Environmental Management Plan of the Project of New Bleaching Technology Reform

Nan’ning Sugar Industry Co., Ltd Pumiao Paper Plant

October 2011
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1. Overview

1.1 Project Background

Pumiao Paper Plant of Nan’ning Sugar Industry Co., Ltd was formerly Pumiao Sugar Plant, where sugar production was stopped by Nan’ning Sugar Industry Co., Ltd in 2000 for adjustment of industry structure based on the consideration of market demand, then it was converted for producing alcohol and bleached bagasse pulp by using the open place for construction of public utilities and pulp production lines. The Stage 1 construction of the 34,000t/a production line of bleached bagasse pulp (absolute dry) was finished in 1999 and the Stage 2 extended construction of the 68,000t/a production line of bleached bagasse pulp (absolute dry) was finished in 2004 and put into commissioning, after which technology research and reform has been conducted continuously until 2007, when the productivity was improved from 68,000t/a to 98,000t/a. At present, environmental impact assessment on the Project of technology reform has been conducted and submitted for approval.

After technology reform in 2007, chlorine has been used as the bleaching agent in the 98,000t/a pulp production line of Pumiao Paper Plant, which has caused dioxin pollution. In 2008, the State Council promulgated the “Discharge Standard of Water Pollutants for Paper Industry” (GB3544-2008), in which the limit for the final discharge of wastewater from pulp making process has been further improved. According to the “Official Reply to the Environmental Impact Report Concerning the Technology Reform Project of Nan’ning Sugar Industry Co., Ltd Pumiao Paper Plant for Extension of 68,000t/a into 98,000t/a Pulp Production Line” (GuiHuanGuanZi [2008] 268), the assessment of wastewater discharge previous to 2010 shall implement the standard specified in Table 1 of GB3544-2008, and the assessment of wastewater discharge as of 2010 shall implement the standard specified in Table 2 of GB3544-2008. Due to the fact that the bagasse water from pulp making is directly filled into the Biochemical Treatment Pool to be treated with other production wastewater, the quality of the treated wastewater failed to meet the Table 2 standard of GB3544-2008 since 2010.

According to Article 22 of the “Paper Industry Development Policy”, “The technology used for paper industry should develop toward a direction of high level, low consumption and less pollution. The development and application of the following technologies should be encouraged: high-yielding pulp making technology, biotechnology, low-pollution pulp making technology, medium-concentration technology, ECF/TCF bleaching technology, low-energy-consumption mechanical pulp making technology, etc.”; and according to Article 23, “The use of lime process for pulp making must be banned, the element chlorine bleaching process must not be adopted in new projects (the existing ones should be eliminated gradually). The import of outdated second-hand pulp and paper making equipments must be prohibited.” More strict requirements have been specified in the “Discharge Standard of Water Pollutants for Paper Industry” (GB3544-2008) for regulating the discharge of AOX with wastewater as well as the benchmark discharge of wastewater per unit product and the quality of discharged wastewater. According to the abovementioned regulations and in order to realize comprehensive use of resources to become a stronger and more competent enterprise and enhance the awareness of social and industry responsibility, the Company has been focusing on the construction of a new development mode of resources saving, environment friendly and development
harmonious by strictly implementing the relevant national laws and regulations relating to environmental protection, resources conservation, industry adjustment, labor protection and safe production. Meanwhile, in order to meet the relevant standard specified in Table 2 of the “Discharge Standard of Water Pollutants for Paper Industry” (GB3544-2008), Pumiao Paper Plant has conducted reform of the bleaching process and wastewater treatment technology, including the construction of a new bleaching unit for the 98,000t/a Pulp Making System for replacing the original 1# and 2# bleaching units, in which the ECF bleaching process shall replace the CEH bleaching process to reduce the generation of dioxin and lower the AOX index, with the auxiliary construction of a 8t/d Chlorine Dioxide Preparation Unit. In addition, a 11000 m³/d Anaerobic Treatment Unit shall be built for treatment of bagasse water from washing and spraying, as well as the construction of a 40000 m³/d Advanced Treatment Unit for treatment of wastewater from Paper Machine Room.

1.2 Project Overview

The Project construction includes the construction of a new bleaching unit for the 98,000t/a Pulp Making System for replacing the original 1# and 2# bleaching units, with the auxiliary construction of a 8t/d Chlorine Dioxide Preparation Unit, in which the ECF bleaching process shall replace the CEH bleaching process; the construction of a 11000 m³/d Anaerobic Treatment Unit for treatment of bagasse water from washing and spraying, as well as the construction of a 40000 m³/d Advanced Treatment Unit for treatment of wastewater from Paper Machine Room.

1.3 Bases and Standards


(2) “The State Council’s Decision on Strengthening Energy Conservation”


(5) “Guiding Catalogue for Structural Adjustment of Industry” (NDRC Order [2005] 40)

(6) “The Outline of the ‘11th Five-Year Plan of the People’s Republic of China for National Economy and Social Development’”

(7) “Official Reply of the State Council Concerning Each Region’s Planning of Energy Consumption Reduction Index Per Unit Total Production Value During the Period of the ‘11th Five-Year Plan’” (GuoHan [2006] 94)

(8) “The Discharge Standard of Water Pollutants for Paper Industry” (GB3544-2008), jointly promulgated by MEP and AQSIQ on June 25, 2008

(9) “Paper Industry Development Policy” (NDRC [2007] 71)

1.4 Important Environmentally-Sensitive Target

1.4.1 Environmental Protection Target

Environmental protection targets include the scenic spots and nature reserves within 1km from the Plant boundary and unnecessary for special protection, no detection of sensitive areas and targets such as cultural and ancient relics.

The definition of environmental protection targets should be based on the consideration of the following factors: the population of the Project area, social economy, historical and cultural background, environmental quality, etc. The targets for environmental protection included in the assessment are listed in Table 1.4-1.

<table>
<thead>
<tr>
<th>Environmental Media</th>
<th>Environmental Protection Targets</th>
<th>Level of Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface water</td>
<td>Water quality of Bachi River and Yongjiang River</td>
<td>Type III</td>
</tr>
<tr>
<td>Ambient air</td>
<td>Residential areas around the Plant site</td>
<td>Level II</td>
</tr>
<tr>
<td>Noise</td>
<td>Residential areas around the Plant site</td>
<td>Type II</td>
</tr>
</tbody>
</table>

1.4.2 Environmentally Sensitive Points

There are 8 environmentally sensitive points distributed around the Plant site, such as Nan’ning City No.43 Middle School. The distribution of the sensitive points are shown in Table 1.4-2.

| No. | Sensitive Point         | Relative Direction and Minimum Distance to Plant Boundary (km) | Relative Direction and Minimum Distance to Bagasse Stockpile (km) | Relative Direction and Minimum Distance to Wastewater Treatment Station (km) | Basic Facts                                                                 |
|-----|-------------------------|----------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------|
| 1   | Staff’s dormitories     | North, lateral upper drift 0.1km                                | North, lateral upper drift 0.3km                                 | Northwest, lateral lower drift 0.4km                                     | Located north to the Production area and traversed by Yongheng Road; north side on mountain slope and a small market in front of the dormitories. |
| 2   | Nan’ning City No.43 Middle School | West, lower drift 0.4km                                       | West, lower drift 0.4km                                         | West, lower drift 0.7km                                                 | Yongheng Road in front of the school gate with high volume of traffic on |
2. Environmental Impact Analysis During Construction Period

The construction of the new Bleaching Unit is located at the original open space, while the Anaerobic Treatment Unit and Stage 1 Advanced Treatment Unit are reconstructions on the original Wastewater Treatment Facility. The onsite investigation showed that the construction of the new Bleaching Unit and the auxiliary Chlorine Dioxide Preparation Unit, the Anaerobic Treatment Unit and the Stage 1 Advanced Treatment Unit (8000m³/d) have all finished and the commissioning has started. The new Project construction is mainly the construction of

<table>
<thead>
<tr>
<th>No.</th>
<th>Location</th>
<th>Distance from the Flat Road</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Nali Village</td>
<td>South, lateral upper drift 2km</td>
<td>Extensive countryside, with a population of 220.</td>
</tr>
<tr>
<td>4</td>
<td>Yongning District Welfare House</td>
<td>North, lateral upper drift 0.1km</td>
<td>Perched on the slope with Yongheng Road passing in front; staff, senior residents and orphans approx. 70.</td>
</tr>
<tr>
<td>5</td>
<td>Security Staff’s Dormitories</td>
<td>Northwest, lateral lower drift 0.8km</td>
<td>Dormitories and production area in southeast section, higher topography of hillside extended from the north, with medium vegetation.</td>
</tr>
<tr>
<td>6</td>
<td>Nan’ning No. 1 Nationality Normal School</td>
<td>West, lower drift 2.3km</td>
<td>Open and wide space around the school, a number of teaching buildings and dormitories. Approx. 900 teachers, students and staff.</td>
</tr>
<tr>
<td>7</td>
<td>Pumiao Township</td>
<td>Northwest, lateral lower drift 2km</td>
<td>County jurisdiction area, densely populated, approx 123,000 residents.</td>
</tr>
<tr>
<td>8</td>
<td>Namei Village</td>
<td>Southwest by west, lateral lower drift 1.6km</td>
<td>Open and wide country, 420 residents.</td>
</tr>
</tbody>
</table>
Stage 2 Wastewater Advanced Treatment Unit (32000m³/d) on a newly appropriated land, therefore the assessment should be conducted on the construction of the Wastewater Advanced Treatment Unit and the dismantling of the equipments of the old Bleaching System.

The construction contents are mainly earth excavation, material and equipments transportation, equipments installation, as well as the installation of auxiliary power supply and distribution facilities, pipelines and meters, etc. The main environmental impacts include construction-raised dust, welding-induced waste gas, construction wastewater, construction equipments noise and solid waste.

2.1 Environmental Impact Caused by Noise

The main sources of noise during the Project construction include: noise caused by Rooters, blenders, loaders and equipments, sound level at the range of 80-110dB(A). The level and frequency of the noise caused by construction machines are listed in Table 2.1-1, and the noise values monitored at different distances and intensities are listed in Table 2.1-2.

<table>
<thead>
<tr>
<th>Equipment Name</th>
<th>Noise Value dB(A)</th>
<th>Frequency Spectrum</th>
<th>Daytime Limits at Plant Boundary</th>
<th>Nighttime Limits at Plant Boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rooter &amp; Loader</td>
<td>82</td>
<td>Low intermediate frequency</td>
<td>75</td>
<td>55</td>
</tr>
<tr>
<td>Blender</td>
<td>75</td>
<td>Medium high frequency</td>
<td>70</td>
<td>55</td>
</tr>
<tr>
<td>Vibrator</td>
<td>83</td>
<td>Medium high frequency</td>
<td>70</td>
<td>55</td>
</tr>
</tbody>
</table>

Table 2.1-2 Noise Values at Different Intensities [dB(A)] and Different Distances (m)

<table>
<thead>
<tr>
<th>Distance Sound Intensity</th>
<th>10</th>
<th>20</th>
<th>50</th>
<th>60</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>60</td>
<td>54</td>
<td>46</td>
<td>44</td>
<td>40</td>
</tr>
<tr>
<td>85</td>
<td>65</td>
<td>59</td>
<td>51</td>
<td>49</td>
<td>45</td>
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<tr>
<td>90</td>
<td>70</td>
<td>64</td>
<td>56</td>
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<td>95</td>
<td>75</td>
<td>69</td>
<td>61</td>
<td>59</td>
<td>55</td>
</tr>
<tr>
<td>110</td>
<td>90</td>
<td>84</td>
<td>76</td>
<td>74</td>
<td>70</td>
</tr>
</tbody>
</table>

Table 5.5-2 showed that the noise generated during the Project construction does not meet the “Noise Limits for Construction Site” (GB12523-90). According to onsite investigation, it is known that the main body Project area is located near the southern boundary, while the southern side of the Plant area is a barren hill where there are no
sensitive points, plus the construction is usually daytime operation, after which the adverse impacts on the environment shall diminish with the ending of the construction. It is concluded that the environmental impact caused by construction noise is at small scale.

2.2 Impacts on Atmospheric Environment

1. Construction-raised Dust

Large amount of dust shall be caused by construction and form the event of regional dust pollution; meanwhile, the dust generated during transportation of building materials and mechanical equipment may cause certain pollution for the residents along the road. Water spray should be adopted at such sites for preventing the generation of dust, and due to short period of construction, the impact caused by the dust on the atmospheric environment is comparatively small.

2. Welding-induced Exhaust Gas

Steel structured stairs are used for constructing the buildings of the Wastewater Advanced Treatment System and the Oxidation Tower, the onsite welding during the construction period will inevitable produce certain amount of waste gas, mainly the hazardous O₃, NOₓ, CO and HF, which have complicated components and not easy to quantify.

2.3 Impacts on Water Environment

During the Project construction, certain amount of domestic sewage water will be generated, the 40 workers do not eat or live at the construction site, the water consumption quota is 20L/d per person, the generation of domestic sewage water is 0.8m³/d, calculated by the quotient 80%, the discharge of domestic sewage water is 0.64m³/d. This part of wastewater will be transported to the Domestic Wastewater Treatment System and be discharged after treatment.

2.4 Impact of Solid Waste

During the Project construction, certain amount of earth and waste will be produced due to earth excavation and filling, which shall affect the environment unless appropriately treated. The tools and materials should be put in right place and in good order, the waste from construction should be cleared away right after the operation, and the wheels of vehicles should not be stuck with mud during driving, so as not to contaminate the road.

The domestic waste generated by the construction workers is calculated at 1kg/person, multiplied by 40 persons, then the generation of domestic waste shall be 0.04t/d, temporary dustbins should be put into place for collecting the garbage, which shall be transported to the Environmental and Personal Health Department for collective and timely treatment.

2.5 Impacts on the Eco-environment

The total land area for the Project construction is 5.3316hm, in which 3.8649hm is agricultural-use land (including 0.2437hm cultivated land), without occupation of basic farmland, and the rest is a barren land dominated by natural grassland and shrubs, with sporadically distribution of arbor trees (artificial plantation). The types of grass include saccharum arundinaceum retz, silver grass, Al-grass, cogon grass, holosteuem umbellatum, gramineae, chryopogon aciculatus, herba bidentis bipinnatae and sedge, the shrubs include myrica rubra, rhus chinensis, alangium chinense, lindera communis, vitex negundo and B roussonetia a k az i nok, and the artificially
planted trees include cedar, pine, fast-growing eukalyptus, peach tree, plum tree and banana. The Project construction will cause minor impact on the ambient forest, grassland and farmland. The animal resources in the mines are mainly commonly seen mice, frogs and sparrows. Onsite investigation showed that there is no existence of rare and wild animals or plants in the Project area, nor large piece of pristine forest or secondary forest, nor animals or plants under the protection at national or provincial level. The regional ecosystem’s level of sensitivity is comparatively low, so the Project construction and operation shall not cause impacts on the habitat. Due to the Project construction, the land functions have been artificially changed, certain biomass have been lost, and the discarded earth is loose and easy to be washed away by rain, which is a loss of water and soil.

3. Mitigation Measures

3.1 Mitigation Measures of Construction Pollution Impacts

3.1.1 Mitigation Measures of Impacts Caused by Waste Gas Pollution

The atmospheric pollutants generated during the construction period are mainly the dust, vehicle exhaust gas a small amount of waste gas from welding. In order to control the emission of exhaust gas from vehicles, it is required that all vehicles should realize up-to-standard emission, so as to prevent serious impact. Due to cautious operation and small scale of welding at a short time, the generation of exhaust gas is at small volume, so the impact on the atmosphere is small. As to the dust raised by construction operation, the following measures are suggested to be taken to alleviate pollution:

(1) Civilized construction and strict management. Vehicles for transporting earth and mucks should be cleaned timely; the transportation of sand and stones should be conducted according to the loading limit, with the surface pressed hard and sprayed with water, or covered by a paulin to eliminate dropping and flying away.

(2) During the operation when the generation of dust is frequent, water spray is the effective method for reducing pollution of suspended particulates; the more times the spraying procedure is implemented, the more effective it shall be in reducing the concentration of total suspended particulates in the air.

(3) For transportation and stockpiling of building materials easy to raise dust, the materials should be covered.

(4) Construction-use vehicles must be checked regularly, damaged tank must be repaired in time. The leaking of building materials must be strictly banned.

The abovementioned environmental protection measures adopted during the Project construction shall be effective in reducing the impacts on the atmospheric environment.

3.1.2 Mitigation Measures of Impacts Caused by Wastewater Pollution

The generation of wastewater during the Project construction is mainly the storm runoffs, possibly discharge of ground water caused by foundation excavation, construction-induced wastewater and domestic sewage water generated by workers. The construction-induced wastewater includes the sludge water, equipments cooling
water and vehicles and equipments washing water. The domestic sewage water includes the water left by the workers after washing, sewage water from cooking and washing and toilet flush water. If not treated appropriately, the wastewater generated during the Project construction shall cause adverse impacts on the water environment around the site for a short time, therefore effective measures should be formulated for prevention and control of wastewater pollution during the Project construction.

The following measures are to be adopted according to “Nan’ning City Management Regulations on Construction Project Engineering”:

1. Drainage pipes with reasonable diameter should be paved around the construction site, in addition to the oil separation tank and sand sedimentation tank to be constructed for pre-discharge treatment, open drains built with bricks should be covered with plates. Construction should be conducted before or after the rainy season. The supernatant liquid in the sedimentation tank may be used for washing equipments and vehicles.

2. Strict environmental protection system must be formulated and implemented during the Project construction, the workers should be educated to follow the rules self-consciously, with necessary and strict supervision and management.

3. The domestic sewage water generated by the workers should be transported to the Domestic Wastewater Treatment System for collective treatment and up-to-standard discharge.

4. The inspection and maintenance of mechanical equipments during the Project construction should be intensified to avoid oil leaking, and the maintenance of the mechanical equipments should be conducted by professional agents.

3.1.3 Mitigation Measures of Impacts Caused by Noise Pollution

The impact on the environment caused by the construction noise is temporary and it will diminish with the ending of the Project construction. However, due to the higher value of noise during the construction period and to minimum the impact on the environment caused by the construction noise, the following measures should be taken:

1. Except for those construction projects that need continuous engineering, the other construction activities are forbidden during nighttime. Meanwhile, the construction time should be reasonably arranged and the supervision on the construction site should be strengthened, and the operation time of high-noise equipments should be controlled.

2. The high-efficiency low-noise construction equipment with better performance should be purchased with priority. Attention should be paid to the daily maintenance of the construction equipments to maintain the satisfactory operation state and avoid the generation of noise.

3. The construction plan and the deployment of construction machines and equipments should be reasonably designed. The construction unit should strictly follow the instructions as specified in “Nan’ning City Regulations on Prevention and Control of Environmental Noise Pollution” (2008 Revision): the project construction should avoid the noon time (12:00-14:30) and nighttime (22:00-6:00), it should be avoided to use massive power and mechanical equipments collectively at the same
time.

(4) The construction unit must strictly implement the instructions as specified in the “Noise Limits for Construction Site” (GB12523-90).

3.1.4 Mitigation Measures of Impacts Caused by Solid Waste Pollution

Solid waste generated during the Project construction mainly includes the domestic waste from the workers’ residence and the building waste. According to abovementioned analysis, the highest volume waste is the building waste with simple components and in large magnitude, for which centralized collection and timely transportation should be conducted and different treatment methods should be adopted based on different components.

(1) Strictly follow the instructions as specified in “The Announcement of Nan’ning Municipal People’s Government Concerning the Management of Building Waste” (NanFuZi [2011] 1).

(2) The building waste, architectural ornament waste and decoration waste generated during the Project construction should be treated appropriately after being assorted. The stable components of the building waste (e.g., broken bricks and debris) may be stockpiled or backfilled with the excavated earth and stone. The waste earth may be used for road paving but not randomly dumped, in addition, supervision should be strengthened and necessary water spray should be adopted for avoiding the stimulation of dust and secondary pollution.

(3) As to unstable components such as waste oil paint and coating materials, suitable vessels should be used for collecting and transporting these materials to the unit qualified for treatment of hazardous solid waste or the manufacturers. The waste paint containers should be collected and sent back to the manufacturers or sold to professional recycle companies, self cleaning is not recommended.

(4) The domestic waste generated by the workers must be collectively treated. Domestic waste from the workers’ dormitories should be packed in bags and collected by dustmen and sent to fixed stockpile every day and then be moved away for collective treatment by the Environmental and Public Health Department. In case the collected domestic waste can not be moved away in time, it must be covered to avoid the generation of hazardous percolate as a result of rain water soaking of perishable substances.

According to onsite investigation, there is no plan for the disposal of idled equipments of the old bleach system, and if dismantling is needed for reconstruction, the dismantle order is: power switch off, cleaning of equipments surface, fixation of equipments, dismantling of pipelines, disconnection of the bolts connecting the equipments and the platform, hoist of equipments. Waste engine oil shall be generated during the dismantling process, but there will be no generation of asbestos or other hazardous chemicals. It is suggested to use iron vessels to collect the waste engine oil and send to qualified units for treatment; dismantling should be conducted through the combination of artificial and mechanical work. The dismantling of waste equipments may be conducted by professional recycle units, and the dismantled equipments must
be hoisted onto the trucks for transportation to avoid piling up inside the Plant. The dismantled waste equipments may also be sold for eliminating the environmental impact.

3.1.5 Mitigation Measures of Impacts Caused by Water and Soil Loss

In order to reduce water and soil loss, the recommended mitigation measures are as follows:

(1) Strengthen construction management and try to protect the surface vegetation, soil and eco-environment of the construction site. The most strict system of farmland protection should be implemented, and the construction site and waste stone storage site should be located in barren mountain areas and wasteland, the occupation of farmland should be eliminated.

(2) Protective works such as the construction of drains and walls should be finished before dumping waste to the selected waste stone storage site.

(3) The waste earthwork and stonework should be used comprehensively.

(4) Previous to excavation at the construction site and waste piling at the Waste Stone Storage Site, the surface layer of cover or the arable layer of earth should be stripped off and stored at the Earth Storage Site with easy access and impossible loss, with necessary measures adopted for protection and fertilizer conservation. After the construction, the waste earth should be rearranged and restored and then be covered by arable earth.

(5) The original roads should be used as passageways for construction transportation, and the additional construction of new passageways should avoid the occupation of farmland or the damage of trees and vegetations, so as to alleviate the damage to the natural landscapes. In addition, protective measures should be adopted along the passageways to avoid water and soil loss.

(6) The vegetation on the exposed surface after excavation should be restored as soon as possible.

(7) Fencing walls should be built around the temporary stockpiles to avoid water and soil loss.

(8) For construction during rainy season, engineering canvas should be used as cover to avoid major loss of water and soil. The surface of the canvas should be kept smooth to avoid rain water washing.

The environmental impacts during the Project construction are characterized with small volume and short period of discharge, and such impacts shall perish with the ending of the construction.
3.2 Pollution mitigation measures in operation period

3.2.1 Mitigation measures for waste gas pollution

1. Odors

The agent addition of this advanced waste water treatment project is conducted by individual dosing devices via closed automatic pipes. Therefore, few odors are emitted by the agents, and the advanced waste water treatment station is the terminal treatment unit of the grey water discharged by the Paper Mill, thus the quality of the waste water is relatively good, the odors generated by the waste water has little effect on the environment, and the odor environment within the plant site still meet the standards of Grade II (the concentration in new, rebuilding or expansion projects ≤ 20) in Table 1 required in the "Emission standards for odor pollutants" (GB14554-93).

When this project’s collection and treatment of bagasse waste water is carrying out, the primary sedimentation tank, collecting well and other position of the waste water anaerobic system are not sealed, thus the bagasse waste waster emits volatile odors, which have an impact on the ambient air quality within 100m at the downwind direction to a certain extent. Compared to the waste waster treatment plants with similar technology and treatment capacity, the odor concentration downwind 50m and 100m away from the waste waster treatment system are 16.0 and 11.0 respectively, which meet to meet the standards of Grade II (the concentration in new, rebuilding or expansion projects ≤ 20) in Table 1 required in the "Emission standards for odor pollutants" (GB14554-93). In order to reduce the impact of odors on the surrounding environment, the proposed project has enhanced the sealing management in the parts that emit odors.

2. Methane gas

The IC reactor of this project’s waste water anaerobic system generates methane gas, and in the design of this project, the methane gas shall be collected and sent to the biogas combustion furnace for combustion, and the combustion product consists of carbon dioxide and water vapor, which have little effect on the ambient air quality. Methane has a relatively great economic value.

3.2.2 Mitigation measures for waste gas pollution

After the treatment in the IC anaerobic system, biochemical tank and secondary sedimentation tank, the enterprise’s production waste water shall go into the advanced waste water treatment system, and the treated waste water can meet the requirements in Table 2 of the "Discharge standard of water pollutants for pulp and paper industry"
(GB3544-2008), and after that, the treated waste water shall be discharged into the Yongjiang River via a 300m long sewage sewer. After the advanced treatment, the attained waste water has little impact on the water quality of the Yongjiang River.

The newly-built bleaching production line of this project will generates bleaching effluent in bleaching process, the concentration of pollutants in the bleaching effluent is low, the waste water can be reuse in bleaching section after the treatment via the sedimentation tank, and no bleaching effluent shall be discharged. In addition, on a rainy day, the storm water runoff from the bagasse yard contains a large amount of organic pollutants; therefore, the storm water drainage system should be prepared on the project site, so as to discharge the storm water on a rainy day into this waste water treatment system for treatment.

3.2.3 Mitigation measures for noise pollution

The noise sources of this project mainly come from the noises made by fans, pumps and other transmission equipments, and the noise value is 85 ~ 100 dB (A). According to the requirements of the assessment, closed insulation booths should be set up for fans, pumps, etc., fixed base or shock mount shall be installed in fans, pumps and other transmission equipments, so as to minimize noise, mufflers shall be installed at fan outlets, and the noise value is expected to be 60 ~ 70dB (A) after the implementation of the above measures. And due to the workshops and factory buildings around the project site, it is estimated that the completion of the technological transformation project will have little impact on the surroundings, and the noise value at plant boundary will meet the standards of Class 3 required by the "Emission standard for industrial enterprises noise at boundary" (GB12348-2008) (daytime≤65dB (A), nighttime≤55dB (A)).

3.2.4 Mitigation measures for solid waste pollution

Because the sludge generated by the project’s waste water treatment plant can be used as a high-efficiency fertilizer, the sludge shall be delivered to the Mixed Fertilizer Plant and used as raw material in the production of mixed fertilizer after the dewatering treatment by the sludge press dryer. The sludge generated by the waste water treatment plant can be utilized in a comprehensive manner, thus there is no impact on the environment.

Part of by-products in the project’s preparation and production of chlorine dioxide mainly consist of Glauber's salt crystals, and the crystals shall be collected by a filter before they are dissolved and sent by tanker for sale.

3.3 Occupational health and safety measures
3.3.1 Safety facilities and measures used in the design

1. General layout and countermeasures on construction

(1) According to the "Code of Design on Building Fire Protection and Prevention", the fire risk class of this project can be classified as Class B and Class C. According to production processes and safety requirements, the production workshops adopt natural ventilation and natural lighting, and the main approach to decoration includes: plastic-steel doors and windows; ground using cement mortar; flexible waterproof roof.

(2) The general layout ensures the safe distance between factory buildings and buildings in accordance with the requirements of the code of fire and explosion protection and prevention. All factory buildings shall have fire control passageways connecting one another, so as to form the fire control passageway network.

(3) The fire protection rating of building design is Grade II. According to the requirements specified in the code of fire protection and prevention, entrances, exits and evacuation staircase shall be set up, and evacuation signs and emergency lighting shall be set up at the evacuation entrances and exits. The installation of fire-proof doors and the choice of building materials shall be carried out in accordance with the code of fire protection and prevention.

(4) The design of buildings and structures designed shall strictly comply with the code for anti-seismic design.

(5) The requirements on the layout of process equipments in the production area shall be implemented strictly and the flow of materials and the flow of people shall be safe and unblocked, so as to reduce mechanical accidents.

(6) According to the requirements of the "Code of Design on Building Fire Protection and Prevention", different production fire risk classes shall be classified, so as to choose the correct fire protection rating structural types of various factory buildings and take corresponding fire and explosion precaution. The building design shall improve the natural ventilation condition and reduce the accumulation of harmful flammable substances; the setting up of safety exits in each factory buildings shall be considered, and necessary fire fighting equipments shall be prepared. The measure for protection of buildings and equipments against lightning shall be taken.
(7) The arrangement of UMIC reactors and marsh gas shall be conducted in accordance with relevant requirements of current "Code of Design on Building Fire Protection and Prevention", the structures shall adopt reinforced concrete structures, seepage resistance shall be taken into account in the design of all of the pools, and seepage resistance grade shall be S8.

(8) The widths of plant roads are: 9 meters wide on trunk road, 6 meters wide on sub trunk road, and the roads is connected as a ring, so as to be convenient for emergency rescue and fire fighting.

(9) The design of production equipments and buildings shall provide sufficient space for operation and area for maintenance, and the design layout of the position of equipments, pipes and valves shall facilitate the operation, maintenance, examination and repair.

2. Security measures concerning processes, equipments and installations,

(1) Advanced, mature and reliable technologies and equipments shall be adopted, so as to prevent all kinds of leaking problems and realize airtight production in the whole process.

(2) All of the mechanical transmission parts shall be equipped with deflector shields, and protective railings shall be set up on the operating platforms. Towards the operation posts in production area that have the risk of falling, escalators, platforms, railings and other ancillary facilities that facilitate the operation, inspection and maintenance shall be established according to regulations.

(3) The equipments and pressure pipelines, which are used in the system’s storage and utilization processes and belong to pressure vessels, shall be designed, installed and constructed according to current national standards.

(4) The design and material selection of the accessories and other materials at the connections of equipments and pipelines shall be conducted according to current national standards, and the installation and construction shall be carried out in accordance with the design requirements.

(5) The inner surface of concrete tanks for acid storage shall go through anti-corrosion treatment, and the inner surface of other reinforced concrete pools for waste water or sludge storage shall go through anti-corrosion treatment in accordance with relevant codes.
3. Security countermeasures concerning electrical safety

(1) The corrosion-proof electrical equipments shall be selected in the workshops with potential corrosion hazards.

(2) The safe clear space between power transformation equipments and power distribution equipment shall comply with the requirements of relevant codes.

(3) The relaying protection and security automatic equipment project should be equipped in accordance with the requirements specified in the "Technical code for relaying protection and security automatic equipment" (GB14285-1993).

(4) In order to prevent the personal electric shock or injury caused by potential misuse, sets of switchgear cabinet with "five-anti" feature should be selected for use. The electrical interlock or mechanical locking device shall be set up between high-voltage circuit breakers and the grounding switches of switchgear cabinets.

(5) Power distribution cabinet, station transformer, control cabinets and other devices shall be equipped with closed protective shell for protection.

(6) The three-phase five-wire system should be adopted in the low-voltage electric power system, and a dedicated neutral wire shall be equipped, so as to avoid the risk of electric shock to persons.

(7) The earth protective devices shall be connected to the enclosures and steel structures of electrical equipments. Disconnectors shall be installed at the openings for incoming electrical lines of the power distribution boxes or the load points that are far away from power source, so as to ensure the safety of personnel during the maintenance of equipments.

(8) The design of lightning protection of buildings shall be implemented in accordance with the "Code for design of lightning protection of buildings" (GB50057-2000).

(9) In order to prevent the electric shock of staff in inspections and maintenance, the hanging of signs, the installation of isolation railings and other measures shall be
implemented at distributor cabinets and voltage transformers.

(10) The static grounding devices should be installed in various types of tanks.

4. Countermeasures concerning fire protection and prevention

(1) According to the construction scale and production nature of the project, the project design plan shall comply with relevant regulations, and the requirements specified in the "Code of Design on Building Fire Protection and Prevention" and other regulations shall be strictly implemented. The fire protection configuration in plant site and workshops shall be increased, the principle of “putting prevention first and combining fire prevention and fire control”, and the fire protection plan shall be based on self-rescue. If necessary, the fire brigade of Yongning County Fire shall provide support.

According to the Code of Design on Building Fire Protection and Prevention (GB50016-2006 version), the fire risk of this project’s engineering workshop can be identified as Class C, and the fire resistance rating of buildings can be identified as Grade II. The firewater consumption is 65 l/s (including 55 l/s outdoor firewater consumption, 10 l/s indoor firewater consumption), in case of a fire lasting for three hours, the total volume of firewater consumption required in a fire shall be 702m³; the firewater consumption of the raw material yard is 55 l/s, and in case of a fire lasting for six hours, the total volume of firewater consumption required in a fire shall be 1188m³. In accordance with the standards, the occurrences of fire at the same shall be one fire, so the total volume of firewater consumption required in a fire shall be calculated in accordance with the point with the maximum firewater consumption, namely 1188 m³. 500m³ of the fire water shall be stored in the clean water pool of the water purification station, and 500 m³ shall be stored in the additional firewater pool of the material yard.

The fire alarm systems shall be installed, the layout of security exits and indoor fire hydrant or fire extinguisher shall be arranged according to the Code of Fire Protection and Prevention

(2) Appropriate fire extinguishers and the corresponding sets of fire fighting equipments shall be equipped in workshops, offices, warehouses, etc..

5. Countermeasures concerning gas protection
(1) Towards a certain amount of harmful gases, local exhaust ventilation shall be taken in the design, so as to conduct high-altitude long-range emissions after the collection and washing of waste gases, and the ventilation shall be improved, so as to prevent the accumulation of harmful substances.

(2) Towards the buildings and structures that emit odors and contain toxic, flammable and explosive gases, all such equipment shall be covered in this project, air flow inlets and outlets shall be added, a vent fan shall be connected to the air flow outlets, so as to collect the waste gases through the pipe collection system and send them into the reserved gas scrubbers, and the odor substances in waste gases shall be absorbed through the alkaline washing at the top of gas scrubbers. In order to ensure safety, the ventilation capacity of the vent fan should be large enough, and once the system is put into use, the vent fan and the spraying water should be normally operated.

(3) The marsh gas is flammable and explosive, thus the direct emission of unburned marsh gas into the atmosphere shall be avoided.

3.3.2 Countermeasures concerning safe engineering design

(1) In power supply design, the electricity load for this project’s process and fire protection can be identified as Grade II.

(2) The emergency lighting and the security evacuation signs shall be set up on the production site.

(3) Towards the premises and equipments that are susceptible to accidents or endanger the safety of personnel, and the places requiring warnings to the operators, various safety signs shall be set up according to the standards.

(4) The eye washer and wash basin shall be set up in the operating sites of each workshop. A variety of commonly used protective equipments, first aid facilities and equipments shall be equipped in each workshop, including the gas masks, protective masks and protective glasses used by the rescuers.

(5) Automatic alarm devices shall be set up in the workplaces with the potential escape of toxic gases from the chlorine dioxide system.
(6) The central computer-controlled fire-alarm system shall be set up in the whole plant.

(7) Exhaust fans and blowing fans shall be installed in each workshop and section, so as to ensure ventilation indoors. Air conditioners shall be installed in the instrumentations and electrical operating rooms, so as to ensure proper indoor temperature, humidity and air circulation in the operating rooms.

(8) The lightning protection system and the anti-static system in workshops, factories, process devices and equipment should be qualified in the tests carried out by relevant departments and their effectiveness shall be maintained.

(9) Explosion-proof equipments, electrical facilities and instrumentation should be selected for use.

(10) In the engineering foundation design, the basic construction program shall be identified according to the geological conditions, so as to prevent the occurrence of collapse.

3.3.3 Countermeasures concerning safety management

(1) The safety management body in the whole plant shall be established, the policies and laws concerning labor protection shall be fully implemented, and safety and health training and education shall be carried out, so as to prevent accidents. Its main task is to implement standard health and safety management in the production process, as well as inspect and eliminate a variety of dangerous and harmful factors in the production process. Part-time safety inspector shall be appointed in each workshop, and they shall be responsible for the daily health and safety management in areas under their jurisdiction.

(2) In accordance with regulations, a safety management system shall be established, the operation specification of safety technologies shall be developed, and the operation specification shall be strictly implemented.

(3) The "Three Simultaneous" shall be implemented seriously, and the gradual implementation of modern management shall be carried out.

(4) Since the project construction begins, qualified supervisory agency or personnel
shall be employed, so as to carry out the implementation of project supervision; when the construction project is completed, the check before acceptance, the pressure test and the test run shall be carried out according to design specifications and engineering acceptance criteria, relevant management systems and procedures shall be developed, and then the project can be put into use after passing inspection procedures.

(5) The safety education for employees shall be enhanced, and the staff shall go through rigorous training and pass the examination before taking a post. Personnel conducting special operations shall pass the examination carried out by the relevant regulatory authorities and obtain job qualifications.

(6) A safety management body shall be established, a full-time person responsible for safety management shall be appointed, and the safety inspector shall go through the training and pass the examination carried out by the safety production supervision and administration departments and obtain the safety production management certificate.

(7) The production safety responsibility systems and the safety management systems shall be developed for various personnel at all levels, and procedures and programs shall be developed for test run; comprehensive procedures for safety operation shall be developed before the production, apart from startup and normal operation, emergency shutdown, startup after short-term shutdown, predictable exception handling, inspection and maintenance, hot work procedures should also be included.

(8) Regular education concerning safety awareness and knowledge of skills for staff shall be carried out, so that employees can master the safety production knowledge for their own work, improve and enhance safety production skills, and enhance their accident prevention and emergency response capabilities.

(9) The preparation of emergency rescue plan for accidents shall be conducted according to the requirements in the "Guide to the drafting of emergency rescue plan for hazardous chemical accidents (institution version)", and exercises shall be organized regularly.

(10) Towards the on-site toxic and corrosive materials generated in the preparation, storage and transportation of chlorine dioxide, repair equipments, effective protection equipments and fire protection equipments shall be equipped in accordance with the standards. For example, the equipments include fusible plug, hex nut, special wrench, rubber mat, sealing tape, isolated gas masks, as well as rubber or vinyl protective clothing.
(11) Enterprise shall carry out focused safety inspection and management towards major hazardous resources. The enterprise shall control major hazardous sources by using engineering, technical and management measures, and the design, manufacture and installation shall comply with high quality standards; safe and reliable process procedures shall be strictly implemented, and the operation shall be strictly controlled; the implementation of security checks towards major hazardous sources shall be conducted after the production and operation. Major hazardous sources shall be registered and filed, so as to carry out regular tests, evaluations and monitoring, and emergency plans shall be developed, so as to inform employees and associated personnel of the emergency measures that should be taken in emergency situations. The institution’s major hazardous sources and relevant safety measures and emergency measures shall be reported to the local people's government departments and relevant departments responsible for the safe production supervision and management for record in accordance with the relevant provisions.

3.3.4 Other comprehensive measures to be taken

Towards the operators exposed to strong acid and alkali, as well as the workplaces with toxic, corrosive and irritant gases, the operators shall be equipped with rubber gloves, rubber boots, acid resistant working suits, protective glasses, gas masks and so on. Eye washer and shower facilities shall be established at appropriate positions.

Enterprise shall comply with the policy covering the work-related injuries and pay insurance premiums for new employees. The enterprise must provide staff with articles of labor protection conforming to the national standards or industry standards, and the supervision and education should be conducted, so as to ensure workers to wear and use them correctly; effective measures should be takes to manage occupational health protection, and the protection and management in the labor process should be strengthened.

Towards the places that may have toxic gas leakage, the toxic gas detection and alarm devices and the absorption and treatment devices shall be set up.

Chlorine dioxide can decompose rapidly under certain conditions, or even an explosion may occur, thus a safe discharge and water cooling device shall be installed at the top of the generator, so as to prevent the explosion.

The vacuum technology shall be adopted in the absorption system of the chlorine dioxide preparation section, so as to prevent any emissions of chlorine dioxide gas;
Protective measures shall be taken at flanges and joints of the overhead acid and alkali pipelines outside the channels, so as to avoid dripping and leaking.

4. Risk control and emergency management

4.1 Major risk factors

According to “Hazardous chemical inventory” (2002) and relevant data, the hazardous chemicals related to production process of this technology upgrade are sulfuric acid, sodium chlorate, methyl alcohol, methane, hydrogen peroxide, chlorine dioxide.

Table 4-1.1 physicochemical property and hazard of sulfuric acid

<table>
<thead>
<tr>
<th>Nature</th>
<th>GB number</th>
<th>81007</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS NUMBER</td>
<td></td>
<td>7664-93-9</td>
</tr>
<tr>
<td>Chinese name</td>
<td></td>
<td>硫酸</td>
</tr>
<tr>
<td>English name</td>
<td></td>
<td>Sulfuric acid</td>
</tr>
<tr>
<td>Other name</td>
<td></td>
<td>磺镪水</td>
</tr>
<tr>
<td>Molecular formula</td>
<td>H2SO4</td>
<td></td>
</tr>
<tr>
<td>Molecular weight</td>
<td>98.08</td>
<td></td>
</tr>
<tr>
<td>Melting point</td>
<td>10.5</td>
<td>boiling point: 330.0</td>
</tr>
<tr>
<td>Density</td>
<td>Relative density (water=1)1.83: relative density (air=1)3.4</td>
<td></td>
</tr>
<tr>
<td>Hazard label</td>
<td>20(Corrosive)</td>
<td></td>
</tr>
<tr>
<td>Hazardous characteristics</td>
<td></td>
<td>Hazardous characteristics: React violently with inflammable substance (such as benzene) and organic (such as sugar, fiber, etc) on contact, and even cause combustion. May react with some active metal powder to release hydrogen. It is soluble in water with release of heat and may cause spattering. With strong corrosive. Combustion (decomposition) product: Sulfur oxide.</td>
</tr>
<tr>
<td>Toxicity</td>
<td></td>
<td>Acute toxicity: LD_{50}80mg/kg(rat, oral); LC_{50}510mg/m³, 2h(rat inhalation); 320mg/m³, 2h(mouse inhalation)</td>
</tr>
</tbody>
</table>

Pure sulfuric acid is colorless, transparent and odorless oily liquid.
Vapor pressure 0.13kPa(145.8)
Soluble in water
Stable
Used for making chemical fertilizer and industry such as chemical industry, medicine, plastics, dyeing, and Petroleum refining.
| Health hazard | Invasion ways: inhalation, ingestion. Health hazard: strongly irritative and corrosive to skin and mucosa. Contact with eyes may result in conjunctivitis, oedema, opacitas corneae, or total loss of vision; Irritative to respiratory tract. In serious case, it may cause breath difficulty and pulmonary edema; High concentration may cause laryngospasm or demaoglottis and leading to death. If swallowed by mistake, it may cause burn or ulcer to digestive tract. In most serious cases, stomach perforation, peritonitis, laryngospasm, demaoglottis, kidney damage or shock may happen. Chronic exposure may cause includes teeth corrosion, chronic tracheobronchitis, pneumonectasis and pneumosclerosis. |
| Emergency response to leakage | Evacuate people from affected area to safe area, unauthorized people are prohibited to enter polluted area. Emergency response people are suggested to ware masks and chemical protecting suit. Ventilate reasonably; do not directly contact leaked substance, prevent leaked substance to contact with combustible substance (wood, paper, oil); stop the leakage under the condition to ensure safety. Spray water to slower volatility (or diffusion) without directly spray at leaked substance or leakage point. Mix with sand, dry lime or soda ash and collect to send to waste treatment area. Or wash the exposed area with large amount of water, and emit diluted water to waste water system. If the leakage is large in amount, the stop diffusion with closure and collect, transfer, recycling or dispose after treatment. |
| Protection measures | respiratory system protection: When it is possible to contact its vapor or smoke, gas mask or air supply helmet must be worn. It is suggested to wear contained breathing apparatus in case of emergency response or escape.  
eye protection: wear chemical safety glasses  
Protecting suit: working clothes(made from anticorrosive material).  
hand protection: wear rubber glove.  
Others: take a shower and change clothes after work. Polluted clothes shall be restored separately and used again after cleaning. Maintain good sanitary habit. |
| First aid | Skin exposure: Take off polluted clothes and immediately wash the exposed area with water for at least 15 minutes. Or wash the exposed area with 2% sodium bicarbonate solution. Rush to the hospital.  
Eye exposure: Immediately lift the eye lip and eyes must be flushed with running water or normal saline solution for at least 15 minutes. Rush to the hospital.  
inhalation exposure: Remove victims to fresh air. If breathing is labored, administer oxygen support. Inhalation of 2-4% sodium bicarbonate solution. Rush to the hospital.  
ingestion exposure: give victims milk, egg white or vegetable oil; do not induce vomiting. Rush to the hospital immediately.  
Fire-fighting method: with sand. Water is prohibited to use. |
| Package, storage and transportation | Transported with tank truck. Stored in tank in factory with storage quantity of approximately 50t. |
| Environmental standard | The maximum allowable concentration in air of workshop is (2mg/m³)  
The maximum allowable concentration in air of residential area is (one time value: 0.30mg/m³. daily average value :0.10mg/m³). |
<table>
<thead>
<tr>
<th>Nature</th>
<th>GB number</th>
<th>51030</th>
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</thead>
<tbody>
<tr>
<td>CAS NUMBER</td>
<td>7775-09-9</td>
<td></td>
</tr>
<tr>
<td>Chinese name</td>
<td>氯酸钠</td>
<td></td>
</tr>
<tr>
<td>English name</td>
<td>sodium chlorate</td>
<td></td>
</tr>
<tr>
<td>Other name</td>
<td>氯酸碱</td>
<td></td>
</tr>
<tr>
<td>Molecular formula</td>
<td>NaClO3</td>
<td></td>
</tr>
<tr>
<td>Appearance</td>
<td>Colorless, odorless crystalline, salty and cool, with hygroscopic</td>
<td></td>
</tr>
<tr>
<td>Molecular weight</td>
<td>106.45</td>
<td></td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>Decomposed</td>
<td></td>
</tr>
<tr>
<td>Melting point</td>
<td>248~261</td>
<td></td>
</tr>
<tr>
<td>solubility</td>
<td>Easily soluble in water and slightly soluble in ethanol</td>
<td></td>
</tr>
<tr>
<td>density</td>
<td>Relative density (water=1) 2.49</td>
<td></td>
</tr>
<tr>
<td>stability</td>
<td>Stable</td>
<td></td>
</tr>
<tr>
<td>Hazard label</td>
<td>11(oxidizer)</td>
<td></td>
</tr>
<tr>
<td>Major utilities</td>
<td>Used as oxidizer, to produce chlorate, herbicide, pharmaceuticals and used in metallurgy ore treatment</td>
<td></td>
</tr>
<tr>
<td>Hazardous characteristics</td>
<td>Hazardous characteristics: Strong oxidizer. Explode with large heat or contacting with strong acid. May form explosive mixture with reductant, organics, inflammable substance such as S and P or metal powder. Explode with violent heat. combustion (decomposition) product: oxygen, chloride and sodium oxide</td>
<td></td>
</tr>
<tr>
<td>Toxicity</td>
<td>acute toxicity: LD₅₀ 1200mg/kg (rat, oral)</td>
<td></td>
</tr>
<tr>
<td>Health hazard</td>
<td>invasion ways: inhalation, ingestion, percutaneous absorption. health hazard: The powder is irritative to respiratory tract, eye and skin. Acute toxic if swallowed, with the methemoglobinemia, gastroenteritis, liver and kidney damage or even suffocate.</td>
<td></td>
</tr>
<tr>
<td>Emergency response to leakage</td>
<td>Polluted area shall be insulated to limit enter and exit. Emergency response people are suggested to wear contained breathing apparatus. Ventilate reasonably; do not directly contact leaked substance, prevent leaked substance to contact with organics, reductant, and inflammable substance. Small leakage: avoid dust, collect with clean shovel into dry, clean and covered container. Large leakage: collect for recycling or send to waste treatment area.</td>
<td></td>
</tr>
<tr>
<td>Protection measure</td>
<td>Respiratory system protection: when it is possible to contact its powder, it is suggested to wear Eye protection: wear chemical safety glasses Body protection: wear polythene gas protection clothes Hand protection: wear rubber glove Others: smoking, eating and drinking is prohibited at working site. Take a shower and change clothes after work. Maintain good sanitary habit.</td>
<td></td>
</tr>
</tbody>
</table>
### First aid

**Eye exposure:** Immediately lift the eye lip and eyes must be flushed with running water or normal saline solution. Rush to the hospital.

**Inhalation exposure:** Remove victims to fresh air. If breathing is labored, administer oxygen support. If not breathing, provide artificial respiration. Rush to the hospital.

**Ingestion exposure:** Drink enough lukewarm water, induce vomiting. Rush to the hospital.

**Fire-fighting method:** Pour with large amount of water and suffocate with powder fire extinguishing agent.

### Package, storage and transportation

Stored in plastic woven bag with plastic film in 50kg/bag. Transported with truck. Stored in warehouse bank with storage quantity of approximately 25t.

### Environment al standard

The Soviet Union the maximum allowable concentration in air of workshop is 5mg/m³.

The Soviet Union(1975) The maximum allowable concentration in water is 20mg/L.

### Table 4-1.3 Physicochemical property and hazard of methyl alcohol

<table>
<thead>
<tr>
<th>Nature</th>
<th>GB number</th>
<th>32058</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS NUMBER</td>
<td>67-56-1</td>
<td></td>
</tr>
<tr>
<td>Chinese name</td>
<td>甲醇</td>
<td></td>
</tr>
<tr>
<td>English name</td>
<td>methyl alcohol: Methanol</td>
<td></td>
</tr>
<tr>
<td>Other name</td>
<td>alcohol methylque</td>
<td></td>
</tr>
<tr>
<td>Molecular formula</td>
<td>CH4O: CH3OH</td>
<td></td>
</tr>
<tr>
<td>Appearance and property</td>
<td>Colorless and clean liquid, with pungent odor</td>
<td></td>
</tr>
<tr>
<td>Molecular weight</td>
<td>32.04</td>
<td>Vapor pressure</td>
</tr>
<tr>
<td>Melting point</td>
<td>-97.8 boiling point: 64.8</td>
<td>solubility</td>
</tr>
<tr>
<td>density</td>
<td>relative density (water =1)0.79; relative density (air=1)1.11</td>
<td>stability</td>
</tr>
<tr>
<td>Hazard label</td>
<td>7 (inflammable liquid)</td>
<td>Major utilities</td>
</tr>
<tr>
<td>Hazardous characteristics</td>
<td>Inflammmable, its vapor may form explosive mixture with air. Explode when contacting with fire, large amount of heat. React chemically or combust when contacting with oxidizer. The heated container may explode. Its vapor is heavier than air, may travel some distance to a source of ignition and flash back. combustion (decomposition) product: carbon monoxide, carbon dioxide.</td>
<td></td>
</tr>
<tr>
<td>Toxicity</td>
<td>Toxicity: moderately toxic</td>
<td>Acute toxicity: LD₅₀5628mg/kg(rat, oral): 15800mg/kg(rabbit, percutaneous);</td>
</tr>
</tbody>
</table>
### Health hazard

| LC₅₀ | 8277mg/kg, 4h (rat inhalation); human being, oral 5~10ml, incubation period 8~36h, cause come; human being, oral 15ml, retinitis or even blindness within 48h; human being, oral: 30~100ml serious damage to central nervous system, faint breath or even death. Subacute and chronic toxicity: rat inhalation 50mg/m³, 12h/d, three months, damage to mucosa of trachea and bronchia, dystrophia of cerebral cortex cells within 8-10weeks. Mutagenicity: microorganism mutagenicity: Saccharomyces cerevisiae 12pph. DNA restrain: lymphocyte of human beings 300mmol/L. Reproduction toxicity: rat, oral minimum poisoning concentration (TDL₀): 7500mg/kg (pregnant 7~19 day), impose impact on behavior of baby mouse. Rat inhalation minimum toxic concentration (TCL₀): 20000ppm (7h), (pregnant 1~22d), cause abnormal development of muscle, ossature, cardiovascular system and urinary system. |

### Invasion ways

Inhalation, ingestion, percutaneous absorption. Health hazard: narcotism to central nervous system; special selection of optic nerve and retina, cause pathological changes; may cause metabolic acidosis. Acute poisoning: short time and large mount inhalation may be slightly irritative to eye and upper respiratory tract (gastrointestinal tract irritation if inhalation); after a period of incubation period, it may cause headache, dizziness, lacking in strength, giddiness, drunkenness, clouding of consciousness, delirium or coma. Pathological changes in optic nerve and retina, even blindness in serious cases. In case of metabolic acidosis, decline of Carbon Dioxide Combining Power and breath acceleration may happen. Chronic impact: neurasthenic syndrome, vegetative nerve functional disturbance, irritation of mucosa, blindness. Skin may appear situation of scaling, dermatitis, etc. |

### Emergency response to leakage

Evacuate people from affected area to safe area, and insulate affected area to limit entry and exit. Cut off fire source. Emergency response people are suggested to ware positive pressure respirator and gas protection clothes. Do not directly contact leaked substance. Cut off leakage source to prevent it from entering the limited space such as kennel and drainage channel. Small leakage: absorb with sand or other non-flammable material. Or wash the exposed area with large amount of water, and emit diluted water to waste water system. Large leakage: construct closure or pit, covered with foam to reduce the harm of its vapor. Transfer to tank car or special container with explosion-prevention pump. Collect for recycling or send to waste treatment area. |

### Protection measure

Respiratory system protection: when it is possible to contact its powder, it is suggested to wear filter gas mask (half mask). It is suggested to wear respirator in case of emergency response or escape. Eye protection: wear chemical safety glasses. Body protection: wear anti-static working clothes. Hand protection: wear rubber glove. Others: smoking, eating and drinking is prohibited at working site. Take a shower and change clothes after work. Conduct physical checking after taking position and
Skin exposure: Take off polluted clothes and immediately wash the exposed area with soup water or clean water.
Eye exposure: Immediately lift the eye lip and eyes must be flushed with running water or normal saline solution. Rush to the hospital.
Inhalation exposure: Remove victims to fresh air. Keep respiratory tract unobstructed; If breathing is labored, administer oxygen support. If not breathing, provide artificial respiration. Rush to the hospital.
Ingestion exposure: Drink sufficient lukewarm water, induce vomiting, and wash stomach with clean water of 1% sodium thiosulfate. Rush to the hospital.
Fire-fighting method: move the container from fire field to blank area. Spray water to maintain cool of container and until fire distinguish. If container change air or sound is heard from safety pressure release device, people must leave.
Fire extinguishing agent: alcohol resistant foam, dry powder, carbon dioxide, and sand.

Shipped with tank truck. Stored in tank in factory with storage quantity of 10t.

The maximum allowable concentration in air of workshop is (50mg/m³)
The maximum allowable concentration in air of residential area is (one time value: 3.00mg/m³, daily average value 1.00mg/m³)

<table>
<thead>
<tr>
<th>Table 4-1.4 Physicochemical property and hazard of methane</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nature</strong></td>
</tr>
<tr>
<td>CAS NUMBER</td>
</tr>
<tr>
<td>Chinese name</td>
</tr>
<tr>
<td>English name</td>
</tr>
<tr>
<td>Other name</td>
</tr>
<tr>
<td>Molecular formula</td>
</tr>
<tr>
<td>Appearance and property</td>
</tr>
<tr>
<td>Molecular weight</td>
</tr>
<tr>
<td>Vapor pressure</td>
</tr>
<tr>
<td>Flashing point:</td>
</tr>
<tr>
<td>Melting point</td>
</tr>
<tr>
<td>Boiling point:</td>
</tr>
<tr>
<td>Solubility</td>
</tr>
<tr>
<td>density</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>Hazard label</td>
</tr>
</tbody>
</table>

**Hazardous characteristics**

Hazardous characteristics: inflammable, may form explosive mixture with air. Explode with heat or fire. React violently with bromine oxide, chlorine, hypochlorous acid, nitrogen trifluoride, liquid oxygen, oxygen difluoride and other strong oxidizer.

Combustion (decomposition) product: carbon monoxide, carbon dioxide.

**Toxicity**

Toxicity: Slightly toxic. Safe diffusion into air is allowed or used as fuel. Purely suffocate. In case of high concentration, may cause poisoning by oxygen deficit and suffocate. If the content in air reaches 25~30%, headache, speed up breathe, dyslexia.

Acute toxicity: mouse, inhalation 42% concentration × 60 minutes, narcotism; rabbit: inhalation 42% concentration × 60 minutes, narcotism.

**Health hazard**

Invasion ways: inhalation.

Health hazard: methane is not toxic to human being. But if the concentration is too high, it will cause the reduction of oxygen content and leading to suffocate. If methane content in air reaches 25%-30%, it may cause headache, dizziness, lack of strength, attention-deficiency disorder, breath and cardio acceleration, dystaxia. If not leave, it may cause death because of suffocate. Contact the liquid of this product may cause cold injury.

**Emergency response to leakage**

Evacuate people from affected area to upwind area, and insulate affected area to strictly limit entry and exit. Cut off fire source. Emergency response people are suggested to wear positive pressure respirator and Protecting suit. Cut off leakage source. Reasonable ventilation to speed up diffusion. Spray vaporic water to dilute and dissolve it. Construct closure or pit, to collect the large amount of waste water. If possible, send the leaked gas to black space with fan and equip with proper sprayer for combustion. Move the leaked container to black space and pay attention to ventilation. Leaking container shall be treated, repaired and checked before use again.

**Protection measure**

Respiratory system protection: no special protection is needed generally. It is suggested that contained filter gas mask (half mask) is worn under special conditions.

Eye protection: no special protection is needed generally. Wear safety glasses in case of high concentration.

Body protection: wear anti-static working clothes.

Hand protection: wear common protecting gloves.

Others: smoking is prohibited strictly. Avoid longtime and repeat contact. Working in tank, limited room and other high concentration area, must guarded with other people.

**First aid measure**

Skin exposure: Rush to the hospital in case of cold injury.

Inhalation exposure: Remove victims to fresh air. Keep respiratory tract unobstructed; If breathing is labored, administer oxygen support. If not breathing, provide artificial respiration. Rush to the hospital.

Fire-fighting method: cut off gas source. If gas source can not be cut off immediately, the burning gas is not allowed to distinguish. Spray water to cooling container. If possible, move the container from fire field to open area. Fire-fighter: vaporific water, foam, carbon dioxide,
<table>
<thead>
<tr>
<th>Nature</th>
<th>GB number</th>
<th>51001</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS NUMBER</td>
<td>7722-84-1</td>
<td></td>
</tr>
<tr>
<td>Chinese name</td>
<td>hydrogen peroxide</td>
<td></td>
</tr>
<tr>
<td>English name</td>
<td>hydrogen peroxide</td>
<td></td>
</tr>
<tr>
<td>Other name</td>
<td>双氧水</td>
<td>hydrogen peroxide</td>
</tr>
<tr>
<td>Molecular formula</td>
<td>H2O2</td>
<td></td>
</tr>
<tr>
<td>Appearance and property</td>
<td>colorless and transparent liquid, with slight special smell</td>
<td></td>
</tr>
<tr>
<td>Molecular weight</td>
<td>43.01</td>
<td></td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>0.13kPa(15.3)</td>
<td></td>
</tr>
<tr>
<td>Melting point</td>
<td>-2 /without water, boiling point: 158 /without water</td>
<td></td>
</tr>
<tr>
<td>solubility</td>
<td>soluble in water alcohol, ether, but not in benzene and petroleum ether</td>
<td></td>
</tr>
<tr>
<td>density</td>
<td>relative density(water=1)1.46(without water)</td>
<td></td>
</tr>
<tr>
<td>stability</td>
<td>Stable</td>
<td></td>
</tr>
<tr>
<td>Hazard label</td>
<td>11(oxidizer), 20(corrosive)</td>
<td></td>
</tr>
<tr>
<td>Major utilities</td>
<td>Used for bleaching, medicine and as analysis agent</td>
<td></td>
</tr>
</tbody>
</table>

**Table 4-1.5 Physicochemical property and hazard of hydrogen peroxide**

**Hazardous characteristics**

Hazardous characteristics: explosive strong oxidizer. Hydrogen peroxide itself is not inflammable, but may generate large heat and gas after reaction with inflammable substance and leading to fire and explosion. Hydrogen peroxide is most stable when the pH value is 3.5～4.5. It is easy to decompose in alkali solution, or meet with strong light, especially short wave ray. It began to decompose after heated to or above 100 °C. It can form explosive mixture with many organics such as sugar, starch, alcohol, and petroleum. It can explode with shock, heat and electric spark. Hydrogen peroxide can quickly decompose after contact with inorganic compound or foreigners, leading to explosion, sending out large heat, oxygen and water steam. Most heavy metal (such as Cu, Ag, Pb, Hg, Zn, Co, Ni, Cr, Mn) and their oxide and salt are active catalyze, dust, cigarette ash, carbon powder, rust can also speed up its decomposition. Hydrogen peroxide with the concentration over 74% will cause **气相爆炸** in sealed container if...
there is proper fire source or temperature. Combustion (decomposition) product: oxygen, water.

<table>
<thead>
<tr>
<th>Toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity: LD₅₀4060mg/kg(rat, percutaneous); LC₅₀2000mg/m³, 4h(rat, inhalation) mutagenicity: microorganism mutagenicity: salmonella typhimurium 10µL/vessel; escherichia 5ppm. Sister chromatid exchange: hamster lung 353µmol/L. carcinogenicity: IARC carcinogenicity comment: animal probable positive.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invasion ways: inhalation, ingestion. Health hazard: inhalation of its vapor or smoke is irritative to respiratory tract. Eye Directly contacting with its liquid may cause irreversible damage to eyesight and even blindness. Swallow may cause stomachache, chest ache, breath difficulty, vomiting, temporary dyskinesia or sensory disturbance, temperature raise. In special cases, it may cause vision disturbance, epileptic spasm, and paresis.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency response to leakage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evacuate people from affected area to safe area, and insulate affected area to strictly limit entry and exit. Emergency response people are suggested to ware positive pressure respirator and acid-proofing and alkali-proofing working clothes working suit. Cut off leakage source to prevent it from entering the limited space such as kennel and drainage channel. Small leakage: absorb with sand, vermiculite, or other inert material. Or wash the exposed area with large amount of water, and emit diluted water to waste water system. Large leakage: construct closure or pit, Spray water to cool and dilute vapor. Protect on site people and dilute leaked substance to non-inflammable substance. Transfer to tank car or special container with pump. Collect for recycling or send to waste treatment area. Waste water disposal method: The waste liquids are diluted and decomposite to release oxygen. After complete decomposition, wash the water liquid to kennel.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protection measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory system protection: when it is possible to contact its vapor or smoke, contained filter gas protection mask (full mask) shall be worn. Eye protection: protected in respiratory system protection Body protection: wear polythene gas protection clothes Hand protection: wear neoprene rubber gloves Others: smoking, eating and drinking is prohibited at working site. Take a shower and change clothes after work. Pay attention to personal cleaning.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>First aid measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin exposure: take off polluted clothes and immediately wash the exposed area with large amount of running water. Eye exposure: immediately lift the eye lip and eyes must be flushed with running water or normal saline solution for at least 15 minutes. Rush to the hospital. Inhalation exposure: Remove victims to fresh air,. Keep respiratory tractunobstructed; If breathing is labored, administer oxygen support. If not breathing, provide artificial respiration. Rush to the hospital. Ingestion exposure: drink enough lukewarm water, induce vomiting. Rush to the hospital. Fire-fighting method: fire-fighting people shall wear the whole body fire-proof gas protection clothes. Move the container from fire field to blank area. Spray water to maintain cool of container and until fire distinguish. If container change air or sound is heard from safety pressure release device, people must leave. Fire-fighter: water, vaporific water, dry powder, sand.</td>
</tr>
<tr>
<td>Package, storage and transportation</td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Environment standard</td>
</tr>
</tbody>
</table>

Table 4-1.6 Physicochemical property and hazard of chlorine dioxide

<table>
<thead>
<tr>
<th>Nature</th>
<th>GB number</th>
<th>CAS NUMBER 10049-04-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese name</td>
<td>chlorine dioxide</td>
<td></td>
</tr>
<tr>
<td>English name</td>
<td>Chlorine dioxide; Chlorine oxide</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>physicochemical property</th>
<th>Molecular formula ClO₂</th>
<th>Appearance and property</th>
<th>Yellow red gas with irritation smell, able to diffuse along ground. The solution with concentration lower than 10% is used and restored.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular weight</td>
<td>67.45</td>
<td>Vapor pressure</td>
<td>9.9/97.2kPa(explosion)</td>
</tr>
<tr>
<td>Melting point</td>
<td>-59</td>
<td>Solubility</td>
<td>Not soluble in water</td>
</tr>
<tr>
<td>Density</td>
<td>relative density(water=1)3.09(11); relative density(air=1)2.3</td>
<td>Stability</td>
<td>unstable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hazard label</th>
<th>Major utilities</th>
<th>Used as bleacher, deodorant and oxidizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous characteristics</td>
<td>hazardous characteristics: strong oxidizing property. Can react explosively with many chemicals. sensitive to heat, shock, hit, and friction and easy to decompose for explosion. combustion (decomposition) product: hydrogen chloride</td>
<td></td>
</tr>
<tr>
<td>Toxicity</td>
<td>No record</td>
<td></td>
</tr>
<tr>
<td>Health hazard</td>
<td>invasion ways: inhalation, ingestion. Health hazard: strong irritativeness. Will be irritative to eye and respiratory tract after contact. High concentration of inhalation will cause pulmonary edema and leading to death. The gas with concentration causing serious damage to respiratory tract may be irritative to skin. Skin exposure with or swallow of high concentration solution may be strongly irritative and corrosive. Longtime contact may lead to chronic tracheobronchitis.</td>
<td></td>
</tr>
<tr>
<td>Emergency response to leakage</td>
<td>Evacuate people from affected area to upwind area, and insulate affected area until gas is sent over. Emergency response people are suggested to ware positive pressure contained respirator and Protecting suit. Avoid contact of leaked substance with inflammable substance (wood, paper and oil). Cut off gas source. Spray vaporic water to dilute and dissolve it. Extract (from indoor) or strong ventilation (to outdoor). Leaked container can</td>
<td></td>
</tr>
<tr>
<td>Protection measure</td>
<td>not be used again, and the left gas shall be eliminated with technical treatment.</td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Respiratory system protection:</td>
<td>When the concentration is high in air, gas protection mask shall be worn. It is suggested to wear positive pressure contained respirator in case of emergency response or evacuation.</td>
<td></td>
</tr>
<tr>
<td>Eye protection:</td>
<td>wear chemical safety glasses</td>
<td></td>
</tr>
<tr>
<td>Body protection:</td>
<td>Wear anticorrosive working clothes.</td>
<td></td>
</tr>
<tr>
<td>Hand protection:</td>
<td>when it is possible to contact this substance, wear chemical preventing gloves if its possible to contact toxics.</td>
<td></td>
</tr>
<tr>
<td>Others:</td>
<td>smoking is prohibited at working site. Take a shower and change clothes after work. Maintain good sanitary habit.</td>
<td></td>
</tr>
<tr>
<td>Skin exposure:</td>
<td>Take off polluted clothes and immediately wash the exposed area with large amount of running water for at least 15 minutes. Or wash the exposed area with 2% sodium bicarbonate solution. Rush to the hospital.</td>
<td></td>
</tr>
<tr>
<td>Eye exposure:</td>
<td>Immediately lift the eye lip and eyes must be flushed with running water or normal saline solution for at least 15 minutes. Rush to the hospital.</td>
<td></td>
</tr>
<tr>
<td>Inhalation exposure:</td>
<td>Remove victims to fresh air. Keep respiratory tract unobstructed; If breathing is labored, administer oxygen support. If not breathing, provide artificial respiration. Rush to the hospital.</td>
<td></td>
</tr>
<tr>
<td>Ingestion exposure:</td>
<td>The person swallowing it by mistake shall rinse the mouth, drink eat or egg white. Rush to the hospital immediately. Fire-fighting method: cut off gas source. Spray water to cooling container. If possible, move the container from fire field to open area.</td>
<td></td>
</tr>
<tr>
<td>Self-generated and self-used chlorine dioxide is absorbed with water. Stored temporarily in tank with the storage volume of 10m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment al standard</td>
<td>US, work shop sanitary standard 0.3mg/m³ The Soviet Union(1975) The maximum allowable concentration in water is 0.4mg/L</td>
<td></td>
</tr>
</tbody>
</table>

### 4.2 Environmental risk mitigation measures

#### 4.2.1 Protection measures on general layout and construction design

General layout and construction design shall consider relevant prevention measures: the building’s seismic intensity is set up at 7 degree, the buildings fire-resistance rate shall be not lower than level II, and the plants in factory are mostly those containing much water. Green hedge or thick bushes shall not be planted near production device and road (especially fire-fighting road), the green plan shall not influence fire-fighting operation. The distance between buildings within each area and between areas shall be determined according to fire prevention and fire-fighting requirement. Safety distance between raw material and accessories warehouse and offices, and power distribution room shall be set, according to “Code of Design on Building Fire Protection and Prevention” (GBJ16-87).
4.2.2 Risk prevention measures during transportation process

The transportation of hazardous substance shall be transported by qualified transportation agency, so the transportation shall be careful to ensure safety. In addition, following problems shall be focused.

(1) Tank car with good safety performance specially design for chemical transportation shall be used. The vehicles shall be equipped with necessary fire-fighting equipment and material to prevent accident. Transportation lines and transportation time shall be rationally planned to avoid area with large population and residential area. In addition, the driver of tank car shall receive strict training and hold qualification certificate.

(2) Specific vehicle and people shall be designated for transportation of hazardous substance. Designation of vehicles is to fix the vehicles for transporting hazardous substance; specific vehicles shall be used for specific purpose. The containers (including tank car) used to contain hazardous substance can not be used to contain other substance (especially food). Vehicles must be specially designated, two-wheel motors or three wheel motors shall not be used to transport hazardous substance even incase of urgent task and limited vehicles. Designation of people is to fix the people in charge of management, driving and loading and downloading, which ensures that the transportation of hazardous substance is conducted by professional people from starting to the end and ensure the safety of hazardous substance transportation in people.

(3) Transported hazardous substance must bear hazardous substance label and correctly according to “Labels for packages of dangerous goods” (GB190-90) on its external package. Chemical with multiple hazardous characteristics such as inflammability and toxicity shall stick to several package labels according to different hazardous characteristics so that several prevention and protection measure can be taken in case of emergency.

(4) In case of emergency during the transportation of hazardous substance, in the mean time of taking emergency response, the case shall be immediately reported to department of public security and environmental protection. The public shall be evacuated to prevent case from expanding. Assist staffs from transportation, public security and fire-fighting departments to rescue the injured and properties so as to minimize loss.

(5) Drivers and escorters transporting toxic and corrosive substance must check whether the gas protection and protection articles are brought completely and in shelf period. They shall take treatment measure actively in case that leakage is found during transportation to prevent case from expanding. After cutting off leakage source, the case shall be reported to department of public security and other departments in time. If the case is out of their control, it shall be immediately reported to department of public security and environmental protection for assistance.

4.2.3 Risk prevention measures during transportation

“Ban on safe production of ministry of chemical industry” (41 bans) issued by ministry of chemical industry shall be strictly followed during production process. The transmission pipeline must in good condition, with good connection and no leakage during production process. The leftovers in pipeline must be cleared regularly to eliminate blocking. Material source and power must be cut off when repairing pipeline and guarded by professionals. Safety management must be strengthened.
during production process to improve accident prevention measures. Emergency pollution accidents, especially major accidents of hazardous chemicals will cause serious danger to life and health of people at site, and direct or indirect economic loss, as well as social unstable factors and damage of ecological environment. Therefore, the good prevention of Emergency pollution accidents, improve the capability to respond to and treat pollution accidents plays an important role. It is suggested the following tasks shall be focused.

(1) Strictly control the project design and construction
   Project design includes the design of techniques and general layout. Reasonable design will improve working conditions and eliminate major accidents potentials. Strictly control the construction quality and equipment arrangement, commissioning quality and inspection and acceptance checking when project completed. During the design of techniques, automatic, mechanical and remote sensing operation shall be used for extremely hazardous and harmful and toxic work, and attention shall be paid to shield. The selected equipment shall meet the requirement in “General rules for designing the production facilities in accordance with safety and health requirements” and professional harm treatment and auxiliary safety facility shall be considered. The general layout design shall pay attention to reasonable function zoning. Certain protection belt and green belt shall be set and strictly follow safety specifications. According to the features of this project, this assessment suggests that the following safety protection measures shall be considered in future design, construction and operation process to avoid accidents.

(2) Strictly carry out national and industrial regulations, standard and specification concerning working safety and health;

(3) Arrangement of equipment in factory shall strictly carry out national regulations and specifications concerning fire prevention and explosion prevention. The sufficient safety distance between equipment shall be ensured and fire-fighting road shall be design according to requirements;

(4) Equipment with advances technology and reliable safety shall be applied as much as possible and necessary safety and health facilities shall be set in workshops according to related national specifications;

(5) Reliable sealing technology shall be applied in equipment, pipelines and 管件 to ensure that storage and reaction process are conducted in sealed situation, thus to prevent material leakage.

(6) Hazardous zones are set in factory according to related specification on zoning. Different explosion prevention level shall be applied on electrical equipments installed in hazardous zones according to corresponding zone level. All electrical equipments shall be grounded.

(7) Special telephone on fire alarm shall be set between central control room and fire-fighting office to ensure communication in emergency situation;

(8) Accident cabinet and first-aid material, and prevention and first-aid articles such as protection mask, eye protection glasses and rubber glove, earplug, shall be
(9) For the position of device where toxic substance leakage is easy to happen, facilities such as first-aid washing equipment, eye wash fountain, and safety shower sprayer shall be prepared.

4.2.4 Risk prevention measures during storage

(1) Major factory buildings shall be open in order to accelerate ventilation. The model selection and procure of all technique equipment such as (valve, flange and pump) shall be control in quality and strengthen repair and maintenance. Eliminate the situation of leaking during production. Electrical equipment shall select those will good corrosion resistance, explosion prevention and power insulation; prevent electrical spark and static electricity, good grounding.

(2) Before loading and downloading hazardous chemicals, preparation work shall be done, such as understanding substance property, check whether loading and downloading tools is fixed. Unfixed tools shall be replaced or repaired. Tools polluted by inflammable, organic substance, acid and alkali must be cleaned before use.

(3) Operator shall wear corresponding prevention tools, including working suit, rubber apron, rubber cap, rubber gloves, rubber boots, toxicity prevention mask, gas filter mask, yarn mask, yarn gloves, eye protecting glasses. Specially designated people shall check whether the tools are in good condition, whether the wearing is suitable before operation. Tools shall be cleaned or disinfected after operation and stored in special cabinet.

(4) Hazardous chemicals fallen on ground and vehicles shall be cleared in time. For inflammable and explosive substance shall be cleared after soaking by water with soft article.

(5) No drinking or smoking during loading and downloading hazardous chemicals. After operation, wash hands, face, rinse mouth or take shower in time according to work situation and property of hazardous chemicals. In case of nausea, dizziness and other poisoning cases, the people shall immediately be sent to area with fresh air for rest, taken off working clothes and prevention articles. The skin polluted shall be washed. In serious cases, the people shall be sent to hospital for treatment.

(6) Explosive prevention or sealed safe lighting shall be used in operation at night. Anti-skidding measures shall be taken in operation in rain, snow and ice conditions.

(7) Clean water alkali agent (such as lime, sodium carbonate) shall be prepared at site for first-aid use.

(8) Reduce contact of human body with substance package. Wash hand and face with soap or water or take a shower after operation before eating and drinking. Prevention tool and other tool shall be carefully washes.

(9) Emergency acid pump and emergency pool shall be set beside storage tanks and emergency material such as lime and sand shall be prepared.

4.2.5 Emergency response measure

(1) Leakage of sulfuric acid

① Leakage of sulfuric acid: Evacuate people from affected area to safe area, and
insulate affected area to limit entry and exit. Emergency response people are suggested to wear positive pressure respirator and acid-proofing working clothes. Do not directly contact leaked substance. Cut off leakage source to prevent it from entering the limited space such as kennel and drainage channel. Small leakage: absorb with sand or other non-flammable material. Or wash the exposed area with large amount of water, and emit diluted water to waste water system. Large leakage: construct closure or pit, covered with foam to reduce the harm of its vapor. Transfer to tank car or special container with explosion-prevention pump. Collect for recycling or send to waste treatment area.

2 Fire-fighting: in case of fire happened in area with sulfuric acid, vaporific water, foam, and carbon dioxide, dry powder can be used for fire-fighting. Wear protection clothes and tools for fire-fighting.

3 First aid: clothes with sulfuric acid shall be taken off immediately. Wash exposed skin area. For serious burn, sufferer shall lie on his back and be kept warm. No ointment drug is allowed to use without permission of doctor. Wash the eye splashed in sulfuric acid with large amount of water for at least 15 min and drop two or three drops of 0.5% Bupivacaine or other local anesthetic into eye. The victim with sulfuric acid into mouth shall not vomit. Do not put anything to the mouth of people with coma, after waken up, drinking large amount of water for wash and drinking milk mixed with egg white. In serious case, send the suffered to hospital for treatment.

(2) Leakage of methyl alcohol

1 In case of large leakage, all valves shall be cut off in shortest time. Find the leakage point. Try any possible method to stop leakage and report to workshop and relevant departments such as environmental protection.

2 In case the leaked methyl alcohol causes fire and the fire is small at first, leakage point shall be cut off quickly and evacuate people. Dial 119, 118 to contact with fire-fighting and gas protection department for fire-fighting assistance.

3 If methyl alcohol is leaked in large amount, but no fire is caused, this situation is more dangerous, which need to be treated calmly. Emergency response people shall were required working clothes (anti-static clothes) to cut off all valves connecting with outside. Any fire-related operation and high operation around shall be stopped immediately and evacuate people. Block roads and wash the leaked methyl alcohol with large amount of water.

4 In case of fire and explosion, alarm as soon as possible, conduct treatment in order and divide the work clearly.

5 Fire brigade shall come to the accident site at the first time. For burned tanks, spray water to reduce temperature. If necessary, foam fire-fighting tank shall be opened to distinguish the open fire in tanks. Contact with the local professional fire-fighting teams to participate in fire-fighting. Control the roads in factory and evacuate people and vehicles.

6 Production department (control room) is responsible for contacting production in case of accident, ordering section without accident to stop production, ensuring gas and steam supply of accident field, contacting the power supply and cutting
off of accident area.

⑦ Environmental protection department is responsible for coordinating accident rescue, collecting original accident data, analyzing accident condition and possibility of expansion, as well as reporting work to ensure busy and ordered rescue.

4.3 Emergency response plan

4.3.1 Structure of emergency response organization
Pumiao Papermaking Factory, Nanning Sugar Manufacturing CO., LTD establishes “Major accident emergency response organization” and set up leading group of emergency response organization.
The management member of emergency response organization is as following:
General Director: one person, factory manager of Pumiao Papermaking Factory, Nanning Sugar Manufacturing CO., LTD
Vice General Director: two people, vice factory manager of Pumiao Papermaking Factory, Nanning Sugar Manufacturing CO., LTD
Member of leading group: five people, the head of GM administrative office, department of technology and technical development, department of finance, department transportation and sales and department of quality control.
Command: located at GM administrative office and its daily work is administrated by GM administrative office.

4.3.2 Responsibilities and tasks of emergency response organization
The main responsibilities of “Major accident emergency response organization” and its departments are:

(1) Leading group
Responsible for the formulation and revision of emergency response plan
Responsible for organizing emergency response team, and excise
Responsible for supervising the preparation of environmental accident prevention measures and emergency response
Responsible for organizing emergency response team to conduct response action
Responsible for sending signals of emergency response order and elimination of order
Responsible for reporting pollution accident to governmental department and ambient enterprises and public, and inviting assistance if necessary
Responsible for organizing accident investigation and summarize the experience and lessons of emergency response work

(2) Leaders
General Director: Responsible for the organization and command of emergency response work. In case of unavailability of General Director, the work shall be conducted by one Vice General Director designated by General Director.
Vice General Director: Responsible for assisting the work of General Director.
(3) GM administrative office
It is responsible for the daily work of emergency response organization. In case of accident, it is responsible for alarming, road control, and maintaining order at site and transportation command.

(4) Department of quality control
Responsible for environmental monitoring at accident site and in diffusion scope of hazardous substance and reporting to command on the results. Responsible for assisting General Director to treat the accident in at accident site and in diffusion scope of hazardous substance and situation report.

(5) Department of technology and technical development
Responsible for turning on and off of production equipment in case of accident. Responsible for communication at accident site.

(6) Department transportation and sales
Responsible for equipment urgent repair and installation, ensuring power supply, electrical equipment repair and insurance, supply and transportation to emergency response materials on time.

4.3.3 Focus of environmental emergency response plan
The focus of environmental emergency response plan shall be: methyl alcohol storage area, sulfuric acid storage area, storage and use position of hazard installation, and the whole process of hazardous chemical transportation.

4.3.4 Report system of environmental accident
General accidents shall be immediately reported to production control room who must organize accident rescue, analyze accident causes within 24 h after accident and report to higher leaders.
The major and huge pollution accident must be reported to General Director and environmental pollution accident reporting work must be conducted. Reporting of environmental pollution accident shall follow the specifications in “Temporary methods on reporting environmental pollution and damage accident” issued by SEPA. Leader of “Major accident emergency response organization” shall first report the accident to local environmental protection department (Nanning Environmental Protection Bureau and Yongning District Environmental Protection bureau), who will report to Guangxin Environmental Protection Bureau on the pollution situation and the treatment process.

4.3.5 Disposal of pollutants in environmental pollution accident
(1) Disposal of pollutants from equipment unit: when leakage is happened at the position (section) of equipment unit, feeding shall be stopped immediately. The
accident cause shall be checked to eliminate failure. In case of leakage cause be equipment damage, the leakage point shall be sealed immediately. Ventilate reasonably to speed up diffusion. Uncontrolled situation shall be reported to control room to start emergency response plan, organize emergency response team for rescue and evacuate irrelevant people.

(2) Treatment of leakage at methyl alcohol storage area: Evacuate people from affected area to safe area, and insulate affected area to limit entry and exit. The scope of insulation area shall be determined according to monitoring results and potential damage. Generally, the preliminary insulation radius for small leakage is 150m and that of large leakage is 450 m. Emergency response people are suggested to ware positive pressure contained respirator and gas protection clothes. Cut off leakage source. Removal or eliminate combustible and inflammable substance from leakage site. It is prohibited to use tool with oil on to prevent explosion accident. Prevent leaked methyl alcohol from entering drainage channel. Ventilate reasonably to speed up diffusion. Construct closure or pit to collect the large amount of waste water.

(3) Treatment of leakage at sulfuric acid storage area: for small leakage of sulfuric acid, close the valves and absorb with sand; for large leakage, sulfuric acid shall be led to emergency pool for collection and recycled or neutralized.

In addition to above measures, corresponding measure shall be taken according to the accident situation to minimize the accident impact.

4.3.6 Emergency environmental monitoring of accident-polluted area and information release

Department of quality control shall assist agencies of public security, fire-fighting, local environmental monitoring to conduct site investigation to determine the accident time, avenue, cause, types and properties of pollutants, and conduct environmental monitoring of accident polluted area and pollution tract, assess the pollution scope and impact degree of polluted area to provide basis for commanding department to make decision.

According to monitoring data and site investigation, Emergency environmental monitoring of accident polluted area shall be reported to local government to suggest set pollution alarm area. Local environmental protection will reform related department to decide whether to release alarm. In accordance with “Scope of state secret on environmental protection” by National Administration for the Protection of State Secrets and SEPA and “management methods on news release of environmental pollution and damage accidents” by SEPA the information about emergency accident shall be released by news media of accident treatment area. No agency and individual is allowed to disclose accident information without permission.

The focus of monitoring is emergency monitoring of air pollution.

(1) Emergency monitoring of air

Air emergency monitoring points are set near polluted area and nearby residential area. The focus of Air emergency monitoring points is at the area downwind which may be impacted. If emergency monitoring on air pollution show the emergency monitoring
factors at monitoring point exceed requirements in relevant standard, the public shall be evacuated.

C. monitoring time
Twice a day from the beginning to the end of pollution accident.

D. Sampling and monitoring analysis method
Following relevant national specifications and standards, meeting requirement for data validation.

(2) Emergency monitoring of surface water
If accident pollution involves surface water, monitoring to water shall be conducted according to specific situation. Pay attention to water safety, inform the public to stop using water before the elimination of danger.

4.3.7 Emergency response guarantee measures
(1) Fund guarantee: Pumiao Papermaking Factory, Nanning Sugar Manufacturing CO., LTD shall prepare certain pollution accident emergency fund specially used to purchase emergency response facilities, equipment, tools, daily propaganda, training and exercise as the guarantee of environmental pollution accident emergency fund.

(2) Equipment guarantee: factory shall prepare certain articles of emergency response and relevant equipment of fire-fighting, and maintain those article and equipment to provide equipment guarantee for environmental accident emergency response.

(3) Communication guarantee and HR guarantee: ensure the communication of the whole factory. The member of major accident emergency response organization shall be equipped with corresponding communication tool and maintain communication of 24 h a day to ensure that the emergency response people and rescue equipment and material will come on time.

(4) Propaganda, training and exercise: strengthen the propaganda of pollution accident prevention and invite local fire-fighting department to offer direction and training to the member of leading group of emergency response organization and general staff. Distribute “environmental emergency response manual” and organize an emergency response excise once half a year. Conduct scientific propaganda, education and information release to the public to improve their awareness of self-protection and self-rescue and mutual rescue.

4.3.8 Treatment of pollution accident
After environmental emergency is controlled, the following treatment shall be conducted:

(1) Investigate the cause of environmental pollution accident, describe the basic situation of pollution accident in quality and quantity, assess the whole accident, for serious consequence cause by neglect, relevant people shall take corresponding responsibility.

(2) Collect related data of record, including accident nature, parameters and
consequence, decision record, information analysis. Summarize the work to provide basis for commanding department to make decision.

(3) Injured staff or public shall be rescued; relevant compensation plan shall be stipulated.

(4) The damaged facilities and equipment shall be repaired and began production when it is sure that facilities and equipment can work normally.

5. Improvement of community relationship

5.1 major issued concerned by community

(1) Enterprise shall invest sufficient fund in environmental protection to do well in environmental protection work, and ensure all pollutants are emitted after meeting relevant requirements, especial that the prevention and treatment measure on waste water from paper makings shall be strengthened;

(2) Local environmental protection departments shall strengthen to enterprise and require them to carry out all environmental protection measure during operation.

(3) All production of enterprise shall be based on the condition of no harm to human health and no reduction to environmental quality. If human health or local environmental quality is damaged, local government, environmental protection bureau and the enterprise shall take effective measure to minimize the adverse impact.

5.2 Community relationship improvement plan

(1) Enterprise improve propaganda, and publish the project situation and applied environmental protection measure to the public to eliminate the worry of the public on “three waste”, gain the support of the public, and coordination relationship with the public.

(2) Implement the environmental protection measure proposed in this statement; guarantee the pollution prevention and treatment fund. After put into operation, each environmental protection measure work normally and each pollutants treatment meets relevant requirements.

(3) Local environmental protection department is suggested to conducted long-term supervision to ensure that each environmental protection measure work normally and each pollutants treatment meets relevant requirements.

6. Responsibility of environmental management

6.1 Management organizations and responsibility distribution

6.1.1 Management organizations and responsibility distribution during project construction period

To strengthen environmental protection management of this technology upgrade programme and minimize the adverse impact of the project construction on environment, Pumiao Papermaking Factory set up a environmental protection management leading group, with the factory manger taking the position of group leader, with vice factory manager as vice group leader. There are five sub-groups
under this leading group including: production and environmental protection center, supply and sales department, labor and HR department, and project construction unit. Their respect responsibilities are as following:

1. Group leader is responsible for managing all environmental protection work, implement national and local policy, guidelines, specifications and rules concerning environmental protection, and propose environmental protection requirements.

2. Vice Group leader is responsible for delivering environmental protection requirement from higher level, organizing, coordinating and carrying all environmental protection work, and for the management work of “three at the same time”.

3. Project team at factory level: responsible for environmental protection required in EIA, communication and cooperation with project construction unit, and implementing the environmental protection measures during construction period.

4. Project construction unit: responsible for organizing construction workers to implement environmental protection measures and environmental protection management system and emergency response plan.

5. Labor and HR department: responsible for training on environmental protection knowledge and technology.

6. Production and environmental protection center: responsible for stipulating system of environmental protection measures and management, supervising the implementation of above measures and system; monitoring environmental pollution situation during construction period; publicizing project construction and environmental protection situation, as well as receiving and resolving environmental complaints. There are one director, three vice directors, three technicians and one environmental supervisor in the production and environmental protection center. The environmental supervisor is responsible for environmental protection management of the whole factory. There is a environmental protection data room with specific staff responsible for the collection of environmental protection record. There is a separate laboratory at the waste water treatment station with one professional laboratorian responsible for analysis and monitoring of three wastes. Thus a complete environmental protection network is formed to enable the environmental protection of whole factory in a orderly and controlled management.

7. Department of finance: responsible for ensuring the fund for environmental protection is ready and in place.
6.1.2 Management organizations and responsibility distribution during project operation period

To strengthen enterprise’s internal environmental protection management, Pumiao Papermaking Factory set up a environmental protection management leading group, with the factory manager taking the position of group leader, with vice factory manager in charge of environmental protection as vice group leader, with the main member including head of environmental protection center, department of supplying and sales, department of finance, power workshop, material workshop, pulp smelt workshop, Soda recycling workshop and alcohol workshop. (Attached the chart of environmental protection management structure)

Environmental protection management leading group is responsible for the environmental protection work in the whole factory, formulate and implement environmental protection system as well the examination of waste water, waste gas and SW treatment facilities and environmental protection account table. If problems are found, it shall put forward the correction opinions directly to ensure normal operation of all environmental protection facilities, completion of relevant environmental protection account table, emission of waste water and waste gas after meeting relevant requirements, SW is treated properly.

The responsibilities of environmental protection management leading group are as following:

1. Group leader is responsible for managing all environmental protection work, implement national and local policy, guidelines, specifications and rules concerning environmental protection, and propose environmental protection requirements.
2. Vice Group leader is responsible for delivering environmental protection requirement from higher level, organizing, coordinating and carrying all environmental protection work, holding environmental protection work meeting regularly and finish emission reduction tasks issued by higher level.
3. Other group members shall conduct and finished its own work in accordance with “responsibilities on environmental protection of each department of Pumiao
6.2 Environmental supervision

6.2.1 Environmental management measures

1. Environmental management during construction period

(1) Competent department of project construction is responsible for the over work of environmental during construction period, including implementing environmental protection plan, examining regularly, accepting the supervision and direction of Guangxi environmental protection bureau.

(2) Arrange construction order and field setting according to the requirements of environmental protection department and environmental protection measures suggested in report.

(3) Manage the construction team to construct according to environmental protection requirement, and examine and supervise the environmental protection risk during construction period.

2. Environmental management during operation period

The environmental protection work during operation period shall be incorporated in the whole management work. Each link of management work shall pay attention to environmental protection, regularly check environmental protection work and accept the supervision and direction of Guangxi Environmental Protection bureau.
6.2.2 Environmental supervision measure

As of the inevitable environmental impacts during project construction and operation, technically feasible and operable environmental measures shall be stipulated and taken to minimize the adverse impact of the project during project construction and operation on society and environment. Refer to table 6.2-1 for environmental supervision plan and table 6.2-2 for environmental management plan.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Organization</th>
<th>Supervision content</th>
<th>Purpose of supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>feasibility study stage</td>
<td>Guangxi environmental protection bureau</td>
<td>Examining and approving environmental impact assessment statement</td>
<td>1. ensure complete assessment content, theme setting properly, and notable focus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. ensure all major potential problems were reflected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. ensure there are specific and reliable implementation plan for mitigating environmental impact</td>
</tr>
<tr>
<td>Design and construction stage</td>
<td>Guangxi environmental protection bureau, Nanning environmental protection bureau, Yongning environmental protection bureau, Pumiao Papermaking Factory, Nanning Sugar Manufacturing CO., LTD</td>
<td>1. Examining and approving the preliminary design of environmental protection</td>
<td>1. Ensure the feasible implementation of environmental protection measures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Examining whether the construction site meets the requirements of approval</td>
<td>2. Ensure the preparation of environmental protection investment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Examining whether investment in environmental protection is prepared</td>
<td>3. Ensure no water environment is polluted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Examining the household water drainage and treatment situation at construction site</td>
<td>4. Ensure environmental protection facilities can run when the project is put into operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Examining whether the soil and stone is disposed disorderly</td>
<td>5. Inspect and accept environmental protection facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Examining the implementation situation of “three the same time” of environmental protection facilities to determine the final deadline</td>
<td></td>
</tr>
</tbody>
</table>
7. Examining whether the environmental protection facilities meet the requirements in standard

Operation stage

Guangxi environmental protection bureau, Nanning environmental protection bureau, Yongning environmental protection bureau, Pumiao Papermaking Factory, Nanning Sugar Manufacturing CO., LTD

1. Examining the implementation of environmental protection measures in during operation period
2. Examining the implementation of environmental monitoring plan in during operation period
3. Determining the sensitive points needs further environmental protection measures
4. Examining whether the environmental quality in sensitive area meet the requirement of relevant standards

1. Implement environmental protection measures
2. Implement environmental monitoring plan
3. Strengthen environmental management, ensure the normal operation of environmental protection facilities, pollutants are emitted up to the standard
4. Ensure human health

Table 6.2-2 environmental management plan

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Potential impact</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dust</td>
<td>The excavation, construction and transportation of project may impose partial dust pollution to nearby environment</td>
<td>Spray water at the construction site and transportation lines, and increase water spraying times by 2 times in case of wind. Sealed transportation methods shall be applied.</td>
</tr>
<tr>
<td>2</td>
<td>Water pollutants</td>
<td>The waste water generated from the living and construction work of construction workers emitted directly to surface water may impact water quality of surface water</td>
<td>Waste water generated from the living and construction work of construction workers shall be led to waste water treatment system for treatment through Water leading channel set in construction area or used as sprayed water to prevent dust.</td>
</tr>
<tr>
<td>No.</td>
<td>Item</td>
<td>Potential impact</td>
<td>Mitigation measures</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>3</td>
<td>Noise</td>
<td>Noise generated by construction machine may impose pollution on nearby environment</td>
<td>Stipulate detailed construction plan and construct at day, equipment with high noise is prohibited during 12:00 to 14:00 at moon and from 22:00 to 6:00 at night, operator of high noise equipment shall wear personal noise-prevention devices.</td>
</tr>
<tr>
<td>4</td>
<td>Construction garbage</td>
<td>Waste soil and residue from excavation and landfill, and waste iron and painting barrel may impose pollution on nearby environment</td>
<td>Temporary garbage box shall be set at construction site to treatment garbage in classification. The recyclable part of garbage shall be recycled or sold out, un-recyclable part of garbage shall be transferred the area designated by municipal department</td>
</tr>
<tr>
<td>5</td>
<td>Water and soil loss</td>
<td>Part land exposed for excavation and landfill may cause water the soil loss in rain days</td>
<td>Compact and harden the land of excavation and landfill. Trees shall be planted in time to recover vegetation.</td>
</tr>
<tr>
<td>6</td>
<td>Land occupation and ecological damage</td>
<td>Permanent and temporary land occupation may cause loss of certain living being.</td>
<td>Strengthen the vegetation recovery of construction area.</td>
</tr>
<tr>
<td>7</td>
<td>Public and professional health</td>
<td>The movement of construction workers may cause epidemic disease.</td>
<td>Coordinate with construction enterprise and require it to take effective measure to protection construction workers, conduct physical check regularly. In case of epidemic disease, patients shall be sent to hospital immediately for treatment or insulation.</td>
</tr>
<tr>
<td>8</td>
<td>Public security, owners, contract parties and construction party</td>
<td>Emergency accident may cause injury or damage of construction workers.</td>
<td>Stipulate good site safety protection measure with construction enterprise, regulate the operation of construction workers, prepare relevant safety protection devices, strengthen site safety checking and prepare and implement emergency response and accident rescue plan</td>
</tr>
</tbody>
</table>

Environmental impact and environmental protection measure during construction period

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Potential impact</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Water</td>
<td>Pollutants</td>
<td>Limit the storage amount of materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>material such as methyl alcohol, sulfuric acid, hydrogen peroxide and chlorine dioxide may enter surface water, or waste water treatment system and leading to pollution of surface water and river water. which may cause water pollution such as methyl alcohol, sulfuric acid, hydrogen peroxide and chlorine dioxide and strengthen management; prepare corresponding emergency response facilities and strengthen management and repair; prepare emergency response plan for environmental risk; strengthen operators skill and conduct regular training and examination.</td>
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<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Noise</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The running of equipment may impose noise pollution on nearby environment</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>In design, the equipments are mostly installed indoor and select equipments of low noise and with shock absorption and sound insulation devices. As of equipment with high noise, further noise elimination measures shall be taken.</td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>3</td>
<td>Waste gas</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>In case of failure of tail gas absorption device, the waste gas may cause nearby air pollution.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Strengthen management and repair of tail gas absorption system. Entrust environmental protection department to check and ensure the normal operation of tail gas absorption system if it is necessary.</td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td>4</td>
<td>SW</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The side production sodium sulfate generated in operation may cause SW pollution if not treated properly.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Strengthen storage management of sodium sulfate, sell out after dissolving and minimize storage amount</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Public and professional health</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professional health problem may happen such as hearing loss for impact of noise because workers are working in the same position for long time.</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Issue labor protection article on time, and conduct professional physical check on a year; strict implement the 8 h working time; exchange positions if it necessary. Regulate and improve environment in workshop and improving professional health management system.</td>
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<tr>
<td></td>
<td>6</td>
<td>Public security in the factory</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improper operation and other emergency accident may cause injury or harm of workers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stipulate and implement relevant safety protection measures, set up safety warning sign, safety protection equipment; stipulate and complete safety facilities and equipment operation</td>
<td></td>
</tr>
</tbody>
</table>
procedure. strengthen safety knowledge training, and technique, equipment operation training; strengthen site safety checking and prepare and implement emergency response and accident rescue plan

6.2.3 Environmental monitoring plan
The project’s environmental monitoring includes two stages: construction period and operation period. The purpose of environmental monitoring is to understand the environmental quality change, the scope of impact of proposed project on regional environment, and environmental quality dynamics during operation period, to report to competent department and provide scientific basis for project’s environmental management.

According to the suggestions in “General EHS Guidelines” on waste gas and waste water sampling analysis, pulp and paper industry shall conduct environmental monitoring to monitor all activities may cause environmental impact. Monitoring shall be conducted during both normal and abnormal operation period. Environmental monitoring work shall be based on direct or indirect emission of waste gas or waste water, and resource utility of the project. Sufficient monitoring frequency shall be ensured to offer representative monitoring data. Monitoring shall be conducted by people received special training and follow data monitoring and maintenance procedure. The used equipment shall be properly calibrated and maintained. Monitoring shall be regularly analyzed and compared with applicable standard so as to take necessary correction measures.

According to the other suggestions in “General EHS Guidelines” on professional health and safety monitoring, the professional harm in the working environment of the project shall be monitored. The design and implementation of monitoring shall be conducted by qualified professionals holding certain certificate, as a part of professional health and safety monitoring. In addition, factory shall also maintain the record on professional accident and disease, dangerous incidents and accidents.

1. Environmental monitoring plan during construction period
Refer to table 6.2-3 for environmental monitoring plan during construction period

<table>
<thead>
<tr>
<th>Monitoring period</th>
<th>Monitoring factor</th>
<th>Monitoring point</th>
<th>Monitoring item</th>
<th>Monitoring frequency</th>
<th>Monitoring agency</th>
<th>Agency in charge of</th>
<th>Supervision agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>construction period</td>
<td>Waste water</td>
<td>General outlet of waste water</td>
<td>COD, BOD, SS, PH, DO, petroleum, NH₄⁺</td>
<td>Once a season and two days one time</td>
<td>Nanning environmental protection monitoring station</td>
<td>Pumiao Papermaking Factory, Nanning Sugar Manufacturing CO., LTD</td>
<td>Guangxi environmental protection bureau, Nanning environmental protection</td>
</tr>
</tbody>
</table>
2. Environmental monitoring plan during operation period
Refer to table 6.2-4 for environmental monitoring plan during operation period

<table>
<thead>
<tr>
<th>Monitoring period</th>
<th>Monitoring factor</th>
<th>Monitoring point</th>
<th>Monitoring item</th>
<th>Monitoring frequency</th>
<th>Monitoring agency</th>
<th>Agency in charge of</th>
<th>Supervision agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>Area in four direction of the factory</td>
<td>Equivalent sound level at day and night (Leq)</td>
<td>Once a season and two days one time</td>
<td>Nanning environmental protection monitoring station</td>
<td>Pumiao Papermaking Factory, Nanning Sugar Manufacturing CO., LTD</td>
<td>Guangxi environmental protection bureau, Nanning environmental protection bureau, Yongning environmental protection bureau</td>
<td></td>
</tr>
<tr>
<td>Waste water</td>
<td>General outlet of waste water, waste water from new bleaching workshop</td>
<td>COD, BOD, SS, PH, TP, TN, color degree, AOX, dioxin, NH₄⁺</td>
<td>Once a season and one day one time</td>
<td>Nanning environmental protection monitoring station</td>
<td>Guangxi environmental protection bureau, Nanning environmental protection bureau, Yongning environmental protection bureau</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.2-4 environmental monitoring plan during operation period
### 6.2.4 Environmental supervision plan during construction period

During the construction period of the project, environmental supervision shall be conducted according to the requirement of environmental protection design. Supervise and examine the process and effect of implementing all environmental protection measure, resolve environmental pollution and damage problem in time through supervision. Based on the features of this project, the scope of environmental supervision is construction area.

1. Contents of supervision
   (1) Manage environmental protection work of the whole construction area according to environmental protection regulation and environmental supervision contract.

<table>
<thead>
<tr>
<th>Smoke gas</th>
<th>funnel of drive furnace</th>
<th>SO$_2$, NO$_X$, smoke dust, blackness, flow quantity</th>
<th>Once a season and one day one time</th>
<th>Nanning environmental protection monitoring station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>Area in four direction of the factory</td>
<td>Odorous gas, NO$_X$, TSP, SO$_2$</td>
<td>Once a season and five days one time</td>
<td>Nanning environmental protection monitoring station</td>
</tr>
<tr>
<td>Waste water</td>
<td>General outlet of waste water, waste water from new bleaching workshop</td>
<td>COD, BOD, SS, PH, TP, TN, color degree, dioxin, NH$^4$</td>
<td>Three time a day</td>
<td>Production and environmental protection center of the factory</td>
</tr>
<tr>
<td>operation period</td>
<td>surface water</td>
<td>pH, SS, COD, BOD$_5$, DO, petroleum, ammonia nitrogen, color degree, AOX, total phosphorus, total nitrogen</td>
<td>Three times a year and consecutive three days one time</td>
<td>Nanning environmental protection monitoring station</td>
</tr>
</tbody>
</table>
(2) Assist in the tender invitation of environmental supervision part and participate in tendering related to environmental supervision.

(3) Supervise the implementation of environmental protection contract of construction party and explain environmental protection articles in contract. Propose treatment opinions and report concerning major environmental problems, and require relevant agencies to correct within certain time.

(4) Find and control environmental problems during construction period, issue monitoring orders for monitoring indicators such as air, noise and water. Analyze monitoring results and propose environmental protection improvement plan.

(5) Participate in review meeting on construction organization design, construction technical plan and construction progress plan proposed by construction party, and put forward opinions on environmental protection. Review construction materials, equipment list and environmental protection indicators proposed by construction party which may cause pollution. Coordinate the relationship between owner and construction party, resolve the problem concerning violating contract on environmental protection aspects. Treat fairly the two-way claims on environmental protection according to stipulations of contract and claiming procedure.

(6) Record the environmental problems and treatment results at construction site every day and submit monthly statement to environmental management office each month. Arrange environmental monitoring file based on the accumulative data and submit a environmental supervision assessment report each season.

(7) Participate in inspection and acceptance of unit engineer upon completion and issue order to clear and recover site on completed project. The specific monitoring contents include: quality and progress of waste water treatment system, construction action of construction enterprise and implementation of environmental protection measures, prevention measures at temporary residue storage yard, pollution problem during construction material transportation, treatment of household garbage and construction garbage generated by construction workers, protection, vegetation recovery and greening of the construction occupied land, impact of mechanical noise and waste gas emission on nearby resident areas.

2. Method of supervision
The main method of environmental supervision is daily tour inspection. According to the distribution of pollution sources in construction area, environmental supervision engineer will make an inspection tour in construction area. In environmental pollution problems are found during tour inspection, the engineer will orally inform contractor to treat within certain time and confirm with written mail. As of the environment problems need to be treated within certain time, environmental supervision engineer will inspection on time and accept, and issue inspection result to contractor.

3. Setting of supervision organizations
Qualified supervision agency and qualified people with years of environmental protection experience shall be selected to conduct environmental supervision work. Environmental supervisor shall have the knowledge on both engineering and environmental protection with the focus on environmental protection, including full knowledge of environmental protection such as pollution treatment and ecological protection.
6.3 Management of contract party
Construction unit shall take part in relevant training before construction and be informed with potential pollution during construction. It shall sign related responsibility letter and pay risk guarantee deposit. As of transportation vehicles, transportation lines shall be designed. No detour or over-speed is allowed. The contract party is required to take the system of the managing party is responsible and to comply with the environmental protection system in the factory.

7. Environmental training plan

7.1 Training goals and contents

1. Service training of environmental management personnel
The purpose of service training of environmental management personnel is to strengthen environmental management during construction and operation period to ensure the quality of environmental monitoring and effective environmental management, thus to eventually improve the overall quality of the project. The service training enables environmental management personnel to distinguish major environmental problems at construction stage and understand the problems and lack in environmental management.

2. Training for people in charge of each projects and construction workers
People in charge of each projects and construction workers shall receive systematic training on professional environmental knowledge before the start of construction in order to avoid damage to environment caused by misoperation during construction. The purpose of training to people in charge of contract is to strengthen the right operation mode during construction and operation period and to avoid unnecessary damage to environment. The training to people in charge of each projects and training of construction workers can be conducted by the director of production and environmental protection center, whose major task is to explain the potential damage of environment during construction, environmental protection measure taken in construction period and the treatment method in case of environmental problems. The training enables people in charge of each projects is able to understand his obligations in environmental protection, and potential consequence of environmental damage. The training enables construction workers to understand the degree and ways of protection of environmentally sensitive points. The training period for construction workers is one week according to the actual situation of this project.

3. Training for worker during operation period
Training on environmental protection knowledge shall be conducted regularly during the operation of the programme to enable each staff to identify the potential problems for his position and take necessary measures. Each staff shall have the concept of environmental protection.
### 7.2 Training method and expense budget

<table>
<thead>
<tr>
<th>No</th>
<th>Trainee</th>
<th>Training content</th>
<th>Training method</th>
<th>Number of people</th>
<th>Budget (10000 RMB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Management personnel in project team</td>
<td>Knowledge on environmental management</td>
<td>Training in factory</td>
<td>8</td>
<td>3 days, 2000 RMB</td>
</tr>
<tr>
<td>2</td>
<td>Management personnel in project team</td>
<td>Visit related factory to learn mature experience on environmental management</td>
<td>Visit and inspection</td>
<td>8</td>
<td>4 days, 15000 RMB</td>
</tr>
<tr>
<td>3</td>
<td>Other members in project team</td>
<td>Measure on environmental management related to projects</td>
<td>Training in factory</td>
<td>10</td>
<td>1000 RMB</td>
</tr>
<tr>
<td>4</td>
<td>People in charge of project and construction workers</td>
<td>Knowledge on environmental protection and environmental management as well as environmental protection measures</td>
<td>Training in factory</td>
<td>15</td>
<td>3 days, 2000 RMB</td>
</tr>
<tr>
<td>5</td>
<td>construction workers</td>
<td>Environmental protection</td>
<td>Training in factory</td>
<td>60</td>
<td>2 days, 6000 RMB</td>
</tr>
<tr>
<td>6</td>
<td>Operators after completion of project</td>
<td>Knowledge on environmental protection and environmental management as well as environmental protection measures</td>
<td>Training in factory</td>
<td>200</td>
<td>20000 RMB</td>
</tr>
</tbody>
</table>

### 8. Legal effect of environmental management plan

Environmental protection action plan is not only the action guidelines for construction unit to implement environmental protection measures, but the basis for environmental
protection department to inspect the situation of implementing environmental protection measures, thus environmental protection action plan shall bear the same legal effect with contract, invitation for bids and other documents.

When the programme owner is inviting tender publicly from construction unit, the environmental protection action plan shall be provided to units responding to offer of tender and ask them to incorporate the related contents of environmental protection action plan into bid documents, and incorporate expense for environmental protection measures into construction budget. Programme owner shall take the commitment of implementing environmental protection action plan as one of the basis of review when examining the bid document, shall taken the commitment of implementing environmental protection action plan as one of services when signing the project contract. Programme owner shall also clarify that the environmental protection action plan is one of the basis for project inspection and acceptance, the loss caused by failing to implement environmental protection action plan shall be borne on construction unit. The director of environmental protection department in project office shall deeply understand the significance of environmental protection action plan and shall explain it to construction unit. Project supervision unit shall take environmental protection action plan as one of the basis of supervision, and the inspection and acceptance is not given if construction unit fails to implement environmental protection measure.

Construction unit shall designate specific person to be responsible for the implementation of environmental protection action plan, and stipulate the plan for implementing environmental protection measures. Each environmental protection measure shall be implemented according to the schedule in environmental protection action plan.

9. Assessment of investment in environmental protection

9.1 Principles and basis

1. Polluter Pays Principle and Developer Protects Principle shall be followed. The investment in measures concerning environmental protection, environmental monitoring and environmental project management which can not only protect environment, but serve the main body of the project and is able mitigate or eliminate the adverse impact of the project construction on environment shall be enlisted in the total investment in environmental protection of the whole project.

2. The principle of “focusing on key points” shall be followed. The environmental factors with large impact and concerned by the public and with high protection level shall be focused and given prior consideration in fund.

3. The principle of “Function recovery” shall be followed. Indemnifying measure shall be taken to mitigate the adverse impact of the project construction on environment with the principle of “Function recovery”. Additional investment for standard improvement or scale expansion to integrate renovation shall be borne on local governments, related department or owner.

4. Environmental protection is an important part of project construction, thus its expense composition, calculation basis, pricing level shall be aligned with the
main project.
5. “Design methods and calculating criteria of hydropower projects (2002)”
(notice of State Economic and Trade Commission of P. R. China [2002] No. 78)

9.2 Investment items and their classifications
Article 62 of “Requirements of Environmental Protection Design of Construction Project”: “the devices, equipments, monitoring methods, and project facilities required by pollution treatment and environmental protection are all environmental protection facilities”. The investment in the whole program of new bleaching process upgrade of Pumiao Paper Making Factory is all for environment treatment.

9.3 Estimation of investment in environmental protection
The total investment (used to calculate investment amount and investment benefit) of this project is the sum of construction fund and all current fund, 148629.7 thousand RMB, including 148049.5 thousand RMB in construction, 1934.1 thousand RMB as current fund.
Refer to table 9.3-1 for the composition of total investment and its percentage classified with the nature of expense.

| Table 9.3-1 composition analysis of the total investment of the programme |
|-----------------------------------------------|----------------|----------------|----------------|
| unit: 10000 RMB, 10000 Euro                  |                |                |                |
| No   | Item                        | investment amount | Percentage in construction investment (%) | Percentage in total investment (%) |
|      |                             | Total   | Foreign currency |                  |                          |
| 1    | Item                        | 14804.95 | 0.00            | 100.00           | 98.71                     |
| 1.1  |                             |          |                 |                  |                          |
| 1.1.1| Investment in construction | 1916.28  |                 | 12.94            | /                         |
| 1.1.2| Engineering expense         | 6731.0   | 0.00            | 45.46            | /                         |
| 1.1.3| Construction               | 2735.00  | 18.47           | /                |                          |
| 1.2  | Expense in equipment and tools | 2423.50 | 0.00            | 16.37            | /                         |
| 1.3  | Installation expense       | 690.29   | 0.00            | 4.696            | /                         |
| 1.4  | Others                     | 308.88   |                 | 2.09             | /                         |
| 2    | Basic reserve fund         | 193.41   |                 | /                | 1.29                      |
| 2    | Interest for loan during construction period | 58.02 |                 | /                | /                         |
| 2    | current fund               | 14998.36 |                 | /                | 100.00                     |
10. Current situation of enterprise on implementation and certification of ISO 14000

According to GB/T24001-1996, GB/T28001-2001 and internal management requirement, the enterprise stipulate guidelines on environmental and professional health safety, set up and maintain management system to improve the performance of environmental and professional health safety in the enterprise. Environmental and professional health safety management system includes 17 factors to control the activities of guidelines, decision-making, implementation and operation, inspection and correction and management review systematically and in document, thus to form a dynamic, circular and continuously improved management mode.

10.1 Implementation and operation method of system

Implementation and operation of system includes organizations at each level and their responsibilities, documents on current operation management system, determination of relevant procedures of system operation and setting of operation resource, stipulations of training, identification of internal and external information exchange scope, stipulations on method for staffs participating in management, and principle requirements to conduct control on major environmental factors and main hazard risks.

Based on the analysis of environmental factors/ hazard risks and the need of management, relevant management stipulations (system, procedure and process) shall be formulated and revised. Upon the issuing of newly formulated and revised procedure or system, all staff shall strict following the stipulations.

As of unacceptable major risks, targeted emergency response plan shall be stipulated and relevant emergency response resources shall be prepared. Conduct corresponding exercise to make emergency response in the best condition. In case of emergency situation, related emergency response plan shall be started immediately to minimize loss. In emergency situation, three firsts principle shall be followed: safety of staffs and emergency response people first, preventing accident expansion first and protecting environment first.

10.2 Management system supervision mechanism

Management system monitoring system includes: daily supervision and monitoring, regular performance monitoring and measuring, accident, incident, unconformity and correction measures, and system review and management review. After the official implementation of management system, production and environmental protection center/department of safety and other departments shall seriously focus on the performance of environmental factor and hazard installation control, which involves performance in four aspects: monitoring of the goal completion, monitoring of implementation of relevant management plan, monitoring of implementation of and conformity with relevant control procedures and monitoring
of conformity with laws, regulations and standards. To ensure the effective operation of management system, workshop and teams shall conduct position and sit performance inspection as frequent as possible in performance inspection and do well in targeted inspection. Performance inspection is the most important measure of maintain the effective operation of management system, so it shall be implement properly.

The treatment of accident, incident and unconformity shall clarify the levels and analyze treatment method. As of major accident, major near accidents and serious unconformity, production and environmental protection center/department of safety shall focus on them, participate in analysis and treatment, and stipulate correction measures. Repeat unconformity shall be deed as serious unconformity, which shall be corrected with more effort. The problems found in daily performance inspection shall be treated as unconformity. As of individual system violation problem found in performance inspection, if it is done on purpose, it shall be corrected immediately without analyzing reasons. System violation problems repeatedly found in performance inspection shall be treated with more effort combining former treatment methods. Other unconformity shall analyze reasons and find the fundamental reason for unconformity, and stipulate and implement targeted correction measures to eliminate similar unconformity.

Conduct internal review of system in a planned way. Unconformity found in internal review shall be treated strictly with relevant stipulations.

Management review of system shall focus on the sustainable applicability, sufficiency and effectiveness of system and maintain closed cycle management.

10.3 Organizations and responsibilities

1. Factory manager
   a) Stipulate and issue environmental/professional health safety management guideline
   b) Designated manager’s representatives of environmental/professional health safety management
   c) Approve management manual and procedure documents
   d) Determine organizations of management system
   e) Ensure the input and effective implementation of environmental protection and safe production, and bear the final responsibility of environmental pollution accidents and safe production accidents
   f) Hold management review to ensure the effective operation and continuous improvement of system

2. Management’s representatives
   a) Assist factory manage to stipulate management guidelines and determine organizations
   b) Responsible for set up, implement and maintain environmental/professional health safety management system
   c) Responsible for managing internal review of management system
   d) Entitled to propose improvement measures on activities influencing the realization the guidelines and goals of environmental and professional health safety
   e) Contact with outside on issues concerning environmental/professional health safety management system on behalf of the factory
   f) Report to the factory manager on the operation, performance and improvement need of management system
3. Vice factory manager in charge of production
   a) Examine and approve goal and indicators of environmental/professional health safety at factory level
   b) Approve management plan
   c) Bear the direct leading responsibility on environmental protection and safety work, specifically lead and support the work of production and environmental protection center/department of safety

4. Safe production commission of the factory
   a) Organize, lead, coordinate and arrange the safe production of the whole factory
   b) Implement national, provincial, and municipal guidelines, policies, laws and regulations concerning professional health safety and focus on health and safety of staffs
   c) Stipulate safe production management goals at factory level
   d) Implement safety veto power and Responsible for inspection of safety facilities designed, constructed and used at the same time with body project for new, renovated, expended and repaired projects.
   e) Discuss the treatment opinions on accident proposed by department of safety, and report and propose suggestion to factory manager on issues influencing health and safety of staffs

5. Department of safety
   a) Responsible for inspecting the implementation of guidelines professional health safety management, goals at factory level and management plan
   b) Responsible for identification, obtain and transmission of laws, regulations on health safety management and relevant requirement
   c) Responsible for identification of hazard installation, risk assessment, Responsible for supervision and inspection of risk management measures
   d) Set up safety responsibility system to clarify the safety responsibility of each department and individual
   e) Set up and complete safe production management system and safe operation procedures and inspect their implementation situation
   f) Investigate safety accident, propose treatment opinions, and Responsible for track and inspection of correction measure of safety accidents (incidents)
   g) Stipulate major safety risk emergency rescue plan, organize and coordinate emergency rescue work
   h) Responsible for license, annual inspection and registration of special equipment, pressure container and pressure pipeline
   i) Responsible for safety education and propaganda
   j) Entitled to stop “three violation” action, entitled to order to stop operation in case of extremely urgent unsafe situation
   k) Responsible for license of hazardous chemical storage and utility and supervise
   l) Report to safe production commission on safe production, and treat daily business of safe production commission
   m) Measure and review performance of professional health safety

6. Production and environmental protection center
   a) Responsible for organizing, supervising and inspecting environmental
protection work of the whole factory
b) Responsible for identification, obtain and update of environmental laws and regulations and relevant requirements, implement national and local guidelines, policies, laws and regulations concerning environmental protection
c) Responsible for identification, assessment and update of environmental factors
d) Organize the stipulation of environmental goals, indicators and management plan the supervise their implementation
e) Set up and complete the environmental protection management system
f) Supervise and inspection the “three the same time” on new, renovated, expended and repaired projects
g) Responsible for inspecting environmental protection situation and environmental protection monitoring
h) Responsible for investigating environment accidents and submit treatment opinions to meeting for review, Responsible for track and inspection of correction measure of safety accidents (incidents)
i) Responsible for treatment of environmental protection complains
j) Organize the stipulation of emergency response plan for environmental pollution accident
k) Measure and review environmental performance

7. Enterprise management office
a) Organize the stipulation and revision of environmental/professional health safety management manual and procedure documents
b) Stipulate internal review plan and management review plan, and organize implementation

8. Staff representatives
Responsible for collecting opinions and suggestions of staffs, including stipulation of guidelines and procedures, professional health safety state, accidents and risks and reasonable suggestion, and report to the factory as well as coordinate treatment

9. Refer to “Responsibility system of leaders at factory level”, “Responsibilities of departments”, “Responsibilities of positions”, “Responsibility system on environmental protection”, and “safety responsibility system” for the responsibilities and rights of other departments and individual

10. Specifications on responsibilities and rights are issued to each department in documents and enable all staff to understand his responsibilities and rights through training and meetings.

10.4 Operation control
Conduct effective control on activities and products related to environment factors and professional health safety risks, reduce environmental pollution, ensure the safety of staffs, set up operation control procedures, operation guides and management system concerning selection and procure of raw materials, working area, production process, equipment and facility maintenance, water, power and steam supply, product storage and transportation, treatment of alcohol waste liquid and pulp making black liquid, disposal of wastes.

a) Operation control procedures concerning professional health safety
b) Procedures on environment sanitation management
c) Procedures on waste control
d) Procedures on resource, energy consumption control  
e) Procedures on material procure control  
f) Procedures on production equipment control  
g) Procedures HR management  
h) Technique procedures, operation procedures and safety procedures  
i) Safe production management system, fire-fighting safety management system  
j) Specification on supervision and inspection management of alcohol delivery  
k) Management system on transportation, storage and utility of toxic and harmful substance  
l) Management system on major hazard installation monitoring  
m) Management system on occupational and sanitation  
n) Procedures on treatment of black liquid from pulp making and waste liquid from alcohol  
o) System on training people operating environmental protection facilities  
p) Specifications on pollutants from environmental protection facilities washing  
q) Specifications on inspection, repair, and maintenance of environmental protection facilities (equipments)  

2. Related functional department shall inform relevant parties involved by hazard installation and environmental impact  
3. New and expended projects must implement “three the same time” of environmental protection facilities and safety facilities.

10.5 Emergency preparedness and response  
1. Set up “procedures on emergency preparedness and response” and prepare emergency response plan concerning potential accidents and emergency situation  
2. In case of accidents and emergency, accident departments shall quickly take emergency response measure and transmit to related department and agencies  
3. If conditions permit, regularly excise on emergency preparedness and response  
4. Regularly review the applicability of emergency preparedness and response plan. Review and revise corresponding procedures emergency response plan after accidents and emergency and emergency response plan exercise.

10.6 Monitoring and measuring  
1. Contents of monitoring and measuring  
   a) Monitor and measure the operation situation of environmental/professional health safety management system  
   b) Production environmental protection center/department of safety shall be responsible for monitoring the operation situation of system, implementation of laws, regulations and other requirements, and conformity with goals, indicators and management plan.  
   c) Monitor the key characteristics of operation and activities concerning major environmental factors and hazard factors, including health of staffs, effectiveness of operational control and completion of performance on a regular basis  
2. Implementation of monitoring and measuring  
   a) Determine monitoring points, monitoring items and indicators,
monitoring frequency based on relevant requirements. Conduct monitoring of key characteristic parameters and assess monitoring results to verify its conformity with standard.

b) Each department is responsible for monitoring the key characteristics of operation and activities concerning major environmental factors and hazard factors, monitoring the implementation of relevant procedures and safety operation procedures and report to high leaders regularly.

c) Labor and HR department is responsible for monitoring the health of operators.

d) Equipment repair center, inspection center and environmental protection department are responsible for calibration, test and maintenance of instruments and equipments used for monitoring.

e) Production environmental protection center/department of safety is responsible for checking the implementation of goals, indicators and management plan and assessing the implementation situation and performance of goals, indicators and management plan based on the implementation steps in management plan.

f) Unconformity found in monitoring and measuring shall be treated in accordance of “Management procedures on accident, incident, non-conformity, correction measures prevention measures”.

3. Relevant documents
   a) Procedures on monitoring and measuring control
   b) Management procedures on accident, incident, non-conformity, correction measures prevention measures

10.7 Internal review

1. Set up and maintain “procedures on internal review control”, conduct internal review to verify whether the results of enterprise environment and health safety activities conform to the requirements of standard and management system, and to advance the continuous and effective operation of environment and health safety management system.

2. Head of internal review group organize the members of the group to implement internal review based on “procedures on internal review management”.

3. Internal reviewer shall receive training and hold relevant qualification certificate.

4. Each department shall prepare well in accordance with internal review plan, assist the work of internal review group, implement and implement correction/prevention measure concerning the unconformity related to this department.

5. Review report shall be prepared based on review results and issued according to procedures after internal review.

6. Enterprise management office shall track the implementation results of correction measures and make record.

7. Internal review report the basis of system improvement and one of input of management review.

8. Documents and records based on internal review shall be maintained.

9. Time of internal review shall be increased in case of major environment accidents, safety accidents, serious complaint from relevant parties and huge change of organizations.
10.8 Management review

1. Conduct management review on environmental/professional health safety management system on a regular basis to ensure its sustainable applicability, sufficiency and effectiveness, and to guarantee the normal and effective operation and continuous improvement of management system.

2. Enterprise management office stipulates management review plan and implement after approval of factory manager.

3. The basis of management review
   a) Results of internal review on environmental/professional health safety management
   b) Change of external environment and expectations of relevant parties

4. Contents of management review
   a) Applicability of guidelines, implementation situation of goals, indicators and management plan
   b) Conformity to related laws, regulations and other requirements
   c) Implementation situation of the last review meeting
   d) Operation situation of system and necessary revision to goals, indicators and management plan

5. Management review is conducted once a year. Time of review can be increased in case of following situations, which at the discretion of factory manager:
   a) Management system is changed largely
   b) Change of market environment and expectations of relevant parties
   c) The applicability and effectiveness of management system is greatly influenced in case of incidents, safety accident and environmental pollution accident.

6. Review report shall be prepared based on review results and record related to management review shall be maintained.

11. List of inspection and acceptance of “three at the same time” completion

According to the principle of “three at the same time”, environmental pollution prevention facilities shall be designed, constructed and used at the same time with body project. Therefore, when the proposed project is completed and to put into operation, environmental protection facilities shall be inspected. Refer to table 10-1 for the suggested inspection and acceptance list.
Table 10-1 inspection and acceptance list of “three at the same time” of environmental protection facilities

<table>
<thead>
<tr>
<th>Items</th>
<th>Content</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1、Construction period</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction dust treatment</td>
<td>Pre-mixed concrete is used, spray water to stop dust and clear the road in time</td>
<td>Standard level II in “Ambient air quality standard (GB 3095-1996)”; welding waste gas shall comply with the requirements of level II for new pollution source in “Integrated emission standard of air pollutants” (GB16297-1996)</td>
</tr>
<tr>
<td>Construction waste gas</td>
<td>Use qualified transportation vehicle and machine, the generated welding waste gas is small which can be diffused freely</td>
<td>Level III in “Integrated wastewater discharge standard”</td>
</tr>
<tr>
<td>Construction waste water</td>
<td>Household waste water of construction workers shall enter household waste water treatment system and be emitted out after collective treatment after meeting relevant requirements</td>
<td>Level III in “Emission standard for industrial enterprises noise at boundary”(GB12348-2008)</td>
</tr>
<tr>
<td>Construction noise</td>
<td>High noise equipment shall be installed indoor and sealed environment and equipped with sound elimination and shock absorption measure</td>
<td>Safety disposal</td>
</tr>
<tr>
<td>Construction garbage</td>
<td>Disposal area for construction garbage and waste soil shall be determined according to relevant specification and construction garbage shall be transported in time</td>
<td></td>
</tr>
<tr>
<td>Water and soil retaining measure</td>
<td>Based on relevant design specifications</td>
<td>Reduce water and soil loss</td>
</tr>
<tr>
<td><strong>2、Operation period</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fenton storage tank, oxidizing tower</td>
<td>/</td>
<td>Little odorous gas is generated, thus the quality of waste water is relatively good, which imposes little impact on environment</td>
</tr>
<tr>
<td>Gabasse storage yard, waste water anaerobic treatment system</td>
<td>Strengthen sealing management</td>
<td>Impose little impact on environment</td>
</tr>
<tr>
<td>Dryer</td>
<td>HPC64-2×7pulse bag filter with blow rate of 97640 m³/h. with the dust removal rate of 99.5%.</td>
<td>Reach the requirement of table II in “Emission Standard of Air Pollutants for Cement Industry” (GB4915-2004)</td>
</tr>
<tr>
<td>Production waste water</td>
<td>Waste water deep treatment system</td>
<td>Level II in table 2 of “Discharge standard of water pollutants for pulp and paper making industry” (GB3544-2008)</td>
</tr>
<tr>
<td>Waste water treatment system</td>
<td>To compound fertilizer factory as raw materials</td>
<td>Comprehensive utility of sludge will not pollute environment</td>
</tr>
<tr>
<td>Chlorine dioxide preparation workshop</td>
<td>Sold out after dissolving</td>
<td>Comprehensive utility will not pollute environment</td>
</tr>
<tr>
<td>Noise prevention</td>
<td>Equipping sealed sound insulation room for fan and pump, and installing fixture or shocking absorption base on transmission equipment such as fan and pumping to minimize noise to minimize their noise, and install silencer at the fan outlet.</td>
<td>Reach level III in “Emission standard for industrial enterprises noise at boundary” (GB12348-2008)</td>
</tr>
</tbody>
</table>