HUANGTAI THERMAL POWER PLANT
No.7&8 UNITS HEAT SUPPLY RECONSTRUCTION
& NETWORK CONSTRUCTION PROJECT
SHANDONG, CHINA

ENVIRONMENTAL MANAGEMENT PLAN

OCTOBER 2007

SHANDONG HUANGTAI THERMAL POWER PLANT
Abbreviations

CC----------Construction Contractor
EIA----------Environmental Impact Assessment
EP----------Environmental protection
EPB--------Environmental Protection Bureau
EMP--------Environmental Management Plan
EMPs-------Environmental Management Plan and Environmental Monitoring Plan
EPMs-------Environmental Protection Measures
EMO--------Environmental Management Office (Organization)
ESE--------Environmental Supervision Engineer
HTTPP------Huangtai Thermal Power Plant
JDTPLC-----Jinan Dongtai Thermal Power Limited Corporation
PMO--------Project Management Office
RAP--------Resettlement Action Plan
SEPA-------State Environmental Projection Agency
WB---------The World Bank
CHAPTER ONE

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1 Introduction

1.1 EMP purpose

The purpose of EMP establishment is based on unavoidable environmental impacts to map out a set of EPMs, that technique feasible, finance persistent and applicable, to apply in the project during construction and operation, so to possibly reduce negative impacts on society and environment, and to solve left problems by means of EPMs.

The function of EMP is to list all EPMs that are to adopt during construction and operation to avoid or control adverse impacts from project, and bring forth detailed actions to implement these measures.

1.2 Project Description

1.2.1 Project background

Shandong Huangtai Thermal Power Plant (abbreviated as HTTPP) was founded in September of 1958, is one of major power plant of network, undertaking heat supply task for the eastern area of Jinan and power supply task for the city. It has 7 stoves and 8 units after six-time reconstruction, with power capacity 1025MW, and heat supply capacity 720t/h.

In order to improve city air quality, to become “national environmentally modern city”, during 2004~2006, a large numbers of small-scaled boilers were wiped out, 48 within the scope that heat supplied by HTTPP, as result, a large areas of heat blank come into being. At present, there are 29 boilers in the area, and will be wiped out with city implementing central heat supply plan. Meantime, new buildings increases rapidly in this area, and administrative offices and its compatible establishments are to be built and put into use in 2007 as well at the east; Olympic center and its compatible establishments will put into use in 2009, as well, heat demand will be huge.

According to Jinan City government relevant document, No.1~4 units of HTTPP are severely overused, should retire from their service recently, by then, HTTPP will lose 360t/h steam heat supply capacity. HTTPP current heat supply capacity is only 720t/h, with the four units close, is far away from the heat supply demand at the east of Jinan City.

In order to alleciate heat supply conflicts in winter at the east, HTTPP is going to reconstruct No.7&8 units to change single unit power generation into thermoelectricity united units, and also to build first heat supply station, steam and water pipelines network within the plant.
1.2.2 Project content

Proposed project is to reconstruct No.7&8 units and build first heat supply station, steam and water pipelines network within the plant, etc. Project total cost is 113.666 million RMB Yuan. After it built, its heat supply capacity can reach 800t/h.

(1) No.7&8 units reconstruction

No. 7 & 8 units will be reconstructed in two-phase, in which No.8 unit will be rebuilt in 2007, and No. 7 unit in 2008. While only parts of steamers are to be replaced, boilers and generators are to be remained in principle.

The elevation of link-tube of steam for No. 8 unit is to be lift up to 6m over the center of unit axis, and valve added. Two pipes, DN1000, are to be educed from two link-tubes, whose elevations are 4m higher than the center of unit axis. Educed pipe and link tube are both linked by means of expansion to reduce thrust to unit. Self-balanced expansion joints are installed on heat supply pipes.

The elevation of link-tube of steam for No. 7 unit is to be lift up to 6.5m over the center of unit axis, and valve added. Two pipes, DN800, are to be educed from two link-tubes, whose elevations are 4m higher than the center of unit axis. Then the two pipes are combined into one heat supply pipe. Educed pipe and link tube are both linked by means of expansion to reduce thrust to unit. Self-balanced expansion joints are installed on heat supply pipes.

(2) To build first heat supply station at the south of HTTPP, installing 4 steam-water exchangers, all kinds of pumps, steam-gathering boxes, water-gathering boxes, etc, and lying deoxidize machine and softening water equipment at deoxidizing room.

(3) To build new steam heat supply pipelines 1100m within plant, condensed water pipelines 600m, and water pipelines 800m for heat supply production.

1.3 Basis for EMP

1.3.1 Basis

1.3.1.1 Chinese laws, regulations

(1) “Environmental Law of P.R.C.” (1989);
(2) “EIA Law P.R.C” (2002);
(3) “Cleanness Manufacture Enhancement Law P.R.C.” (2002);
(4) “Law of Prevention of Water Pollution in P.R.C.” (1996);
(5) “Law of Prevention of Air Pollution in P.R.C.” (2000);
(6) “Law of Prevention of Solid Waste Pollution in P.R.C.” (2004);
(7) “Law of Prevention of Noise and Vibration Pollution in P.R.C.” (1996);
(8) “Detailed rules of implementation of the Law of prevention of air pollution of the
P.R.C.” (1991);
(9) “Detailed rules of implementation of the Law of prevention of water pollution of
P.R.C.” (1989);
(10) “Environmental protection classification management catalogue of
construction project” (2001);
(11) “Shandong Environmental Protection Ordinance” (2001);
(12) “Methods to implement ‘EIA Law P.R.C.’ in Shandong” (2005);
(13) “Methods to implement ‘Law of Prevention of Solid Waste Pollution in
P.R.C.’ in Shandong”;
(14) “Detailed rules of implementation of the law of prevention of noise pollution
in Shandong Province”;
(15) “Shandong Provincial Water Pollution Prevention Rules”;
(16) “The fifteenth “five years” environmental protection plan of Shandong
Province”;
(17) “Detailed opinions of Shandong Provincial Government regarding further
implementing scientific view to reinforce environmental protection” (No. 72 in
2006);
(18) “Notice of provincial government office regarding management of EIA and
“three contemporary” of environmental protection establishment of construction
projects”;

1.3.1.2 WB policies
(1) “World Bank OP/BP4.01 and annexes (EIA)” (1999);
(2) “World Bank OP/ (EIA)” (1999);
(3) “World Bank GO4.01 (EIA)” (1999);
(4) “World Bank EIA Materials Collection (Vol. 1-3)”;
(5) “World Bank OP4.11 (Cultural Relics)” (1999);
(6) “World Bank OP/BP4.04 (Natural Habitats)”(1995);
(7) “World Bank OP/BP4.12 (involuntary emigration)” (1990);
(8) “World Bank GP4.07 (Water Resource Management)”(2000);
(9) “World Bank GP14.07 (Non-government involvement during WB financing
activity”).
1.3.1.3 Project Basis

“Shandong Huangtai Thermal Power Plant No.7&8 units reconstruction project feasibility research report”.

1.3.2 Pertinent criterions

1.3.2.1 Environmental quality criterion

(1) Ambient air quality

Air environment quality is to be judged according to the Class II of “Ambient air quality standard” (GB3095-1996), seen in table 1-1.

Table 1-1 Ambient Air Quality Standard adopted in this EIA ( unit: mg/m³)

<table>
<thead>
<tr>
<th>No.</th>
<th>Pollutants</th>
<th>Standard value (mg/m³)</th>
<th>An hour average</th>
<th>Daily average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SO₂</td>
<td>0.50</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>TSP</td>
<td>—</td>
<td>—</td>
<td>0.30</td>
</tr>
<tr>
<td>3</td>
<td>PM₁₀</td>
<td>—</td>
<td>—</td>
<td>0.15</td>
</tr>
<tr>
<td>4</td>
<td>NO₂</td>
<td>0.24</td>
<td>0.12</td>
<td></td>
</tr>
</tbody>
</table>

(2) Surface water

Water quality of Xiaoqing River is evaluated based on the Class V of “environmental quality standards for surface water”(GB3838-2002), seen in table 1-2.

Table 1-2 Criterion for surface water (unit:mg/l, pH excluded)

<table>
<thead>
<tr>
<th>Evaluated factors</th>
<th>pH</th>
<th>COD</th>
<th>BOD₅</th>
<th>Volatile hydroxybenzene</th>
<th>NH₄⁻N</th>
<th>Sulfide</th>
<th>Oil</th>
<th>Chloride</th>
<th>Cr₆⁺</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard value</td>
<td>6.5</td>
<td>40</td>
<td>10</td>
<td>0.1</td>
<td>2.0</td>
<td>1.0</td>
<td>1.0</td>
<td>250</td>
<td>0.2</td>
</tr>
</tbody>
</table>

(3) Ground Water

It is to be judged based on the Class III of “Quality Standard for ground water”(GB/T14848-93), seen in table 1-3.

Table 1-3 Standard value for ground water (unit: :mg/l, pH excluded)

<table>
<thead>
<tr>
<th>Evaluated factors</th>
<th>pH</th>
<th>Total rigidity</th>
<th>COD₅</th>
<th>Sulfide</th>
<th>Chloride</th>
<th>NH₄⁻N</th>
<th>Nitrate</th>
<th>Nitrite</th>
<th>Volatile hydroxybenzene</th>
<th>Cr₆⁺</th>
<th>Pb</th>
<th>Cu</th>
<th>Zn</th>
<th>Fluoride</th>
<th>Total bacteria number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard value</td>
<td>6.5</td>
<td>8.5</td>
<td>450</td>
<td>3.0</td>
<td>250</td>
<td>250</td>
<td>0.2</td>
<td>0.02</td>
<td>0.002</td>
<td>0.05</td>
<td>0.05</td>
<td>1.0</td>
<td>1.0</td>
<td>3.0</td>
<td>3×10⁸/L</td>
</tr>
</tbody>
</table>

(4) Noise

Traffic noise is to be judged based on 4-class of “Standard of environmental noise of urban area”(GB3096-93), the rest are to be judged based on corresponding criterions 2-class, in which noise limit is 50dB(A) at daytime and 50dB(A) at night.
1.3.2.2 Pollutants emission/effluent standards

(1) During Construction

Construction noise is to be judged based on “Noise limits for construction site” (GB12523-90), seen in table 1-4.

<table>
<thead>
<tr>
<th>During construction</th>
<th>Major noise sources</th>
<th>Noise limits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Daytime</td>
</tr>
<tr>
<td>Earth and rocks</td>
<td>bulldozer, grab, trucks etc.</td>
<td>75</td>
</tr>
<tr>
<td>Piling</td>
<td>All kinds of pile drivers</td>
<td>85</td>
</tr>
<tr>
<td>Structure</td>
<td>Concrete mixer, muddler, electric saw</td>
<td>70</td>
</tr>
<tr>
<td>Decoration</td>
<td>Crane, lifter etc.</td>
<td>65</td>
</tr>
</tbody>
</table>

(2) During operation

废气排放

According to “Emission standard of air pollutants for thermal power plant” (GB13223-2003),

“All new, enlarging or rebuilding projects whose EIA report have been approved before December 31st, 1996, the first phase pollution emission control requirement is adopted”;

“All new, enlarging or rebuilding projects whose EIA report have been approved since January 1st, 2004, the third phase pollution emission control requirement is adopted”.

7# & 8# units are to follow the third phase criterion requirement above-said (GB13223-2003), in which SO\textsubscript{2} is to be controlled under 400 mg/m\textsuperscript{3}, dust under 50mg/m\textsuperscript{3}, and NO\textsubscript{2} under 450mg/m\textsuperscript{3}.

废水

HTTPP has no other wastewater discharged except ash wastewater, whose pollutants are simple SS, discharge into Xiaoqing River and Dashigan River directly. In December of 2006, “Integrated discharged standard of water pollutant of Xiaoqing River basin in Shandong Province” was issued, in which,

“All organizations who discharge wastewater into Xiaoqing River, except for city or town wastewater treatment plant, should follow the relevant regulation in the Table 1 in terms of wastewater pollutants concentration, and also follow the regulations in table 2, 3, or 4 according to phase”.
Hence, HTTPP is to apply its ash wastewater in the above-mentioned criterion in the important areas of DB37/656-2006, detailed values are list in table 1-5.

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>pH</th>
<th>SS</th>
<th>CODcr</th>
<th>Oil</th>
<th>Fluorid</th>
<th>Arsenic</th>
<th>Sulfide</th>
<th>Volatile hydroxybenzene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard value</td>
<td>6.0-9.0</td>
<td>70</td>
<td>100</td>
<td>5</td>
<td>10</td>
<td>0.2</td>
<td>1</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Noise

HTTPP is located at miscellaneous area with residents and industries. Its north is Gongye north Road, south is Jiaoji railway, east is Daxin River, and west is laboratory farmland of Shandong Province Agriculture Science Institute. In accordance with “Standard of noise at boundary of industrial enterprises”(GB12348-90), traffic noise at both sides of main road is to follow IV-class standard, and miscellaneous area with residents, business and industries is to follow II-class standard.

Therefore, the boundary noise at east and west of HTTPP will follow II-class standard, which means the noise at daytime should be restricted within 60dB(A), 50dB(A) at night; meanwhile, the boundary noise at south and north of HTTPP will follow IV-class standard, which means the noise at daytime should be limited within 70dB(A), 550dB(A) at night.

Solid wastes

Major solid wastes of HTTPP contain coal dust and slag, who are excluded in the “National dangerous solid wastes category”, therefore to follow “Standard for pollution control on the storage and disposal site for general industrial solid wastes”(GB18599-2001).

2 Major impacts and mitigation measures

2.1 Major impacts and mitigation measures during construction

Seen in table 2-1.

2.2 Major impacts and mitigation measures during operation

Seen in table 2-2.
### Table 2-1 Major environmental impacts and mitigation measures during construction

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Major pollution</th>
<th>Mitigation measures</th>
<th>Implementer</th>
</tr>
</thead>
</table>
| Dust             | In the whole course of construction, pipes laying down, transportation, loading and unloading, stacking disposal earth in the air, and etc. will produce dust, and become severe while it is a dry and windy day. | - According to construction schedule to map out dust prevention precautions, like sprinkle, timely clear spare soils, and set up block boards, to cover vehicles while transporting, and avoid loading and unloading materials while it is windy.  
- Periodically monitor TSP at the sites and reinforce to correct if exceeding standard. | HTTPP and Jinan Environment Protection Bureau |
| Noise            | Major noise sources are machines and vehicles                                  | - To adopt advanced low-noise technology to replace high construction process.  
- To limit speed of high-noise machines while entering sites, and strengthening maintenance of machines and transportation vehicles.  
- To well schedule construction and time to avoid continuous work to disturb surrounding residents.  
- To use modern operational equipment to avoid whistle.  
- Periodically monitoring noise level at sites, and to bring out control measures. | CC |
| Surface water    | Oil leakage, dripping, and running out and mechanical washing water and domestic wastewater from workers. | - To set-up depositing tank during construction, to deposit SS of sites wastewater till meeting pertinent standard, then sprinkling road without discharging.  
- To possibly utilize already built living establishments near the sites. | |
| Solid wastes     | Construction disposals and domestic garbage                                    | Abandoned sand, materials, packages are to be recycled and timely clean workstation.  
- To pile at designated places to be collected by environmental sanitary sector. | |
| Ecological impact| Soil and water loss: Earthwork digging and waste soils stacking, vegetation destroy will cause soil and water loss. | - To prepare earthwork digging and filling back reasonably during construction, to adopt appropriate measures at disposed soils sites, and to avoid digging and filling at rain days;  
- and to stack earthwork reasonably to keep certain distance away from sewers and river, and to cover materials and disposed earth without shipping out duly when it is a rainstorm day. | |
|                  | biodiversity: Lots of arbors and shrubbery and lawn are to be destroyed        | To do greening along pipelines and heat exchange station in the anaphase of construction.                                                             | |


Table 2-2 Major environmental impacts and mitigation measures during operation

<table>
<thead>
<tr>
<th>Pollution sources</th>
<th>Major pollutants</th>
<th>Mitigation measures and effects</th>
<th>Implementer</th>
<th>Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhaust gas</td>
<td></td>
<td></td>
<td>Httppp</td>
<td>Jinan</td>
</tr>
<tr>
<td>Boiler’s smoke</td>
<td>Major pollutants of exhaust gas from coal-boilers include SO₂, dust and NO₂, have certain impact on ambient air.</td>
<td>☐ to use Five electric fields electrostatic cleaner, dedusting efficiency 99.5% above, dust concentration &lt;50mg/m³; ☐To desulfurizing by Limestone-gesso, efficiency 95% above, SO₂ concentration &lt;200 mg/m³; ☐To setup low nitrogen burner, NOₓ concentration &lt;450 mg/m³; ☐To install on-line monitoring equipment to monitor and manage pollution sources.</td>
<td></td>
<td>Httppp</td>
</tr>
<tr>
<td>Dust from coal</td>
<td>Unorganized emission of dust during coal storage, and transportation</td>
<td>☐To cover transporters and build roof for coal storage sites; ☐To install a set of spraying water equipment to periodically spray in case to keep moisture at coal storage sites 7% above; ☐Periodically sprinkle dry and loose ground.</td>
<td></td>
<td>Jinan Environment Protection Bureau</td>
</tr>
<tr>
<td>Waste water</td>
<td>Waste water from recycle-cool treatment anti-filtrate system, acid/alkali water, and domestic sewage, and from ash system</td>
<td>☐To pumping high-salt wastewater to coal storage sites to sprinkle; ☐Acidic/alkali water will be neutralized before discharging to ash sites; ☐Domestic sewage will be reused for cycle-cool water after treatment; ☐After desulfurizing, 5t/h wastewater will be produced, with gesso, and pH 5 or so, to be used as washing ash; ☐To build water-blocked wall to collect wastewater with coal, then pumping to deposit tank, upper diluted water is used to wash ash, and deposit slag is sent back to coal sites to reuse. To build roof from rain at coal sites. After all done, no wastewater discharged except ash water.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solid wastes</td>
<td>Main includes crushed coal dust and boiler’s slag</td>
<td>☐Slag and crushed coal dust can be reutilized by three plants mentioned in EIA; ☐Desulfurizing gesso are sent to Shandong Taihe Dongxin Company to reuse.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td>Heat exchanger, hot-water pump, and water-supply pump, generator, miller, and etc, with noise level in the range of 85dB(A)~103dB(A).</td>
<td>All noise elimination measures adopted, to ensure west-east boundary noise is within the limit of II-class standard of GB12348-90, and north-south boundary noise is limited in the IV-class standard of “Standard of noise at boundary of industrial enterprises”.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 EMP

3.1 Setup environmental management organization (EMO)

According to “Environmental Law of P.R.C” and “Environmental protection management ordinance of construction projects”, this EIA is to be approved by Shandong Province environmental protection bureau (EPB), so Shandong EPB will be environmental management organization for this project, whose duties are to point out request based on this EIA, to coordinate different sectors, and to be responsible for checkup of “three contemporary works” which means designing, constructing and checking-up simultaneously”.

Shandong Financial Bureau project office is in charge of project’s plan, design, and environmental process management; Jinan City EPB is to implement project programs and carry out all technical criterions, and also to supervise all environmental prevention measures.

Project owner should setup environmental department to be in charge of environmental management and environmental monitoring at each phase, and to carry out all kinds of environmental laws and regulations, and to check environmental protection measures implementation; and to recommend advanced technology and experience; and to train people for this project in environmental technique and so on.

Since EM has great difference during construction and operation in terms of components, temporary or long-term, different organizations should be established for two phases, after construction, corresponding department may withdraw, and entering the next phase, yet they may have certain period to work together.

3.1.1 EMO during construction

It may include Shandong Province EPB, Jinan City EPB, PMO of WB, Central PMO, Shandong Financial Bureau PMO, and etc. During construction, Jinan EPB is under the leadership of Shandong EPB, to carry out relevant laws and regulations, and criterions, to coordinate various sectors, and to check up EPMs implementation, operation. EMO during construction is composed of departments of monitoring, designing, EIA, and owner, detailed EPMs is to be carried out by HTTPP and its CC. Meanwhile, in order to ensure rightness and effectiveness of environmental management, particular environmental management office should set up, shown in table 3-1.

<table>
<thead>
<tr>
<th>Personnel</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team-leader</td>
<td>1</td>
</tr>
<tr>
<td>Ambient air supervisor</td>
<td>1</td>
</tr>
<tr>
<td>Noise supervisor</td>
<td>1</td>
</tr>
<tr>
<td>Solid wastes supervisor</td>
<td>1</td>
</tr>
<tr>
<td>Hot on-line worker</td>
<td>1</td>
</tr>
</tbody>
</table>
3.1.2 EMO during operation

Jinan EPB will be in charge of daily Environmental management, to carry out all environmental laws and criterions, to map out environmental protection rules and supervision its implementation, to learn project sites environmental condition so as to stipulate environmental quality control objectives, and to put forth pollution control measures, to report to top environmental protection department, WB, and HTTPP are responsible for detailed EPMs.

In order to advance environmental management standardization, to determine duties, requirement and proceed, so to control pollution effectively, to ensure all pollutants to meet pertinent criterions, HTTPP has set up an environmental management system in which plant director is a team leader, and vice-plant director is responsible for details, taking production sector as major EMO, and establishing monitoring station at running sector. Each sectors of plant will coordinate with each other to be responsible for environmental management work. Appointed environmental engineer and plant monitoring station will be responsible for implementation of EMP. The system is illustrated in figure 9-3.
3.2 Environmental management duty and responsibility
3.2.1 During construction

Environmental management team should stipulate detailed EMP according to construction schedule, and check up monthly so as to modify timely.

Team leader should report to project leader, monthly hand in EMO report, and to put forth appropriate means to solve potential environmental problems.

Air, noise and solid wastes supervisor should inspect sites to check mitigation measures implementation, to arrange monitoring, and to report the results to team leader.
Hot on-line employee should record and tidy complaints calls, and report to leader, also to let public know how to solve problems.

3.2.2 During operation

(1) Plant director is the head of team, to be responsible for legal duty;

(2) Vice-director and General senior engineer are to carry out national, industrial, and local environmental laws, regulations and orders, to strictly implement “three contemporary”. They are to periodically call for team meeting, summarize environmental protection work, and also to map out environmental protection plan. They also will examine pollution treatment plan in details, check coal slag and crushed coal reutilization, to direct and coordinate relevant sectors in HTTPP.

(3) Vice-general senior engineer directs and examine implementation of national policy, regulations and orders, to technically check EPMs and program, to supervise environmental establishments running and maintenance, to check and accept examination and repairing. He is also to coordinate each sector’s duty and tasks, and to bring forth detailed suggestion.

(4) Production sector is to carry out national, industrial, and local environmental laws, regulations and orders, and identify and evaluate. Under the leadership of the team, it is to organize, coordinate internal environmental protection supervision management, and to map out long-term EP plan, yearly EP plan, and environmental monitoring periodical plan, and also responsible for these plans’ implementation. It is responsible for environmental establishments running and maintenance, to pay attention to deal with dust, noise. To participate all EPMs’ stipulation, approval, and examination, to supervise “three contemporary”. Following “Thermal power industry environmental monitoring management regulation”, and “Thermal power plant environmental monitoring technical regulation”, to examine, supervise and direct daily EP works. To build and perfect EP files, and to learn all reutilization condition, and to check EP special fund status; and to assist investigation of pollution accidents and conflicts. To organize new projects monitoring study and train, and carry out new projects’ monitoring.
(5) Foreign affairs office is responsible for pollution accidents and conflicts investigation and dealing, to write accidents report.

(6) Construction office is in charge of design, construction, test and examination of new environmental treatment project. And also to be responsible for full-course management of “three-contemporary” of new, enlarging and reconstruction project.

(7) Running sector is responsible for environmental establishments running, to set up healthy environmental establishments running rules. To submit full-time employee at ash site on-duty, for daily management of reutilization at ash. To responsible for environmental establishments running statistical work.

(8) Safety sector is responsible for safety of environmental establishments running, pollution treatment and reutilization, and for heavy pollution accidents survey, analysis and dealing.

(9) Financial sector is to ensure environmental protection special fund implemented.

(10) Maintenance team is to examine and maintain environmental establishments, and pollution source on-line monitoring machines.

(11) Fuel sector is to determine coal consumption plan and find low-sulfur coal source, to supervise coal quality and coal storage site.

(12) Accommodating sector is to monitor sulfur content of coal, and report 110 line regarding abnormal smoke before units start.

(13) Planning sector is to supervise, manage coal quality and prohibit high-sulfur to enter HTTPP.

(14) Group company is to advocate coal ash reutilization policy and regulations, and for new environmental products development, management, and to fill out reutilization table on time.

(15) Environmental sanitary greening company is to manage solid wastes.

(16) Training center is to organize relevant employee to learn environmental knowledge and consciousness.

(17) Administration sector is responsible for environmental information and knowledge education.

3.3 EMP

(1) EMP during construction

It is important to reinforce EM because adverse impacts of this project are mainly brought out during construction.

Before construction, CC should stipulate construction schedule.
CC’s contract with owner should include EPMs, and take EP into consideration of construction means, machines, schedule, and phase, to adopt effective measures to mitigate noise, wastewater impacts on surrounding, and it is suggested that to put this component as one of significant factor to check and accept construction work.

Owner should carefully supervise CC’s legal action in terms of EP, to learn impacts from equipment, materials stacking, temporary buildings, construction road and method, to crack down on CC for its heavy pollution consequence, and report to head EP department to follow relevant laws.

When work completion, CC should clean occupied land in time, dispatch temporary establishments, clear garbage, and recover land with greening.

(2) EMP during operation

To gradually pack up environmental management relationship according to environmental auditing request, and to tackle environmental management in the plant, meanwhile, to periodically audit environment, continuously improve and raise industrial environmental management level.

To strengthen environmental establishments running management to ensure normal and meet designed treatment efficiency, so to assure pollutants to be limited within the standard.

After reconstruction of No.7 & 8 units and heat supply network construction, to close No. 1~4 units, simultaneously, to build No.9 & 10 units before No.5 & 6 units stops.

To reinforce safety and EP education, and carry out all kinds of labor protection measures, and to enhance employee’s safety and EP consciousness to ensure them safe and healthy.

To adopt mature and effective risk precaution measures, and to set up emergency program to be strict with supervision and monitoring alarm system, to prevent or reduce accidents, personal harm, and environmental pollution.

According to industry character and potential impacts, to strengthen communication with regional society, to periodically report enterprise outline, energy saving countermeasures, pollution condition to the public.

3.4 CC’s management

During construction, CC plays a critical role to manage environment, pollution control, and prevention measures implementation, herein; some requirement to CC is put forward.

(1) To choose strong CC to ensure EMP implementation.

(2) To ask CC and engineering supervisor to be trained in terms of EP and environmental management before construction.
(3) All EPMs mentioned above should be included in the bidding document and finally in the contract with CC.

(4) To ask CC to monitor its environmental activities, and provide daily or weekly record for their environmental achievement. PMO and construction supervision team will examine and audit.

(5) 1 or 2 full-time environmental employee is necessary for CC, have to be trained to fit for their task.

(6) During construction, CC should communicate and negotiate with local residents, to set up notice board to notify construction time, activities. Meanwhile, CC should provide contact and phone number for complaints and suggestion.

4 Environmental monitoring plan

4.1 monitoring purpose

Environmental monitoring includes work at two phases, is to fully, timely know pollution dynamic condition, and to learn environmental quality change, impact coverage, and dynamic environmental quality condition during operation, so to feedback to supervision department, to provide scientific basis for management.

4.2 Monitoring components

4.2.1 Monitoring plan during construction

Details list in table 4-1.

4.2.2 Monitoring plan during operation

Jinan environmental monitoring station and internal monitoring station will undertake the task of monitoring No.7&8 units, meantime, smoke on-line monitoring system installed on these two units’ boilers. Details shown in table 4-2.

4.2.2.1 Smoke on-line monitoring

Smoke on-line monitoring equipment has been installed on No. 7&8 units, and it is to strictly follow “Smoke emission continuously monitoring technical regulation for thermal power plant” (HJ/T75-2001).

4.2.2.2 Jinan environmental monitoring station’s routine monitoring task

In order to fully learn pollution condition, HTTPP has entrust Jinan city environmental monitoring station to monitor its boilers emission, ash water and noise.
(1) Exhaust gas: At smoke emission tunnel of No.7&8 boilers, to monitor once annually, according to “Air and gas emission monitoring analysis method”, while boiler in good condition.

(2) Wastewater: At outlet of Xiaoqing River, and Lijia Village ash site, to set each monitoring locations, following method mentioned in GB3838-2002 and regulation in “water and wastewater monitoring analysis method” to monitor once each year, to choose two days to sample six times (7:00am, 11:00am, 14:00pm, 17:00pm, 20:00pm, 22:00pm).

(3) Noise: In machine good condition, to monitor once each year, and one day for each time at both day and night, monitoring time is 10:00am, and 22:00pm; and 8 noise points are set, two points at each side of surrounding. Noise monitoring locations are shown in figure 4-1.

Gongye north Road

<table>
<thead>
<tr>
<th>1#</th>
<th>2#</th>
</tr>
</thead>
<tbody>
<tr>
<td>8#</td>
<td>3#</td>
</tr>
<tr>
<td>7#</td>
<td>4#</td>
</tr>
</tbody>
</table>

| 6# | 5# |

Jiaoji railway

**Figure 4-1** HTTPP noise monitoring locations map

### 4.2.2.3 Internal environmental monitoring plan

(1) Major duties and tasks

It is to monitor pollutants concentration to the environment, work environmental noise, and dust, also to periodically maintain and check equipments. It is to take part in environmental accidents survey and pollution control work; and to perfect all regulations and environmental monitoring files. It is to evaluate environmental quality, and to finish temporary environmental monitoring tasks assigned by the above sector.

(2) Apparatus and equipments

Seen in table 4-2.
### Table 4-2  Apparatus and equipments at internal monitoring station

<table>
<thead>
<tr>
<th>No.</th>
<th>Apparatus or equipment name</th>
<th>Model</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electrical analysis scale</td>
<td>BS210S</td>
<td>weight</td>
</tr>
<tr>
<td>2</td>
<td>COD constant temperature heater</td>
<td>TH-12 model</td>
<td>COD</td>
</tr>
<tr>
<td>3</td>
<td>Spectrophotometer</td>
<td>752 model</td>
<td>monitoring</td>
</tr>
<tr>
<td>4</td>
<td>Acid</td>
<td>PHS-3C model</td>
<td>pH</td>
</tr>
<tr>
<td>5</td>
<td>Electrical constant temperature dryer</td>
<td>CS202</td>
<td>dry</td>
</tr>
<tr>
<td>6</td>
<td>Portable smoke analyzer</td>
<td>KM9106</td>
<td>analysis</td>
</tr>
<tr>
<td>7</td>
<td>Dust sampler</td>
<td>FC-A-3</td>
<td>sampling</td>
</tr>
<tr>
<td>8</td>
<td>Dust sampler</td>
<td>FC-A-3</td>
<td>sampling</td>
</tr>
<tr>
<td>9</td>
<td>Smoke continuous monitoring equipment</td>
<td>--</td>
<td>monitoring</td>
</tr>
<tr>
<td>10</td>
<td>Noise level meter</td>
<td>AWA6218 model</td>
<td>noise</td>
</tr>
<tr>
<td>11</td>
<td>Oil concentration meter</td>
<td>CMA-220</td>
<td>monitoring</td>
</tr>
<tr>
<td>12</td>
<td>Coal quality analyzer</td>
<td>--</td>
<td>For coal</td>
</tr>
<tr>
<td>13</td>
<td>Other regular equipments</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

(3) Monitoring plan

□Dust

To periodically monitor dust at boilers of No.7&8, and fuel sites.

Parameters: dust; frequency: one-term/season, two-day/term, twice/day, and check at anytime when it is dry or windy.

□Wastewater

To set monitoring location at outlet of Xiaoqing River and Lijia Village ash site.

Parameter: pH, SS, COD, oil, F, S²⁻, Ca²⁺, etc, once per ten-days, and As, volatile hydroxybenzene once per month, meanwhile, to monitor recycled water to ensure water can be reutilized.

□Noise: To monitor equipments noise, boundary noise, and life zone noise once at each season, and one day at day and night for each time, monitoring time: 10:00am, and 22:00pm.

□Solid wastes: To record solid wastes name, amount and destination monthly.
### Table 4-1 Environmental monitoring plan during construction

<table>
<thead>
<tr>
<th>No.</th>
<th>Environment factors</th>
<th>Locations</th>
<th>Parameters</th>
<th>Frequency</th>
<th>Implementer/supervisor</th>
<th>Cost ((×10^4\text{Yuan/a}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ambient air</td>
<td>Each for construction sites, interior residents area, offices</td>
<td>TSP</td>
<td>One-term/two-month, 2days/term, twice/d, occasional check when dry</td>
<td>Qualified environmental monitoring station/local EPB</td>
<td>0.7</td>
</tr>
<tr>
<td>2</td>
<td>Noise</td>
<td>Boundary of construction sites and plants</td>
<td>Leq</td>
<td>Once/term at day and night, and one-term/one-month</td>
<td>Jinan environmental monitoring station/Jinan EPB</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Solid wastes</td>
<td>Construction sites</td>
<td>Names, amounts, and destination</td>
<td>Once/month</td>
<td></td>
<td>0.1</td>
</tr>
</tbody>
</table>

### Table 4-2 Environmental monitoring plan during operation

<table>
<thead>
<tr>
<th>No.</th>
<th>Environmental factors</th>
<th>locations</th>
<th>parameters</th>
<th>frequency</th>
<th>Implementer/supervisor</th>
<th>Character</th>
<th>Cost ((×10^4\text{Yuan/a}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exhaust gas</td>
<td>Each at No.7&amp;8# boilers smoke exit</td>
<td>SO₂</td>
<td>Daily continuous</td>
<td>Jinan environmental monitoring station/Jinan EPB</td>
<td>Smoke online</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>Exhaust gas</td>
<td>Each at No.7&amp;8# boilers smoke exit</td>
<td>SO₂, NO₂</td>
<td>A day/term, one term/year</td>
<td>Jinan environmental monitoring station/Jinan EPB</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Waste water</td>
<td>Outlet at ash site</td>
<td>pH, COD, SS-N, NH₃-N, F, As</td>
<td>Two days/term, one-term/year</td>
<td>Internal monitoring station/Jinan EPB</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Noise</td>
<td>1m away from plant boundary</td>
<td>Leq</td>
<td>Once at day and night/quarter</td>
<td>Internal monitoring</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Exhaust gas</td>
<td>Each at coal site, mill, and coal feeder</td>
<td>Dust form coal</td>
<td>One-term/quarter, 2days/term, twice/d, occasional check when dry</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Wastewater</td>
<td>To set one monitoring point at outlet of Xiaoqing River and ash site, and monitoring recycled water.</td>
<td>pH, SS, COD, As, S²⁻, etc</td>
<td>Once/ten-day except As one/month, recycled water one-term/month, two-days/term</td>
<td>Internal monitoring station/Jinan EPB</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Noise</td>
<td>1m away from equipment and plant boundary, and office, residents area, on-duty office</td>
<td>Leq</td>
<td>Once at day and night/quarter</td>
<td>Internal monitoring</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Solid wastes</td>
<td>Interior of plant</td>
<td>Names, amounts, and destination</td>
<td>Once/month</td>
<td></td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>
5 Environmental Protection Supervision Plan

Seen in table 5-1.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Supervisor</th>
<th>Supervising contents</th>
<th>Supervising purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cons-truction</td>
<td>Shandong EPB, Jinan EPB, Jinan Cultural Relics Bureau</td>
<td>1. To check EP preliminary design and EMP; 2. To exam recovery of temporary land occupation and vegetation, and settings; 3. To exam dust and noise pollution control and decide construction time; 4. To exam pollutants emission; 5. To exam domestic wastewater and oil water discharging; 6. Disposals handling; 7. To exam if cultural relics found</td>
<td>1. To carry out “three contemporary”. 2. To ensure temporary land occupation meet EP demands. 3. To reduce impacts on local environment. And to follow relevant standards and regulations. 4. To ensure river water quality not to be polluted. 5. To ensure sights and land resources not to be destroyed so to cause soil and water loss.</td>
</tr>
<tr>
<td>Opera-tion</td>
<td>Jinan EPB</td>
<td>1. To exam EPMs implementation; 2. To exam EMP implementation; 3. To check if environmental quality of sensitive targets meet pertinent criterions.</td>
<td>1. To carry out EMP 2. To carry out monitoring plan 3. To truly protect environment 4. To strengthen environmental management, and to protect people’s health</td>
</tr>
</tbody>
</table>
6 Environmental staffs training

6.1 Environmental staffs training during construction

Trainees for environmental management come from project owner, CC, and supervision organization. Training components include environmental management, auditing process, criterions and EPMs of this project, and pollution control, etc.

Project owner will appoint qualified organization to train full-time or part-time environmental employees for CC, supervision organization. Before construction but after determining supervision organization, HTTPP should set up one environmental training class for No. 7&8 units reconstruction, 2 or 3 days, and at least one technical engineer and one leader from CC and supervision organization join in it.

Training contents: national and provincial regulation and request regarding EP, EPMs of this project and EP requirement during construction; EP guide of this project during construction.

Environmentalist from provincial EPB, Jinan EPB and EIA organizations may be invited as teachers.

6.2 Environmental staffs training during operation

During operation, professor from university or environmentalist from academy or institute may be invited to teach new full-time or part-time environmental staffs, or short-term class may be an option.

<table>
<thead>
<tr>
<th>Table 6-1 Environmental training plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
</tr>
<tr>
<td>Project owner</td>
</tr>
<tr>
<td>CC's environmental leader</td>
</tr>
<tr>
<td>Environmental supervisor</td>
</tr>
<tr>
<td>Emergency staff</td>
</tr>
<tr>
<td>No.7&amp;8 Reconstruction project</td>
</tr>
<tr>
<td>Operation</td>
</tr>
<tr>
<td>Environmental staff</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

7 Budgets for EMPs

Seen in table 7-1.
Table 7-1  Budgets for EMPs

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Annual budget $10^4$ Yuan/y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>During construction</td>
</tr>
<tr>
<td>EMO’s running</td>
<td></td>
</tr>
<tr>
<td>Salary</td>
<td>8</td>
</tr>
<tr>
<td>Administrative cost</td>
<td>4</td>
</tr>
<tr>
<td>Transportation cost</td>
<td>3</td>
</tr>
<tr>
<td>Sub-total</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Air quality monitoring</td>
<td>0.7</td>
</tr>
<tr>
<td>Water quality monitoring</td>
<td></td>
</tr>
<tr>
<td>Noise monitoring</td>
<td>0.9</td>
</tr>
<tr>
<td>Solid wastes management</td>
<td>0.2</td>
</tr>
<tr>
<td>Sub-total</td>
<td>1.8</td>
</tr>
<tr>
<td>Environmental staffs training</td>
<td>4</td>
</tr>
<tr>
<td>total</td>
<td></td>
</tr>
</tbody>
</table>

8 Information communication, gathering and report

8.1 Information communication

Environmental management requires information communication from various sectors and positions, meanwhile, EMO will disclose information to outside such as society, and related parties. Internal information communication can hold meeting, internal news in-brief, but once formal meeting each month. All communicated information should be recorded and filed. External information communication can once at a year or half a year, also information with coordinate parties should be recorded and filed.

8.2 Record

In order to keep effective environmental management system, EMO should set up perfect record system, and to keep following information.

(1) Requirement from laws and regulations;
(2) Permission;
(3) Environmental factors and relevant environmental impacts;
(4) Training;
(5) Examination, check and auditing, vindicating activities;
(6) Monitoring data;
(7) Correcting and preventive measures effectiveness;
(8) Related parties information
(9) Auditing;
(10) Evaluation and approval
In addition, records above-mentioned should take necessary dealing, such as record identification, collection, filing, storage, management, maintenance, query, and preservation time, and handling etc.

8.3 Report

CC, monitoring organization, and PMO should report to relevant departments regarding project evolvement, EMP implementation, environmental quality monitoring result and records. Report mainly includes three components.

(1) Monitoring station and CC detailed record for EMP implementation, and to report to PMO in time;

(2) Project schedule report (monthly, quarterly, or annually) from PMO should include EMP implementation components, such as EMP implementation schedule and effects.

(3) EMP implementation report should finish and submit to WB before 31st, March of the second year.

EMP implementation report includes following major contents.

(1) Training plan implementation;

(2) Project getting along condition, such as built pipelines length, water purification plant schedule, and wastewater treatment plant schedule, etc.

(3) If any complaints, or complaints records, solving method and satisfaction of the public.

(4) EMP implementation plan for the next year