite the rapid growth in population, to have permitted an increase in the per capita availability of cloth of about 12-1/2%. This would have raised the amount available from the 1963 figure of 14.69 meters to 16.5 meters in 1973--a figure giving a comfortable margin over the 4th Five-Year Plan target of 15.8 meters per capita. As mentioned previously the per capita availability actually realized was only 12.1 meters.

11. In the light of this experience it would be unwise to press on with further plans for increasing the installed capacity of the textile industry. Broadly the capacity planning of the 3rd and 4th Five-Year Plans was sound, but it has not led to the increases in output which might reasonably have been expected. Clearly plant availability is not the major constraint. It is therefore necessary to take a closer look at the industry in order to determine the real limitations on output.

B. Availability of Power

12. Cotton spinning is an energy intensive process. In modern medium count, ring spinning mills, one spinner tends about 5,000 spindles. The power required to drive these spindles depends on the count, the package size, and the spindle speed, and is typically of the order of 200 kilowatts. Thus, in a country such as the U.K. the cost of power to drive the spindles is often greater than the wages of the spinner. For some years now the Indian textile industry has suffered from serious limitation of power availability. Clearly it is quite uneconomic to set a production target for the industry, sanction the purchase of additional machinery and then deny that industry the power needed to drive its factories. If, as seems likely, India will continue to suffer from a chronic power shortage for many years yet, the only rational policy is to determine the quantity of power which can sensibly be allocated to textile manufacture and to plan the industry capacity in relation to this allocation.

13. At this point, it is worth noting that power consumption in spinning is more than linearly speed dependent. For typical Indian conditions, spinning 30's count on ring frames of 7" lift and 1-5/8" diameter rings at 11,000 rpm the specific power requirement would be reduced from 1.87 to 1.14 horsepower per 100 spindles by reducing the speed to 9,000 rpm. A power reduction of 39% for a speed reduction of 18%. As the productivity per spindle will, of course, be reduced only in direct proportion to the reduction in speed it is clear that where power availability is the principal constraint a useful increase in production can be obtained by reducing the spinning speed. In the situation just described the increase in production for a given power consumption at the ring frame would be 41.39%.

14. In considering the best strategy for a mill as a whole the situation is complicated by the fact that the speed/power relationship for the preparatory machinery has a very different characteristic and, moreover, technical considerations seriously limit the degree of speed flexibility possible in some of the preparatory processes. Given a mill ideally balanced with regard to preparatory capacity and actual spinning capacity the most rewarding strategy to deal with a total power consumption constraint is to reduce spindle speed to such an extent that when the spindles are run full time sufficient power is saved in spinning to permit just sufficient additional running time by the preparatory machinery to match the increased spinning frame output.

15. The optimum spindle speed for a given percentage power cut can be determined reasonably easily using a linear programing technique. By way of example, this has been done for the conditions outlined above (30's count, 7" lift, 1-5/8" ring, spindle speed for balanced operation 11,000 rpm) when subjected to a power cut of 25%. The answer is to reduce the spindle speed to 9,570 rpm and operate all spindles full time. This gives

an increase in productivity relative to 75% working of $\frac{9,570 - .75 \times 11,000}{.75 \times 11,000}$ that is, 16%. This makes it necessary to operate the preparatory machinery for 16.0% longer, that is a total of $\frac{116}{100} \times 75\% = 87\%$ of the total time. It will be found that the power saved by running the ring frames at a lower speed although for a longer time is just sufficient to provide the additional power to run the preparatory machinery for the necessary extra time. The net result of this simple strategy is an increase of production of 16% relative to the direct alternative of running the whole mill at balanced speed for only 75% of the time. It is of course a strategy only justified where plant is already in existence and power shortage has become the principal constraint on production.

16. Its implication for power rationing schemes is obvious. It is more economic to ration power by limiting the amount of power consumed by mills in any one day rather than limiting the number of days that the mill could operate. In planning the installation of additional productive capacity in a situation where power stringency can be expected to be a chronic condition a more complex appraisal is needed to see to what extent the capital cost of additional spinning machinery may be justified by the power saving of lower spinning speeds. Although given a situation of chronic power shortage there is a sound case for operating spinning machinery at lower speeds than would be economically optimum in the absence of a power constraint, the net effect is inevitably to increase the real cost of yarn manufacture. For this reason it is pertinent to consider ways in which the power constraint on textile manufacture may be removed. The prospects for doing this in the near future generally throughout India by expansion of public generating capacity are poor. A policy far more likely to succeed is that of encouraging mills to install local generating capacity exactly matched to their needs and to use this not as standby equipment but as the normal system of powering the mill. In terms of operating costs, in particular fuel consumption, this solution is likely to be more economic than continued use of the national grid supply for the following reasons: (i) the high transmission losses of the national grid (currently c.20% in India) will be avoided; (ii) no part-load working of the prime movers will be involved, as the power requirement is accurately predictable and substantially constant for 24 hours per day the prime mover will operate always in the region of maximum efficiency; and (iii) the thermal energy requirements for warp sizing and fabric processing can be obtained from the waste heat rejected by the prime mover effectively at no cost.

17. Local power generation is also attractive in terms of capital cost. In a situation where cuts are at such a level as to justify the installation of standby power, there is clearly an overall investment economy in the avoidance of duplication of generating equipment and in saving the cost of

transmission lines and sub-station equipment. As an alternative to the acceptance of power cuts local generation again offers lower investment cost per unit of effective productive capacity where the expected percentage of time lost by power cuts exceeds the cost of generating equipment expressed as a percentage of the capital cost of the mill machinery. At prices obtaining in the U.K. the cost of four diesel electric generators of such a size that only three need be used at any one time is roughly 10% of the cost of machinery for a 50,000 spindle mill with 700 looms and a complete range of finishing equipment. Thus in terms of capital cost only the purchase of generating equipment is justified if power cuts are expected to exceed 10%. Generating sets of high thermal efficiency, both diesel engine and steam turbine powered, are commercially available worldwide in sizes appropriate to typical mill needs (about .5 megawatts for a 50,000 spindle composite mill with a complete range of processing equipment).

18. Whatever solution is chosen it is essential that this basic problem of textile manufacture be resolved. There is no justification whatever for increasing the installed capacity of the industry until such time as there will be sufficient power available to drive both existing installations and the proposed additional capacity.

C. Raw Materials

1. Cotton

19. The cotton textile industry of India labors under a number of handicaps as a result of which its overall performance is, by all measures of performance, very low in relation to world standards for both developed and developing countries. The quality of the raw cotton available to the industry is, perhaps, the most important of these handicaps. It is difficult to pinpoint any one facet of cotton quality to which attention should be directed. No Indian cottons available today can be classed as other than of the lowest quality in relation to their counterparts available to the industries of other nations. They are generally excessively dirty, variable in staple length and other fiber properties and contain a great deal of immature fiber. In addition the nominal staple lengths produced are always too short for the end uses for which they are intended.

20. As a result gross overspinning, i.e. spinning a yarn finer than that for which a cotton is, by international standards, suitable, is the norm in India. This gives rise to difficulties at all stages of manufacture and processing. For example, in ring spinning a yarn breakage rate of less than 2 per 100 spindle hours is usual in modern mills but in even the best Indian mills breakage rates in excess of 20 per 100 spindle hours are not uncommon. This practice of overspinning has been defended on the grounds that although labor is cheap, cotton is expensive. But is this defense

valid? To answer the question, it is necessary to determine two factors: (a) the extent to which shortcomings in cotton quality are responsible for the low productivity of the Indian textile industry, and (b) the cost of producing cotton of a higher quality.

21. Let us consider (a) first. Just how low is Indian productivity by international standards? In terms of yarn production per installed spindle per annum it is very low indeed. Normalized to 20's count the output of yarn per spindle per annum for the Indian cotton textile industry in 1973 was 82.3 kg against figures of 197.7 kg for Hong Kong and 202.4 kg for USA. Some of the difference is accounted for by the low proportion of "active" spindles in India and by the effect of power cuts. The magnitude of this factor is difficult to assess, but an alternative approach is offered by the tables of Productivity Norms for the India Textile Industry compiled by ATIRA. From these it has been calculated that if Indian spindles were operated 24 hours per day for 360 days per year without power limitations then the yarn output per spindle per annum for 20's count would only be raised to 151.2 kg. The difference between this figure and the figure of 199.7 kg achieved by Hong Kong is probably a fair measure of the handicap imposed on the Indian industry by the poor quality of Indian cotton.

22. In other words, if the quality of Indian cottons were raised to international standards for comparable cotton types, the per-spindle output could be increased by about 32%. Some of the improvement would result from higher machine efficiency resulting from fewer machine stoppages and breakage of yarn but the most direct gain in spinning would come from the lower twist requirement when larger and more uniform staples are used. At present the number of turns per unit length required to make yarns in India is typically of the order of 20% greater than world norms. Reduction of turns per unit length will of course give a direct increase in yarn production for a given spindle speed, but in addition increased yarn strength from the use of better cottons will permit the use of higher spindle speeds without excessive end breakage. These two factors together could well give the productivity increase of 32% suggested as possible above.

23. Productivity gains from the use of better cottons are not confined to the spinning process. Warp and weft preparation efficiency and weaving performance will also improve. A meaningful measure of the quality of a yarn from the point of view of its behavior in subsequent processes is offered by the standardized Uster imperfections count. This test, which is internationally accepted, counts the number of imperfections, of various specified types, per 100 meters of yarn. The Uster company has published tables of world norms for the number of imperfections of each type to be found in a number of specified yarns and ATIRA has published similar tables giving norms for yarns spun in India. Comparison of the Indian and world norms shows very clearly the penalty which the Indian industry suffers as a

result of overspinning. For example the number of "thick places" per meter expected in 36's combed quality yarn is in the range 0.6 to 3 for world norms, but for Indian yarn the range is 3 to 39 with an observed mill average of 17. For the same yarn the number of neps per 100 meters by world norms is in the range 0.1 to 3; by Indian norms it is 10 to 30, with a mill average of 28.

24. High imperfection frequencies in the yarn inevitably lead to high breakage frequencies in weaving preparation and at the loom, but this is not the end of the matter. Yarn defects result in cloth defects and it is common practice in India to employ an army of "menders" to remove defects from the cloth. This is an operation which is very prodigal of labor but which in India, because of the ready availability of labor, is accepted as the not unreasonable price one must pay for overspinning. This would be true if mending were able to remove defects reasonably efficiently. Unfortunately this is not so; very few defects in cotton cloths can be satisfactorily mended and in countries such as the U.K. no mending of cotton cloth is attempted.

25. Another disadvantage of overspinning is the low yield of yarn from a given weight of raw cotton. For carded yarns the difference in yield may be between 5 and 10% but for a very important part of the Indian count range, the "higher medium" count group which accounts for 36% of total production, the situation is very much worse. For these counts, Indian cotton cannot be used without combing, and this involves an additional loss of between 15% and 25% of the fiber. If the yarn produced from the combed Indian cotton were a good yarn the situation would not be too discouraging, but in fact a combed Indian cotton yarn is not superior to a carded American yarn. Comparative figures from the Uster and ATIRA surveys show that in regard to numbers of thick places and neps a 30's yarn from carded American cotton is fully equal to a 30's combed yarn from Indian cotton. In regard to the Uster% figure the combed Indian is fractionally better at 16 against the carded American figure of 16.2. This is a very small return for the process complication of combing and the associated loss in weight of roughly 20%.

26. Let us move on to factor (b) which constitutes the other side of the equation. Strictly, consideration of the cost of improving cotton quality is outside the present terms of reference, but a few observations on the situation might not be out of place: (i) the soil and climatic requirements of suitable cottons can be met in India, although perhaps not without some measure of artificial irrigation, (ii) recent attempts to produce "superfine" cottons in India to replace the cottons formerly obtained from Egypt and the Sudan, have been to a large extent successful, and (iii) the yield per acre of typical Indian cottons is very much lower than the yield obtained from American Uplands types grown in other lands. That it is possible to produce good cotton in India is beyond doubt. The growth of American type cottons in the Punjab introduced more than fifty years ago and the more recent development of superfine cottons has demonstrated that

it can be done. It is equally beyond doubt that the availability of better cottons would enormously improve the performance of the Indian textile industry.

2. Use of Man-Made Fibers

27. Throughout the world increasing use is being made of man-made fibers both alone and in the form of blends, particularly in blends with natural fibers. Two man-made staples suitable for blending with cotton stand out as being of great potential significance for the economy of the Indian cotton textile industry during the next decade. The first is viscose rayon staple. This is cotton-like in that it is cellulosic and able to absorb a significant amount of water. In its original form it had the disadvantage of a low tensile modulus, particularly when wet. It can now be produced as a polynosic rayon in which form it matches cotton very closely in most physical properties, including wet modulus. It can therefore form a satisfactory two component blend with cotton or with polyester staple. It can also be used in a useful three component blend with cotton and polyester. In both the original form and in the polynosic form viscose rayon staple/cotton blends are well established for medium count yarns (12's to 50's) in applications where good yarn appearance is called for. It is very clean working and is basically cheap, particularly in a country such as India where timber suitable for pulp can be readily grown. In recent years eucalyptus trees have become the preferred timber for rayon manufacture and they are now grown for this purpose as a 7-10 year crop in tropical countries. As there are natural eucalyptus forests in India there can be no serious obstacle to cultivation of this wood, with the object of increasing the availability of rayon staple. Production of viscose staple fiber in 1973 was 62,627 tons, roughly 5.4% of the mill consumption of cotton during that year. If the quantity were increased fivefold to, say, 300,000 tons per year, it would, by usefully upgrading the average raw material standard, raise the overall productivity of the cotton textile industry with a minimum expenditure of foreign currency and reduction of food growing potential. The associated artificial afforestation would, if suitably sited, make a contribution to conservation of water resources.

28. The other important man-made staple is polyester. Unlike rayon, it is not cellulosic. It is thermoplastic synthetic polymer of high strength and high modulus which, unlike both cotton and rayon, is almost completely hydrophobic. Its most striking properties are remarkable durability and very good appearance retention. In combination with cotton or rayon it gives yarn and cloth properties which are almost ideal for most apparel uses. It gives a good appearance and "handle" without need of starch or resin finishes and confers easy-care properties on made-up garments to such a degree that shirts, blouses and trousers can be "drip-dried" after washing and worn immediately without need of ironing or pressing. In addition fabric weights can

be materially reduced while still giving durability of a far higher order than is possible with cotton or rayon alone. The present capacity for polyester staple production is only 24,000 tons per annum and shortage of the polymer precursor, DMT, and very high excise tax is preventing full utilization of even this modest capacity. In this situation it is not surprising that the industry regards polyester staple as a luxury commodity and the 1973 output of 11,500 tons was almost all consumed in expensive non-utilitarian end uses. A particularly expensive and non-utilitarian use which is currently fashionable is to spin very fine yarns from a polyester/cotton blend then, after weaving, "burn out" the cotton component to leave a diaphanous all-polyester fabric. This practice is undoubtedly commercially rewarding to the industry but from the national point of view it is grossly prodigal of resources. In the first place the cotton, which is completely wasted, must be of the expensive, long, fine staple type, much of which is imported. Secondly, the great merit of polyester staple, its sheer utility, is not exploited. In the West it is now used as a reinforcing fiber to give durability and easy care to such an extent that all-cotton fabrics have come to be regarded as luxury items. The all-cotton shirt is now the status symbol of the man who can afford to buy shirts with a short life and pay the higher cost of laundering and pressing. The fact that polyester staple is essentially a cheap durable fiber which will eventually play an important part in reducing the real cost of clothing the nation should be accepted by India. There are immediate difficulties concerned with foreign exchange and the availability of the polymer precursor but this should not prevent the carrying out of a realistic appraisal of the real cost of continuing the present policy of reliance on cotton for clothing the masses.

29. It is possible that one day India will be in a position to produce polyester precursor chemicals from domestically available hydrocarbons but even if this does not come to pass there is every expectation that such internationally available chemicals will become very much more plentiful and cheaper in real terms during the next ten years. In this situation the proposal to increase the capacity for polyester staple production to 50,000 tons seems unduly cautious. This quantity, used in 50/50 blends with cotton and rayon, would be sufficient for reinforcement of only 3.7% of planned fabric consumption. A capacity of about 200,000 tons by the end of the decade could well be the real need.

3. An Integrated Raw Materials Policy

30. In 1973 the cotton and allied textile industry of India consumed a total of 1,230 thousand tons of fiber made up of:

	Thousand tons
Indian cotton	1,053
Imported cotton	106
Cellulosic staple	61
Polyester staple	10

On the basis of the 5th Five-Year Plan the Task Force on Textile Industries reports that the expected consumption of fiber in 1978/79 is 1,615 thousand tons made up of:

	Thousand tons
Indian cotton	1,301
Imported cotton	144
Cellulosic staple	143
Polyester	27

In addition a small quantity of domestically produced acrylic staple is expected to be available.

31. This is an ambitious program in regard to the production of Indian cotton which is presumably possible. Accepting this as a program capable of achievement, the following is an alternative broad strategy worthy of detailed consideration.

(i) Materially improve the international grading of Indian cottons by:

(a) increasing the acreage of American Upland types;

(b) increasing the acreage of long fine staple types;

(c) correspondingly reducing the acreage of low-yield Asiatic cottons; and

(d) modernize ginning practice.

(ii) Increase the availability of cellulosic staple twofold and polyester staple fourfold relative to the Plan. This would mean almost a fivefold increase in cellulosic and a more than tenfold increase in polyester availability relative to the productions actually achieved in 1973.

Successful implementation of (i) would increase the total yield to about 1,500 thousand tons and obviate the need for any imports of cotton. Implementation of (ii) would, taking account of the lower waste losses with man-made staples, reduce the requirement of cotton to about 1,200 thousand tons, the new breakdown being:

	Thousand tons	
Indian cotton crop	1,500	
Less exports	300	
		1,200
Cellulosic staple		286
Polyester		108
Total		1,594

This strategy has several merits. From the viewpoint of the textile industry it would improve productivity and thus reduce both operating costs and the investment needs of the industry. From the textile consumer's point of view it would increase the attractiveness of textiles, reduce their cost and increase their durability.

32. Economic appraisal of the strategy is a complex task. The major considerations involved are:

(a) The effect of improved cotton growing practices on the cost of production of raw cotton;

(b) the costs of producing polyester, nylon and rayon in India;

(c) the cost reductions in textile manufacture resulting from the availability of better cottons and blends;

(d) the value of the increased durability of textile products;

(e) the foreign exchange value of the cotton which will become available for export as raw cotton, as yarn or cloth and as a component of made-up goods;

(f) the effect of increased use of man-mades on the profitability of textile exports.

(a) Cost of Cotton Production

33. The present cost of growing cotton in India requires detailed study. By world standards it is probably low, but meaningful comparison is difficult because of the very low quality of the product. In a typical year the average price of Indian cotton in world markets is little more than half the average price of the cottons of the rest of the world (excluding Egypt and the Sudan, both producers of high priced cottons). Some indication of cost levels is given by the fact that in 1971 the support price offered by the Government to growers of American type cottons in India was about Rs. 3.4 per kg against 32 cents per lb, the cost of production of cotton of similar genetic types in the USA estimated by USDA surveys. Assuming 8 Rupees = $1, this comparison shows that the Indian support price to growers is 57% of the US cost of production.

34. The likely cost of growing better cotton in India depends on the response obtained from the more liberal use of fertilizers and control chemicals, genetically pure seed and irrigation. At present the average yield per hectare of American Upland types grown in India is roughly 1/5 of that achieved in America. The highest for the whole of a distinct area in India, growing American Upland types, is achieved in the Punjab where the yield is about 3/4 of the American figure. It may be presumed that, if in

other areas of India, expenditure per acre on seeds, chemicals and irrigation is raised to the American level the yield per acre may be raised to at least something approaching the Punjab figure—say 3/5 of the American figure or 3 times the present average yield.

35. In 1971 the harvested and ginned cost per hectare in these areas of India was about Rs. 340 for a yield of 100 kg per t/a. The cost of seed, chemicals and irrigation in America in the same year was US$43 per acre, i.e. Rs. 757 per hectare. Thus we are considering a situation in which the yield per acre is increased threefold by incurring a threefold increase in cost per acre. This gives no pay-off in terms of reduced cost per pound of cotton but it does pay off in providing a better cotton at only half the cost of production in America. When account is taken of the cost of freight it offers a considerable direct advantage to the Indian textile industry and also an opportunity to establish a very profitable cotton export trade. Briefly, improved cotton growing practice may not materially affect the cost of production but it will provide a better product at roughly half world prices and release about 4 million hectares of land for food production. This latter factor has some emotional appeal but it should be seen in relation to the fact that in 1972 the total area devoted to food grain crops in India was 124 million hectares.

(b) Cost of Producing Man-mades

36. There is no good direct economic case for manufacturing synthetic staple fibers in India. The major inputs are raw materials and plant and machinery costs. In the large American plants the cost of labor is only of the order of 5% of all costs for polyester, nylon and rayon staple manufacture. Even though wage rates in India are very low the saving of labor costs cannot be significant in relation to total costs of production in America, Europe and Japan. The use of pulp from indigenous sources could give an advantage in the production of viscose rayon. In America the cost of the pulp is about 40% of the total cost of production of viscose staple. The cost of indigenous pulp in India could conceivably be as little as half the cost of American pulp and this would, other things being equal, give home produced rayon a cost advantage of 20% against world costs. With regard to plant and machinery costs, which form 30-40% of total costs, very little could be saved by manufacture of machine parts in India but there could be some saving on the cost of building construction.

37. Against the possibility of these relatively small savings being made must be set the high risk of unduly low plant utilization. Power and other shortages are very common features of the Indian industrial scene and these could be disastrous for any industry so capital intensive as fiber manufacture. On the other hand, if high plant utilization can be ensured, synthetic staple could be produced at costs of the same order as world costs and viscose staple could be produced at a little below world costs. With all man-made staples home production would have the merit of safeguarding

supplies to the textile industry but it would be unduly optimistic to expect a significant saving in cost. For our present purposes it will be prudent to take the cost of man-made staple, considered as an input to the textile industry, at world prices.

(c) Saving of Manufacturing Costs

38. The cost reductions in textile manufacture from the availability of better cottons and blends come both from increased machine and operative productivity and also from reduced material costs. The potential gain from the first factor has been assessed earlier in this section (paras. 21 - 23) as a production increase in spinning of 32%. In financial terms the gain would be slightly less because of the increased power requirement consequent on the use of higher spindle speeds. The net cost reduction would be of the order of 25% of all spinning costs. Direct gain from the second factor would be small, say 5%, for carded yarns but could be as much as 20% of material costs for combed qualities. The gain under this heading from the blending of cotton with the relatively low priced man-made staples depends on the view one takes of the value of the improved cottons. If they were supplied to the mills at a little above cost there would be little, if any, saving from the addition of man-mades. If, however, these improved cottons were valued and supplied to the mills at world prices the savings would be considerable. For example, world polyester staple prices have been falling steadily in relation to cotton prices. When account is taken of the greater density and higher proportion of waste of cotton, the polyester component has, weight for weight in the finished cloth, been the cheaper component for some years now. In 1973 when cotton prices were very high the in-the-cloth polyester/cotton price ratio fell to less than .5. It has risen a little since and it is not at present possible to make anything better than a guess as to what the ratio will be during the next few years. Taking the longer term view, however, there can be little doubt that the trends of the past 20 years will continue and it is probable the ratio will ultimately stabilize at a value within the range .3 to .6. If we take the figure of .5 for our present purpose, the saving in raw material costs for 2:1 polyester cotton cloths works out at 1/3 of the raw material costs of the corresponding 100% cotton cloths.

(d) Value of Increased Durability

39. The benefit to the national economy from increased durability of textile products made from better cottons and blends of polyester with cotton could be enormous. Increasingly the life of garments in the West is terminated not by wear but by changes of fashion or even a desire for change alone. This situation also exists in the upper strata of Indian society but for a large proportion of the population the durability of garments is important. The difficulty is to determine the magnitude of the effect over the whole range of textiles produced. Let us assume that for half the population the life of a garment is determined solely by its durability and that for the other half of

the population durability beyond the present level is of no value. Let us further assume that the affluent half of the population consumes, in value terms, three-quarters of the fabric produced, i.e. that the affluent consume textiles at three times the rate of the indigent. Taking to 2:1 as the durability ratio between polyester/cotton and cotton alone, the quarter of present production now consumed by the indigent would be reduced to 1/8 giving a net saving of 12-1/2% of total textile requirements for the country.

(e) Export Value of Improved Cotton

40. If the cotton growing industry of India moves up the world league table and becomes an average producer of medium staple cottons, in terms of quality and yield per acre, it will have become a considerable asset to the nation. This asset may be deployed in a number of ways. For our present purposes let us suppose that it is deployed in the way suggested in para. 2.25 above. This is based on the export of 300 thousand tons of cotton out of a total crop of 1,500 thousand tons. From (a) above it appears that Indian cotton growers could expect their production costs per lb of lint to be of the order of 57% of American production costs for similar cotton types. It would be unrealistic to assume that the cotton produced would be as good as that produced in America and, initially at least, prejudice based on the past reputation of Indian grown cottons would tend to hold down realizable prices. It seems reasonable to assume that the new Indian grown cottons would command a price of the order of 80% of the price of American grown cottons. On the further assumption that freight costs would not be significantly different this would give a return of about 23% of the market price of American type cottons. The 1974 price was roughly Rs. 13 per kilo so that export of 300 thousand tons would bring in foreign exchange to the value of Rs. 3,000 million and with a profit content of about Rs. 1,000 million. This return depends on the form in which the cotton is exported. The total return is, of course, greater if the form of export is yarn, cloth, or most rewarding of all, garments. It must, however, be accepted that the export of yarn and cloth does not demand a supply of home produced cotton (for many years Britain was a great exporter of cotton goods). A profitable textile and garment industry based on imported fibers could be established in India. Nevertheless there are useful economies in freight charges and financing costs if indigenous cotton of satisfactory quality is available to the textile industry.

D. Machinery

41. It has been estimated by IFCATI that roughly 33% of the spinning machinery and 22% of the looms in India are less than 10 years old. Comparable figures are not available for the finishing (processing) machinery of the industry, but observation and inquiry in the course of the mission suggest that an overall figure of 25% less than 10 years old is of the right order. This covers a wide spectrum of situations. Possibly as much as 40% of printing capacity is less than 10 years old, but the proportion of scouring and bleaching equipment more than 10 years old could be as high as 90%.

42. So far as age distribution is concerned, the industry is good by world standards of established textile industries. The F.R. of Germany, for example, is a very efficient producer of textiles and there 85% of spindles and 80% of looms are more than 10 years old. Age distribution, however, does not tell the whole story. In the case of spinning and weaving, almost all machinery installed during the last 10 years has been of Indian manufacture. It has been made on the basis of collaborations and licensing arrangements with Western textile machinery makers and although the quality is, by and large, satisfactory, the designs are by no means the most modern. This is not a wholly unsatisfactory situation because many Western developments have been primarily of a labor saving nature and there is no pressing need for such developments in India. With minor reservations, it can be said that the machinery at present being made in India and much of that supplied during the past 10 years is ideally suited to the conditions obtaining in the country.

1. Spinning

43. Most of the older machinery, too, although not of a type suitable for today's conditions in the high labor cost countries, is not inappropriate to Indian conditions. Unfortunately, however, much of it is in a deplorable condition and operating in a most unsatisfactory environment. That this is not inevitable was evident during the course of the mission. Two of the mills visited, although equipped with very old machinery, were operating extremely well by any standards. Machine condition was excellent; all practices were good and the standard of housekeeping was all that could be asked for in even the most modern mill. In each mill the machinery had been modestly updated from time to time, everything was scrupulously maintained and the net result was a productivity level little short of that achieved by the most modern mills seen.

44. The majority of mills with old equipment, however, can only be described as industrial slums. By Western European standards of mill housekeeping, the machinery is operated in conditions of almost unimaginable squalor. The machinery itself is in bad state of repair and this, together with the appalling operating conditions, gives an abysmally low technical performance in terms of both quantity and quality of product. It is difficult to be precisely quantitative in regard to the effect of these conditions on productivity, but the productivity surveys carried out by SITRA give some useful pointers. For example, from these surveys it can be seen that among 58 mills spining 60's from carded Indian cotton, productivities ranged from 22.8 to 51.4 grams of yarn per active spindle shift although all were making nominally similar yarns from nominally similar cottons. Despite this, the lea C.S.P., a direct measure of strength, ranged from 1,485 to 2,100. This difference was not caused by a difference in twist factor. The weaker yarn had in fact slightly the greater number of turns per inch; 34.2 as against 32.7. Waste loss of the spinning frame also covered a wide range from about 2% for the more efficient spinners to nearly 9% for the least efficient. All these measures of performance were roughly paralleled--i.e. strong yarn and low waste loss was generally associated with high machine productivity and also with high operative productivity which, in terms of sides tended per

operative, ranged from 3 to 6. The waste of resources which this inefficient operation of existing plant represents is a socio-industrial problem rather than a technical problem. If it could be eradicated the return in increased productivity would be considerable. For a relatively small expenditure on updating and reconditioning the productivity of the worst mills could be more than doubled and the output of the whole industry increased by from 40 to 50%.

45. The requirement is not more technologists. There are already enough technologists who know how a mill should be run and who are aware of the penalties which poor maintenance and bad housekeeping inevitably exact but there are too few people willing and able to establish conditions under which a work force may be inspired to carry out duties at all levels conscientiously and competently. In discussion of this problem, firms which are operating old machinery efficiently expressed the view that mills degenerate not because the labor force is basically uncooperative, nor as a result of obstructive policies initiated by sectional interests in the labor force, but largely because of the failure of management to provide and maintain good working conditions and operative amenities. This could well be true as it was noted that in all the bad mills the general environment was bad--broken floors, poor lighting, walls dirty, and all amenities in a dilapidated condition. The efficient mills, even those with very old machinery, had good level floors, clean paintwork and a general air of well being.

46. Particularly discouraging was the situation of a number of mills visited which had bought good modern machinery and merely installed it in the same squalid environment as the old machinery. In one such installation of about 5,000 ring spindles of the best modern type (Lakshmi-Rieter) had been set up in an old spinning room alongside about 10,000 very old spindles and fed from the same source of roving. The floor was badly broken, the place was filthy, and the new frames (still only about 6 months old) were giving a performance very little better than that of their decrepit neighbors. The management said they were very disappointed with the new frames. Contrast this with the situation in the two mills already mentioned, where very old ring frames, which had been updated and reconditioned at a cost of the order of 40% of the cost of new frames, were giving a performance equal to that of new frames in a new mill. At one of the mills the reconditioned frames were spinning 80's at 16,000 revolutions per minute with a breakage rate of 7 per 100 spindle hours, whereas the new Lakshmi-Rieters in the old mill were spinning 60's at only 11,000 revolutions per minute and with a breakage rate in excess of 20 per 100 spindle hours.

47. The machinery situation may be summarized by saying that the total installed capacity of the industry is more than sufficient to meet the target of the 5th Five-Year Plan. A small fraction of the machinery should be scrapped and replaced by new. A very large proportion, perhaps 50% of the ring frames, require to be updated and reconditioned at a cost of about 40% of new and the environment and general working conditions in the majority of old mills are desperately in need of radical improvement.

2. Weaving

48. Many of the comments made above in relation to spinning are equally applicable to weaving. Most of the mills are industrial slums by Western European standards, practices are bad and productivity is very low indeed. There are roughly 4,000,000 looms engaged in the weaving of cotton and allied fabrics. Of these, 208,000 are in composite units in the Mill Sector. The remainder are in the Decentralized Sector and are operated in units of from 1 to 20 looms. The actual performance of these looms outside the Mill Sector is not well documented. Published figures suggest that output is very low indeed but because of the close links between hand loom and power loom weaving and the system of differential excise concessions real doubt exists as to the reliability of the statistics which are available (this matter is discussed more fully in paras. 107 - 111 under the heading "Credibility of cloth production statistics"). Because of these doubts, because there is no technical reason for the efficiency of power looms to be appreciably lower in small installation and because in the Power Loom establishments visited during the course of the mission performance was similar to that observed in the Mill Sector, no attempt will be made here to seek a technical explanation of the apparently inefficient operation of power looms.

49. Rather more than 80% of all looms in the Mill Sector are non-automatic and these are generally staffed on the basis of 2 looms to 1 weaver although in some mills the allocation is 4 per weaver. The automatic looms are mostly of the conventional shuttle type with automatic pirn changing although there are quite a lot of shuttle-changing automatics. In the mills visited most of the pirn-changers were operating automatically with allocations of from 4 to 16 looms per weaver. Many of the shuttle-changers, however were operated non-automatically because of technical difficulties concerned with interchangeability of shuttles. These looms were operated with allocations of 2 to 4 per weaver and for all practical purposes should be regarded as being non-automatics.

50. A very small number of shuttleless looms have been imported. Two small installations were seen by the mission, one of Sulzer and the other of Dornier rapier type looms. The case put by both machinery making and textile trade representatives to justify the expenditure of foreign exchange was that shuttleless looms make better cloth more cheaply. This is not so. It is true that an analysis of world cloth quality would show a very strong correlation between cloth quality, degree of sophistication of loom type and cost of weaving but this is not to say that there is a causative relationship. The work load of a power-loom (i.e. non-automatic) weaver has two major components (a) periodic replenishment of the weft yarn supply carried by the shuttle and (b) the repair of yarn breakages which occur randomly during weaving. Shuttle yarn (pirn) replenishment frequency depends on a number of factors but for the range of cloths we are concerned with is typically in the range 12 to 30 times an hour for each loom. Thus at the higher end of the range a weaver tending two looms has to replenish a shuttle once per minute. Between making

shuttle replenishments he spends his time dealing with task (b) which, under Indian conditions, is the major part of his work load. By improving the strength and uniformity of the yarn, the task (b) load can be greatly reduced and in principle this will permit a weaver to look after more looms but the extent to which this fact may be exploited is seriously limited by the time taken to walk from loom to loom as the allocation per weaver is increased and also by machine interference consideration. Even with the best yarns, giving a negligible component (b) work load, the practicable number of non-automatic looms which one weaver can tend is limited to about 8. To reduce the work content further it is necessary to automate component (a), weft yarn replenishment, leaving a situation in which labor requirements can be very substantially reduced by reducing component (b). Thus, with automatic looms and a rational labor policy there is considerable incentive to improve yarn quality, reduce component (b) of the work load and increase the number of looms per weaver. At a load of about 24 looms per weaver and a low component (b) the labor of replenishing the magazines which feed the automatic weft replenishment mechanism becomes the limiting factor. This can be overcome most rationally by adopting one or other design of shuttleless loom so that the weft can be supplied to the loom in the form of large packages each holding 3 or more kilos of yarn rather than in the form of pirns each holding only about 50 g of yarn. An alternative solution is the Unifil device which by preparing pirns actually on the loom and automatically filling the pirn magazine permits a conventional pirn-changing automatic loom to be converted to accept a large package weft supplies.

51. Again, as in the step from non-automatic to automatic, the step from conventional automatic to shuttleless (or Unifil conversion) looms permits even greater economies of labor by further reducing component (b) of the work load. By this means allocations of 80 or more looms per weaver can be operated with high machine efficiencies although it does, of course, mean that the yarn for both warp and weft must be very good indeed. It is therefore not surprising that firms equipped with expensive shuttleless looms use only the very best yarn in order to utilize the labor saving potential as fully as possible. In consequence cloths produced on shuttleless looms tend to be very good quality cloths. It is incorrect to suppose that shuttleless looms can produce good cloth from bad yarn. The true situation is that, given good yarn, the cloth made on conventional automatics in good condition will be as good as cloth made on shuttleless looms. The only significant advantage of shuttleless weaving is reduction in labor content and this feature has very little to commend it in India. There are two other considerations which may be important in some circumstances. The first is that shuttleless looms give a more convenient method of introducing automatic color changes in the weft, and particularly so where single picks of one color are in demand. This is a feature which is useful in the color-woven suitings trade. The other feature is that no shuttleless loom can make cloth with conventional selvedges, although most of them give reasonably satisfactory false selvedges. Finishers used to conventional selvedges tend to have difficulty with false selvedges and given the choice the majority of customers still prefer the conventional.

52. To summarize the situation it is true to say that with the wage rates now paid in India and the low quality of yarn available there is very little to be said against the use of non-automatic looms to produce most of the fabrics needed for the home trade. If yarn quality is improved during the next few years the case for using more conventional automatics will be greatly strengthened but it will not provide a case for the widespread use of shuttleless looms. With yarn quality at its present level shuttleless looms would be a disastrous investment both technically and economically.

E. The Labor Force

1. Overstaffing

53. The numbers employed in all branches of the Textile Industry of India are very high indeed even by the standards of other developing countries, and incredibly high by the standards of developed countries. They are high in relation to installed capacity and even higher in relation to the output of the industry. In a country which has a large unemployment problem it is sound policy to employ labor intensive rather than capital intensive methods of production, particularly where labor intensive working, either by requiring cheaper, simpler machinery or by giving higher productivity per unit of installed capacity, reduces the capital investment required per unit of production. In India, however, there is ample evidence that this policy has been carried much too far. The industry has got the worst of both worlds and is suffering both low operative productivity and low machine productivity.

54. In spinning, for example, the amount of a particular yarn produced per operative shift in Hong Kong is 2.2 times greater than the amount of a similar yarn produced per operative shift in India. At the same time the number of actual working spindle shifts needed to produce the same amount of the same yarn is 1.42 times greater in India than in Hong Kong. This is particularly discouraging when it is appreciated that the machinery of the Indian spinning industry is very similar in type, although not in condition, to that installed in Hong Kong. The situation is even worse in weaving. In Hong Kong the productivity per operative shift figure for a standard sheeting is 2.87 times higher than the comparable Indian figure for weaving on automatic looms. Relative to Indian productivity per operative shift on non-automatic power looms Hong Kong operative productivity is 6.5 times greater. Productivity per loom shift is roughly the same for automatic as for non-automatic power looms in the Mill Sector in India, but again it is significantly below the corresponding figure for Hong Kong.

55. In most other developing countries the comparison is similar. Relative to such developed countries as Japan and USA the contrast is even greater—clearly there is something wrong when the use of a substantially larger labor force results in a lower output per unit of capacity. Part of the explanation lies in the fact that the majority of the mills in India are using a labor force of a size which is much larger than is optimum

in the opinion of management. Although it is far larger than is justifiable on technological grounds, management is not free to reduce it. This situation often militates against the operation of good practice. For example, a compulsory excess of labor in spinning encourages "overspinning" of cotton, gives management little return for money spent on the maintenance of drafting systems and on those consumable stores such as travellers, cots and drafting aprons which have an important bearing on spinning performance and yarn quality. In consequence end breakage rates in spinning are many times higher than world norms and yarn quality is very low indeed. In other circumstances this could not be tolerated because it would incur far higher costs in spinning room labor than would be justified by savings in raw material or maintenance costs but with a fixed labor force there is no incentive to better practice. Thus the burden of a too-large labor force reduces machine productivity and increases the capital cost content of each unit of production. If this were the only penalty it would be serious enough but in fact it is only one of the lesser evils of gross overstaffing. Far more important is the effect of the associated malpractices on the quality of the product. Irregular yarn which has been spun with a high breakage rate causes trouble and excess costs in rewinding, in warp preparation and in weaving. The finished cloth is more expensive and of inferior quality, particularly in regard to the incidence of visually objectionable yarn faults.

56. Employment is clearly a sensitive political area in India and one can sympathize with the desire to provide employment through the textile industry but only insofar as it is compatible with the efficient use of expensive capital equipment. In spinning there is a serious dilemma. The older labor-intensive methods of yarn production, cottage wheels, Brunswick wheels and Ambar Charkha spinning, require a higher capital investment per unit of production than do the modern labor saving systems of ring spinning and open-end spinning. It is just possible that large manually operated spinning jennies which could be built by local craftsmen and used in cooperatives could have a place for coarse yarn spinning, but for the most part the only economically viable way of producing yarn is in well-equipped, power driven mills of at least 30,000 ring spindles or 10,000 open-end rotors.

57. There is more scope for employing greater numbers in weaving; some speciality cloths such as elaborately patterned saris can be produced viably on simple handlooms but for quantity production handloom weaving can have no long-term future. On coarser fabrics there is limited scope for the use of "high performance" handlooms which can be operated at 100 to 120 picks per minute as these machines are much cheaper to build than even the simplest power looms. Generally, however, the most economic system consistent with the provision of maximum employment is the use of non-automatic power looms. They may be installed in composite mills, run by cooperatives or privately as a cottage industry. As there are no large economies of scale in the actual weaving process they are viable in very small units (perhaps even singly) so long as centralized, commission or cooperative, facilities for warp preparation are available. The normal economic work load is in the range 2 to 6

looms per weaver depending on the fineness and quality of the yarn. As these looms are very much cheaper to build, yet have a very similar rate of production to conventional automatics, this is in principle the most economic way of weaving in a low-labor-cost country. In practice the performance of the Decentralized Power Loom Industry is disappointingly low in terms of both loom and operative productivity.

58. Almost 20% of the looms in India are in fact automatics although Mill Sector performance of non-automatic looms is satisfactory. The reason for this has not been investigated. It could be that the lower labor requirement of automatics more than offsets the higher capital charges and maintenance costs but the saving can only be marginal with loadings in the range 6 to 16 looms per weaver. The other possibility is that cloth appearance is generally better from automatics because of the elimination of the many "starting place" marks which are to be found on all but the most openly woven fabrics produced on non-automatic looms. In cloth intended for export this could be an important consideration.

59. Labor utilization in finishing is a very complex topic. Generally there is no serious penalty to the use of labor-intensive methods based on very simple equipment; and a great deal of finishing in India is done in this way. In a low labor cost country the only advantage offered by the sophisticated labor saving equipment which has appeared over the last decade or so is that, by eliminating the human element more consistent performance can be achieved. This could well be important in relation to exports which may be destined for consumption by a mass production garment making plant but for domestic sale the standards achieved on simple equipment are quite acceptable. This is generally true for all the main cotton finishing processes.

60. To summarize, the situation may be said to be one in which it is in the national interest to eschew the use of new labor-saving machinery except where (a) additional capacity is needed and the capital cost per unit of production is lower for the labor-saving machinery than for machinery of the old type, or (b) the new machinery produces a product which is superior in some important respect. This means that, apart from the possibility of a viable form of large jenny being developed for rural use, spinning must be done using high productivity modern machinery installed in large mills and the numbers employed in spinning should be reduced to near world norms. In weaving, however, there is some scope for the use of very labor intensive hand looms and the main channel of production should continue to be based on relatively labor intensive use of non-automatic power looms. Labor-saving automatic looms are needed only to meet quality requirements for higher grade fabrics. In finishing, too, continued use of labor intensive methods can be justified for most processes and fabrics.

2. Competence

61. That the Indian textile industry, although equipped with reasonably modern machinery, produces very low quality goods while employing a remarkably large labor force to do so, is a matter worthy of further investigation. Some responsibility for this state of affairs lies in the failure of the cotton growers to provide satisfactory cotton, but equally culpable is the labor force of the industry. Some of the best mills seen during the mission were satisfactory by world standards but the vast majority of mills are very badly operated. This stricture applies equally to spinning, weaving and finishing. Nor is it confined to the less profitable mills and the "sick" mills--several of the large profitable mills seen were surprisingly badly run. The practices of shop floor labor in most mills are deplorable. The importance of cleanliness, or more particularly the avoidance of accumulations of short fiber in the many critical regions of textile machinery, is often completely ignored. In a small number of the mills visited the standard of machine cleanliness was high but in the majority it was extremely low indeed. In these mills the extent of short fiber accumulations was such as to greatly affect yarn and cloth quality and be a major cause of roving and yarn breakages in spinning and of loom stoppages in weaving. Generally there appeared to be an inverse correlation between overstaffing and machine cleanliness. This is surprising as one would expect that, constrained to carry a substantial surplus of labor, management would take advantage of the situation to maintain particularly high standards of cleanliness. Regrettably this is not so. With regard to "housekeeping"--the handling of materials in process, the care of bobbins and the handling and storage of finished yarn packages and cloth pieces--it was discouraging to see that, despite the abundant supply of labor, the standard in most mills was abysmally low. Apparently minor damage sustained by roving or yarn packages as a result of rough or careless handling leads to difficulties later. From bale opening to fabric finishing materials handling was unsatisfactory. Only in packing departments was any real attempt made to avoid damage, and then of course it is too late.

62. It is difficult to come to any firm conclusion as to the basic cause of this unsatisfactory state of affairs. Discussion with technical management revealed that the importance of cleanliness and good housekeeping was appreciated but this was generally accompanied by a fatalistic acceptance of the situation as it is. Generally they were aware that standards were very low but were unable or unwilling to do anything about it. This apathetic attitude could arise from a realization that, as there is ample labor available to deal with excess yarn breakages in both spinning and weaving and to "mend" defects in the resulting cloth, action to improve operative practices would at best be unrewarding and might even lead to operative discontent out of sheer boredom. In other words, it is not that overstaffing is made necessary by managerial tolerance of bad practices, but rather that bad practices arise and are tolerated, or even condoned, by management because of overstaffing.

63. With regard to another, equally important, aspect of mill operation the situation is rather different although equally unsatisfactory. Standards of machine maintenance and setting are generally very low indeed. In spinning, cards are badly ground and badly set, drafting systems are in poor order and the relative positioning of spindles and rings is far too rough. In weaving it is the same story; all parts of the loom mechanism are neglected and this gives rise to frequent stoppages from loom malfunctions and an excessive requirement for such consumable stores as shuttles, picking bands, healds and reeds. Again technical managers are aware of the importance of this aspect of mill operation and have detailed knowledge of the requirements. Despite this they appear to be completely unaware of the extent of their failure to achieve satisfactory standards of machine maintenance. Solution of the problem would substantially increase the productivity of the Indian textile industry, lower its costs, and increase the value of its product.

F. Industry Structure

64. Legally and administratively the textile industry is clearly divided into two sectors, the Mill Sector and the Decentralized Sector. The two sectors operate within a complex network of restrictions and concessions, obligations and privileges. For example, installation of machinery is subject to the granting of license, composite mills are required to produce specified quantities of controlled price cloths even though this may be unprofitable, the production of certain cloths is restricted to hand loom weavers and units of less than five power looms. There is also fiscal regulation of industry activities. Most textile products are subject to excise duties levied according to a bewilderingly complex plan made even more complex by a variety of concessions granted to particular sections of the industry. For example, excise duty is levied on most cloth on a scale dependent on the fineness of the yarn from which it is made. The standard rate is applied to all cloth produced by the Mill Sector but very much lower concessionary rates apply to cloth produced by power looms in the Decentralized Sector. Here the rate is dependent on fineness but also dependent on the number of looms operated by the unit which manufactured the cloth. A fuller treatment of the effects and implications of the legislation by which the industry is controlled is not within the terms of reference of this mission. In this section attention will be paid only to those aspects of Government control which directly affect the performance of the industry.

1. Activities of the Mill Sector

65. Broadly the Mill Sector consists of two sorts of mills, 'spinning' and 'composite'. There are 335 spinning firms which produce yarn only and 251 composite mills which have both spinning and weaving capacity. Of these 199 also have finishing capacity (finishing is known as processing in India). About 31% of total spinning capacity is operated by the spinning mill and of the composite mills those with finishing capacity operate 91% of weaving

capacity, i.e. only 9% of Mill Sector weaving capacity is without its own finishing capacity. The total number of employees on the payroll of the Mill Sector averages about 1 million and the numbers actually employed average about 800,000.

66. All firms in the Mill Sector were originally established by private or public limited liability companies. Many of these companies have substantial interests outside of textiles and some of these, finding their other activities to be more profitable, have allowed their textile mills to run down to such a level that they can only be described as "sick." Rather than let these mills die Government has intervened with schemes for the rehabilitation of sick mills. Some of this has been undertaken by Regional Governments and some by IRCI, a bank group charged with responsibility for industrial reconstruction. More recently the National Textile Corporation has been formed to acquire the assets of sick mills and arrange for their rehabilitation. At the time of the mission visit NTC had control of 103 firms of which 98 were actually in production. Management of these mills is to be decentralized to the extent of forming nine subsidiary groups within NTC. The remaining 483 firms comprising the Mill Sector continue to be owned and operated by limited liability companies.

2. Activities of the Decentralized Sector

67. The Decentralized Sector is mostly concerned with weaving. Of all cloth woven in India almost one half is produced in the Decentralized Sector. Roughly two-thirds of this is woven on handlooms. The number of handlooms in use has been estimated at 3,000,000 and the number of people dependent on handlooms for their living is thought to be around 7.5-10,000,000. The remaining third of the Decentralized Sector cloth production is woven on non-automatic power looms operated in small workrooms or in larger installations financed by cooperatives. The proprietors of these hand and small shed power looms are encouraged by concessional excise duty rates and other fiscal concessions and in addition are given monopoly rights in the production of some cloths. Most of the yarn used in the Decentralized Sector is spun by the Mill Sector. To ensure a satisfactory supply of yarn Government puts pressure on the Mill Sector in various ways. Some yarn is supplied by co-operative spinning units set up specifically to provide yarn to the Decentralized Sector. In 1974 the capacity of cooperative spinning mills was roughly 8% of total spinning capacity in India and growth is being encouraged. There are also cooperative finishing units which process fabrics produced by the Decentralized Sector. Much of the cloth produced is sold locally but there are cooperatives undertaking retailing on a regional scale.

68. The Decentralized Sector is an important feature of the Indian domestic economy and is a significant part of the textile industry. In comments which follow below those made in relation to spinning and finishing are as relevant to Decentralized Sector cooperative spinning and finishing as to the Mill Sector. Comments made in relation to weaving are generally applicable only to the Mill Sector of the industry.

3. The Product Mix of the Industry

69. The range of cotton textiles demanded by the home trade in India is far wider than in most other countries. In particular at one end of the range there is a very large demand for high quality cloths made from extremely fine all-cotton yarns. At the other end of the range there is a large market for coarse cloths of a quality so low that they would be completely unacceptable in most countries of the world. In the "Report of the Task Force on Textile Industries" the variety wise production of weight of cotton cloth at the end of the 4th Five-Year Plan is given as -

Coarse and Lower Medium (up to 20's count)	42%
Higher Medium (20's - 35's)	36%
Fine and Superfine (Finer than 35's)	22%

After discussing a number of points the task force comes to the conclusion that a similar distribution pattern should be the aim of the present five-year plan but notes that the Indian Cotton Mills Federation holds the view that the proportion of coarse and medium is too high and urges an increase in the proportion of fine and superfine. This conclusion is the reflection of a conscious, or perhaps sub-conscious, appreciation that the manufacture of finer yarns and cloths is more profitable.

70. When the detailed figures for count-wise output of yarn and cloth are considered in relation to the national objective of clothing the masses and increasing the per capita availability of cloth it becomes clear that the above brief table is to some extent misleading in that it gives only proportions by weight. On the basis that the 'weaker' section of the population, i.e. those people living below the poverty level and dependent on coarse cloth for their clothing, is roughly 40% of the total population, the distribution shown above appears to be satisfactory in that 42% of total textile production is in the "coarse and lower medium" category. However, when working from the detailed count-wise output statistics contained in the annual statistical Bulletin of S.I.M.A., the distribution is expressed in terms of area of cloth, the picture looks rather different:

Variety-wise Production of Cloth by Area	
Coarse and Lower Medium	30.2%
Higher Medium	39.3
Fine and Superfine	30.5
	100.0

The proportion of coarse and lower medium cloth, seen in a way which is appropriate when considering the use of cloth, now appears as only 30.2% of the total.

71. When the figures are examined further to investigate the fractions of industry capacity employed in the three categories the picture is even further altered.

Variety-wise Production of Cloth by Proportion of Industry Capacity

	Spindles	Looms
Coarse and Medium A	16.2%	20.3%
Medium B	35.2	37.9
Fine and Superfine	48.6	41.8
	100.0	100.0

Put into words this means that almost one half of the employed spinning capacity and more than 40% of employed weaving capacity was engaged in the production of fine and superfine textiles. Only less than one-sixth of employed spinning capacity and slightly more than one-fifth of employed weaving capacity was engaged in the production of coarse and lower medium goods.

72. Clearly the industry is, naturally enough, applying a very substantial fraction of its resources to the more profitable luxury end of the trade.

73. In view of the fact that influential people in the industry and in government departments concerned with the industry have expressed the view that it would be beneficial to spin finer yarns and weave finer cloths it is pertinent to look further into the relationship between fineness and productivity. At constant spindle speed the number of spindle hours needed to produce one kilogram of yarn goes up roughly in proportion to the count to the power 3/2. Thus the number of spindle hours needed to produce one kilogram of 80's yarn is eight times greater than is required to produce one kilogram of 20's yarn. In practice there are a number of considerations which lead to minor deviations from this simple formula and it is necessary to consider each count group separately. This has been done and it was found that if, over the whole range, the average count were to become 10% finer it would be necessary to increase the number of active spindles by 16% in order to spin the same weight of cotton as at present.

74. To those members of the industry who regard the availability of cotton as a principal constraint spinning finer would have the merit of permitting a 16% increase in spinning activity without requiring an increase in the amount of cotton produced. There are two objections to this course. The first is that gross overspinning is already an important factor in the low productivity of the Indian textile industry and to spin even finer would make matters worse. The other objection is that increased spinning activity would require an equal increase in power availability. In the present situation this would further aggravate an already difficult power shortage situation. Even if, whilst spinning 10% finer, the weight spun were reduced so as to permit weaving only the same area of cloth, approximately 10.3% increased spindle activity would be needed with a corresponding increase in power requirement. On the credit side spinning finer would offer the advantage that a greater area of cloth would be produced from the same weight of cotton, a 10% increase in average count would lead to an increase of roughly 5% in the area of cloth available. Unfortunately the lighter cloths would, in general, be less durable but there is insufficient quantitative data available on this aspect of Indian textiles to allow an assessment to be made of the magnitude of the effect.

75. Going finer would also require an increase in weaving activity. To weave the same weight of yarn into cloth of the same cover from yarn 10% finer would require, on average, a 9% increase in loom activity. To weave yarn 10% finer into the same area of cloth would require a 4% increase in loom activity.

76. More detailed study of the implications is needed to appraise fully the merits of a proposal to modify the product mix of the industry in any direction. The present product mix in India appears to be completely unsuited to the cotton supplies which are available and any change which made the average count even finer would make the situation worse. If market requirements absolutely dictate the present product mix efforts should be made to improve the cotton quality. If, however, improvement of the cotton quality is unlikely in the near future, then the only rational change in product mix should be towards a coarser average count.

4. Specialization

77. Lack of specialization is a serious weakness of the industry. Almost every company in the Mill Sector and, to a lesser extent, the co-operatives of the Decentralized Sector, aspire to manufacture every product over the whole of the very wide spectrum of counts and cloth constructions which constitute the Indian domestic market for textiles, and companies generally feel that product flexibility is essential for the maintenance of commercial viability. The soundness of the commercial grounds on which companies base their practice of having a very wide product range may be arguable but there can be no doubt about the merits of specialization from the point of view of reducing manufacturing costs. There are two principal ways in which specialization reduces costs. The first is concerned with reduction of operating cost.

78. Paper exercises on the effect of reduced variety on the productivity of spinning mills and weaving mills have revealed a number of identifiable and quantifiable costs which are incurred directly as a result of variety. Combining these enables the expected productivity of any given unit to be assessed for various degrees of specialization. In the event the actual gains from specialization are very much greater than can be accounted for in terms of the identifiable costs of variety. In a major field exercise undertaken in the U.K. it was found that the real cost of variety in both spinning and weaving was generally in the range 5 to 10 times greater than the directly predictable cost. A typical example of the cost of variety in spinning was the case of two almost identical mills owned by the same group and located in the same district of Lancashire. Their machinery was the same, they each had about 35,000 spindles and they had roughly the same counts range of 24's to 40's - a very narrow range by Indian standards. One of the mills produced only four yarns to long term contracts, the other produced about twelve different yarns at any one time in small batches. The production of the specialist mill was the greater by 25% and unit costs were lower by 20%. Naturally the profitability per unit of production was very high and the profit per unit of installed capacity was even higher.

79. The same situation was found in weaving. In one study of the cost of variety 58 weaving establishments with a wide range of loom and fabric types were investigated. The number of warp changes per 10,000 loom shifts was used as a measure of variety. The range was from 5 to 96 and the range of a measure of specialization, the typical lengths of run, was from 3,800 to 62,000 yards. Loom efficiencies ranged from 67.5% with the greatest variety to 91% with least variety. Operative productivity, in units of 10,000 yards of weft inserted per operative hour ranged from 4.2 to 11.7. Average production costs, taking account of labor, power, capital and spares costs, were determined for each mill. The results are expressed in the following table.

Cost of Variety in Weaving
(a survey of 58 mills)

	Warp changes per 10,000 loom shifts	Cost of weaving in pence per yard (at 1974 prices)	Variation in cost from whole population average
Upper Quartile	17	4.18	-23%
Average	44	5.42	
Lower Quartile	70	7.23	+33%

This indicates that variety is an even more expensive business in weaving than in spinning. As most Indian weaving units have a degree of variety in the lower quartile of the U.K. sample there must be considerable scope for cost reduction and productivity gains by introducing a higher degree of specialization.

80. It has not been found possible to identify with certainty the causes of the unexpectedly large gains in productivity which result from specialization. It has been established that it is not simply the result of increasing the scale of production for each line. The units studied covered a wide range of sizes and analysis revealed no evidence of significant economies of scale. The explanation appears to lie rather in the effect of specialization on the expertise of staff at all levels but particularly at skilled worker, technical supervisor and manager levels. As the number of products is reduced skill is increased, variables are optimized more finely in relation to very specific requirements and generally all activities concerned with manufacture proceed more smoothly and more expeditiously.

81. The second factor is more efficient plant utilization. Consider first the productivity of each section of a spinning mill when producing yarns of different counts. In the blowroom, where the cotton is opened and cleaned, the ultimate count has only a second order effect on production rate in kilograms per shift. In the present context the effect can be regarded as negligible. The next important process is carding. Here there is an appreciable effect; long, fine staples suitable for spinning fine yarns cannot be carded at so high a speed as can the shorter and coarser staples used for coarse yarns. Over the range of counts commonly spun in India the carding rate, in kilograms per shift, is roughly twice as great for the coarse counts as for the fine. Through the sequence of preparatory drawing stages from first draw frame to roving the effect of count on productivity increases from the first drawing, where the effect is only marginal, to the final speed frame where the effect is considerable but rather less than at the spinning frame. By far the greatest effect of count on productivity is found at the spinning frame itself. The A.T.I.R.A. survey to establish industry norms in India gives industry average production rates falling from 317 gms per spindle shift on 10's to 12 gms per spindle shift on 120's.

82. Although it is clear that because of the wider range of sensitivities to count change in the various sections of a mill flexibility of count can only be obtained at the expense of reduced plant utilization, the magnitude of the effect can only be assessed after making a detailed study of how productivity in each section is influenced by specific changes of count. Such a study has been made and two examples of the effects on productive capacity and plant utilization of changes in product mix are described below. To avoid problems of machine fractions a large mill (100,000 spindles) has been assumed. The mill is so equipped that, with the exception of the opening and cleaning section 1/ all machinery is fully utilized when the product mix is approximately the 1973 average product mix of the Indian industry, viz:

1/ Opening and cleaning machinery is relatively cheap and for good operational reasons it is usual for a mill to have considerable excess capacity in this section.

Distribution of Yarn Production by Count

Count	-10	20	30	40	60	80	
Production by weight (%)	12	30	27	19	7.6	2.7	1.7

Calculations of the effects of change have been made using this seven element product mix but for easier appreciation the results are presented in the simpler, three element form used in the "Report of the Task Force on Textile Industries" and already introduced above.

83. The first change considered was a reduction of 50% in the weight of coarse and lower medium yarn produced, no change in the weight of higher medium counts and as much machinery as possible kept in operation. In the changed situation the number of spindles is the effective constraint. The reduction in the number of spindles needed for coarse and lower medium spinning increases the spindle capacity available for fine and superfine spinning by 3.66%. There is a net reduction in the total output of the mill of 17.33%. All spindles are fully utilized but 9.9% of the cards are surplus to requirements. As cards are quite expensive machines this is an important consideration. In the drawing section of spinning preparation there is some underutilization of the drawframes but combers and speed frames continue to be almost fully used.

84. The second change considered was an increase of 50% in the weight of coarse and lower medium yarn and again no change in the weight of higher medium counts and as much machinery as possible kept in operation. In this case carding capacity is the effective constraint. The additional carding capacity required for coarse and lower medium production reduces the availability of card sliver for fine and superfine production by 47.6%. There is a net increase in the total output of the mill of 10.5%. All carding capacity and all drawframes are fully utilized but there is some surplus capacity in combers and speed frames. The greatest penalty of the change is that 15.1% of the spindles are idle.

85. When account is taken of both the effect of specialization on efficiency and the cost of product-mix flexibility in terms of reduced machine utilization, the fact must be faced that however desirable versatility may be for the commercial viability of individual companies it must inevitably increase the real cost of textile manufacture.

5. Optimum Mill Size

86. Mills in India vary in size from less than 10,000 to more than 200,000 spindles and, in the mill sector, from less than 100 to more than 2,500 looms. Although this is a very wide range of sizes the difference could be justified by differences in product range. In fact differences in product range are not reflected in mill size. Some of the smallest mills make a very wide range of products and although the larger mills are better able to cover

a wide range many of the largest are still small in relation to their product range. For example the Binny Mill in Madras with 118,000 spindles, 2,600 looms and 12,600 workers is not untypical of the larger units - it lists 36 'standard' yarns in counts ranging from 2's to 100's and 28 categories of cloth ranging from heavy ducks to voiles and including such specialized cloths as tapestries, jacquard furnishings and corduroys.

87. The question of optimum size is often debated. Around the turn of the century the spinning industry in Lancashire almost standardized on the 80,000 spindle mill. Today the 'standard' unit for spinning an average count of 30's could be said to be the 30,000 spindle ring mill. This is not strictly an absolute optimum; it is, rather, the smallest unit which can fully employ a standard twin delivery opening and cleaning line. It can be said that beyond this point there are no economies of scale so far as machinery cost is concerned. With this criterion, and taking account of the effect of fiber characteristics on machine performance, minimum size economic units for various counts are:

		Minimum Size Economic Units	
	Average Count	Number of Ring Spindles	Productive Capacity Kg/shift
Carded	12	11,000	4,800
	20	20,000	4,400
	30	30,000	4,100
	40	42,000	3,800
Combed	40	33,000	2,900
	60	49,000	2,600
	80	59,000	2,400
	100	96,000	2,200

88. For highest efficiency, single units of size based on this criterion can be operated over a counts range not wider than ± 20%. For example a mill of 30,000 spindles could have a counts range from 24's to 36's with an average of 30's. For a wider range it would, in general, be both economically and technically desirable to use more than one blend of cotton. Although it is quite common practice in India, the processing of more than one blend through one opening line inevitably introduces a number of difficulties which militate against efficient operation. Where it is required that a mill should produce a wider range of counts, optimum machine utilization can only be achieved by arranging that the mill consists essentially of two or more sections possibly with some overlapping of count and preferably with a measure of both physical and administrative separation of the sections. For example a mill wishing to produce counts from 24's to 50's could be most efficiently arranged in two sections, a carded section of 30,000 spindles spinning from 24's to 36's and a combed section of 35,000 spindles spinning 34's to 50's.

89. On this basis the smallest optimum mill to produce yarns from 10's to 80's would have a total of 152,000 spindles arranged in five sections. Three sections would be for carded yarns with average counts of 12's, 20's and 30's (range 10's to 36's) with spindle complements of 11,000, 20,000 and 30,000 respectively. The other two sections would be for combed yarns with average counts of 45's and 68's (range 36's to 80's), with spindle complements of 36,000 and 55,000 respectively. With efficiently run modern machinery the production rate of the mill would be about 18,600 kg per shift and the count-wise distribution by weight would be:

Coarse and Lower Medium	39%
Higher Medium	33%
Fine and Superfine	28%

90. The optimum size of a weaving unit cannot be so positively defined. Where it is thought necessary to have control of sizing the lower limit is set by the capacity of a single warp preparation unit but where commission sizing facilities are available (as in the Decentralized Power Loom sector) this is not a serious constraint. In most countries of the world the optimum size of weaving unit is determined by the typical length of run and degree of variety required. The considerations are unlike those which obtain in spinning. Where the degree of variety is high and runs are short it is necessary to keep weaving units small because of the loss of efficiency which arises as a result of the 'dilution of expertise' which occurs when many cloth sorts are produced in one unit. In some trades where the variety needed is great, the optimum number of looms may be as few as 200. With very standardized products such as drills and sheetings there are economies of scale in operating as many as 1,000 looms of one type in a single unit. The guiding principle here is to have only one type of loom and a minimum number of cloths in one unit. Multiple units in one establishment should be clearly segregated both physically and administratively.

91. Optimum size in finishing is almost impossible to define. At the lower limit, for any finishing processes requiring the use of a stenter, the minimum size is that which gives an acceptable degree of utilization of a single stenter - say 60%. The upper limit is set by variety and deployment of expertise considerations; studies in the U.K. revealed that efficiency and profitability generally reduced as size increased but that this trend could be reversed by the use of highly sophisticated computer aided recipe formulation techniques. This development opens up the way to efficient operation of very large commission finishing establishments.

6. An Overall View

92. The complex legal and administrative structure of the textile industry is important in relation to the social and economic goals of the Government of India. Whether or not it provides a satisfactory instrument for control is outside the scope of this section of the report. So far as the technology and practice of textile manufacture is concerned this aspect of the structure of the industry is almost irrelevant. There is virtually no difference between mill sector spinners and decentralized co-operative spinners regarded as producers of yarn. Considering the vast difference in scale of operation between Mill Sector and decentralized power loom weavers performance differences are not very great in relation to world norms. The only features of the industry structure which are important from the point of view of manufacturing efficiency are the absence of any useful degree of product specialization and the strength of vertical integration in the Mill Sector.

93. Increased specialization with a reduction of counts ranges would pay dividends in increased productivity in spinning, weaving and finishing. A reduction in the degree of vertical integration, leading to more horizontal stratification and narrower specialization, would be rewarding in all sectors but particularly in finishing. As modern finishing machinery is very highly productive (a single bleaching range can handle the output of 3,000 looms, a stenter 2,000 looms) it is inevitable that rigid vertical integration will lead to very low machine utilization factors and generally inefficient plant operation. The only rational answer here is the establishment of large commission finishing units, strategically located and independent of both manufacturing and marketing interests. Just how both specialization and horizontal stratification may be increased is a matter for Government. There may be difficulties but purely from the technical point of view the making of these changes would greatly strengthen the industry.

G. Technology in the Decentralized Sector

1. Criteria of Suitability

94. Regarding the objective of the Decentralized Sector as being the fulfillment of a social purpose by providing a framework within which textiles can be produced by labor intensive means in so far as this can be done at reasonable cost, it is pertinent to examine the technical possibilities in each of the three major subdivisions of the industry. This is an aspect of textile manufacture in relation to which broad generalizations can be grossly misleading and in particular the generalization that Western technology of, say, fifty years ago is appropriate to conditions in developing countries today, although substantially true in some instances is utterly wrong in others. For a sound picture of the situation it is necessary to examine the major processes in detail. In the examination below two criteria of suitability have been assumed.

(a) Labor requirements, in relation to all production costs of the corresponding Mill Sector process, must be such that, without excessive subsidy or protection, a worker can earn a satisfactory wage.

(b) The capital investment required to maintain or establish a process with high labor requirements in the Decentralized Sector must be less than, or at least should not grossly exceed, the investment required to set up machinery of equal productive capacity and of low labor requirement type in the Mill Sector.

2. Spinning

95. Primitive systems of spinning were extremely labor intensive. The simple spindle and whorl, the use of which was developed to a high degree of efficiency in India, requires about sixty days, working twelve hours per day, to produce 30 g of 80's yarn sufficient to make one square yard of the fine voile or muslin used for saris. A modern ring spindle produces the same quantity of yarn of the same count but of better appearance, in one 8 hour shift. In addition one man can tend many spindles so that the total labor requirement using ring spindles under Indian mill conditions is only about 0.02 operative hours per spindle, an increase in operative production of 36,000 to 1.

96. Cost studies published by ATIRA show that production costs for 80's in an average Indian mill in 1973 were:

Labor	2.1	Rupees per Kilogram
Stores	.5	
Power	.9	
Misc.	1.0	
	4.5	

This means that the amount of 80's yarn produced on a spindle and whorl as a result of 720 hours work could be produced in an Indian mill in 1973 at a cost of 0.135 Rupees. So, if we assume that a hand-spinner is prepared to work 12 hours per day and 30 days per month he would be able to earn 0.0675 Rupees per month. Clearly, as there can be no future for a trade at which a craftsman's real earnings are less than 1 Rupee per annum, simple hand spinning of fine yarns cannot meet criterion (a). For coarser counts the spindle and whorl is not at so great a disadvantage but even when spinning 16's it can hardly be said to be worthwhile. Working 12 hours per day it takes about 14 days to spin 1 kg of 16's count yarn. The average cost of production of 16's in Indian mills in 1973 was Rs. 1.16 per kg. Thus a hand spinner even on 16's would be contributing toward the gross national product at a rate of only Rs. 2.32 per month.

97. Cottage wheels and Brunswick wheels increase the productivity of the spinner by a factor of 5 to 10 so that on coarse counts they could be marginally worthwhile except that the capital cost in relation to the productive capacity makes investment in these devices unattractive. At 1975 prices the cost of equipping a ring spinning mill with all necessary machinery and accessories of modern design is about Rs. 1,000 per spindle. Such a mill could produce 16's yarn at the rate of 25 kg per spindle per month. If we relate this to the production rate of a cottage or Brunswick wheel spinner of 2 kg per month the break-even capital cost per wheel is Rs. 80. It is difficult to put a reliable figure to the cost of making spinning wheels but a reasonable estimate is in the range Rs. 100 to Rs. 200. Thus it costs more, per unit of output, to buy simple machines which produce poor yarn and have a high labor requirement than to buy labor saving modern machines able to produce much better yarn. This rules out wheel spinning as failing to meet criterion (b). The same considerations apply to the spinning system known as Ambar Charkha - a system of hand spinning encouraged by the teachings of Mahatma Gandhi. In the mid-sixties Sreenivasan estimated that the cost of yarn manufactured by Ambar Charkha was three times as great as that of mill spun yarn even though Ambar Charkha spinners at that time were receiving only 75 nP per day.

98. The only hand spinning system conceivably able to compete with mill spinning is the jenny. The jenny became popular for weft yarns in Britain in the latter half of the 18th century. Although soon displaced by the mule for spinning fine yarns it remained in limited use for coarse yarns in Britain until well into the present century. For fine cotton spinning, jennies with up to 150 spindles have been built and used but for most purposes 80 spindles was regarded as the largest economic size. The jenny has the merit of being a simple machine in engineering terms. In this respect it is no more demanding than a hand loom and, like the hand loom, can be built by local craftsmen largely from wood. If the Government of India is anxious to provide employment in rural areas through the Decentralized Sector without dependence on power supplies it could be rewarding to look further into the possibility of using jennies.

3. Weaving

99. The enormous increase in productivity per spindle which has been achieved worldwide by mechanization of spinning has not been paralleled in weaving. Modern ring spindles are driven at up to 16,000 revolutions per minute - roughly ten to twenty times the speed maintained by wheel spinners. In contrast the typical conventional automatic loom of today runs at only twice the speed of the handloom used in Europe in the early part of the 19th century. The more important advances in weaving technology and practice have been concerned with reduction of labor requirement and improvement of cloth quality. The machine development which has contributed most to the achievement of low labor usage and high cloth quality is the so-called automatic loom. All power looms are in the broadest sense automatic but

the term has now come to have the specific meaning of automatic weft replenishment in a conventional shuttle loom. In addition to reducing labor requirements the automatic has improved cloth quality by eliminating 'starting places'. (A starting place is a local increase in the spacing of the weft threads which results basically from relaxation of the warp threads during the time when a loom is stopped awaiting a shuttle change.)

100. To take full advantage of the labor saving potential of automatics it is necessary to use strong, uniform yarn free from neps and slubs. It is then possible for one weaver to look after 80 or 100 looms and produce superb cloth. For reasons which have been discussed elsewhere in this report, Indian yarns are not good and the labor saving potential of automatics can only be partially attained. In fact very few Indian mills operate with as many as 16 looms per weaver and more commonly automatics are operated on the basis of 4 to 6 per weaver as against 2 to 4 looms per weaver for non-automatic power looms. Not only is the labor saving potential not realized in India but equally the potential quality improvement is lost because the high frequency of yarn imperfections greatly reduces the importance of freedom from starting places as a factor in cloth appearance. There is, therefore, a good case for the continued use of non-automatic power looms for the manufacture of a very large proportion of the cloth intended for domestic consumption. Non-auto looms are a little cheaper to build (about 30% other things being equal) but as the number of such looms already in existence in the country is greater than can be needed in the immediate future this is not important. That non-auto powerlooms can be satisfactorily reconditioned using local resources of labor and materials is important as is also the fact that there is virtually no difference in rate of production of cloth between non-autos and the typical automatics currently in use in the Mill Sector.

101. There is, however, one very substantial sector of power loom activity in India which is seriously threatened by developments in weaving technology of the last decade. Roughly one third of the looms in the decentralized power loom industry are engaged in the manufacture of what is known in India as art silk fabric. This is made from continuous filament man-made fiber, some of it is cellulosic but increasingly nylon is being used. These yarns by their nature are strong and uniform enough for the advantages of conventional automatic looms, both with regard to labor saving and quality improvement, to be fully realized. There is, therefore, at least a prima facie case for a reconsideration of policy in regard to the production of these fabrics in view of the potential savings from the use of conventional automatics. In addition one cannot ignore the remarkable advances which have been made in water-jet weaving. The water jet loom is outstanding in that it is a cheap fully automatic loom which operates at more than twice the speed of conventional automatics and produces continuous filament fabrics of superb quality. The fact that it is only suitable for the weaving of substantially hydrophobic continuous filament yarns is of little concern in the present context. The important point is that it is a low capital cost, low labor requirement machine, the existence of which seriously challenges the wisdom of continuing production of 'art silk' fabrics on non-automatic looms in India. A detailed appraisal of this challenge should be made.

102. For much of the spun-yarn fabric requirement however there is no doubt that non-automatic powerlooms can continue to play an important part. The case for deploying these looms in the Decentralized Sector is however difficult to establish on purely technical grounds. Given competent management, good industrial discipline and freedom from restrictive practices on the part of organized labor there is no doubt whatever that powerlooms can be used more efficiently in composite mills. The advantage of mill operation is not overwhelming - it should not be greater than a reduction of about 25% in the cost of production. The stimulus of being the loom owner or of being one of a closely knit community could well be sufficient to offset the economies of scale which Mill Sector operation can offer. Certainly there are no serious technical difficulties inherent in the operation of looms as single units and sheds of 4 to 20 looms can be very efficient indeed so long as each unit has access to a supply of well prepared warps. Nevertheless, the published figures show that the productivity of the powerloom sector is disappointingly low in relation to that of the Mill Sector in both per loom and per worker terms.

103. The situation with regard to handloom weaving is by no means clear cut. There is a great paucity of information concerning the types of handlooms which constitute the industry, and also concerning the types and quantities of cloth produced. With information at present available it is difficult to come to any firm conclusions regarding this sector of the industry other than that the amount of cloth produced is meager indeed in relation to the numbers of looms and weavers employed. The total amount of cloth produced in 1972 was estimated by the Task Forces on hand looms and power looms as 2450 million meters. Spread over 3 million looms and assuming 300 working days in the year this is a production rate of 2.72 meters per day. Further assuming an average density of 40 picks per inch and a twelve hour working day this works out at roughly 6 picks per minute. This is a rate justifiable on only the most elaborate cloths, and only a very small fraction of the total of 2450 million meters can be so elaborate. Alternatively we must suppose that the looms are used only desultorily or do not exist at all.

104. An alternative basis of appraisal is to suppose that most of the cloth produced is plain and that the average operating speed is in the order of 20 picks per minute. (This is a very modest speed, modern handlooms in Bangladesh were recently seen operating at 120 picks per minute.) This requires that each loom be worked for 3.6 hours each day. This is, perhaps, not an unreasonably low rate of utilization for a simple tool; it is certainly not high. The position is somewhat confused by a lack of precise information as to how many weavers are associated with this activity. Mr. Somappa, President of the All-Indian Handloom Fabrics Marketing Co-operative in an article in 'Commerce', December 1973, claimed that 7-1/2 million weavers were directly employed on the 3 million handlooms. At 20 picks per minute this requires a little less than 1-1/2 hours work per day per weaver. This can hardly be described as an industry, it is no more than a pin-money part-time occupation. But is this the true situation? If it is, is the sector necessarily so unproductive? Handlooms have very real advantages when used as a cottage industry. They require no electric power and can be quite reasonably

productive, depending on the degree of sophistication of the hand loom. The hand looms used in Britain for the manufacture of Harris tweed are almost as complex and as expensive to build as simple power looms. A comparatively simple but effective design, which can be built by rural craftsmen has been seen in Bangladesh but no comparable looms were seen by the mission in India. It is a true hand loom, with no automatic co-ordination of shedding, picking and beating-up, which can be operated manually for long periods at 120 picks per minute. Assuming more leisurely operation and taking account of downtime for warp changes this type of hand loom could be expected to average at least 20 picks per minute. With 3 million such looms worked for an average of 12 hours per day, 300 days per year, the annual production of fabric (assumed 40 picks per inch) would be 8,226 million meters per year - more than the total cloth production of the country in 1973.

105. To put the alternative methods of cloth production into perspective the following table has been prepared. The line of the table designated 'Handloom B' is hypothetical and based on the premise that hand looms can be operated at an average speed of 20 picks per minute for 12 hours per day, 300 days per year with a machine efficiency of 70%. The other three lines are based on actual or estimated performance during 1973 as recorded by various Indian authorities. The Mill Sector figures are for installed capacity and for all workers employed in weaving. Power Loom and Hand Loom figures are trade estimates, which have been used by the Task Force on the Textile Industry.

Performance of Mill, Power Loom and Hand Loom Weavers

	Thousands of Looms	Thousands of Workers	Million meters of cloth	Index of Productivity (Mill = 100) per Loom	per Worker
Mill Sector	208	260	4169	100	100
Power Loom	205	480	1270	30.9	16.5
Hand Loom A	3,000	7,500	2450	4.1	2.1
Hand Loom B	3,500	7,500	6750	9.6	5.6

The productivity indices do nothing to encourage further development of the Decentralized Sector. Even with power looms a worker can achieve real earnings of only 1/6 the value achieved by his counterpart in the mill sector and the hand loom weaver, for all his skill, has only 1/50 the real earning capacity of a mill weaver. Under Hand loom B conditions the factor could be raised to roughly 1/18 but even this is too large a differential to be accepted with equanimity. If however these differentials are, in fact, acceptable within the socio-economic context of India during the next decade the implications of the per loom productivity indices must be considered. The power loom situation would be hopeless if the purchase of new powerlooms were under consideration. The differential of roughly 4 to 1 means that one should not spend appreciably more than one quarter of the cost of one new automatic for

mill use on the purchase of a new non-auto powerloom for the Decentralized Sector. New non-auto looms of comparable quality cost from 30 to 40% of the cost of simple automatics and are, therefore, ruled out of consideration. However, the meaningful comparison is between the cost of reconditioning an ex-mill sector non-auto power loom and the purchase of a new automatic for mill use. The reconditioning can be done very easily within a budget of less than one quarter the cost of a new automatic.

106. The investment requirement for hand looms is also within the bounds of possibility. To continue to operate the present hand looms at their present low efficiency would cost nothing. To raise them to the performance assumed under 'Hand Loom B' would require some expenditure. The amount required cannot be determined without a more detailed breakdown of the present equipment but even if the majority of existing hand looms had to be scrapped it could probably be done within the implied constraint of a maximum expenditure of 9.6% of the cost of a new automatic loom on each new or modified hand loom. Although possible in these terms the wisdom of such a course is doubtful in view of the extremely low real earning capacity of even a well equipped hand loom weaver.

4. Credibility of Cloth Production Statistics

107. The above discussion of the performance of the weaving section of the Decentralized Industry leads to two broad conclusions: (1) The amount of cloth produced by power looms operating in the Decentralized Industry is small both absolutely and in relation to the amount produced on similar looms in the Mill Sector. For this reason there appears to be no good case for encouraging further development of the Power Loom Industry. (2) The amount of cloth produced by the hand loom weavers is so small as to suggest that hand loom weaving is an occupation of only marginal importance to the majority of the people nominally involved. These conclusions have been reached on the basis of official statistics supplemented by estimates given by trade associations. There are no significant internal inconsistencies but the conclusions to which they lead are such as to cast serious doubt on the reliability of the figures. In particular, the amount of cloth produced by the power looms is strongly suspect.

108. It is remarked in paras. 100 - 102 that (a). there is virtually no difference in unit productivity between non-automatics (power looms) and the automatics currently in use in the Mill Sector and (b) there are no serious technical difficulties in the operation of looms as single units and sheds of 4 to 20 looms can be very efficient indeed. It is necessary, therefore, to look for the reasons why the declared amount of cloth produced is so small.

109. First let us examine the technical implications of assuming that the declared production is, in fact, the true production. The range of operating speeds for looms of this type is from 120 to 210 picks per minute. If we assume an average speed of 150 picks per minute and further assume that the

actual running time is 75% of a 300 day year, the amount of cloth produced at 40 picks per inch by the 205 thousand active looms of the industry works out at 6,324 million meters per annum. This is almost five times the declared production of 1,270 million meters for 1973. This is a very large discrepancy which it is difficult to explain. The limits of credibility are that the average pick spacing is as close as 60 per inch and that actual running time is as little as 50% of a 300 day year. On the basis of these values the average operating speed of the 205 thousand active looms to produce the declared quantity of cloth works out at 68 picks per minute. During the visits of the mission no power looms were seen operating at this speed and most were operating about 3 times faster. It seems extremely likely, therefore, that there is deliberate understatement of the amount of cloth produced by power looms or overstatement of number of looms. There is certainly a temptation to pass off power loom cloth as hand loom cloth in order to profit from the preferential excise duty situation.

110. If we assume that 90% of the cloth recorded as hand loom cloth is in fact power loom cloth the total annual production of the power loom industry is raised to 3,470 million meters. Although still only 55% of the 'reasonable' estimate of 6,324 million meters made above it approaches credibility and is a much more likely situation than the declared situation in which production appears to be only 20% of the 'reasonable' estimate. If this is the true explanation the implications for the hand loom industry are very grave indeed. It means that each of the 7-1/2 million hand loom weavers works for only 10 minutes per day and that each of the 3 million hand looms is worked for no more than 25 minutes per day. The grave implication of these figures is that the hand loom industry, described by the Task Force on Textile Industries as being second in importance to agriculture, is nothing more than a facade maintained to permit large scale evasion of excise duties on power loom fabrics. If this explanation and its implication is accepted where do we stop? There are even heavier excise duties on Mill Sector cloth and the possibility of widespread evasion cannot be ignored. Total fabric production and the performance relationships between sectors both become seriously suspect.

111. Unfortunately the documentation presently available is not sufficient to enable us to decide where the truth lies. In the light of the discrepancies discussed above it would be unwise to plan the future of the hand loom and power loom industries on the performance figures deducible from the statistics we have been given.

5. Finishing

112. The extent to which finishing can be done economically as a high labor-content process in small establishments depends on the end use of the fabric. For mass market, mass production garment making it is necessary for technical reasons to do all finishing operations by long-run, low labor content processes. For piece goods to be sold in small quantities, which is the lot of much of the Decentralized Sector cloth, processing can be done satisfactorily in small batches on simple machines with a high labor requirement.

Generally there is no great saving in the investment need in machinery because the greater number of simple machines (jiggers for example) cost about the same per unit of capacity as a large sophisticated machine such as a continuous dyeing range. There is also the possibility of the consumption of dyestuffs and auxiliaries being higher with simple machines because of end losses, although with care these losses can be kept quite small - say less than 10% of total usage. The extra labor requirement will always be there and it can be considerable - productivity differentials could well be of the order of 5:1 but if this is an acceptable ratio there is no reason why much of the production of the Decentralized Sector should not be processed on simple, high labor requirement equipment.

113. The question of scale of operations is important. Finishing can not be carried on as a cottage industry but it can be done by quite small co-operatives working in a labor intensive way and serving a district with, say, a total of 3,000 power looms. Units smaller than this would become costly to operate and there could well be a case for concentration on very much larger units in order to gain economies of scale. The whole question is very involved, depending on such things as degree of variety required, transport costs both from the mill and to the point of sale, the availability of water and the availability of energy, both mechanical and thermal. It is necessary to make detailed appraisal of specific situations typical of requirements in different regions before broad policy recommendation can be made.

H. Knitting

1. Spun yarns

114. Fabrics and garments knitted from spun yarns are not popular in India. This is presumably a matter of personal choice and there is no social or economic reason why any attempt should be made to change the situation. Yarn to fabric conversion is cheaper by knitting than by weaving but against this yarn costs are higher. The reason for this is that to produce generally comparable cloths the knitting process requires a greater length of finer yarn. The two considerations are of roughly equal weight and in most circumstances finished fabric costs are not significantly different for similar end uses. In India however there is the special difficulty of the poor quality of the cotton available. As all Indian spinners already grossly overspin the cottons a shift towards more knitted cotton, with its concommitant requirement of a finer average count, would be an undesirable trend.

2. Continuous Filament (CF) Yarn

115. Man-made fibres have been challenging the established position of the natural fibres for the whole of the century but it is only since 1950 that significant advances have been made. The table below summarizes the relationship between the three principal groups of apparel fibers since 1940, in terms of percentage of world usage.

Development of World Fiber Usage

	1940	1950	1960	1970
Cotton	77	71	68	53
Wool	12	10	9	7
Man-mades	11	19	23	40
	100	100	100	100

116. In the developed countries, and in particular the non-cotton-growing countries of Western Europe, the changes have been even more dramatic. In all these countries man-mades are now the dominant group. In the very early days the synthetics were regarded as glamour fibers to appeal to a very narrow market sector but it soon became apparent that their outstanding characteristics are strength and durability, particularly in continuous filament form. Initially the application of CF synthetic yarns to apparel end uses was limited by the narrow appeal of the 'lean', silk-like appearance of the early yarns. 'Texturing' of yarns to give them bulk and a wool-like appearance, together with development of knitted constructions giving good dimensional stability to the fabrics, has enormously expanded the range of end uses in which CF synthetic yarns are acceptable and, in many instances, preferred. The extent to which these developments have changed the pattern of yarn usage in Britain during the past 20 years is shown in the following table.

Pattern of Yarn Consumption in Britain

	1954	1959	1964	1969	1974
Cotton	50	43	35	24	14
Wool	29	30	29	27	23
Man-made Staple	9	11	14	19	24
Man-made CF	12	16	22	30	29
	100	100	100	100	100

117. The figures refer to actual yarn consumption by the textile industry of Britain. The distribution of fiber types in textiles consumed in Britain would show a markedly different pattern because of the fairly high level of imported cotton fabrics and of exports of wool and worsted goods. For the staple yarn groups the position is complicated by the fact that a very large proportion of each of these groups consists of blended yarns. A great deal of the polyester staple is blended with cotton or wool. The same is true of viscose rayon staple and, to a lesser extent, nylon. Of man-mades only acrylics are widely used unblended. For our present purpose, however, the most important group is man-made CF. Here the situation is unambiguous; the yarns are all 100% man-made and, although some are woven together with natural fibers, by far the greatest proportion is used to make 100% man-made cloths. Of these cloths most are knitted, either on warp or weft knitting machines.

118. Initially, the elusive properties of aesthetic appeal and comfort delayed market acceptance of knitted CF synthetics, particularly for garments worn next to the skin. In this connection there is a fetish that only natural fibers are really comfortable worn next to the skin - cotton for the body and wool for the feet. The fetish was given a rationale based on the knowledge that both cotton and wool are able to absorb much more water than can the synthetics. That it is desirable that water vapor should be able to pass through a fabric is well appreciated on a sound physiological basis but the importance of water absorbency of the fiber itself is not. Men have been rather more conservative than women but even so a very wide measure of acceptance of knitted all-synthetic garments has been achieved.

119. In most Western European countries the situation has become one in which knitted synthetics are available for all apparel end uses, from men's suits to women's lingerie - formal shirts, casual shirts; in fact the whole gamut of apparel textiles. In some areas, notably men's formal shirts, there has been some recession of demand occasioned, to a considerable extent, by the very utility of the product. Warp knitted synthetic fiber formal shirts have a good appearance, are comfortable, easily laundered and do not need ironing. In addition they outlast the conventional cotton shirt by a factor of at least 3 and cost from 20 to 40% less than a similar shirt made from spun/woven fabric. As the formal shirt is very largely a status symbol the low price and high durability of the warp knitted product detracts greatly from its ability to meet its principal objective - i.e., to raise the social status of its wearer.

120. Such considerations are important in India too, but in addition there is an enormous demand for sheer utility in apparel fabrics for those in the lower income groups. Shirts, blouses, saris and lunghis could be made more cheaply by warp knitting than by weaving. Preferably the yarn used would be CF nylon or polyester as these would give very high durability. Alternatively high wet modulus ('polynosic') rayon CF yarns could be used in order to limit the raw materials to those which are available in the country. Although polynosic rayon is rather less durable than the synthetics, warp knitted fabrics from this material would be expected to outlast woven cotton by a factor of at least 2. Heavier fabrics such as trouserings, suitings and household drapes could be made economically by weft knitting. The remarks made above concerning the suitability of different fibers are also applicable to these heavier fabrics. Yarns spun from staple can also be used satisfactorily on weft knitting machines but the fabrics produced lack the durability of those made from CF yarns.

121. The possibility of producing warp knitted fabrics from cotton yarns has attracted a great deal of attention in recent years. Some progress has been made but it is still too early to be able to forecast the extent to which this may eventually be worthwhile. The certain thing is that machine

speeds are seriously limited even when the best cotton yarns available today are used. Yarns of the quality produced in India are of no practical use whatever for this end use.

122. Briefly the case for an increase in the knitting capacity of India must be based on the high utility of both warp and weft knitted fabrics made from CF yarns. If such fabrics became widely used by the masses the cost of clothing the nation would be greatly reduced. The nature and strength of the resistance which there might be to such a change cannot, however, be assessed by a technologist. The fact that these fabrics have found ready acceptance in many other countries is at least a useful pointer.

COTTON TEXTILES FOR EXPORT

A. The Markets

123. World trade in textiles is an ever changing business so far as individual countries are concerned. A broad pattern may be seen by considering the world trade in cotton textiles as taking place within and between the countries of five groups: North America, Western Europe, Eastern Europe and USSR, Asia and Oceania, and the rest of the world. North America is a marginal net importer of cotton textiles. Out of a total consumption of cotton cloth of a little over 1000 million kg roughly 11% is imported. Exports are equal to about 5% of home consumption so that net imports are about 6% of home consumption, i.e. about 60 million kg per annum. Western Europe is much more important as a trading area even though the annual consumption of cotton cloth at 1260 million kg per annum is only 25% greater than the North American figure. In the first instance there is a great deal of inter-country trading within the group but, more important for our present purpose, is the fact that net imports into Western Europe are at a level of 210 million kg, roughly 17% of home consumption. Much of this cloth is supplied by Asia. Eastern Europe is just a little more than self sufficient. The annual consumption of cotton cloth is about 1200 million kg but total imports are only 26 million kg and, overall, the group is a net exporter to the extent of about 35 million kg, roughly 3% of home consumption.

124. Asia and Oceania is the only important exporting group. Total production of cotton cloth is about 1720 million kg per annum of which 45 million kg is used in Australia. Published export/import figures show some anomalies which are difficult to resolve but in broad terms the position is that net exports are probably in excess of 250 million kg, of which about 60 million kg is exported from India. The rest of the world group (mainly Africa and South America) can be disregarded in the present context. The total usage of this group is probably less than 400 million kg and much of this is home produced.

125. This simplified view of world trade in cotton cloth is summarized in the table below:

Production and Trade in Cotton Cloth (Million kg) in 1973

	North America	Western Europe	Eastern Europe (Inc. USSR)	Asia and Oceania	Rest of the World (Mainly Africa and S. America)
Production	940	1050	1230	1720	350
Imports	115	385	26	160	
Exports	52	175	61	410	
Consumption	1003	1260	1195	1470	
Net Imports	63	210	- 35	-250	

126. The most striking feature of the situation seen in this way is the complementary relationship of Western Europe and Asia as importers and exporters respectively. The picture is completed by noting the relative self-sufficiency of North America and Eastern Europe plus USSR. This is, of course, the situation one would logically expect having regard to the fact that USA and USSR are both very substantial growers of cotton, each contributing about 20% to the world total crop. Against this the proportion grown in Europe, less than 1-1/2%, is insignificant but it is complemented by the fact that almost 40% of the world total crop is grown in Asia. In relation to our present concern it is worthy of note that roughly one half of the acreage devoted to cotton growing in Asia is in fact in India but India contributes only about one quarter of the total amount of cotton produced. Even so, India is second only to the People's Republic of China as the largest producer of raw cotton in Asia and as such can aspire to being a very substantial exporter of textiles to Europe.

127. The present situation is that India cannot be regarded as a successful exporter of cloth in relation to either the size of her cotton crop, the size of her industry, or her total production of cloth. Indian exports of cotton cloth have been averaging about 47 million kg per annum out of a total production averaging 867 million kg per annum - approximately 5.4%. There is obviously great scope for expansion of the quantity available for export when the comparable proportions for near neighbors, Taiwan, Hong Kong, Pakistan and Korea are considered. For these four countries the average fraction of cotton cloth produced which is exported is 72.7% with a range from 71.2 to 74.6%.

128. The great concern is to find out why the export fraction from India is so small. It is very difficult to find out exactly what the incentives to export are really worth to a manufacturer. Many met during the mission felt that export incentives should be stronger but this appeared to be only natural cupidity as there was evidence that most manufacturers seemed to be anxious to increase exports. The most likely explanation lies in the poor quality of Indian cottons and the cloths made from them. Of mill produced cotton cloth

the U.K. is, perhaps for historical reasons, the largest single customer, taking in a typical year roughly 25% of the total quantity exported. Excluding the abnormal year of 1973, Indian cloth has averaged over recent years 18.8% of all cotton cloth imports into the U.K. Enquiries in the U.K. indicate that the quality of the cloth offered is the most serious factor limiting the amount of imports. In the abnormal year of 1973 when a world shortage of cotton cloth led to a situation in which many importers were forced to reduce their quality requirements, Indian imports soared to 32% of all cotton cloth imported into the U.K. This was followed by a spate of court actions and settlements by arbitration initiated by garment makers against importers of unsatisfactory Indian fabrics.

129. High uniformity of dyed shade and of cloth width, together with a very low incidence of minor blemishes is being increasingly demanded by cloth buyers in Western Europe and North America. The pressure comes from mass production garment makers and from mass marketers of apparel and household textiles. Under Indian domestic conditions these attributes are at no great premium as most cloth is sold from the piece and made-up into garments on an individual basis. A shirt tailor, given cloth with defects, can generally arrange to cut out the parts in such a way that differences in nominal width do not cause trouble and so that blemishes do not appear on the collar or front of the garment. He is not worried by shade differences because all the garment parts are cut from the one piece of cloth. The mass production garment maker of Europe, however, cannot shuffle the pattern about to accommodate fabric defects. He must cut out blindly from multiple layers and make up with a minimum of inspection and re-cuts because inspection and re-cutting employ expensive labor and disrupt production line activity. At the end of the day he is left with a number of garments rendered 'seconds' by the presence of minor defects in the 'display areas' or by slight shade differences between adjacent parts. As his business is the making of first quality goods, not seconds which must be 'jobbed-off' at the best price he can get, the mass production garment maker is increasingly demanding, and getting, a closer and closer approach to perfection in the cloth he buys.

130. The mass marketer too has his problems. Not only must he avoid offering blemished garments but in addition he must ensure that all garments and household textiles of nominally the same color are in fact the same color. Small differences in shade show up when rows of nominally identical goods are displayed together in close proximity. Such differences suggest to the potential customer that some fading has taken place and from this he infers that the goods are something less than top quality and takes his custom elsewhere. These requirements of the Western market may seem unreasonable to an Indian merchant. They may in fact be unreasonable and illogical. They certainly demand an approach to perfection which must seem impossible of achievement to most Indian manufacturers. Nevertheless this is what is wanted and what is being supplied by other Eastern countries. The recipe for the production of such cloths is simple enough. You buy good cotton, process it on modern

machinery kept scrupulously clean and meticulously maintained. Surprisingly, cloth made in this way is not prohibitively expensive to produce. The very high machine and worker efficiencies which follow from this method of working, together with reduced raw material wastage, would almost certainly produce excellent fabrics more cheaply than the indifferent to bad fabrics which are at present being produced in India.

131. Conditions and requirements vary from country to country in Europe but, by and large, the countries which are actually or potentially substantial importers of cotton textiles are the countries demanding the highest quality standards. There is a spread of requirements within each of these countries, but the general level is rising inexorably year by year. Indian fabrics are now able to satisfy the requirements of only the very bottom end of the range - perhaps the lowest 15% in the U.K. In a few years' time it will have become the lowest 5% and the day when Indian fabrics will be completely unacceptable in the U.K. purely on quality grounds is not far distant.

132. The message is clear enough. Cotton growing Asia is the natural and logical producer of cotton textiles for Western Europe. India is ideally placed to exploit this situation except for the fact that the quality of the fabrics she produces does not meet European requirements. Although the quality standards are high, other Asian countries have shown that they can be met by the construction of specialist mills. This could be done on a substantial scale in India and the requirements for such a venture to be successful are discussed in sections B and C below.

133. The above remarks are almost entirely concerned with the Western market for international cotton textiles. They are not relevant to the small but worthwhile market which exists for Indian speciality fabrics produced by the hand loom sector. It is unlikely that this market can be expanded as much as tenfold but it could well be doubled by better promotion. On the technical side there is little which could be done to help. It would be possible, as is mentioned elsewhere in this report, to make any of these fabrics efficiently and well on modern speciality looms, but this would almost certainly undermine the appeal of the fabrics. It is difficult to pin-point the factors which make Indian handloom specialities attractive, but rarity and the individual craftsmanship image of the products are both important. It is possible that the use of better yarns would reduce costs without destroying the character of the fabrics but it would be unwise to make changes without careful experiment. This is a market which could well be destroyed by improved 'quality' and reduced price.

B. Raw Material Requirements

134. A profitable export industry cannot exist without a reliable supply of cotton. Moreover the cotton must be of the right type, of good quality and inexpensive. India is potentially one of the strongest nations in the world so far as basic ability to meet these requirements is concerned but

unfortunately the potential is by no means realized. The cotton crop is, by world standards, reasonably reliable. The crucial weakness is that the types of cotton needed to support a strong export industry are not grown in sufficient quantities. There is a further weakness in that Indian grown cottons of all types tend to be of very low quality. This is largely the result of poor husbandry in the field but unsatisfactory ginning practices also contribute.

135. The generally poor performance of cotton growing in India finds reflection in that not only is the product the lowest priced in world markets, but in addition the yield per acre is outstandingly the lowest in the world. In 1973-4 (a typical year) the average yield by Indian growers was only 133 lbs per acre against an average for the rest of the world of 426 lbs per acre and a rest-of-the-world range of from 243 lbs per acre in Brazil to 1042 lbs per acre in Israel. During the same year the average price of Indian cotton in world markets was 45.5 US cents per lb against a world average price (excluding Sudan and Egypt) of 80.3 US cents per lb. The problem of the low quality of cotton available to the Indian textile industry has already been discussed in relation to the techno-economics of textile manufacture for the home trade. It is therefore pointed out that there are no serious technical difficulties in the way of increasing the growth of American Uplands types at the expense of the low quality, low yield indigenous Asiatic types which at present represent a large fraction of the total acreage. There are social, educational and initial economic difficulties in the promotion of such a change but there is no doubt that (a) appreciably better cottons can be grown in greater quantity and at lower cost and (b) better cotton is essential if the export potential for Indian made textiles is to be developed.

136. Improvements in cotton quality alone would enable the export industry to move up the market to only a limited extent. In addition supplies of man-made staple for blending with cotton will be increasingly needed. Again this topic is discussed in paras. 19 - 40 in relation to the needs of the home trade. It is therefore recommended that the availability of cellulosic staple should be increased to about 18% of total fiber requirement and that polyester staple should be made available to the extent of about 7% of total fiber usage. The needs of the export sector are rather different because of the much higher demand which has arisen for polyester/cotton blends in textile importing countries. Although increased availability of cellulosic staple would be useful, present trends suggest that polyester staple to the extent of at least 15% of total fiber usage, will be an absolute necessity for the exporting industry in the very near future.

137. It is, of course, possible to import polyester staple and still have a profitable export trade in polyester cotton fabrics. Indeed it could well happen that from time to time world polyester capacity will greatly exceed demand and at such times importing could be cheaper than domestic production. If, however, the export industry expands to such an extent that India becomes a world leader in the export of good quality fabrics

it would be prudent to ensure continuity of supply by setting up adequate capacity within the country. The broad economics of man-mades/cotton blends for export is that blending polyester (or other man-mades) with cotton will appreciably reduce the net foreign exchange value per meter of cloth exported. This is true whether or not the man-made fiber is domestically produced but the penalty of ignoring blends and offering only all-cotton fabrics would be a very serious restriction of market opportunities.

C. Technological Requirements

138. In order to produce textiles able to meet the quality requirements of the developed countries specialist mills making only international market (as distinct from domestic market) textiles will be needed. This can be done using the horizontally stratified system in which specialist spinners, each producing a very narrow range of yarns, supply independent weavers, each concerned with only a narrow range of cloth types. Alternatively the vertically integrated system in which spinning and weaving is combined under one management may be used. The relative merits of the two systems have been discussed in relation to domestic market requirements in the section dealing with industry structure (section F). In the present context either system is viable so long as the range of ultimate products is small. Where considerable variety is needed in cloth of a limited type, for example in the shirting or dress fabric trades, horizontal stratification is to be preferred. Where, however, variety is limited as in the workwear or bed sheeting trades, vertical integration can give useful economies without serious penalty for the attendant loss of flexibility. Generally finishing would best be done by independent companies offering a commission service to weavers and merchants or by finishers owned and controlled by merchants. There is no good case for having finishing integrated with weaving except for trades, such as those mentioned above, where variety is extremely limited. For these goods complete integration from raw material to marketing is a possibility.

1. Spinning

139. With the exception of carding, all spinning processes can be adequately carried out on conventional machinery already produced in India. High production cards as now made would require additional enclosure to reduce the amount of dust and short fiber released into the atmosphere. This is now usual in HP cards of European manufacture and there is no technical difficulty in the application of similar enclosures to cards of Indian manufacture. New quality control procedures will have to be developed and a new attitude to the consumption of consumable stores must be generated. In particular very much more frequent replacement of roller cots, drafting aprons and travellers is essential. There is no difficulty here except that of convincing management and labor that it is false economy of materials and effort to continue running such items right up to the point at which dramatically increased end breakage rates make immediate renewal imperative.

140. With high production carding a critical quality control requirement is the maintenance of the rigid wire clothing of the cards. Wear rates are not so accurately predictable as to permit reliance on strictly scheduled re-grinding. Frequent checking of the nep content of the web delivered by each card is needed to ensure satisfactory carding without excessive grinding. The re-grinding itself can be a problem where there is a long background of experience on cards fitted with flexible fillet clothing. The grinding of rigid wire must be done with a far higher degree of care and precision or the clothing can be ruined in a very few minutes. During the mission a great deal of bad carding caused by unskilled grinding was noted in most mills using rigid wire clothing. Re-training courses could be the answer or alternatively mills could rely on a specialist maintenance service provided by the machinery industry.

141. Effective air conditioning equipment will also be needed. Spinning requires relatively low humidities (c. 55% RH) which are difficult to achieve throughout the year in India without good insulation and full air conditioning. Both temperature and humidity should be held within relatively narrow limits. This will be expensive but there will be a generous pay-off in terms of improved yarn quality and consistent machine performance.

142. Open-end spinning can no longer be ignored in considering the technical requirements of the export industry. Its virtue of low labor requirement is not very important in this context. The fact that from a poorer cotton it produces a yarn of better appearance on a more convenient package is, however, vitally important. It is conceivable that for many end uses, such as shirt poplins, raincoat gaberdines and poplins, where appearance and particularly freedom from knots and slubs, is important, only open-end spun yarns will be acceptable in a few years' time. For the counts range 12's to 36's, and this covers the great bulk of international trade requirements, open end spinning is, in the broadest sense, more economic than ring spinning for new installations. Although the low labor requirement conflicts with India's need to provide more jobs, the pros and cons should be weighed very carefully.

2. Weaving

143. The non-automatic power loom can have no place in the manufacture of cotton fabrics for the international market if only because of the unacceptability of frequent starting place marks. Even if this were not so there would be no economic case for their use with the high quality yarns which are essential for this trade. With these yarns breakage rates in weaving will be so low as to make the economic allocation of looms per weaver at least 40 for plain fabrics and Indian labor.

144. Looms such as the Ruti B type which has been made in India for many years, together with the Ruti C type which is now coming into production will be adequate for a large part of the trade. For wide sheetings more sophisticated looms such as the Sulzer are to be preferred. It is also possible that as the price of the Sulzer is expected to fall relative to other looms, now that other manufacturers are going to build them, these looms could become the most economic for a wider range of goods.

145. As in spinning, better air conditioning is needed and in addition it will be necessary to get acceptance by both management and labor of a regime based on much lower humidities. Current practice in India is based on the use of very heavily sized warps which can only be woven under conditions of very high humidity. This may reflect the weaver's wish to achieve a required cloth weight with a minimum use of cotton and maximum use of size. Although this may be what the home trade wants it will not be accepted by more discriminating customers. However, once the concept of using size scientifically, purely as an aid to more efficient weaving, is accepted it will quickly be found that the optimum amount of size for a given cloth is very much less than the amount which is currently being used. It will also be found that much lower humidities (65 to 75% as against 85 to 95%) will be needed. The net result will be much better weaving and better cloth appearance but a need for very much more accurate sizing and more accurate humidity control.

146. In this new situation old type warping and sizing machinery will be useless but the newer types now being made in India will be found to be adequate. The same is true of cone winding and pirn winding. Manual operation is out, but Indian made automatic machinery will do a satisfactory job although it must be stressed that all these machines require careful handling and meticulous maintenance if good results are to be achieved.

147. It will also be necessary to introduce the practice of routine machine performance monitoring into the actual weaving shed. With four or six looms to a weaver and more or less continuous maintenance-at-will by a large number of loom overlookers, mills can and do manage to muddle along. With the sort of operation which is our present concern strictly scheduled maintenance plus a routine of formal monitoring for loom malfunctions is essential.

3. Finishing

148. One of the requirements most difficult to meet in the finishing of textiles for the international market is the achievement of consistency of color both within deliveries and between deliveries. The task is made easier by the use of the best modern equipment and the avoidance of short runs. Although batch processes have a place for short run fashion goods, continuous bleaching and continuous dyeing ranges are needed to handle the bulk of the trade. There are no serious technical problems once it is recognized that consistency and flexibility do not go well together.

149. The choice of machine types available is wide and a great deal of latitude is allowable. Good work can be done on almost any modern dyeing range or printing machine so long as the technical back-up is competent. The critical areas are the equipment, organization and staffing of the laboratories and the arrangements for supervision and monitoring of the actual processing.

150. Sound reliable recipe formulation and careful supervision of all operations is the key to consistent finishing. For this reason it is anticipated that the most serious technical problem will be that of recruiting staff both able and willing to work to the high standards which the international trade demands. The gulf between current Indian practice and what is needed will be difficult to bridge. Discussion with finishers during the mission visit made it clear that no one really believed that the precautions taken by Western technologists were honestly worthwhile. For example, no finishing unit was seen which did not regard it as completely satisfactory to appraise a color match purely visually in whatever light happened to be available at the time. Although metamerism had been heard of it was regarded as being of no practical importance and the use of standard lighting was looked upon as a pedantic affectation. Indian technologists have the necessary basic knowledge but they require to be convinced of the need to apply it in practice.

D. Garment Making

151. Although garment making is not regarded as being a part of the textile industry it must, in the developed countries of the world, be treated as an extension of the industry. The work of the mass production garment maker is as much dependent on what has gone before as is the work of the textile finisher. The influence of mass production garment making on textile quality standards has already been discussed in the previous section (paras. 138-150), where it is note that if India is to become a substantial exporter of cotton textiles the industry must be geared to the production of fabrics suitable for mass production garment making. Our present concern is with the opportunities which exist for India to strengthen her textile export situation whilst at the same time providing additional employment in the textile areas. Broadly the position is that textiles for the international trade can only be made using low labor requirement techniques but garment making, even for mass markets, is a very labor intensive activity. Thus a sound strategy for India is the establishment of a high quality, low labor demand textile industry closely integrated with a mass production garment making industry. By this means two potentially valuable resources, the capacity to grow cotton and an abundance of low cost labor, may be usefully exploited through the export of garments for the mass markets of Europe and North America. Other Asian countries, notably Hong Kong, Korea and Taiwan, have already become important suppliers of mass market garments to the West but as the markets are large and only India is a major cotton grower, the prospects for a large scale venture into this trade are excellent.

152. The inputs to garment making are generally seen as raw materials, labor and overheads. Power is an insignificant item which is included in overheads. For home garment making or local craftsman garment making in developing countries the cost of the raw materials, principally the cloth itself plus the sewing thread, is generally by far the most important input for all common articles of apparel made from woven cotton fabrics.

153. Logically one would expect the application of mass production techniques to reduce the cost of manufacture and make raw material costs even more important. In the event this has been found to be not the case. The reason for this is that the major item in the cost of manufacture is wages. Mass production techniques have been introduced in the West partly to achieve uniformity but primarily to reduce labor content and hence wage costs. But the extent to which it has been found possible to reduce labor content has been small and, even in the most technically advanced countries of the West, garment making remains a high labor content industry. The table below, which is based on conditions in mass market factories in the U.K., is believed to show the order of importance of the major inputs to woven cotton garment making in most high-wage-cost countries.

Inputs to Garment Making			
Finished cloth			51.5
of which	Cotton	24.3	
	Spinning	10.9	
	Weaving	9.1	
	Finishing	7.2	
Manufacture			48.5
of which	Direct Labor	24.8	
	Indirect labor and overheads	23.7	
		100.0	100.0

154. The added value in garment making is typically about equal to the cost of the cloth from which the garments are made. This is important but it is perhaps even more important to note that it is almost twice as great (48.5:27.2) as the added value in fabric manufacture. This makes garment manufacture attractive for a high labor availability country such as India, particularly as the overwhelming cost component in garment making is labor. In the manufacture of cotton textiles for the international trade a typical breakdown of added value costs is 40% wages, 60% other costs. This relation is not greatly affected by wage rates as such; there is usually a rough correlation between wage rates and operative productivity. In garment making in Europe the wage bill is typically in the range 75% to 85% of total added value. Thus it is clear that an exporting garment industry could help greatly in easing India's employment problem, earn foreign currency in its own right and assist in the export of cotton textiles.

155. The cost of setting-up a garment industry of the size and quality needed to make a real impact on world markets would not be great. In relation to textile manufacture the cost of machinery and buildings per worker employed is very small. Taking 100 as the figure for the annual capital investment per employee in the textile industry of Britain (made up of plant and machinery 82, buildings and works 18), the corresponding figure for garment making is 21 (plant and machinery 15, buildings 6). Another attractive feature is that garment making can be carried out successfully in very small units. For six countries of Europe, Germany, France, Italy, Netherlands, Belgium and Britain, the average number of employees per firm is 57.2 with a range from 42.2 in Belgium to 73.5 in Britain. These averages include many firms with fewer than 50 employees engaged in the manufacture of short-run fashion garments. Most firms in the mass production sector of the industry are in the size range 50 to 500 employees. For the estimation of setting-up costs in India it would be realistic to regard the typical unit as having 100 direct workers making shirts, blouses or pajamas on a two shift basis 6 days per week.

156. The first requirement is a suitable building. There is a strong temptation to economize here by employing outworkers or by arranging that small groups work in miscellaneous accommodation scattered about a convenient area. This would be false economy. The quality standards of the international garment trade require close supervision of all work and a high degree of uniformity of technique. These can only be achieved by a closely knit labor force working together. To provide 50 work places together with storage, inspection and packing area a total factory area of at least 500 square meters is needed. The cost will depend on the type of construction. A just-adequate standard, with all services except air conditioning, could be provided at a cost of about Rs. 250 thousand (1975 prices). Air conditioning is not usual in Northern Europe but in India it may well be essential to minimize perspiration staining of fabrics during sewing. This would increase the building cost to about Rs. 300 thousand.

157. The second requirement is machinery. Simple cutting tables with manually operated cloth laying machines can be made locally at small cost. Powered cutting knives are not a major expense but should be imported and bought new. The sewing machines themselves will be the major expense. Modern industrial sewing machines have become very expensive because of the sophisticated labor saving features which they now incorporate. These devices are not needed in India and simple domestic sewing machines would provide a satisfactory cheap alternative except that they are not sufficiently robust to stand up to factory use. The most economic answer is to buy second-hand older type industrial machines which have become obsolete in Europe or America. Re-conditioned machines able to give good service can be obtained for prices in the range US$20 to US$200. On this basis a complete line-up of machinery for cutting, sewing, buttonholing and pressing shirts and similar garments could be installed for about Rs. 195 thousand.

158. Working capital is generally rather more important than fixed capital in garment making and the most important item of working capital is the materials inventory and the materials contained in work-in-progress. An efficient operation can maintain an average interval between receipt of fabric and dispatch of garments of about 60 days. On the assumption that shirts are being made with a work content of .4 operative hours per garment, the total value of materials, including sewing, buttons, lining etc., to be regarded as working capital comes to Rs. 435 thousand at 1975 prices. Where the business is concerned only with commission (or 'consignment') garment making the value of the inventory would be only about Rs. 50 thousand but, of course, this is merely a transfer of work capital requirements from the garment maker to the merchant or consignee - it remains a capital requirement to be met by someone.

159. The remaining working capital requirement is the cost of operating the factory for 60 days. If we assume that the cost of employing one direct worker is Rs. 350 per 26 day month the direct labor cost for 60 days comes to Rs. 81 thousand. To this must be added the cost of training and the wages paid to learners in training. In the U.K. this is typically 15% of the production wages bill and, if a similar relationship holds in India, brings the direct labor cost to Rs. 93 thousand. Inside management and supervision will cost about Rs. 30 thousand and services about Rs. 20 thousand. The general picture is summarized below:

Capital requirement for a garment factory 1/
(Rs.)

Fixed Capital		
Building	300,000	
Machinery	195,000	495,000
Working Capital		
Materials	435,000	
Labor	93,000	
Management & Supervision	30,000	
Services	20,000	
		578,000
		1,073,000

1/ employing 100 direct workers (2 shift working) assuming 60 days from cloth-in to garments-out

160. As the total number employed, including supervision and training, will be about 125 people, the capital requirement per employee works out at Rs. 8,584. This should be compared with the capital requirement per employee in a new spinning mill. For a modern ring spinning mill of 25,000 spindles to spin an average count of 32's the total capital requirement is about Rs. 3.8 crores. Total employment, if rationally staffed, would be 340 (including technical management and all ancillary workers). This works out at a capital requirement per employee of Rs. 112 thousand roughly 13 times the requirement per employee in garment manufacture.

161. There are a number of practical difficulties in setting-up a mass production garment industry and perhaps the greatest is that garment making is highly skill-dependent. Most mechanized industries require some operative skill but generally the quality of the product is only marginally skill-dependent. Garment making has much more in common with traditional handicrafts; although uniformity of stitch length and tension is ensured by the use of sewing machines, the actual cutting of garment pieces and the accurate following of seams is still largely dependent on the ability of the worker to co-ordinate hand and eye. For this reason quite long training periods are needed before recruits to the industry can work without close supervision. This is a major expense in Europe where garment making is largely a woman's job (in Britain 93% of skilled operatives in the garment industry are female) and many women leave employment on marriage. If, in India, the industry were based on skilled male labor, wastage would probably be lower and training would be less of a problem.

162. The difficulty is increased by the fact that India has no tradition and little experience of mass production garment making. However, there are a number of European and American consultants who can advise on the setting up of factories and there are many colleges offering courses in garment making technology. Given the will to do so, an efficient garment making industry could be set up within a very few years - certainly in no more time than it will take to establish a sector of the textile industry able to make textiles to international standards.

163. The 100 direct worker factory outlined above would have a productive capacity of 624,000 shirts per annum. The average value of shirts imported into Britain in 1974 was 95 pence. On this basis the value of a year's production landed in Britain would be Rs. 9.58 million. The cost incurred would be:

Operating costs (including materials)	Rs. 3,006,000
20% of capital requirement	215,000
Air freight at 3 rupees/kilo	375,000
	Rs. 3,596,000

The cost of agents' fees and commission may be high but as goods saleable at Rs. 9.5 million can be produced and shipped for Rs. 3.6 million there is every expectation that a very profitable trade can be established. The key to this profitability is the very low cost of Indian labor and factory overheads. From the cost data above, the manufacturing cost, including capital charges but excluding materials, is 22.8% of the factory cost of a shirt as against the figure of 48.5% shown in the table in para. 153 as being typical of mass production garment making in the U.K.

PROFILES OF MILLS VISITED

164. The following pages present self-explanatory profiles of the situation of each of the 24 mills visited in the course of the Mission. Two of them, Numbers 21 & 24 were jute mills, the remainder were cotton and allied mills, appraisal was based on world standards rather than developed country standards. Judged in relation to standards in developed countries many of the mills would have been off the scale (at the lower end), only one mill (No. 11) - Reliance Mills of Ahmadabad, a recently established (i.e. 10 years) enterprise concentrating on man made filament yarns and fabrics, could be described as excellent by developed country standards.

165. To summarize the situation, almost all the mills visited were in very poor shape by Western standards. Quite marked regional differences were noted. Taking the Bombay area as the norm, mills around Ahmadabad were rather better and the mills in the South (centered on Coimbatore) were much better, particularly in relation to condition and operating efficiency. Generally the mills around Calcutta were rather worse than the mills around Bombay.

In the profiles the letters NA mean "Not applicable" and are used where a particular process is not used in the mill concerned.

Profiles of Mills Visited in India during June 1975

MILL NO. 1

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern		x		x	
Reasonably Modern	x		x		x
Old but updated	x		x		x
Needs updating		x			
Obsolete				x	

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good				x	
Satisfactory	x	x	x		x
Poor	x	x	x		x
Bad					
Worn out				x	

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent					
Good	x				
Satisfactory		x		x	x
Poor			x		
Bad				x	x

Profiles of Mills Visited in India during June 1975

MILL NO. 2

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern	x	x			x
Reasonably Modern	x	x			x
Old but updated			NA	NA	
Needs updating					
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good	x	x			x
Satisfactory	x	x			x
Poor			NA	NA	
Bad					
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent	x				
Good		x	x		x
Satisfactory				x	
Poor					
Bad					

MILL NO. 3

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern		x			x
Reasonably Modern			x	x	
Old but updated	x	x	x		
Needs updating	x				x
Obsolete				x	

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory	x	x	x	x	x
Poor	x	x	x	x	x
Bad					
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent					
Good					
Satisfactory	x	x			
Poor			x	x	
Bad					x

MILL NO. 4

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					x
Reasonably Modern					
Old but updated	NA	NA	NA	NA	x
Needs updating					
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					x
Satisfactory					
Poor	NA	NA	NA	NA	x
Bad					
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent					
Good	x				
Satisfactory		x	x	x	
Poor					x
Bad					

MILL NO. 5

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern	x	x	x		x
Reasonably Modern	x				
Old but updated				NA	
Needs updating					
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good	x	x	x		x
Satisfactory					
Poor				NA	
Bad					
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent	x				x
Good		x	x	x	
Satisfactory					
Poor					
Bad					

Profiles of Mills Visited in India during June 1975

MILL NO. 6

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern	x	x	x		
Reasonably Modern				x	x
Old but updated	x		x		
Needs updating		x			x
Obsolete				x	

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory					
Poor	x	x	x	x	x
Bad					
Worn out	x	x	x	x	x

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent					
Good					
Satisfactory	x	x			
Poor			x	x	
Bad					x

Profiles of Mills Visited in India during June 1975

MILL NO. 7

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					
Reasonably Modern		x	x		x
Old but updated	x	x		x	x
Needs updating	x		x		
Obsolete				x	

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory	x	x			x
Poor	x	x	x	x	x
Bad			x	x	
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent					
Good	x	x			
Satisfactory			x	x	x
Poor					
Bad					

Profiles of Mills Visited in India during June 1975

MILL NO. 8

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					
Reasonably Modern		x			
Old but updated	x	x	x		x
Needs updating				x	
Obsolete	x		x	x	

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory	x	x	x	x	x
Poor	x	x	x	x	x
Bad					
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent	x				
Good		x	x	x	
Satisfactory					x
Poor					
Bad					

MILL NO. 9

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					
Reasonably Modern	x	x	x		x
Old but updated	x	x		x	x
Needs updating			x		
Obsolete				x	

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good		x		x	
Satisfactory	x		x	x	
Poor					NA
Bad					
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent	x				
Good		x	x	x	x
Satisfactory					
Poor					
Bad					

MILL NO. 10

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern		×	×		
Reasonably Modern	×		×	×	×
Old but updated	×	×			×
Needs updating				×	
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good		×		×	
Satisfactory	×		×	×	
Poor					NA
Bad					
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent	×				
Good		×	×	×	×
Satisfactory					
Poor					
Bad					

Profiles of Mills Visited in India during June 1975

Note: Mostly filament so spinning is Texturising.
Weaving includes warp & weft knitting.

MILL NO. 11

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern	x	x	x	x	x
Reasonably Modern					
Old but updated					
Needs updating					
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good	x	x	x	x	x
Satisfactory					
Poor					
Bad					
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent	x	x	x	x	x
Good					
Satisfactory					
Poor					
Bad					

MILL NO. 12

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern			x		x
Reasonably Modern	x	x		x	
Old but updated			x		
Needs updating	x	x		x	x
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory		x			x
Poor	x		x	x	
Bad					x
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent					
Good	x		x	x	
Satisfactory		x		x	x
Poor					
Bad					

MILL NO. 13

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern	x	x			x
Reasonably Modern			x	x	
Old but updated					
Needs updating	x	x	x	x	x
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory					x
Poor	x	x	x	x	
Bad			x		x
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent					
Good	x	x	x		
Satisfactory				x	x
Poor					
Bad					

MILL NO. 14

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					x
Reasonably Modern	x	x	x	x	
Old but updated					
Needs updating	x	x	x	x	x
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good		x			
Satisfactory	x				x
Poor	x		x	x	
Bad			x		x
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent	x				x
Good		x	x	x	
Satisfactory					
Poor					
Bad					

MILL NO. 15

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					×
Reasonably Modern	×	×	×	×	
Old but updated					
Needs updating			×	×	×
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good	×	×			
Satisfactory					×
Poor			×	×	
Bad			×		×
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent	×	×	×	×	×
Good					
Satisfactory					
Poor					
Bad					

Profiles of Mills Visited in India during June 1975

MILL NO. 16

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern	x				x
Reasonably Modern		x	x	x	
Old but updated	x				
Needs updating			x	x	x
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory	x	x			x
Poor			x	x	
Bad			x		x
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent	x	x			
Good			x	x	x
Satisfactory					
Poor					
Bad					

Profiles of Mills Visited in India during June 1975

MILL NO. 17

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					x
Reasonably Modern	x		x	x	
Old but updated		x			
Needs updating	x		x	x	x
Obsolete		x			

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory	x	x			x
Poor			x	x	
Bad	x	x	x		x
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent		x	x		
Good	x				
Satisfactory					x
Poor				x	
Bad					

Profiles of Mills Visited in India during June 1975

Mill covers wide range so appraisal applies to Standard Products.
(e.g. condenser spinning - very bad; towel weaving - very good)

MILL NO.18

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					
Reasonably Modern		x			x
Old but updated	x	x	x	x	
Needs updating	x		x	x	x
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory		x			
Poor	x	x	x	x	x
Bad	x		x	x	
Worn out					x

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent					
Good	x	x			
Satisfactory			x		x
Poor				x	
Bad					

Profiles of Mills Visited in India during June 1975

MILL NO. 19

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					
Reasonably Modern		x	x	x	x
Old but updated	x	x			
Needs updating	x		x	x	x
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory		x			
Poor	x	x	x		x
Bad	x		x	x	
Worn out				x	x

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent					
Good		x			
Satisfactory	x				
Poor			x	x	x
Bad					

Profiles of Mills Visited in India during June 1975

MILL NO. 20

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern		x			
Reasonably Modern	x			x	x
Old but updated			x		
Needs updating			x		x
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good	x	x	x	x	
Satisfactory					
Poor					x
Bad					
Worn out					x

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent	x	x	x		x
Good				x	
Satisfactory					
Poor					
Bad					

Profiles of Mills Visited in India during June 1975

MILL NO. 21 (J)

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					
Reasonably Modern	x	x			x
Old but updated			x	x	
Needs updating					x
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good	x	x	x	x	
Satisfactory					
Poor					x
Bad					
Worn out					x

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent		x	x	x	x
Good	x				
Satisfactory					
Poor					
Bad					

Profiles of Mills Visited in India during June 1975

MILL NO. 22

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					
Reasonably Modern					x
Old but updated					
Needs updating					x
Obsolete	x	x	x	x	

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory					
Poor					x
Bad					
Worn out	x	x	x	x	x

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent					
Good					
Satisfactory	x				
Poor		x			
Bad			x	x	x

Profiles of Mills Visited in India during June 1975

MILL NO. 23

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					
Reasonably Modern					
Old but updated		x			
Needs updating					
Obsolete	x	x	x	x	x

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory					
Poor					
Bad					
Worn out	x	x	x	x	x

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent					
Good					
Satisfactory					
Poor	x	x			
Bad			x	x	x

Profiles of Mills Visited in India during June 1975

MILL NO. 24 (J)

PLANT AVAILABLE	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Fully Modern					
Reasonably Modern	x	x		x	
Old but updated			x		x
Needs updating					
Obsolete					

PLANT CONDITION	Spinning Preparation	Spinning	Weaving Preparation	Weaving	Finishing
Good					
Satisfactory	x	x	x	x	
Poor					x
Bad					
Worn out					

CORPORATE ORGANISATION	General Management	Technical Management		Direct Labour	House-keeping
		Competence	Dilligence		
Excellent					
Good	x	x	x		x
Satisfactory				x	
Poor					
Bad					

Licensed and Installed Capacity of the Textile Machinery Industry (1973)

Licensed Capacity (1973)

Item of Machinery	Annual Capacity Licensed (Units)	Unit value at current prices (Rs. '000)	Value Licensed (Rs. million)
Blowroom Machinery	66	800	52.8
Carding Engines	2,980	75	223.5
Combers	60	200	12.0
Sliver Lap M/c.	15	120	1.8
Ribbon Lap M/c.	15	120	1.8
High Speed Draw Frames	577	80	46.1
Speed Frames	631	120	75.7
Ring Frames	4,630	100	463.0
Pirn Winders (Spindles)	2,880	2	5.8
H.S. Winders	150	120	18.0
H.S. Warping M/c.	90	150	13.5
Sizing Machines	84	250	21.0
Auto Looms	6,600	18	117.0
Plain Looms	10,285	3	30.9
Looms (Silk & Art Silk)	1,855	5	9.3
Worsted Ring Frames	140	150	21.0
Combined Bobbiners	8	82	0.7
Gill Boxes	16	75	1.2
Worsted Ring Twisting Frames	16	150	2.4
Tape Looms	225	5	1.1
Processing/Finishing M/c.	-	-	168.0
Total			1,286.6

Source: Report of the Working Group for the Fifth Five-Year Plan (1973)

Licensed and Installed Capacity of the Textile Machinery Industry (1973) Cont'd.

Installed Capacity (1973)

Item of Machinery	Annual Capacity Installed (Units)	Unit value at current prices (Rs. '000)	Value gone into production (Rs. million)
Blowroom Machinery	66	800	52.8
Carding Engines	2,400	75	180.0
Combers	60	200	12.0
Sliver Lap M/c.	-	120	-
Ribbon Lap M/c.	-	120	-
High Speed Draw Frames	395	80	31.6
Speed Frames	439	120	52.7
Ring Frames	4,500	100	450.0
Pirn Winders (Spindles)	2,880	2	5.8
H.S. Winders	150	120	18.0
H.S. Warping M/c.	90	150	13.5
Sizing Machines	64	250	16.0
Auto Looms	6,600	18	117.0
Plain Looms	7,625	3	22.9
Looms (Silk & Art Silk)	1,855	5	9.2
Worsted Ring Frames	120	150	18.0
Combined Bobbiners	8	82	0.7
Gill Boxes	16	75	1.2
Worsted Ring Twisting Frames	16	150	2.4
Tape Looms	200	5	1.0
Processing/Finishing M/c.	-	-	168.0
Total			1,172.8

Source: Report of the Working Group for the Fifth Five-Year Plan (1973)

Industrial Projects Department
December 1975

INDIA - SURVEY OF THE TEXTILE MACHINERY INDUSTRY

Estimated World Ring Spindle Production
(1974)

Country	Spindles/Year
Japan	820,000
China	750,000
Italy	720,000
India	700,000
West Germany	520,000
Switzerland	440,000
USSR	440,000
USA	430,000
UK	330,000
Poland	300,000
East Germany	160,000
Spain	150,000
Romania	140,000
Brazil	120,000
France	100,000
	6,120,000

The total world production amounts to about 1,300 frames per month, or 6 million spindles/yearly.

Source: Gherzi Textil Organization, Zurich, Switzerland

Industrial Projects Department
December 1975

INDIA - SURVEY OF THE TEXTILE MACHINERY INDUSTRY

Foreign Collaboration Agreements

No.	Licensee	Licensor	Commencement Date	Product Range
1	Lakshmi Machine Works Ltd., Coimbatore	Rieter Machine Works Ltd., Switzerland	1961/62	Blowroom Draw Frame Speed Frame Ring Frame Comber Sliver Lap Ribbon Lap
		Schweiter Eng.Wks.Ltd.Switzerland	1974	Auto Pirn Winder
2.	National Machinery Manufacturers Ltd., Bombay	Barmag Barmen, Maschinenfabrik AG, F.R. Germany	1971	Synthetic Fibre Machinery
		TMM Ltd. now	8-4-1948	Ctn Spinning Machines
		Platt Saco Lowell Ltd., England	30-6-1964 Now expired	
		Ruti Machinery Works Ltd., Switzerland	30-6-1961 to 30-6-1971 Now Expired	Auto Loom
3.	Machinery Manufacturer's Corp. Ltd., Calcutta	Crosrol Ltd. UK and Carding Specialists Ltd. (Canada)	1965	Crosrol Indiarol
		Whitin International Ltd., USA	1968	Draw Frame
4.	Texmaco Ltd. Calcutta	Howa Machinery Ltd., Japan	1970	Ring Frame Draw Frame
		Zinser Textilmaschinen GmbH, F.R. Germany	1963	Ring Frame Ring Doubler
5.	Textool Co. Ltd. Coimbatore	No Foreign Collaboration in force at 1975	1946	Indigenous Ring frame
		Kamitsu Slisha Kusho Ltd., Japan	1962	Winders
6.	Indequip Engineering Ltd., Ahmadabad	No Questionnaire Hispano Suiza Switzerland	N.A.	Ring Frame
		West Point Engineering Co., USA	N.A.	Sizing M/C
		(Hacoba) Plutte Kokke & Co., F.R. Germany	N.A.	H.P.Sectional Warpers

No.	Licensee	Licensor	Commencement date	Product Range
7	New Standard Engineering Co. Ltd., Bombay	E. Jacobi, F.R. Germany	1957	Suction Units
8.	Central India Machinery Mfg. Co.Ltd., Gwalior	Collaboration Agreements Expired		Auto-Looms, Plain-Loom Warper, Winder Calender, Bowls
9.	Lagan Jute Machinery Co. Ltd., Calcutta	J. Mackie, Sons Ltd., Belfast, New Ireland	1955	Jute Mfg. Machinery
10.	Dalal Engineering Ltd. Thana, Bombay	Obermaier & Co., F.R. Germany	1966 for 10 yrs.	H.T.H.P. Dyeing Drying M/C
11.	T. Maneklal Manufacturing Co., Ltd. Bombay, Ahmadabad	Benninger Eng. Co. Ltd., Switzerland	1955 to 1966 Expired	
		"	1959 to 1969 Expired	Mercerizers Finishing M/C ETC
		"	1961 to 1973 Expired	
		Artos Maschinenbau, F.R. Germany	1964 to 1973 Expired	Stenters Float Dryers Steam Agers
		Sir J. Farmer Norton & Co. Ltd., U.K.	1965 to 1975	Rope Bleaching Felt-Calenders Friction Calenders Shrinking M/C
		"	1966 to 1976	Continuous Bleaching Plant
		Scholl AG, Switzerland	1966 to 1971 Expired	H. P. Dyeing H.T.H.P. Piece Dyeing Skein Dyeing Rotary Centrifuge
12.	Swastik Bansidhar Engineering Ltd., Ahmadabad	Proposed Collaboration, Meccanotessile, Italy		Rotary Screen Printing M/C

No.	Licensee	Licensor	Commencement Date	Product Range
13.	Swastik Textile Trading Co. Ltd., Ahmadabad	Comercio Escole, Italy	16-11-1959 to 15-11-1969	Various Process M/C
		Mezzera Spa., Italy	30-7-1962 to 29-7-1967 Both expired	Various Process M/C
14.	Calico Industrial Engineers, Bombay	K. Menzel Maschinenfabrik, F.R. Germany	1959	Semi Cont.open width Bleaching Plant Flash Bleaching Range
		E. Kusters Textilmaschinen, F.R. Germany	1962	Curing M/C Aquatroll Water-mangle H.S. Cloth Singeing
		E. Turner & Co. Ltd.,U.K.	1960	Chainless Cloth Mercerizer
		T.Gerber Sohne Gebr., F.R. Germany	1965	It is not clear which above refer to which Collaborators
		Callebaut de Blicquy,Belgium	n.a.	H.T.H.P. Dyeing M/C for yarn fabrics
15.	Famatex India Ltd. Engineers, Bombay	Famatex GmbH, F.R. Germany	1959	Stenter Mangle Polymerising M/C Divers
16.	Star Textile Engineering Works Ltd. Bombay	Toshni Kogyo Co. Ltd.,Japan	1973	Rotary Screen Printing M/C Flat Bed Printing
		Hisaka Works Ltd.	1973	Jet Dyeing Plant
		Yamatokoli Machinery Works, Japan	1973	Card Accessories
17.	Sussen Textile Bearings Ltd. Baroda	Spindel fabrik Sussen, Schurr, Stahlecker, Grill GmbH, Sussen, F.R. Germany	1961	Top Arms Top Rollers Jockey Pulleys Spindle Inserts Bearings

No.	Licensee	Licensor	Commencement Date	Product Range
18.	Star Electronics Ltd., Bombay	Zellweger Ltd., Switzerland	n.a.	Uster Testing M/C
19.	The New India Industr. Baroda	U.K.	n.a.	Cotton Healds Pitchbound Reeds
		F.R. Germany & Japan	n.a.	All Metal Reeds
		F.R. Germany		Wire Healds
20.	Lakshmi Card Clothing Mfg. Co. Ltd., Coimbatore	Graf Sales Ltd., Switzerland	1961	Flexible Clothing Licker in Wire Metallic Wire

Source: Directorate General of Technical Development. GOI
IDA questionnaires.

Industrial Projects Department
December 1975

INDIA - SURVEY OF THE TEXTILE MACHINERY INDUSTRY

Product Range and Rating

This annex lists the machinery produced by the major Indian manufacturers and compares the technology of Indian textile machinery with Western European and Japanese machinery and classifies them into three broad categories:

1. Comparable in design and quality with machinery produced in Europe and acceptable in both domestic and all export markets (denoted by 'A' in following tables),

2. Reasonably modern in design (early to mid-sixties) and of acceptable quality for the domestic market and limited export markets (denoted by 'B' in following tables),

3. Obsolete and only marginally acceptable in the domestic market (denoted by 'C' in following tables).

INDIA- SURVEY OF THE TEXTILE MACHINERY INDUSTRY

Product Range and Rating

No.	Company	Type of Machine	Source of Design: Indian	Source of Design: Foreign	Source of Design: Active Collaboration	Original Collaborator	Machine not yet produced	Evaluation: A	Evaluation: B	Evaluation: C
	Lakshmi	Blowroom		X	X	Rieter		X		
		Card		X	X		X			
		Draw Frame		X	X			X		
		Comber Prep.		X	X			X		
		Combers		X	X			X		
		Speedframes		X	X			X		
		Ringframes		X	X			X		
		Doublers		X	X					
		Pirnwinder		X	X	Schweiter				
		Drafting Systems		X		Rieter				
2.	NMM	Blowroom		X	X	Platt-Saco-Lowell	X			
		H. P. Card		X			X			
		Drawframe		X					X	
		Comber Prep.		X	X	"				
		Combers		X	X	"				
		Speedframes (MS 2 Speedframe)		X					X	
		Ringframes (Superspinner)		X					X	
		Ringdoubler		X					X	

Product Range and Rating

No.	Company	Type of Machine	Source of Design: Indian	Foreign	Active Collaboration	Original Collaborator	Machine not yet produced	Evaluation: A	B	C
2 continued										
		Drawtwister		X	X	Barmag		X	X	
		Auto Loom B-Type		X		Ruti			X	
3.	MMC	Card		X		H.B.American Mach.Co.SA			X	
		Crossrol A.V.Unit		X	X	Vrossrol Ltd.			X	
		Drawing Frame		X		Whitin			X	
4.	Texmaco	Ringframe		X		Zinser			X	
		Ringdoubler		X		"			X	
		H. P. Card		X		Howa	X			
		Ringframe		X		"	X			
		Speedframe		X		"				
5.	Textool	Speedframes							X	
		Ringframes							X	
		Cone Winders		X		Kamitsu			X	
		Doutle Winders		X		"			X	
6.	Indequip	Ringframe		X		Ueberlein Hispano			X	

Product Range and Rating

No.	Company	Type of Machine	Source of Design: Indian	Foreign	Active Collaboration	Original Collaborator	Machine not yet produced	Evaluation: A	B	C
6 continued										
		Sect.Warper		X		Macoba			X	
		H.S.Warper		X		"			X	
		Sizing Machine		X		West Point			X	
7.	NSE	Blowroom		X		Trutzschler			X	
		Pneumafil and Trav. cleaners		X		Jacobi			X	
8	Cimmco	Plain Loom	X							X
		Auto Loom		X		Sakamoto			X	
		Winder	X			Original Muller				
		Warper	X			"			X	
		Calender Bowls	X						X	
9.	Lagan	Jute Drawframes " Spinning "								
10.	Birds & Co.	Jute Machinery	X		X	Star Textiles				
11.	Maneklal	Jiggers		X		Benninger			X	
		Mercerisers		X		"			X	
		Fibe Machine		X		"			X	
		Stenters		X		Artos			X	

Product Range and Rating

No.	Company	Type of Machine	Source of Design: Indian	Foreign	Active Collaboration	Original Collaborator	Machine not yet produced	Evaluation: A	B	C
11 continued										
		Hotflues		X		Artos			X	
		Steamagers		X		"			X	
		Rope Bleaching		X		Farmer Norton			X	
		Felt Calenders		X		Farmer Norton			X	
		Friction "		X		"			X	
		Pneumatic "							X	
		Spray Towers		X		"			X	
		Shrinking M/C		X		"			X	
		Cont.open width Bleaching Plant		X	X	"			X	
		H.T.H.P.Dyeing Unit		X		Scholl			X	
		Rubber Blankets		X		Rollin			X	

Product Range and Rating

No.	Company	Type of Machine	Source of Design: Indian	Source of Design: Foreign	Source of Design: Active Collaboration	Original Collaborator	Machine not yet produced	Evaluation: A	Evaluation: B	Evaluation: C
12	Swastik	Open width washer		X		Comerio/Mezzera				
		Polymeryser	X						X	
		Tensionless Dyeing Machine	X			"			X	
		Hydro Extractor	X			"			X	
		Hank Dyeing M/C		X					X	
		Pneumatic Padding Mangle		X		"			X	
		Cylinder Dryer		X					X	
		Bleaching Range	X			Comerio/Mezzera			X	
		Felt Calender	X			"			X	
		Shrinking Range	X			"			X	
		Stenter + Dryer	X			"			X	
		Loop Steamer	X			"				
		Jiggers	X			"			X	
		Rotary Screen Printer		X		Meccano-Tessile			X	

Product Range and Rating

No.	Company	Type of Machine	Source of Design: Indian	Foreign	Active Collaboration	Original Collaborator	Machine not yet produced	Evaluation: A	B	C
13	Calico	Open width Bleaching		X		Gerber/Kusters Menzel/Turner			X	
		Rope Bleaching Plant	X			"			X	
		Curing Range							X	
		O.W.Washing M/C	X			"			X	
		Water Mangle		X		"			X	
		Float Dryer	X			"			X	
		Hot Flue Dryer	X			"			X	
		Cylinder Dryer	X			"			X	
		A.S.Cloth Singeing		X		Gerber/Kusters Menzel/Turner				
		Jiggers	X			"			X	
		Continuous Dyeing	X			"			X	
		Chainless Mercerizer		X		"			X	
		H.T.H.P. Dyeing	X			"			X	
		Beam Batching	X			"			X	
		Washing Machine	X			"			X	
		Pressure Mangles	X			"			X	

Product Range and Rating

No.	Company	Type of Machine	Source of Design: Indian	Foreign	Active Collaboration	Original Collaborator	Machine not yet produced	Evaluation: A	B	C
13	Continued	Dye Winch	X			"			X	
		Decatising M/C	X			"			X	
		Star Ager	X			"			X	
		Colour Mixer	X			"			X	
14	Famatex	Stenter		X		"			X	
15	Star Text.	Fluted Rollers	X						X	
		Jet Dyeing	X	X	X	Hisaket	X		X	
		Beam Dyeing		X	X	Ludwig-Svensen	X			
		Ringframe and Speedframe Conversion	X						X	
		Rotary Screen Printing		X	X	Toshin Kogyo	X			
		Flat Bed Screen Printing		X	X		X			
		Jute Machinery Conversion	X							
		Card Accessories		X		Yamatokoei	X			

Product Range and Rating

No.	Company	Type of Machine	Source of Design: Indian	Source of Design: Foreign	Source of Design: Active Collaboration	Original Collaborator	Machine not yet produced	Evaluation: A	Evaluation: B	Evaluation: C
16	Suessen	Drafting Systems		X	X	Suessen		X		
		Spindle-Inserts						X		
		Jockey Pulleys						X		
17	MK Spindle	Spindles	X						X	
		Rings	X						X	
		Inserts	X						X	
		Card Flats	X						X	
18	New India	Healds	X			UK/			X	
		Reeds	X			West Germany			X	
19	Lakshmi Card Clothing	Card Clothing		X	X	Graf			X	

Industrial Projects Department
December 1975

INDIA - SURVEY OF THE TEXTILE MACHINERY INDUSTRY

Evaluation of Technology of Indian Machinery

PROCESS	MAIN FEATURES OF ADVANCED TECHNOLOGY	MADE IN INDIA BY	AVAILABLE	PLANNED	NO DEFINITE PLANS
BLOWROOM	- Bale digester and mechanical Stack blender				x
CARDS	- High Production	NMM L.M.W.		x	
	- Large Cans	"		x	
	- Card Auto Leveller	"			x
	- Chute Feed	NSE		x	
DRAWFRAME	- High Speed 350/m/min.	NMM L.M.W.	x		
	- Large Cans	"	x		
	- Can change				x
	- Auto Leveller				x
COMBER + PREP.	- High Speed	L.M.W.	x		
SPEED FRAME	Large Packages	NMM	x		
	High Speed	LMW	x		
RING FRAME	- Auto Doffer				x
	- Tangential Drive				x
OPEN END SPINNER	- Entirely new technology				x
CONE WINDING	Automatic Winder	BATLIBOI		x	

PROCESS	MAIN FEATURES OF ADVANCED TECHNOLOGY	MADE IN INDIA BY	AVAILABLE	PLANNED	NO DEFINITE PLANS
PIRN WINDING	Automatic Pirn Winder	LMW SEN	x		
WARPER	H.S. Warper	CIMMCO		x	
SIZEING	H.S. Sizeing	A.T.E.	x		
LOOMS	- H.S. Shuttle Loom	L.L.W.		x	
	- H.S. Shuttleless Loom	N.M.M.		x	

Evaluation of Technology of Indian Machinery (Cont'd)

MACHINE	MAKE	COMMENTS
1) Chainless Mercerising M/C	Benninger/ Maneklal	Robust design, design features somewhat outdated corresponds to Benninger design around 1960
2) Three Bowl Pneumatic Mangle	"	Dated design in satisfactory execution
3) Jigger	"	Good Jigger, corresponds almost to present Benninger design
4) Spray Washing Unit	Norton/ Maneklal	As made since 1968 by J.F.M.
5) Hot-Flue	Artosi Manekcal	Up to date - design
6) Over width Bleaching	Norton/ Maneklal	Modern design however, not comparable to continental design
7) Stenter	Artos/ Maneklal	Modern, design 1968/70 of Artos
8) Stenter	Famatex India	Modern design 1970/1971 of Famatex Germany
9) Thernosol Range	"	Slightly outdated not very successful machine
10) Polymeriser	"	Proven design of Farmatex Germany 1960
11) Padder		Modern Unit
12) Cloth	Calico	Design about 1960
13) Open Width Desizing and Bleaching Unit	"	Proven system, but not up to date Pumping system unsatisfactory
14) Chainless Merceriser	"	Design around 1965, classical machine
15) Drying Range	"	Outdated design especially batching unit attached
16) Jigger	"	Primitive design, No automation no oscillating device etc.

MACHINE	MAKE	COMMENTS
17) Pneumatic Padder	Calico	Design around 1950-1955
18) Finishing Padder	"	Modern, American design not comparable with top makes
19) Hot-Flue	"	Design 1958-1960, high area requirement difficult to service
20) Curing Machine	"	Design about 1950-1960
21) Wide Width Washing Machine	"	Machine is delivered in various executions. Design around 1955 (?)
22) Beam Batching M/C	"	Modern M/C. Design around 1970
23) Horizontal HP and HT Beam Dyeing Machine	"	Corresponds to continental machine design of the year 1965
24) Continuous Open Width Bleaching Range	Swastik	Standard machine design as made since 30 years.
25) Semi-Continuous O.W.B.R.		Modelled after Artos design about 1968
26) Cylinder Dryer	"	Corresponds to continental design of 1965-1970
27) Jigger	"	Automatic, modern design
28) Continuous Dyeing Plant	"	Padder/Hot-Flue execution, dated design
29) Mangle-Float Drier	"	Dated design
30) Hank Dyeing Machine	"	Design of Mezzera machine built in this execution since 20 years
31) Loop Steamer	"	Copy of "Arioli" steamer 1967
32) Polymeriser	"	Standard execution, slightly outdated 1960 design
33) Washer for after Print Washing	"	Design around 1960 but still modern
34) Washer for Open Width Washing		System Mezerra most modern machine
35) Fiber Drier		Standard execution, modern
36) Hank Drier		Standard execution, modern
37) Stenter	"	Corresponds to Stenter of Artos 1965.

MACHINE	MAKE	COMMENTS
38) Felt Finishing Ranges	Swastik	Standard machine, slightly outdated
39) Shrinking Range	"	Copy of "Sanfor" machine
40) Rotary screen printing	Star Swastik	Not yet built, modern Japanese design Not " " own "
41) Flat Bed Screen Printing	Star Swastik	Not yet built, modern Japanese design Not " " own design
42) Jet Dyeing Machine	Star Swastik	Modern Japanese Design

INDIA - SURVEY OF THE TEXTILE MACHINERY INDUSTRY

Production and Capacity Utilization

No.	Company	Licensed Capacity	Installed Capacity	Production 1972	Production 1973	Production 1974	Utilization % 1972	Utilization % 1973	Utilization % 1974
1	Lakshmi	30 Blowroom Lines	18	-	5	7	-	28	39
		175 Sets Drawframes	150	110	91	133	74	60	89
		175 Speedframes	120	94	66	100	78	55	83
		580 Ringframes	480	268	229	380	55	47	79
		60 Combers	60	2	36	55	3	60	91
		15 Comber Prep.	15	-	-	10	-	-	66
		120 Cards	-	-	-	-	-	-	-
		60 Finnwinders	60	-	-	-	-	-	-
2	NHM	1500 Ringframes	1500	464	510	630	32	34	41
		120 Drawframes	120	-	62	77	6	50	64
		600 Cards	600	14	32	91	2	6	15
		3000 Auto Looms	3000	873	611	863	29	20	29
		Drawtwister	30	-	- 72/73	2 73/74	-	-	65
3	MMC	1200 Cards	600	212		431	35	36	57
		200 Drawframes	200	90	75	34	45	38	[illegible]
		2000 C.V.H.P.C.	800	302	311	763	37	40	79
		96 Speedframes	96	34	41	62	35	43	64

Production and Capacity Utilization

No.	Company	Licensed Capacity	Installed Capacity	Production 1972	Production 1973	Production 1974	Utilization % 1972	Utilization % 1973	Utilization % 1974
4	Texmaco	900 Ringframes Doublers	900	189	324	516	21	36	57
		Worsted Ringframes							
5	Textool	900 Ringframes	900	109	150	198			
		96 Conewinders	96	85	96	106	88	100	110
6	Indequip	300 Ringframes							
		Sizing M/C	N.A.						
7	NSE	36 Blowroom	36		18	23		50	64
8	C.I.M.M.C.O.	Auto Looms	1500	-	893	823	-	59	54
		Plain Looms	2400	-	1617	1135	-	67	43
		60 Winding MC	60	-	41	36	-	68	60
		240 Calender Bowls	120	-	22	35	-	18	29

Source: IDA questionnaires

Industrial Projects Department
December 1975

Estimated World Loom Production

Country	No. of shuttle looms		No. of shuttleless looms		Total looms	
Wester Europe						
RHG-Rüti	4.500		1.500		6.000	
Astra	100		-		100	
Desveus	-		800		800	
Diederichs	-		1.100		1.100	
Dornier	-		1.000		1.000	
Engels	-		200		200	
Galileo	1.000		-		1.000	
Giani	700		-		700	
Güsken	-		500		500	
Iwer/Fatex	-		1.000		1.000	
Northrop	600		-		600	
Omita	1.000		-		1.000	
Picanol	8.000		-		8.000	
SACM	-		1.800		1.800	
Saurer	2.000		-		2.000	
SMIT	-		600		600	
Snoeck	-		350		350	
Somet	-		700		700	
Sulzer	-		5.000		5.000	
Miscell. (Günne, Nebiolo, Gardella, Kapp , San Giorgio, Hattersley, Mackie etc.)	2.100	20.000	550	15.000	2.500	35.000
Eastern Europe						
CSSR	2.000		4.500		6.500	
UdSSR	10.000		15-20.000	20-25.000	25-30.000	
Miscell.	6.500	18.500	500	25.000	7.000	40.000
USA						
O & K	400		-		400	
Draper	1.600		1.400		3.000	
Miscell.	400	2.400	-	1.400	400	3.800
Asia						
Enshu	6.000		600		6.600	
Howa	5.000		-		5.000	
Ishikawa	-		1.200		1.200	
Iwama	2.400		-		2.400	
Hirano	3.000		-		3.000	
Hokuriku Kikai	7.200		-		7.200	
Nissan	-		3.000		3.000	
Suzuki	1.200		-		1.200	
Toyoda	7.800		-		7.800	
Tsudakoma	8.600		1.000		9.600	
Other jap. manuf.	5.000		-		5.000	
Taiwan	3.000		-		3.000	
India	1.500		-		1.500	
Red-China	54.000	104.700	-	5.800	54.000	110.500
S. America						
Brasilia	2.300	2.300	-		2.300	2.300
Total		147.900		43.700		191.600
Including USSR & China Total		83.900		27.200		111.100

Source: Gherzi Textil Organization

Estimated World Loom Production

Loom Market	Looms	%
1) Worldwide Manufacturing Capacity of looms in 1970 (Excluding Russia and Red China)	110,000	100
- Shuttle Looms	83,000	73
- Shuttleless Looms	27,000	27
2) Estimated Worldwide Production in 1974	85,000	100
- Shuttle Looms	62,000	63
- Shuttleless Looms	23,000	27

3) The sales distribution of looms sold worldwide in 1974 is estimated as follows:

Country	Shuttle Looms %	Shuttleless Looms %	Total %
- Europe	15	50	26
- North America	6	23	11
- Latin America	3	6	4
- Africa	8	2	6
- Asia	68	19	53
Total	100	100	100

4) Estimate Year 1980

		%
- Shuttle Looms	32,000	51.6
- Shuttleless Looms	30,000	48.4
Total	62,000	100.0

5) A further estimate of distribution of shuttleless loom-sales in 1974 is given below:

- rapier- gripper-looms	53
- projectile-looms	27
- water-and airjet-looms	20
Total	100 %

Source: Gherzi Textil Organization

Industrial Projects Department
December 1975

INDIA: SURVEY OF THE TEXTILE MACHINERY INDUSTRY

Ancillary Suppliers

INSTALLED CAPACITY OF LEADING MANUFACTURERS OF COMPONENTS & ACCESSORIES

(1974)

Items	Star Tex.	Sover-eign	Laksh-mi Matan	Saver NGM	Mac-hine Prod. (I)	S.T.B. (Suc-ceon)	A.B.C. (SKF)	L.K. Spin-dles.	B'bay Ring Trave-llers	A.T.E.	Litex	Madras Spind-les	Indian Card	Lak-shmi Card	Well. Ate.	Metro Wood	New India	Crown Sys. Mills	National Wire	Others	Total
High Draft-ing Conver-sion	900	8 206	600	250	180																2126 Frames.
Ball Bearing Top Rollers						14.40	12.00													3.10	29.50 Thos.Pcs.
Spindle Inserts						7.8	6.00	1.30												4.00	19.10 Thos.Pcs.
Rings								1.50			6.00	3.20									10.70 Thos.Pcs.
Trave-llers									22000											30400	52400 Boxes
Layers										3.00											3.00 Thos.Pcs.
Card Clothing Metallic & Flexible													6000	3600	1800						11400 Sets
Lickerin Wire														30000							30000 Kgs.
Worsted													250000								2,50,000 Kgs.
Shuttles																1800				12000	14,200 Gross
Heddles Cotton																	52000	24000		16200	92,200
Wire																500	145	240	200	45	1170 Mil. Pcs.
Flat																1	4		25	12	42 Mil.Pcs.
All Metal Reeds																	2000			7500	9500 Doz.

Source: Textile Machinery Manufacturers' Association (TMMA)

Annex C
Page 1

PRODUCTION AND CAPACITY UTILISATION OF LEADING COMPONENTS & ACCESSORIES MANUFACTURERS.

	Name of the Firm	Item	Annual licensed/ installed capacity		Production during			Capacity Utilisation		
					1973	1974	1975 (upto Sept)	1973	1974	1975 (upto sept)
	(1)	(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9)
1.	Star Textile Engineering Works Limited.	Ring & Speed Frame High Drafting Conversion.	Nr.	900	800	1,027	568	90%	114%	84%
2.	Associated Bearing Co.	Pendulum Arms	Nos.	4,00,000	2,35,711	3,00,013	2,55,842	59%	75%	85%
		Top Rollers	"	12,00,000	5,76,122	10,26,467	7,77,185	48%	86%	85%
		C.S. Inserts	"	6,00,000	4,48,582	6,00,010	3,40,900	75%	100%	76%
		Tape Tension Pulley	"	1,80,000	1,09,024	1,50,043	1,04,462	60%	83%	77%
3.	Suessen Textile Bearings Ltd.	Top Arms	"	3,60,000	2,14,338	3,10,081	2,18,365	59%	86%	81%
		Top Rollers	"	14,40,000	8,51,434	10,47,046	9,93,756	59%	72%	91%
		R.B. Inserts	"	7,80,000	5,42,129	5,38,378	4,82,161	70%	69%	82%
		Jockey Pulleys	"	1,20,000	92,704	1,24,367	1,02,270	77%	103%	114%
		Bottom Roller Bearing	"	1,20,000	-	15,457	34,664	-	13%	39%
4.	Indian Card Clothing Co. Ltd.	Metallic Card Clothing	Sets	6,000	2,258	5,395	3,422	38%	90%	76%
		Woollen, Worsted & Cotton Waste Card Clothing	Mtrs.	2,50,000	45,075	56,850	84,882	18%	23%	45%
5.	Lakshmi Card Clothing Mfg. Co.	Metallic Card Clothing	Sets	2,400	1,759	1,585	1,305	73%	66%	73%
		Flexible Card Clothing								
		Flat Top Sets	"	4,500	3,089	2,824	1,569	71%	63%	48%
		Stripping Fillets	"	780	692	751	1,174	87%	93%	150%
		Doffers		1,200	657	255	56	55%	21%	0%
		Cylinders		1,200	665	247	74	55%	20%	8%
		Licker-in Wire	Kgs.	30,000	10,094	19,348	19,057	33%	64%	85%
6.	Zell-Ate Ltd.	Metallic Card Clothing	Sets	1,800	1,058	1,218	252	59%	67%	20%
7.	Kunal Engineering Co.	Alu. Plug type Spndls.	Nos.	1,68,000	-	2,81,052	1,91,815	-	167%	152%
		Rabbeth type Spndle	"	60,000	-	-	9,517			21%
		Insert Assembly	"	2,30,000	-	-	1,90,892			106%
8.	Bombay Ring Travellers Co. Ltd.	Travellers	Boxes	22,000	17,766	15,926	11,625	80%	72%	75%
9.	M.K. Spindle Mfg. Co.	Inserts	"	1,30,000	-	-	61,335	-	-	63%
		Spindles	"	2,00,000	2,13,000	2,70,500	1,29,000	106%	135%	86%
		Spinning Rings	"	1,50,000	1,07,000	1,77,600	70,000	71%	78%	62%
10.	Ritex Engineering.	Solid Steel Rings	"	6,00,000	3,00,000	3,34,000	1,37,013	50%	56%	31%
11.	New India Industries	Cotton Healds	Doz.	52,000	38,083	35,353	19,200	73%	68%	49%
		Pitch Bound Healds	"	28,000	17,246	14,695	9,800	62%	52%	45%
		Metal Reeds	"	2,000	1,771	1,405	920	88%	70%	61%
		Wire Healds	Ml.Pcs.	145	50	45	43	35%	33%	40%
12.	Crown Spg. Mills	Cotton Healds	Doz.	24,000	12,301	13,509	12,000	50%	56%	67%
		Wire Healds	Ml.pcs.	240	13	14.5	12	5%	6%	7%
		Steel Reeds	Doz.	3,600	1,006	1,128	1,000	28%	32%	37%
13.	National Wire Heald Co. Pvt. Ltd.	Wire Healds	Ml.pcs.	200	158	174	96	79%	87%	64%
		Flat Healds	"	25	6.3	7.2	4	25%	28%	21%
14.	Metro Wood Co.P.Ltd.	Shuttles	Gross	1,800	980	1,002	950	54%	56%	70%
		Bobbins	"	1,25,000	9,251	10,248	9,000	9%	10%	12%
		Wire Healds	Ml.pcs.	500	37	42	36	37%	8%	10%
		Flat Healds	Doz.	7,200	2,850	3,225	2,800	38%	45%	53%

Source: Textile Machinery Manufacturers' Association (TMMA)

DOMESTIC MARKET SHARE OF MAJOR COMPONENT MANUFACTURERS
(1974)

Items	Star Tex. %	Lakshmi Ratan %	Saver NGK %	Sovereign %	Machine Prod. (I) %	STB (Queen) %	A.B.C. (SKF) %	M.K. Spindles %	B'bay Ring Travellers %	Madras Spindles %	Ritex %	A.T.E. %	Indian Card. %	Lakshmi Card. %	Zell. Ato. %	Metro Wood %	New India %	Crown Grs. Mills %	National Wire %	Others	Total %
H.D. Conversion	56	7	17	10	10																100
Bottom Rollers						50	40													10	100
Spindle Inserts						45	32	6												17	100
Rings								19		44	37										100
Travellers									32											68	100
Flyers												100									100
Card Clothing													68	26	6						100
Shuttles																16				84	100
Healds-Cotton																	65	28		7	100
Wire																8	9	3	35	45	100
Flat																3	12		40	45	100
All-Metal Reeds																	25			75	100

Source: Textile Machinery Manufacturers' Association (TMMA).

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IDBI Bills Rediscounting Scheme

(Rs. crores)

	Total value of Redis-counted bills sanctioned	Total value of Redis-counted bills utilized	Total value of bills sanctioned for Textile Machinery	Total value of bills utilized for Textile Industry	Total Domestic Machinery Sales			
	(1)	(2)	(3)	(4)	(5)	(3)÷(1) %	(4)÷(2) %	(5)÷(1) %
1964/5	0.1	0.1	0.1	0.1	16.5	100	100	0
1965/6	2.2	1.9	2.1	1.8	28.4	95.5	94.7	6
1966/7	7.1	6.1	6.4	5.6	22.5	90.1	91.8	25
1967/8	12.4	10.6	7.5	6.7	17.3	62.9	63.2	46
1968/9	15.5	13.3	8.6	7.4	16.1	55.5	55.6	45
1969/70	24.1	20.6	13.5	11.5	20.0	56.0	55.8	57
1970/71	28.5	24.3	14.8	12.7	30.1	51.9	52.3	42
1971/2	45.3	38.3	22.2	18.8	33.0	49.0	49.1	57
1972/3	49.8	42.5	23.0	19.6	31.0	46.2	46.1	63
1973/4	76.3	63.7	30.1	25.1	43.0	39.5	39.4	58
1974/5*	115.0	92.0	46.0	36.5	60.0	40.0	39.7	60
Cumulative Total	376.3	313.4	174.6	145.8		46.9	46.5	

* Estimates

Source: IDBI & TMMA

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Textile Machinery Manufacturers Visited by Mission

No.	Name of Company	Commencement Year	Location
Spinning and Weaving			
1.	Lakshmi Machine Works Ltd. (LMW)	1965	Coimbatore
2.	National Machinery Manufacturers Ltd. (NMM)	1958	Bombay & Baroda
3.	Machinery Manufacturers Corporation Ltd. (MMC)	1951	Calcutta
4.	Texmaco Ltd.	1946	Calcutta
5.	Textool Company Ltd.	1946	Coimbatore
6.	Indequip Engineering Ltd.	1962	Ahmadabad
7.	New Standard Engineering Co. Ltd. (NSE)	1957	Bombay
8.	Central India Machinery Manufacturers Co. Ltd. (CIMMCO)	1946	Gwalior
9.	Lagan Jute Machinery Co. Ltd.	1955	Calcutta
10.	Bird & Co. Pty. Ltd.	1975	Calcutta
Processing			
11.	SLM - Maneklal Industries Ltd.	1948	Ahmadabad
12.	Swastik Bansidhar Engineering Pty. Ltd.	1946	Ahmadabad
13.	Swastik Textile Trading Co.		Ahmadabad
14.	Calico Industrial Engineers (Calico)	1946	Bombay
15.	Famatex India Pty. Ltd.	1948	Bombay
Ancillary Manufacturers			
16.	Star Textile Engineering Works Ltd. (STE)	1959	Bombay
17.	Suessen Textile Blarings Ltd.	1957	Baroda
18.	M.K. Spindle Manufacturers Pty. Ltd.	1949	Ahmadabad
19.	The New India Industries Ltd.	1942	Baroda
20.	Lakshmi Card Clothing Manufacturers Co. (LCC)	1963	Coimbatore

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Machinery Development by Textile Machinery Manufacturers

L.M.W. There is no R & D in progress. All products being the latest from the collaborator. However, they are engaged in a joint venture with S.I.T.R.A. to develop a 2/1 Twister.

N.M.M. The only machine in their product range, which needs immediate development is the Ruti "B" loom. They are developing this for higher speeds, and greater versatility viz. for canvas and terry towelling fabric.

M.M.C. They have set up an R & D Section, which is presently concentrating on perfecting the new patented Indiarol for cards. This is an extension to the Crosrol "take off," and crushing rollers, and is intended to prevent lapping of the web, which is prevalent in hot and humid countries. This device should boost their sales of card conversions and new cards, significantly.

TEXMACO Upgrading of Zinser 11/13 RM1 Ring Frame, and provision of their own design of nose bar, which makes them independent of imported materials. Design of an appropriate drafting system for Worsted Spinning, which extends their range. Investigating an Apron Drafting System for Jute spinning machines, which is in great demand from the Jute Industry to increase productivity and quality and improve their export competitiveness.

TEXTOOL This firm has an R & D Section. Most of their work is spent on diversifying products away from Textile machinery. One product, allied to Textiles, upon which they have spent considerable time, is the development of Zari fine wire drawing machines. These are for the production of gold plated flattened silver wire, used in the famous Conjeewaram silk sarees, which is now imported.

N.S.E. An R & D Section was started up in 1972. They are engaged in research and development of -:
(a) A heavy duty mixing blender. This is something special for Indian conditions, where large bale mixings are uncommon.
(b) A Chute Feed system for cards. This is nothing new, having been in use for over ten years, but is still not made in India, and is highly desirable.

CIMMCO. There is some development in progress, updating their old type automatic loom:-
(a) To increase the speed from 130 p.p.m. to 160 p.p.m. This is to narrow the gap with the present competition.
(b) To cheapen the design of the present model, by removing some of the more sensitive components, and bring the loom into a cheaper price range, particularly suitable for the NTC mills.

MANEKLAL — They are continually upgrading existing products, and have recently completed-:
(a) A Pressureless High Temperature Bleaching System. This enables bleaching as a continuous operation at speeds in excess of 100 meters per minute. This represents considerable savings in the mills.
(b) A Washing System for continuous open width washing at over 100 meters per minute. Capable of processing basic print washing applications for cotton, cotton blends, 100% synthetic etc. Many other developments are planned, but non-availability of finance restricts their efforts.

SWASTIK — At present there is no R & D, but they intend to set up a department in 1976/77. Some work is "in hand" on a Rotary Screen Printing Machine.

CALICO — Apart from "running" development, there is no active R & D.

FAMATEX — No R & D facilities, and no apparent plans for the future: Probably new products will be undertaken by their sister company, Star Textile Engineering Works.

STAR TEXTILE — This firm is showing the greatest awareness and probably doing more in R & D, than any other. Most notable achievements to date-:
(a) Apron Drafting conversions for Jute Spinning Frames in conjunction with IJIRA of which they were pioneers in India. This allows for considerably higher productions from existing Jute spinning frames, together with improved yarn quality. It could materially assist the Jute Industry to become more competitive in the export market.
(b) New Tabular Type Jute Flyers. These cover three different designs, including a giant flyer, for very coarse weft yarns. This development, which has been a difficult one, enables considerably higher speeds to be achieved on Jute Spinning machines.
(c) New Jute Drawing and Spinning Frames. These have all been designed "in house", and are the first of these machines to be designed in India.

Conclusions

Most of the work being carried out is in the form of development-:

(a) To improve the existing products, by increasing speeds, and adapting more sophisticated controls, measuring and other devices.

(b) Adapting a machine for other than the original purpose, i.e. cotton ring frame for worsted spinning or doubling.

(c) Increasing the product range by copying other competitors machines, or designs, with perhaps some amendments to suit the Indian market or the manufacturers machine tools.

(d) Redesign of an existing machine to meet specialized Indian conditions.

Apart from Star Textile there is virtually next to no fundamental research. Auto-levelling for cards, by N.S.E. would fall in this category, if it eventuates.

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Export Finance

Maturity of Export Credits

Contract Value Rs. million	Maturity[1/] Years
Up to 1	3
1-5	5
5-10	7
Above 10	10

1/ Including grace period of 12-15 months

Source: Engineering Export Promotion Council publication on "Export Finance", August, 1975.

Deferred Payment Arrangements Sanctioned by IDBI as of June 30, 1975[1/]

Commodity	(Rs. Crores)	%	
Textile Machinery	30.3	20	
Railway wagons	24.8	17	
Steel rails/bars/railway equipment	17.1	12	
Transmission Equipment	17.7	12	
Automobiles and spares	11.5	8	
Sugar mill machines	8.6	6	
Diesel engines	4.0	3	
Boilers	4.5	3	
Bicycles and parts	1.7	1	
Others	28.2	19	
Total	148.4	100	(61)
Value of all exports financed by IDBI and Banks	244.4		(100%)

1/ Direct loans, refinance of medium-term export credits, overseas buyers credits and foreign lines of credit.

Source: Reserve Bank of India

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World Trade in Textile Machinery 1/
(Sales in US$ million)

Country	1971 Exports	1971 %	1972 Exports	1972 %	1973 Exports	1973 %
Western Germany	840	34.1	1,257	37.5	1,521	36.0
Switzerland	354	14.4	483	14.2	663	15.7
Japan	245	10.0	258	8.2	465	11.0
U.K.	327	13.3	430	12.6	418	9.9
Italy	182	7.4	255	7.5	327	7.8
France	186	7.5	221	7.4	294	7.0
USA	171	7.0	207	6.0	263	6.2
Others	154	6.3	217	6.5	273	6.5
Total	2,461	100.0	3,328	100.0	4,224	100.0

1/ Excluding USSR, Eastern Europe and China

Source: VDMA, Frankfurt/Main, West Germany

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Recommendations of the Sondhi Committee

The Sondhi Committee made recommendations in June 1975 to the Cabinet on policy for promoting engineering exports. Most of the recommendations were formally accepted and decisions were made as follows: 1/

"(i) Automatic approval for production earmarked for exports beyond the authorized capacity.

(ii) Improved arrangements for supply of inputs for exports production. Within the resources available, the exporters will be provided with all the inputs needed, including raw materials, power and export finance on a priority basis.

(iii) The procedures for allocation of steel have been simplified, and the Iron and Steel Controller will have the sole responsibility to make allocations after the exporters' obligations are sponsored by the Engineering Export Promotion Council.

(iv) In cases where the prices of steel are revised upward by 10 per cent or more, the contracts entered into by the exporters will be protected against revised prices, provided the contracts do not contain escalation clauses to cover the price increase adequately.

(v) In respect of export of capital goods and turnkey projects the rate of cash assistance obtaining at the time of concluding the contract will be protected till the completion of the contract, as against the existing limit of 2 years for turnkey projects and 18 months for capital goods.

For other engineering goods such protection will be made available for a maximum period of three years against the existing limit of one year.

This protection will be applicable in cases where the price is not negotiable.

(vi) For determining cash assistance, while the existing basis of marginal costing will continue, 25 per cent of the rates of such cash assistance will be added towards the fixed cost of production.

(vii) Import duty on raw materials imported against advance licenses will not be charged if such imports are approved by the Advance License Committee.

1/ With the exception of recommendation (vi), which is apparently still under discussion, all the others are now being implemented.

(viii) Export obligations in future will be imposed only by one authority, namely, the Licensing Committee.

(ix) The procedures regarding approval on deferred payment proposals have been simplified. The IDBI has been made the focal point for the receipt and processing of all export proposals for deferred payment, instead of applications being processed as at present at three or four points, namely by the RBI, the ECGC, the IDBI and Government.

(x) In cases where IDBI financing is not required the exporters can enter into firm commitments with foreign buyers without the prior approval of the RBI and the ECGC, provided the deferred payment contracts are of a value not exceeding Rs. 50 lakhs and the deferment period is up to five years.

(xi) A High powered Standing Committee on Export Finance has been set up under the Chairmanship of the Deputy Governor of Reserve Bank of India to deal with general problems faced by the exporters with regard to export finances.

(xii) Decisions have been taken for liberalization of facilities for grant of foreign exchange for travel abroad in connection with export contracts, making available pre-shipment credit at a concessional rate of interest up to 180 days for specified medium and heavy engineering goods and arrangements for collection of specialized data and information and the taking up of preliminary studies by consultants. "

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Projected Production of Textile Machinery (1974-78)
(units/year)

No.	Item of Machinery	Licensed Capacity	Installed Capacity	Average Annual Requirement during 5th, 5Yr.Plan Total one year	TMI Production Plans 1974	1975	1976	1977	1978
1	Blowroom Machinery	66	66	75	30	44	61	79	79
2.	Carding Engines	2,980	2,400	3,504	900	922	987	1,017	1,200
3.	H.S. Draw Frames	577	395	683	250	645	688	770	770
4.	Combers	60	60	121	40	70	80	120	420
5.	Sliver Lap M/C	15	15	8	10	18	20	30	30
6.	Ribbon Lap M/C	15	15	8	5	18	20	30	30
7.	Speedframes	631	439	840	170	371	425	435	440
8.	Ringframes	4,630	4,500	2,380	1,600	2,515	3,270	3,650	3,710
9.	Looms - Auto	6,600	6,600	12,400	1,400	3,300	3,300	3,920	4,220

Source: Task Force Report, Fifth Five Year Plan and IDA questionnaires

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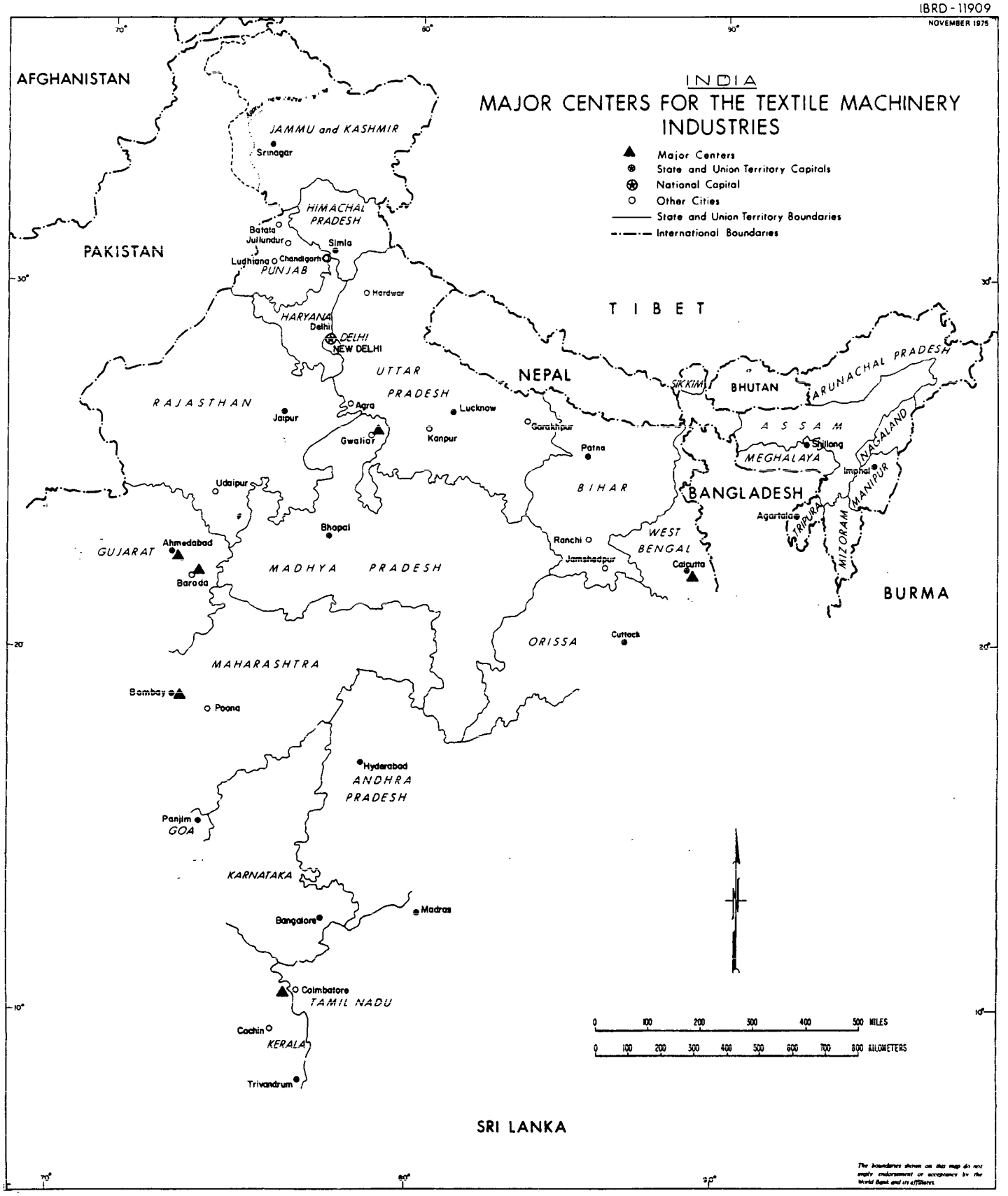

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