**China: GEF Dioxin Reduction from the Pulp and Paper Industry Project(P125528)**

# Environmental Management Plan for

Technical Upgrade of Yueyang Paper Mill

(Cleaner Production Technology Reform Reed Pulp Chemical Bleaching System of Yueyang Forest & Paper Co., Ltd)

Hunan Research Academy of Environmental Sciences

January 2012

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# 1 General provision

## 1.1 Origin of task

The predecessor of YUEYANG FOREST □ PAPER CO., LTD is Hunan Yueyang Paper Co., Ltd which is established in 1958. in September 2000, with the approval from Hunan People's Government "Approval of Hunan People's Government on agreeing the establishment of YUEYANG FOREST □ PAPER CO., LTD" (Xiang Zheng Han [2000] No. 149), YUEYANG FOREST □ PAPER CO., LTD was established with Hunan Tiger Forest & Paper Group (former YUEYANG FOREST □ PAPER) as the major originator by means of promotion.

The enterprise is located at Yueyang City, Hunan Province, at the Chenglingji Sanjiangkou where Dongting Lake and the Yangtse River meet, close to two 5000 tons foreign trade wharf at Port of Chenglingji. Since it is on the south of Yangtse Golden Channel, on the east of the eight hundred Li of Dongting Lake, on the west of Beijing-Guangzhou Railroad and connected with Beijing-Zhuhai Express and the 107 National Road, the land and water transportation is quietly convenient.

The enterprise is mainly committed to the production and sales of cultural printing paper, with major products including more than 30 models in 5 series such as LWC, pigment treated offset paper, color-printing supercalendered paper and light weight printing papers. Its products are widely used for printing of high-level books, newspapers and magazines. The brands of its products enjoy great honor. Its series of offset printing book paper with the brand of "YUEYANGLOU" has won the "Gold Medal of National Quality" and "National Customer Satisfaction Award". Its refined light weight coated paper and pigment treated offset paper with the brand of were elected as the "famous products of Hunan Province". The enterprise passed certification of ISO 9001-2000 international quality system in January 2006, and in the same month, the enterprise passed the

certification of "three in one system" of ISO 9001-2000, ISO 14001 environmental management system and GB/T28001 occupational health and safety management system. The Dongting Lake area where YUEYANG FOREST □ PAPER is located is rich in fibrous paper making raw materials such as Italian poplar, Masson pine, foreign pine, reed, bamboo, etc. The enterprise positively implements the policies concerning "returning farmland to forest and returning farmland to lake", insist to road of "integrating forest and paper making". It has planted forest of 863700 Mu, realized the virtuous circle of "advancing paper making with forest, develop forest with paper making, combination of forest and paper making, and common development of forest and paper making". It has been designated as the leading enterprise of forestry industry in Hunan Province. The enterprise has strong technology research and development capacity. For example, it developed many new products such as 45g/$m^2$ light weight high-grade color printing newsprint, refined high-whiteness color printing newsprint, light weight coated paper, light weight printing papers and pigment treated offset paper. Among above new products, light weight high-grade color printing newsprint, refined high-whiteness color printing newsprint, light weight coated paper, light weight printing papers won the title of "National Key New products". The research programme "Italian poplar AMPM new pulp making technology and its application" conducted by the enterprise won the second prize of National S&T Progress Awards in 2003. In recent years, the enterprise finished a series of important science and technology programme at provincial level or above. Up to end of 2006, the enterprise had developed 3 new products at national level and 20 new products at provincial level. It had declared 26 patents and 15 had gained the national patent. It has been awarded 1 National S&T Progress Awards and 6 S&T Progress Awards at provincial and Ministry level. Current projects of the enterprise include 7 pulp production line in 4 classes—bleached chemical wood pulp, bleached chemical reed pulp, poplar chemimechanical pulp and Deinked Pulp with the total pulp making capacity of 570 t/a. in addition, the enterprise also product machine-made paper such as news paper, light weight coated paper and pigment treated offset paper with self-made pulp and pulp board

purchased from outside with the total paper making capacity of 800 t/a. the enterprise is also equipped with corresponding alkali recovery device and device of co-generation of heat and power.

The production capacity of chemical reed pulp workshop of YUEYANG FOREST □ PAPER is 180 t/d. This workshop uses traditional sulfate batch cooking process, with the bleaching system is EC bleaching technique. This type of technique will generate a large amount of waste water containing AOX, which not only caused high waste water emission of unit product and high content of inorganic matter and organic matter in waste water, but the AOX in waste water is much higher than the new control indicators which will be implemented in near future. Therefore, the enterprise planned to renovate the technology used in the bleaching section of this workshop, i.e. to phase out current chlorine bleaching system and to replace CEH bleaching with ECF bleaching technology. The construction of this technical renovation project will largely reduce the organic matte in pulp bleaching waste water, which will benefit to the development of YUEYANG FOREST □ PAPE to high level, low consumption and low pollution. The project will prevent and reduce the generation of pollutants from the source thus to reduce external treatment, reduce production cost and realize clean production.

According to the requirements in “Environmental Protection Law of the People's Republic of China”, “Law of the People's Republic of China on Environmental Impact Assessment” and “Regulations on the Administration of Construction Project Environmental Protection”, YUEYANG FOREST ＆ PAPE entrusted Hunan Research Academy of Environmental Sciences to undertake the Environmental Impact (EI) Assessment work of Technical Renovation on Clean Production Technology of Chemical Reed Bleaching System of YUEYANG FOREST ＆ PAPER CO., LTD, and prepare this EI report. Upon accepting the entrust, assessment unit prepared this report after it examined the site of proposed project, collected of relevant information, and programme group conducted current environmental quality monitoring, public participation survey.

## 1.2 Preparation basis

1.2.1Relevant laws and regulations onenvironmental protection

(1) "Environmental Protection Law of the People's Republic of China" (December 26th, 1989)

(2) "Law of the People's Republic of China on Prevention and Control of Water Pollution" (revised on September 5th 2007)

(3) "Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes" (December 29th 2004)

(4) "Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution" (April 29th, 2000)

(5) "Law of the People's Republic of China on the Prevention and Control of Environmental Noise Pollution" (March 1st 1997)

(6) "Regulations of the People's Republic of China on Natural Reserves" (December 1st 1994)

(7) "Law of the People's Republic of China on the Protection of Wild Life" (November 8th 1988)

(8) "Law of Land Administration of the People's Republic of China"（August 29th 1998）

(9) "Law of The People's Republic of China on Water and Soil Conservation" (June 29th 1991)

(10) "Law of the People's Republic of China on Conserving Energy" (January 1st 1998)

(11) "Detailed Rules for the Implementation of the Law of the People's Republic of China on the Prevention and Control of Water Pollution" (Order of the State Council No. 284)

(12) "Cleaner Production Promotion Law of the People's Republic of China", (Order of President of the People's Republic of China No. 72 issued on June 29th 2002)

(13) "Law of the People's Republic of China on Environmental Impact Assessment"(Order of President of the People's Republic of China No. 77 issued on October 28th 2002)

(14) "Regulations on the Administration of Construction Project Environmental Protection", (Order of State Council of PRC [1998] No. 253 issued in November

1998)

(15) "Decision of the State Council on Several Issues Concerning Environmental Protection" (Guo Fa [1996] No. 31)

(16) "Classified Catalogue for Administration of Construction Project Environmental Protection" (Order of state environmental protection administration (SEPA) NO.14 issued on October 13th 2002)

(17) The national "the tenth five years" and 2010 special plan of the forest-paper integration project construction (2004)

(18) The "tenth five years" plan and plan outline of 2015 in forestry by State Forestry Bureau

(19) "General plan for construction of fast-growing and high-yield forest base in key regions" by State Forestry Bureau.

(20) "Notice of several opinions on accelerating the construction of forest base of raw materials for paper making industry" (Ji Ban [2001] No. 141, by State Development Planning Commission, Ministry of Finance and State Forestry Bureau)

(21) "Opinions on Further Strengthening Industrial Water Conservation " by six ministries or committees including State Economic and Trade Commission (Guo Jing Mao Zi Yuan [2001] No. 1015 issued on October 25th 2000)

(22) "Guidance Catalog for Adjustment of Industrial Structure (2011)"

(23) "Paper Industry Development Policy" (Order of National Development and Reform Commission [2007] No. 71)

(24) "Decision of the State Council on Implementing Scientific Viewpoint of Development and Strengthening Environmental Protection" (Guo Fa [2005] No. 39 issued on December 3rd 2005)

(25) "Notice of further strengthening environmental impact assessment management and prevent environmental risks" (Huan Fa [2005] No. 152 issued by SEPA in 2005)

(26) "Notice on Printing and Distributing 'Special Action Plan of Hunan Province on Pollution Treatment of Paper Industry'" (Xiang Zheng Ban Ming Dian [2007] No. 208)

(27) Notice of Hunan Economic Committee on Printing and Distributing "the 'Tenth Five Years' Special Action Plan of Hunan Province on Paper Industry Structure

Adjustment" (Xiang Jing Tou Zi [2009] No. 37)

(28) "Notice on the Tenth Environmental Pollution Treatment Programme (Pulp and Paper industry) with limited Deadline in Hunan Province" (Xiang Huan Fa [2009] No. 37)

(29) "Urban Overall Plan of Yueyang City" (2003-2020)

(30) "Regulations on the Management of Hazardous Chemicals" (Order of State Council No.344 on March 15th 2002)

(31) "Detailed Rules for the Implementation of Regulations on the Management of Hazardous Chemicals" (Hua Lao Fa [1992] No. 6777)

(32) Policies and Procedures of the World Bank OP/BP4.01 Environmental assessment

1.2.2 Relevant Technical Specifications

(1) HJ/T2.1-1993 Technical guidelines for environmental impact assessment- general programme"

(2) HJ2.2-2008 "Technical guidelines for environmental impact assessment- atmospheric environment"

(3) HJ/T2.3-1993"Technical guidelines for environmental impact assessment -surface water"

(4) HJ2.4-2009 "Technical guidelines for noise impact assessment"

(5) HJ19-2011"Technical guidelines for ecological impact assessment- ecological environment"

(6) HJ/T169-2004"Technical guidelines for environmental risk assessment on projects"

(7) HJ/610-2011"Technical guidelines for environmental impact assessment - underground water"

(8) "Interim Procedure On the Public Participation In Environmental Impact Assessment" （Huan Fa [2006] No. 28）

(9) "Assessment Index System of Clean Production for Pulp and Paper Industry" (Fa Gai Wei [2006] No. 87)

(10) "Norm of water intake--Part 5:Pulp,paper and paper board production"

(11) "Discharge Standard of Water Pollutants for Pulp and Paper Industry " (GB3544-2008)

(12) "Administration Measure on Automatic Monitoring of Pollution Source of Hunan Province" (Order to Hunan Provincial Government No. 203)

(13) "Environmental, Health, and Safety Guidelines for Paper industry" (the World Bank)

1.2.3 Relevant documents about this programme

(1) "Feasibility Study Report on Technical Renovation on Clean Production Technology of Chemical Reed Bleaching System of YUEYANG FOREST & PAPER CO., LTD" by China CEC Engineering Corporation

(2) "Reply on the Environmental Impact Assessment Report of 400 tons Offset Printing Paper containing Mechanical Pulp of YUEYANG FOREST & PAPER CO., LTD" Xiang Huan Ping [2008] No. 66 by Hunan Environmental Protection Bureau

(3) "Environmental Impact Assessment Report of 400 tons Offset Printing Paper containing Mechanical Pulp of YUEYANG FOREST & PAPER CO., LTD" Environmental Protection Research Institute of Light Industry in October 2006

(4) Reply of Yueyang Municipal Environmental Protection Bureau on the Assessment Criteria of this Programme

(5) Assessment letter of authorization and contract

(6) Other information provided by programme owner

## 1.3 Environmental protection targets and environmentally sensitive points

### 1.3.1 Environmental protection targets

Refer to table 1-2 for the environmental protection targets of proposed programme.

Table 1-2 environmental protection targets

| No. | Items | environmental protection targets |
|---|---|---|
| 1 | Ecology | Ecological function and important ecological protection targets in the region, such as natural reserves, and biodiversity, etc, there are no natural reserves in the assessment area |
| 2 | Water | Ensure the water quality of Yangtze River—the accepting water body to reach the requirements of functional area |

| | | |
|---|---|---|
| 3 | Air | Residential area, schools and villages in assessment area |
| 4 | Sound | The noise level at factory boundary reach the requirements for functional area |

### 1.3.2 Environmentally sensitive points

Refer to table 1-3 for the specific environmentally sensitive points of proposed programme and refer to related figure for their position.

Table 1-3 major environmentally sensitive points of this programme

| Type | environmental protection targets | Scale | Position and direction | Note |
|---|---|---|---|---|
| Air | Residential area of YUEYANG FOREST & PAPER | Residential area with about 3000 houses and 14000 people | S，1km | GB3095-96 Level II area |
| | Downtown of Yueyang City | Commercial and Residential area with about 1.06 million people | SW，8.5km | |
| | Songyang Lake Farm | Residential area with about 2000 houses and 10000 people | NE，6km | |
| | Yueyang Tower | tourist attractions | SW，9.5km | GB3095-96 Level I area |
| Water | Yangtze River | -- | W，100m | GB3838-2002 Level III area |
| Sound | Residential area of YUEYANG FOREST & PAPER | Residential area with about 3000 houses and 14000 people | S，1km | GB3096-93 Level III area |
| | Residential area of Huaneng Yueyang Power Plant | Residential area with about 1500 houses and 6000 people | E，1.5km | GB3096-93 Level III area |

## 1.4 Related Standards

### 1.4.1 Environmental quality standards

#### 1.4.1.1 Air quality standards

"Ambient Air Quality Standard" (GB 3095-1996) and its revised version (January 3rd

2000) are implemented for $SO_2$, $NO_2$, $PM_{10}$, TSP and the requirement for level II is implemented for the programme area and the requirement for level I implemented for the area near Yueyang Tower. Hydrogen sulfide and ammonia implement the maximum allowable concentration of hazardous substances of residential area in table 1 of "Hygienic standards for the design of industrial enterprises" GBZ1-2010. refer to table 1-4 for specific limits.

Table 1-4 limits in air quality standards

| Name of pollutant | Value source | Concentration limit (mg/Nm3) | | Basis |
|---|---|---|---|---|
| | | Level I | Level II | |
| $SO_2$ | Yearly average<br>daily average<br>hourly average | 0.02<br>0.05<br>0.15 | 0.06<br>0.15<br>0.50 | "Ambient Air Quality Standard" (GB 3095-1996) and its revised version |
| TSP | Yearly average<br>daily average | 0.08<br>0.12 | 0.20<br>0.30 | |
| $PM_{10}$ | Yearly average<br>daily average | 0.04<br>0.05 | 0.10<br>0.15 | |
| $NO_2$ | Yearly average<br>daily average<br>hourly average | 0.04<br>0.08<br>0.12 | 0.08<br>0.12<br>0.24 | |
| $H_2S$ | One time | 0.01 | | maximum allowable concentration of hazardous substances of residential area in table 1 of "Hygienic standards for the design of industrial enterprises" |
| $NH_3$ | One time | 0.20 | | |

1.4.1.2 Standard for surface water quality

The accepting water body of the programme is Yangtze River. According to "Surface water functional zoning of major rivers of Hunan Province" (DB43/023-2005) and its revised version (April 2nd 2007), the water quality of Yangtze River shall comply with the requirement for Level III water in "Environmental quality standards for surface water" (GB 3838 —2002). Refer to table 1-5 for specific limits.

Table 1-5 "Environmental quality standards for surface water" (GB 3838 —2002)

| Monitoring item | Limit in standard(mg/L, except pH) | |
|---|---|---|
| | Level II | Level III |
| Water temperature (℃) | The change of water temperature caused by human being shall be limited to: Maximum Weekly average temperature increase ≤1. Minimum Weekly average temperature increase ≤2 | |
| pH value (dimensionless) | 6~9 | |
| DO(Dissolved Oxygen)≥ | 6 | 5 |
| chemical oxygen demand (COD) ≤ | 15 | 20 |
| permanganate Index≤ | 4 | 6 |
| $BOD_5$≤ | 3 | 4 |
| ammonia nitrogen ($NH_3$-N) ≤ | 0.5 | 1.0 |
| total nitrogen (TN) (lake, reservoir, calculated with N) | 0.5 | 1.0 |
| total phosphorus (TP) (calculated with P) ≤ | 0.1 (lake, reservoir 0.025) | 0.2 (lake, reservoir 0.05) |
| Petroleum | 0.05 | 0.05 |
| Sulphide | 0.1 | 0.2 |
| Cyanide ≤ | 0.05 | 0.2 |
| volatile phenol ≤ | 0.002 | 0.005 |
| As≤ | 0.05 | 0.05 |
| Hg≤ | 0.00005 | 0.0001 |
| Cr VI≤ | 0.05 | 0.05 |
| Cu≤ | 1.0 | 1.0 |
| Pd≤ | 0.01 | 0.05 |
| Cd≤ | 0.005 | 0.005 |

1.4.1.3 Standard for underground water quality

The underground water quality shall comply with the requirement for Level III water (with the basis of human health which is mainly used for collectively drinking water source and industrial and agricultural water sources) in "Quality standards for ground water" (GB/T14848-93). Refer to table 1-6 for specific limits for underground water quality.

Table 1-6 limits for Quality standards for underground water unti: mg/L, except pH

| Name | Level I | Level II | Level III | Level IV | Level V |
|---|---|---|---|---|---|
| pH | 6.5 ~ 8.5 | | | 5.5 ~ 6.5<br>8.5 ~ 9 | <5.5，>9 |

| Name | Level I | Level II | Level III | Level IV | Level V |
|---|---|---|---|---|---|
| ammonia nitrogen | ≤0.02 | ≤0.02 | ≤0.2 | ≤0.5 | >0.5 |
| Nitrate | ≤2.0 | ≤5.0 | ≤20 | ≤30 | >30 |
| Nitrite | ≤0.001 | ≤0.01 | ≤0.02 | ≤0.1 | >0.1 |
| volatile phenols (calculated with phenol) | ≤0.001 | ≤0.001 | ≤0.002 | ≤0.01 | >0.01 |
| Cyanide | ≤0.001 | ≤0.01 | ≤0.05 | ≤0.1 | >0.1 |
| As | ≤0.005 | ≤0.01 | ≤0.05 | ≤0.05 | >0.05 |
| Hg | ≤0.00005 | ≤0.0005 | ≤0.001 | ≤0.001 | >0.001 |
| Cr VI | ≤0.005 | ≤0.01 | ≤0.05 | ≤0.1 | >0.1 |
| total hardness(calculated with $CaCO_3$) | ≤150 | ≤300 | ≤450 | ≤550 | >550 |
| Pd | ≤0.005 | ≤0.01 | ≤0.05 | ≤0.1 | >0.1 |
| fluoride | ≤1.0 | ≤1.0 | ≤1.0 | ≤2.0 | >2.0 |
| Cd | ≤0.0001 | ≤0.001 | ≤0.01 | ≤0.01 | >0.01 |
| Fe | ≤0.1 | ≤0.2 | ≤0.3 | ≤1.5 | >1.5 |
| Mn | ≤0.05 | ≤0.05 | ≤0.1 | ≤1.0 | >1.0 |
| TDS | ≤300 | ≤500 | ≤1000 | ≤2000 | >2000 |
| permanganate Index | ≤1.0 | ≤2.0 | ≤3.0 | ≤10 | >10 |
| sulphate | ≤50 | ≤150 | ≤250 | ≤350 | >350 |
| chloride | ≤50 | ≤150 | ≤250 | ≤350 | >350 |
| total coliforms | ≤3.0 | ≤3.0 | ≤3.0 | ≤100 | >100 |

1.4.1.4 Standard for sound quality

The site of proposed programme is located outside the industrial area, and the noise level at the factory boundary shall comply with the requirements for level III in “Environmental quality standard for noise” (GB3096-2008). Refer to table 1-7 for specific limits.

Table 1-7 Environmental quality standard for noise unit: Leq[dB(A)]

| Level | At day | At night |
|---|---|---|
| 3 | 65 | 55 |

1.4.2 Pollutants emission standard

1.4.2.1 **Air pollutants emission standard**

□1□self-owned heat and power station

The waste gas from 1#, 2#, 3#, 4# boiler in self-owned heat and power station shall comply with recruitments for coal-fired boiler emission control in urban downtown and planned areas at county and above levels at the second period in “Emission standard of air pollutants for thermal power plants” (GB13223-2003). Two 260 t/h boiler shall comply with the recruitments for coal-fired boiler emission control at the third period in GB 13223-2003. Refer to table 1-8 for specific limits.

Table 1-8 coal-fired boiler emission control at the third period in "Emission standard of air pollutants for thermal power plants"

| | Maximum allowable concentration mg/m$^3$ ) | | | | Blackness of smoke (Ringelmann number，level) |
|---|---|---|---|---|---|
| Period | the second period | | | the third period | |
| Implementation time | January 1st 2005 | January 1st 2010 | nuary 1st 2015 | January 1st 2004 | January 1st 2004 |
| Dust | 200 | 50 | 50 | 50 | 1.0 |
| $SO_2$ | 1200 | 1200 | 400 | 400 | |
| $NO_x$ | 650 | 650 | 650 | 450（$V_{daf}$>20%） | |

□2□Alkali recovery furnace

The emission of waste gas from alkali recovery furnace shall comply with the requirements for level II in table 2 of "Integrated emission standard of air pollutants" (GB16297-1996). Refer to table 1-9 for specific limits.

Table 1-9 Requirements for level II in table 2 of "Integrated emission standard of air pollutants"

| Pollutants | Maximum allowable concentration（mg/m$^3$） | Emission speed of chimney of 80m（kg/h） |
|---|---|---|
| Dust | 120 | 151 |
| $SO_2$ | 550 | 110 |
| $NO_x$ | 240 | 31 |

□3□Particulate

Particulate shall comply with the requirements for level II in "Integrated emission standard of air pollutants" (GB16297-1996). Refer to table 1-10 for specific limits.

Table 1-10 Level II of "Integrated emission standard of air pollutants"

| Pollutants | Maximum allowable concentration（mg/m$^3$） | Maximum allowable speed （kg/h） | Limit for monitored concentration of fugitive emission（mg/m$^3$） |
|---|---|---|---|
| Particulate | 120 | 3.5（15m） | 1.0（maximum concentration outside the boundary） |

□4□Odorous pollutants

Fugitive emission of Odorous pollutants shall comply with the requirements for level II for factory boundary of new and expanded projects in "Emission standards for odor

pollutants" (GB14554-93). Refer to table 1-11 for specific limits.

Table 1-11 Level II for factory boundary of new and expanded projects in "Emission standards for odor pollutants"

| Pollutants | Unit | Limit for level II for factory boundary of new and expanded projects |
|---|---|---|
| ammonia | $mg/m^3$ | 1.5 |
| hydrogen sulfide | $mg/m^3$ | 0.06 |
| Concentration of odorous gas | dimensionless | 20 |

1.4.2.2 Water pollutants emission standard

The current waste water shall comply with emission limits for other pulp and paper making stipulated in table 2 of "Discharge Standard of Water Pollutants for Pulp and Paper Industry " (GB3544-2008). Refer to table 1-12 for specific limits.

Table 1-12 "Discharge Standard of Water Pollutants for Pulp and Paper Industry " (table 2 of GB 3544-2008)

| Enterprise type | | | Enterprises of joint production of pulp and paper |
|---|---|---|---|
| Emission limit | 1 | pH value | 6～9 |
| | 2 | Color degree (dilution times) | 50 |
| | 3 | suspended matter (mg/L) | 30 |
| | 4 | $BOD_5$, mg/L | 20 |
| | 5 | $COD_{Cr}$, mg/L | 90 |
| | 6 | ammonia nitrogen(mg/L) | 8 |
| | 7 | TN(mg/L) | 12 |
| | 8 | TP(mg/L) | 0.8 |
| | 9 | AOX, mg/L | 12 |
| | 10 | Dioxin (pgTEQ/L) | 30 |
| Base waste water emission amount of unit product, t/t (pulp) | | | 40 |

Note:

1 The indicators of AOX and Dioxin are applied to the situation when Chlorine Bleaching process is used.

2 Amount of pulp refers to the absolutely dry pulp.

3 The actual waste water emission amount of enterprises of joint production of pulp and paper is based on the sum of amount of pulp manufactured by itself and amount of pulp purchased from outside.
4 When the percentage of pulp manufactured by itself in total amount of pulp use is larger than 80%, the base waste water emission amount of unit product is 20 t/t (pulp)
5 When the bleached non-wood pulp production amount in total amount of pulp use is larger than 60%, the base waste water emission amount of unit product is 60 t/t (pulp).

1.4.2.3 Standard for Noise

The noise level during construction period shall comply with the requirement in "Noise limits for construction site" (GB12523-1990). Refer to table 1-14 for specific limits.

Table 1-14 Noise limits for construction site

| construction period | Major noise source | Noise limit dB(A) | |
|---|---|---|---|
| | | At day | At night |
| Earth and stone | Earthmover, excavator, loader etc | 75 | 55 |
| Piling | All types of pile driver | 85 | Construction is prohibited |
| Structure | Concrete mixer, vibrator, electric saw, etc | 70 | 55 |
| Fitment | Crane, lifter etc | 65 | 55 |

The noise level during construction period shall comply with the requirement for level III in "Emission standard for industrial enterprises noise at boundary" (GB12348-2008). Refer to table 1-15 for specific limits.

Table 1-15 Emission standard for industrial enterprises noise at boundary

| Level | At day | At night |
|---|---|---|
| 3 | 65 | 55 |

1.4.2.4 Standard for solid waste (SW)

The SW storage place shall comply with requirement in "Standard for pollution control on the storage and disposal site for general industrial solid wastes (GB 18599-2001)". The household garbage shall comply with requirement in "Standard for pollution control on the landfill site of municipal solid waste" (GB 16889-2008).

# 2 Environmental protection measures

## 2.1 Pollution prevention and treatment measures during construction period

2.1.1 Air pollution prevention and treatment measures during construction period

For the purpose of reduce air pollution during construction period, the construction shall strengthen production and environmental management and implement civilized construction system. The following prevention and treatment measure shall be taken to control influenced scope.

(1) Implement strict rules and systems at the construction site: closed construction shall be implemented and set closure at construction site; conduct hardening treatment to the construction road and spray water regularly on the roads to prevent dust; the construction shall be stopped when the wind is heavy. Plant trees on spare spec of construction site.

(2) Control the links easy to produce dust: spray water properly on the excavating section of earth and stone work; excavated earth and stone shall be filled back or moved to designated place in time; the transportation shall use existing road in the factory to reduce the dust pollution during transportation; transportation vehicles, roads shall be cleaned, washed regularly to maintain the road at certain moisture, washing the wheels of vehicles before their leaving the construction site; Transportation vehicles shall move at low speed or under limited speed to reduce dust. Transportation roads in construction area shall be cleaned and washed in time; vehicles transporting material easy to produce dust such as dinas, cement and residue soil shall be covered with cloth; bulk cement tank shall be closed.

(3) Reduce the dust during material use and storage: construction material shall be loaded or unloaded lightly; commercial concrete shall be used to reduce dust pollution; used commercial bag cement as much as possible; bulk cement shall be stored closed and unloaded pneumatically; prevent the mixing of cement at the construction site; the height of soil in transporting vehicles shall be lower than the closure board of the vehicles; temporarily stored soil and sand shall be covered or sprayed with water

regularly; residue soil shall be cleaned as soon as possible; spray water on construction road to prevent dust.

(4) Construction equipment discharging much smoke shall be quipped with smoke elimination device to reduce impact on air.

(5) The pollution of tail gas from transportation vehicles and construction equipments is most serious during the time of idling, decelerating and accelerating, thus transportation vehicles and construction equipments at construction site shall control their speed to reduce tail gas pollution.

(6) The household energy of construction worker shall use clean energy such as electricity and liquefied petroleum gas (LPG).

2.1.2 Water pollution prevention and treatment measures during construction period

Following measures are suggested to take to reduce the impact of waste water generated from construction.

(1) Construction unit is required to meet relevant environmental protection specifications in construction contract.

(2) Prepare the general plan for temporary water drainage system in construction area before construction; temporary water drainage gutter shall be constructed during construction to emit rain water out; earth embankment can be established to prevent external water from flowing into the flat area; avoid water pond in the area influencing the stability of slopes.

(3) Recycle washing water and concrete conservation water as much as possible: rain, waste water from piling mud and water ponds during construction shall be collected and treated with sedimentation, then the upper layer liquid supernatant shall be emitted and lower layer mud shall be moved out with mud truck. Small oil removal and oil collection pool shall be set at the construction point with waste water containing oil such as vehicles and equipment washing and repair. The emitted water shall comply with the requirements for level I in GB8978-96.

(4) Simple water closet shall be constructed at construction site to collected fecal sewage. The collected fecal sewage shall be treated with three layers of digestion tanks with

the waste water staying in digestion tank no less than 12 hours. After this type of treatment, fecal sewage can be emitted with other general household waste water. The waste water containing oil from dining room shall be removed oil and then emitted with other general household waste water.

6.1.3 Noise prevention and treatment measures during construction period

Following measures are suggested to take to enable noise at factory boundary to meet relevant requirements.

(1) Reduce noise level at the noise source: construction equipment shall selected those will low noise level, for example, vibrator shall use high frequency vibrator, replace impact pile driver with pre-stressed jacked pile or water washed bored concrete pile (with little damage to geology) with low noise, fix equipment and earth excavating, the noise of soil transporting equipment shall be reduced by exhaust pipe or insulation of motor vibrating; improve the quality of equipment installation, equip shock reduction and prevention measure on major equipments; repair and maintain power mechanical equipments regularly to avoid the increase of its sound pressure level during operation caused by the shock of loose parts or damage of silencer; Turn off the equipment after use or unused equipments.

(2) Reasonable layout of construction site: avoid many power mechanical equipments at the same position to prevent local high sould level; screen shall be set near the equipment of high noise level to reduce noise and construct enclosure of certain height at he four sides of factory boundary; each equipment of high noise level shall be placed at the north part of construction site to reduce their impact on sensitive points at he south boundary.

(3) The construction time shall be arranged reasonably: avoid operation of equipments of high noise level at the same time. Except operation which continuous work is required by technique such as drilling, borehole cleaning and priming of bored concrete pile, foundation pit excavating at the earth and stone stage, and concrete casting of basement and roofing other construction work is prohibited to conduct at night. Construction at night must be approved by environmental protection department. If operation with high level noise needs to be arranged, temporary sound insulation

screen shall be established near these construction equipments to reduce noise.

(4) Reduce man-made noise as much as possible: operate mechanical equipment according to stipulations. Reduce noise from collision during molding and support installing and dismantling; moving articles lightly, do not throw construction tools freely or too far; transportation vehicles shall move at limited speed after entering construction site; whistling is prohibited.

2.1.4 SW pollution prevention and treatment measures during construction period

Following measures are suggested to take to reduce the impact of SW generated from construction on nearby environment.

(1) Reasonably design construction order, do well in balancing of excavation and fill, fill the waste soil in time, thus to reduce the time and scope of impact on air, soil and ecology.

(2) Reasonably arrange construction progress, use construction garbage as fill as much as possible; recycle waste construction material for comprehensive use thus to reduce final emission amount; construction garbage shall be stored at designated place according to the requirements of local environmental protection department and related department; for construction garbage requiring classified storage, these garbage shall be sent to designated storage yard separated after classification. Construction garbage shall be cleaned and moved in time, discard of garbage to near lake is prohibited in order to prevent pollution to water body.

(3) Temporary garbage collection container shall be set at construction site and the living area of construction workers to collected household garbage. Household garbage shall be cleaned in time and sent to designated garbage storage yard or landfill yard. Avoid freely discard and placement.

## 2.2 Analysis of waste water treatment measures

I. Analysis of treatment scale

Both water supply amount and water emission amount of chemical pulp system will be reduced after the completion of this programme. Based on engineering analysis, the water emission amount of chemical pulp workshop shall be 10115.8m3/d, reduced by 4043.2

m3/d. Therefore, the current waste water treatment facility can meet the demand of this programme after the completion of this programme.

II. Treatment process

 Treatment process

The medium waste water from the pulp making section shall enter aerobic waste water treatment station for treatment. Refer to figure 2-1 for treatment process.

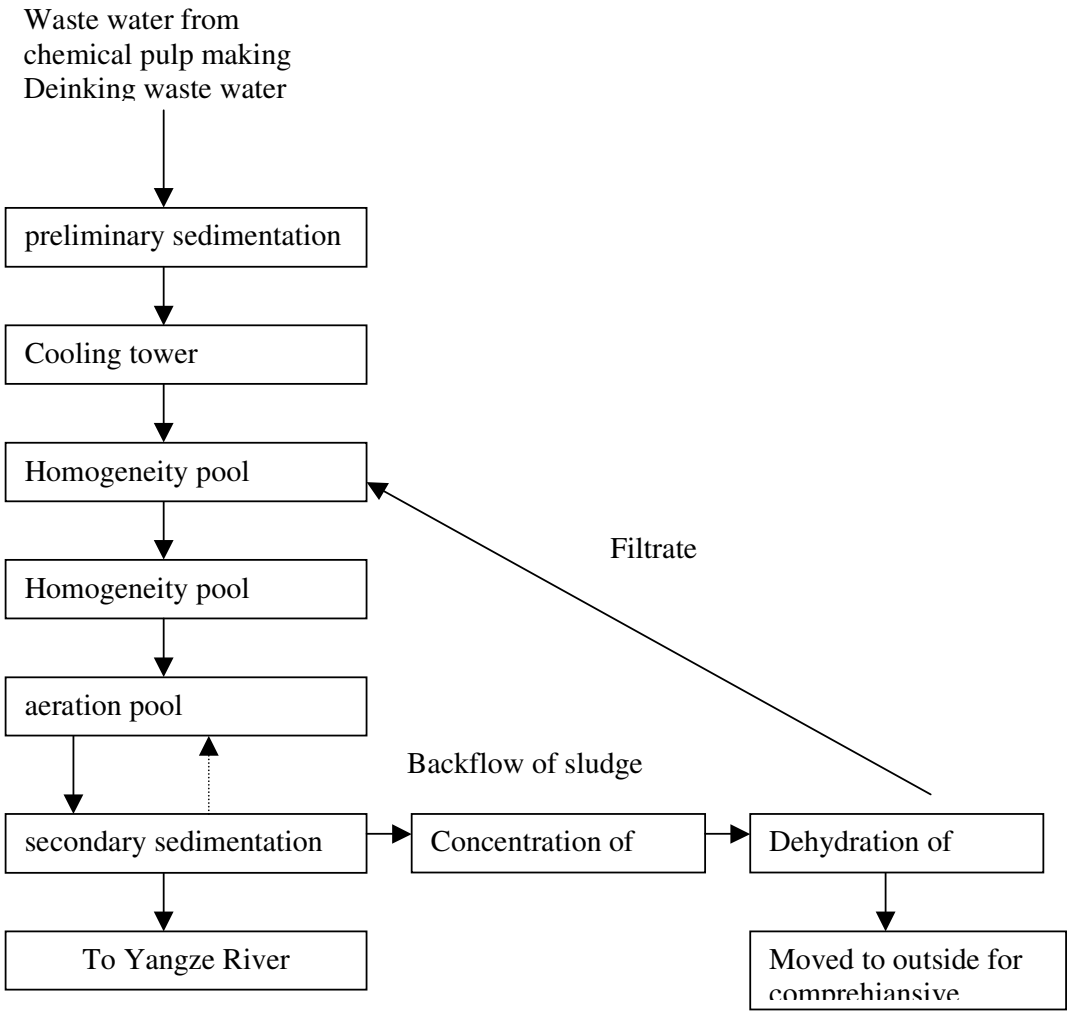

**Figure 2-1 Treatment Process Of Aerobic Waste Water Treatment Station**

Currently, YUEYANG FOREST □ PAPER CO., LTD owns two aerobic waste water treatment stations with the treatment scale are Q1=60000m3/d, Q2=60000m3/d. Both of the two stations use secondary biological treatment process. After the completion of this programme, the medium waste water shall be treated in aerobic treatment in 1# system and with three stage floatation, and then treated waste water is able to meet the requirements for new enterprise in table 2 of "Discharge Standard of Water Pollutants for Pulp and Paper Industry " (GB3544-2008).

## 2.3 Analysis of noise control measures

The major noise sources of proposed progamme are pulp pump, water pump, air compressor, etc.

□**1**□Principles of noise control

The following principles are followed for noise control measure during the design stage.

① Start from the noise source control. Require the manufacturer to manufacture equipment with the noise level not exceeding designed level and equip sound elimination and sound insulation devices on some equipments if necessary.

② The design of equipment and pipeline shall pay attention to shock and impact prevention to reduce vibrating noise, and improve the flow field situation during gas transmission thus to reduce aerodynamic noise

③ The design of factory building, the main working and rest place shall be far away from high noise source, and necessary duty room shall be set and protection operator from noise. Endure the sound insulation level of the buildings during building construction.

④ The general layout of the factory shall focus on overall planning, and reasonable planning and noise prevention distance. Establish green belt widely in the factory, near and factory and outside factory boundary to further reduce the impact of noise on nearby environment.

During the actual operation, the principles for noise control shall be as following based on noise pollution features and actual situation of different workshops and different noise sources in the current projects and proposed projects:

① The control measures for noise with mechanical vibration as major source shall be mainly shock reduction and sound insulation;

② Double measures of sound insulation and working environmental protection shall be applied for noise source in workshops;

③ Parallel silencer shall be considered for intermittent noise source to reduce the number of silencer;

④ For noise caused by high pressure air flow, pressure reduction and damping sound insulation shall be taken as major measures.

## 2.4 Analysis of SW treatment and disposal measures

The SW of proposed progamme is sludge with organics as major component. This type of SW can be sent to power boiler for combustion to recover heat. Refer to table 2-2 for the generation and treatment of SW for proposed progamme.

Table 2-2 situation abut generation and treatment of SW

| Name of SW | Generate position | Amount generated | | Solid component | Treatment |
|---|---|---|---|---|---|
| | | At absolutely dry condition（t/a） | With water（%） | | |
| Sludge | Waste water treatment station | 6120 | 85 | Organics | Combustion in boiler |

□1□Sludge from waste water treatment station

It is estimated that the proposed programme will generate 6120 t sludge every year with the water ratio of 85%. The biological treatment process used in waste water treatment station is surface aeration, thus most sludge is from preliminary sedimentation pool. Refer to table 2-3 for the major chemical compositions of the sludge.

Table 2-3 the major chemical compositions of the sludge

| Item | Concentration |
|---|---|
| Concentration of sludge | 1.5-2.0%（before dehydration） |
| Al | 81-450 |
| As | <0.1 |
| B | <0.1 |
| Cl | 6-49 |
| Cd | <0.01 |
| Ca | 8.35 |
| Cr VI | <0.01 |
| Na | 97-430 |
| Fe | 9.32 |
| Pd | 0.78 |

| | |
|---|---|
| nitrate nitrogen | 0.04-0.8 |
| P | 3-15 |
| K | 13-19 |
| Sulphate | 83-640 |
| TN | 30-420 |
| TC | 1990-8700 |
| COD | 8000-46000 |

Based on the analysis of above table, the major components of sludge are organics and fine fibers. The proposed programme will send sludge to boiler as fuel. Therefore, the sludge is used comprehensively and will not impose impact on environment.

The chlorine dioxide will generate some side products, which is mainly crystal of sodium sulfate. This crystal is filtered in filter, and then sold out after dissolving.

# 3 Environmental management

## 3.1 Enterprise environmental management

□1□Establishment of environmental protection management organizations

The enterprise established environmental protection management committee. Enterprise's GM took the position of director of the committee and each heads of unit are the member of the committee. The general engineer is responsible for environmental protection, safety and environmental protection department is responsible for daily environmental protection management whose specific contents include SW reduction and control, waste gas control and treatment, waster water control and treatment, noise control etc. each unit shall designate one staff as director responsible for environmental protection and one staff as environmental protector. The designated director responsible for environmental protection shall be the leader of unit and environmental protector is responsible for the daily environmental protection management and contact work of the department.

□2□Environmental management system

The enterprise stipulated a environmental protection responsibility system in which GM is responsible for overall work, safety and environmental protection department is responsible for checking and promoting, each unit is responsible for implementation and routing inspection of each section. The environmental protection facilities and staffs related to environmental protection are all incorporated in environmental management network to ensure each environmental protection facility has special staff to response. The production department implements the working system of four groups and three shifts, the production equipment and environmental protection equipment implement the system of central control and the combination of on-site checking and regular point checking. In case of problem found, it shall be reported and treated immediately to ensure the pollutant emission after meeting relevant requirements.

The enterprise stipulates environmental management system and gradually completes it. The environmental management system passed certification of the ISO 14001. The enterprise put forward the environmental guidelines of "complying with rules and regulations, energy conservation and consumption reduction, clean production and

sustainable development". Based on these guidelines, the enterprise also stipulates enterprise's environmental goals with which the performance is checked every month and thus to reward the good and fine the bad. As of pollution control, procedures related to environmental protection such as "environmental factor identification and assessment procedures", "waste water treatment and control procedures", "furnace smoke emission control procedures", "noise control procedures", "radioactive device management procedures", "emergency preparedness and response procedures" etc were stipulated, now these procedures are under normal running. In addition, the responsibility of each environmental protection director and environmental protector shall be implemented. Each management work of the enterprise must have corresponding record to make it "furnished with proof and evidence". Implement daily integrated inspection of positions and incorporated the checking results into the performance of medium leaders, thus to ensure the sustainable and stable running and continuous improvement of ISO 14001 environmental management system.

## 3.2 **Environmental management measures**

1. Environmental management measures during construction period

(1) The department responsible for project construction is responsible for the overall environmental protection work, implementing environmental protection plan during construction period, checking regularly and accepting the supervision and guidance of Hunan environmental protection Bureau.

(2) Implement unified arrange on construction site and place distribution according to the requirements of environmental protection department and the environmental protection measures suggested in the report.

(3) Implement environmental protection management to construction team to requirement it to construct according to environmental protection requirement, and check and supervise the implementation of environmental protection problems during construction.

2. Environmental management measures during operation period

The environmental protection work during operation period shall be incorporated in the overall management work. Each link of environmental management shall focus on

environmental protection, regularly check environmental protection work and accept the supervision and guidance of Hunan environmental protection Bureau.

1) Combine project techniques to carry out environmental protection guidelines of enterprise. Formulate environmental protection responsibility and regulations of each department and each position in line with environmental protection management system. Comply with national and local laws, regulations as well other relevant specifications.
2) Strictly implement environmental protection regulations. Set up and complete pollutant source record, environmental protection facility and technique process record during operation of project. Prepare pollutant discharge data sheet and running situation of environmental protection facility each month.
3) Conduct daily monitoring and maintain to environmental protection facilities and equipments, and record on file.Strictly implement environment monitoring and quality control complyin with the “environment management plan” inside the enterprise.
4) Conduct good environmental protection and safe production publicity and relevant technical training.
5) Strengthen management and set up emergency response system on abnormal discharge of waste water and waste gas, thus to minimize the impact of abnormal discharge. Be Responsible for the storage and utility of hazard chemicals. Organize Regular management, emergency response and evacuation measures of fire, explosion and poison prevention.
6) Assist local monitoring station to monitor waste gas, waste water and pollutant source. Check the disposal of solid waste.

Refer to table 2-4 for the major environmental impact and corresponding mitigation measures of this programme.

**Table 3-1 major environmental impact and corresponding mitigation measures**

| Stage | Field influenced | Potential impact | Suggested mitigation measures | Implementing party | Supervising party | Monitoring party |
|---|---|---|---|---|---|---|
| Design stage | Selection of pulp bleaching technique | Emission of water pollutants | Application of ECF bleaching technique | YUEYANG FOREST □ PAPER CO., LTD | / | / |
| Construction stage | Utility and obtaining of land | The programme is constructed in the existing equipment repair building and mechanical pulp workshop which are both located at the factory. Thus no new land is involved. | / | | Hunan Provincial Environmental Protection Bureau, Yueyang Municipal Environmental Protection Bureau | Hunan Environmental Monitoring Station, Yueyang Environmental Monitoring Station |
| | General problems of construction | Dust, tail gas form vehicles, waste water from construction, noise of construction equipment, waste soil and construction garbage | Stipulate strick construction rules and system, reduce noise level from the source and reasonably distribute construction site | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Dismantling of waste and old equipment and facilities | Risks on environment, safety and health | The dismantling is conducted by Hongtai Construction and Installation Engineering Co., Ltd who holds relevant qualifications thus to ensure the safe removal and disposal of equipments. | | | |
| | Air quality control | Dust, tail gas from vehicles | Well control the links where the dust is easy to generate, reduce the dust during material utility and storage | | | |
| | Water quality control | General waste water from construction includes those from dewatering well in earth stage, concrete maintenance in structuring state and washing of vehicles | Recycle washing water and concrete conservation water as much as possible. rain, waste water from piling mud and water ponds during construction shall be collected and treated with sedimentation, then the upper layer liquid supernatant shall be emitted and lower layer mud shall be moved out with mud truck. | | | |
| | Noise control | Noise from each construction equipment | The construction time shall be arranged reasonably to reduce noise from the source. | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | SW management | Waste earth and construction garbage | SW shall be collected with classes and sent to designated storage yard | | | |
| | Public health and occupational health | The movement of construction workers may cause epidemic disease. | Coordinate with construction unit to 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. | | | |
| | Public security, owners, contract parties and construction party | Emergency accident may cause injury or death of construction workers. | 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 | | | |
| Operation stage | Water quality control | Black liquid from pulp making and cooking, medium waste water from pulp making and paper making, waste water from alkali recovery system | Black liquid will be treated in alkali recovery system, other waste water shall be emitted after treatment in waste water treatment station and after meeting relevant requirements | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Air quality control | Dust, SO2 and NOx generated in heat and power station and alkali furnace in chemical workshop | Emitted after treatment by electric/bag precipitator | | | |
| | Noise control | All types of pump in production workshop, air compressor, coal grinder in heat and power station, fans and exhaust of high-pressure air | The noise sources are far from factory boundary and all in door, thus the noise from the programme imposes no impact on the sound environment of the area 220 m away. | | | |
| | SW management | Sludge of waste water treatment station, waste scraps from material preparation. The improper treatment of sodium sulfate-the side product will also cause SW pollution. | This type of SW can be sent to power boiler for combustion to recover heat. Strengthen the management of sodium sulfate storage, and sold out after dissolving to reduce storage amount | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Risk management | 1. Accidental emission of pollutants.<br>2. The leakage of raw 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. | 1. prepare spare equipments, strengthen accident monitoring and ensure the performance of waste water treatment station<br>2. Limit the storage amount of materials 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. | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Public health and occupational health | Occupational health problem such as hearing loss may be caused by noise because workers are working in the same position for long time. | Distribute 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. | | | |
| | Public security | Improper operation and other emergency accident may cause injury or death of workers. | Stipulate and implement relevant safety protection measures, set up safety warning sign, safety protection equipment; stipulate and complete safety facilities and equipment operation procedure. strengthen safety knowledge training, and technique, equipment operation training; strengthen site safety checking and prepare and implement emergency response and accident rescue plan | | | |

# 4 Environmental risk assessment

## 4.1 Identification of environmental risk

### 4.1.1 Scope of risk

The scope of this environmental risk identification includes the identification of risks concerning production facilities and identification of risks concerning substance related to the production process.

(1) The scope of identification of risks concerning production facilities includes the production device area, storage and transportation system, public project system, environmental protection facilities and supporting facilities.

(2) The scope of identification of risks concerning substance related to the production process can be determined according to the situation of major raw materials, auxiliary material, products and three wastes generated during production process.

### 4.1.2 Risk substance

According to "Hazardous chemical inventory" (2002) and relevant data, the hazardous chemicals related to production process of this programme are sulfuric acid, sodium chlorate, methyl alcohol, methane, hydrogen peroxide, chlorine dioxide. Refer to table 4-1～4-6 for their names, physicochemical property and toxicity.

**Table 4-1 physicochemical property and hazard of sulfuric acid**

| | | | | |
|---|---|---|---|---|
| Nature | GB number | 81007 | | |
| Physicochemical property | CAS NUMBER | 7664-93-9 | | |
| | Chinese name | 硫酸 | | |
| | English name | Sulfuric acid | | |
| | Other name | 磺镪水 | | |
| | Molecular formula | H2SO4 | Appearance and property | Pure sulfuric acid is colorless, transparent and odorless oily liquid |
| | Molecular weight | 98.08 | Vapor pressure | 0.13kPa(145.8℃) |

| | | | | |
|---|---|---|---|---|
| | Melting point | 10.5℃ boiling point: 330.0℃ | solubility | soluble in water |
| | Density | Relative density (water=1)1.83□relative density (air=1)3.4 | stability | Stable |
| | Hazard label | 20(Corrosive) | Major utilities | Used for making chemical fertilizer and industry such as chemical industry, medicine, plastics, dying, and Petroleum refining |
| Hazardous characteristics | 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.<br>Combustion (decomposition) product: Sulfur oxide. | | | |
| Toxicity | Acute toxicity: $LD_{50}$80mg/kg(rat, oral)；$LC_{50}$510mg/$m^3$，2h(rat inhalation)；320mg/$m^3$，2h(mouse inhalation) | | | |
| Health hazard | Invasion ways: inhalation, ingestion.<br>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 demaofglottis and leading to death. If swallowed by mistake, it may cause burn or ulcer to digestive tract. In most serous cases, stomach perforation, peritonitis, laryngospasm, demaofglottis, 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.<br>eye protection: wear chemical safety glasses<br>Protecting suit: working clothes(made from anticorrosive material)。<br>hand protection: wear rubber glove。<br>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.<br>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.<br>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.<br>ingestion exposure: give victims milk, egg white or vegetable oil; do not induce vomiting. Rush to the hospital immediately.<br>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 ($2mg/m^3$)<br>The maximum allowable concentration in air of residential area is (one time value: $0.30mg/m^3$. daily average value :$0.10mg/m^3$)) |

**Table4-2 Physicochemical property and hazard of sodium chlorate**

| | | |
|---|---|---|
| Nature | GB number | 51030 |
| Physicochemical property | CAS NUMBER | 7775-09-9 |
| | Chinese name | □□□ |
| | English name | sodium chlorate |
| | Other name | □□□ |

<table>
<tr><td rowspan="6"></td><td>Molecular formula</td><td>NaClO3</td><td>Appearance and property</td><td>Colorless, odorless crystalline, salty and cool, with hygroscope</td></tr>
<tr><td>Molecular weight</td><td>106.45</td><td>Vapor pressure</td><td>Decomposed</td></tr>
<tr><td>Melting point</td><td>248～261℃</td><td>solubility</td><td>Easily soluble in water and slightly soluble in ethanol</td></tr>
<tr><td>density</td><td>Relative density (water=1)2.49</td><td>stability</td><td>Stable</td></tr>
<tr><td>Hazard label</td><td>11(oxidizer)</td><td>Major utilities</td><td>Used as oxidizer, to produce chlorate, herbicide, pharmaceuticals and used in metallurgy ore treatment</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>Hazardous characteristics</td><td colspan="4">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.<br>combustion (decomposition) product: oxygen, chloride and sodium oxide</td></tr>
<tr><td>Toxicity</td><td colspan="4">acute toxicity: $LD_{50}$1200mg/kg(rat, oral)</td></tr>
<tr><td>Health hazard</td><td colspan="4">invasion ways: inhalation, ingestion, percutaneous absorption.<br>health hazard: The powder is irritative to respiratory tract, eye and skin. Acute toxic if swallowed, with the methemoglobinemia, gastroenteritis, lever and kidney damage or even suffocate.</td></tr>
<tr><td>Emergency response to leakage</td><td colspan="4">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></tr>
<tr><td>Protection measure</td><td colspan="4">Respiratory system protection: when it is possible to contact its powder, it is suggested to wear<br>Eye protection: wear chemical safety glasses<br>Body protection: wear polythene gas protection clothes<br>Hand protection: wear rubber glove<br>Others: smoking, eating and drinking is prohibited at working site. Take a shower and change clothes after work. Maintain good sanitary habit.</td></tr>
<tr><td>First aid</td><td colspan="4">Eye exposure: Immediately lift the eye lip and eyes must be flushed with running water or normal saline solution. Rush to the hospital.<br>Inhalation exposure: Remove victims to fresh air. If breathing is labored, administer oxygen support. If not breathing, provide artificial respiration. Rush to the hospital.</td></tr>
</table>

| | |
|---|---|
| | Ingestion exposure: Drink enough lukewarm water, induce vomiting. Rush to the hospital.<br>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. |
| Environmental standard | The Soviet Union the maximum allowable concentration in air of workshop is 5mg/$m^3$<br>The Soviet Union(1975) The maximum allowable concentration in water is 20mg/L |

**Table 4-3 Physicochemical property and hazard of methyl alcohol**

| Nature | GB number | 32058 | | |
|---|---|---|---|---|
| Physicochemical property | CAS NUMBER | 67-56-1 | | |
| | Chinese name | □□ | | |
| | English name | methyl alcohol□Methanol | | |
| | Other name | alcohol methylique | | |
| | Molecular formula | CH4O；CH3OH | Appearance and property | Colorless and clean liquid，with pungent odor |
| | Molecular weight | 32.04 | Vapor pressure | 13.33kPa/21.2℃ flashing point: 11℃ |
| | Melting point | -97.8℃ boiling point: 64.8℃ | solubility | soluble in water, and many organic solvent, such as alcohol and ether |
| | density | relative density (water =1)0.79；relative density (air=1)1.11 | stability | Stable |
| | Hazard label | 7 (inflammable liquid) | Major utilities | Used to produce methanal, essence, dyestuff, medicine, gun powder and freeze-proof agent |

| | |
|---|---|
| Hazardous characteristics | Inflammable, 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.<br>combustion (decomposition) product: carbon monoxide, carbon dioxide。 |
| Toxicity | Toxicity: moderately toxic<br>Acute toxicity: $LD_{50}$5628mg/kg(rat, oral)；15800mg/kg(rabbit, percutaneous)；$LC_{50}$82776mg/kg，4h(rat inhalation)；human being, oral 5～10ml，incubation period 8～36h，cause come；human being, oral 15ml，retinitis or even blindness within 48h；human being, oral: 30～100ml serious damage to central nervous system, faint breath or even death。<br>Subacute and chronic toxicity: ratinhalation50mg/$m^3$，12h/d，three months，damage to mucosa of traches and bronchia, dystrophia of cerebral cortex cells within 8-10weeks.<br>Mmutagenicity: microorganism mutagenicity: Saccharomyces cerevisiae 12pph。DNA restrain: lymphocyte of human beings300mmol/L。<br>reproduction toxicity: rat, oral minimum poisoning concentration($TDL_0$): 7500mg/kg( pregnant 7～19 day)，impose impact on behavior of baby mouse.Rat inhalation minimum toxic concentration($TCL_0$): 20000ppm(7h)，(pregnant 1～22d)，cause abnormal development of muscle, ossature, cardiovascular system and urinary system. |
| Health hazard | Invasion ways: inhalation, ingestion, percutaneous absorption.<br>Health hazard: narcotism to central nervous system; special selection of optic nerve and retina, cause pathological changes; may cause metabolic acidosis.<br>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.<br>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. |

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| | 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.<br>Eye protection: wear chemical safety glasses<br>Body protection: wear anti-static working clothes。<br>Hand protection: wear rubber glove<br>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 regularly. |
| First aid measure | Skin exposure: Take off polluted clothes and immediately wash the exposed area with soup water or clean water.<br>Eye exposure: Immediately lift the eye lip and eyes must be flushed with running water or normal saline solution. Rush to the hospital.<br>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.<br>Ingestion exposure: Drink sufficient lukewarm water, induce vomiting, and wash stomach with clean water of 1% sodium thiosulfate. Rush to the hospital.<br>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.<br>Fire extinguishing agent: alcohol resistant foam, dry powder, carbon dioxide, and sand. |
| Package, storage and transportation | Shipped with tank truck. Stored in tank in factory with storage quantity of 10t. |
| Environmental standard | The maximum allowable concentration in air of workshop is (50mg/$m^3$)<br>The maximum allowable concentration in air of residential area is (one time value: 3.00mg/$m^3$, daily average value1.00mg/$m^3$) |

**Table 4-4 Physicochemical property and hazard of methane**

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|---|---|---|---|---|
| Nature | GB number | 21007 | | |
| Physicochemical property | CAS NUMBER | 74-82-8 | | |
| | Chinese name | methane | | |
| | English name | methane□Marsh gas | | |
| | Other name | Biogas | | |
| | Molecular formula | CH4 | Appearance and property | Colorless and odorless gas |
| | Molecular weight | 16.04 | Vapor pressure | 53.32kPa/-168.8℃ flashing point: -188℃ |
| | Melting point | -182.5℃ boiling point: -161.5℃ | Solubility | Slightly soluble in water, and soluble in alcohol and diethyl ether |
| | density | relative density (water=1):0.42(-164℃); relative density (air =1): 0.55 | Stability | Stable |
| | Hazard label | 4(inflammable liquid) | Major utilities | Used as fuel and to produce carbon black, hydrogen, ethyen and methanal |
| 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, dysergia<br>Acute toxicity: mouse, inhalation 42% concentration×60minuts, narcotism; rabbit: inhalation | | | |

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| | 42% concentration×60minutes, narcotism. |
| Health hazard | Invasion ways: inhalation.<br>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 headche, dizziness,lacking in strength, attention-deficif 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 ware 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坑, 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 par 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<br>Eye protection: o special protection is needed generally. Wear safety glasses in case of high concentration.<br>Body protection: wear anti-static working clothes.<br>Hand protection: wear common protecting gloves.<br>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.<br>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.<br>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, dry powder。 |
| Package, storage and transportation | Collect the methane generated during waste water treatment process into gas storage tank with the largest storage volume of 140$m^3$ |
| Environme | The Soviet Union The maximum allowable concentration in air of workshop is concentration |

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| ntal standard | 300mg/m$^3$<br>US, work shop sanitary standard asphyxiating gas |

**Table 4-5 Physicochemical property and hazard of hydrogen peroxide**

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| Nature | GB number | 51001 | | |
| Physicochemical property | CAS NUMBER | 7722-84-1 | | |
| | Chinese name | hydrogen peroxide | | |
| | English name | hydrogen peroxide | | |
| | Other name | □□□ hydrogen peroxide | | |
| | Molecular formula | H2O2 | Appearance and property | Colorless and transparent liquid，with slight special smell |
| | Molecular weight | 43.01 | Vapor pressure | 0.13kPa(15.3℃) |
| | Melting point | -2℃/without water, boiling point: 158℃/without water | solubility | soluble in water alcohol, ether, but not in benzene and petroleum ether |
| | density | relative density(water=1)1.46(without water) | stability | Stable |
| | Hazard label | 11(oxidizer)，20(corrosive) | Major utilities | Used for bleaching, medicine and as analysis agent |
| 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 decomposite in alkali solution, or meet with strong light, especially short wave ray. It began to decomposite after heated to or above 100℃. 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 decomposite after contact with inorganic compound or foreigners, leading to explosion, sending out large heat, oxygen and water steam. | | | |

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| | Most heavy metal (such as Cu, Ag, Pb, Hg, Zn, Co, Ni, Cr, Mn) and their oxide and saltare 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. |
| Toxicity | Acute toxicity: $LD_{50}$4060mg/kg(rat, percutaneous)；$LC_{50}$2000mg/$m^3$，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。 |
| Health hazard | Invasion ways: inhalation, ingestion.<br>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. |
| Emergency response to leakage | 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.<br>Waste water disposal method: The waste liquids are diluted and decomposite to release oxygen. After complete decomposition, wash the water liquid to kennel. |
| Protection measure | Respiratory system protection: when it is possible to contact its vapor or smoke, contained filter gas protection mask (full mask) shall be worn.<br>Eye protection: protected in respiratory system protection<br>Body protection: wear polythene gas protection clothes<br>Hand protection: wear neoprene rubber gloves<br>Others: smoking, eating and drinking is prohibited at working site. Take a shower and change clothes after work. Pay attention to personal cleaning. |

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| First aid measure | Skin exposure: take off polluted clothes and immediately wash the exposed area with large amount of running water.<br>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.<br>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.<br>Ingestion exposure: drink enough lukewarm water, induce vomiting. Rush to the hospital.<br>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.<br>Fire-fighter: water, vaporific water, dry powder, sand. |
| Package, storage and transportation | Transported with tank car. Stored in tank in factory with storage volume of approximately 50$m^3$ |
| Environmental standard | The Soviet Union(1975) The maximum allowable concentration in air of working area is 1.4mg/$m^3$ |

**Table 4-6 Physicochemical property and hazard of chlorine dioxide**

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| Nature | GB number | ---- | | |
| physicochemical property | CAS NUMBER | 10049-04-4 | | |
| | Chinese name | chlorine dioxide | | |
| | English name | Chlorine dioxide□Chlorine oxide | | |
| | Other name | | | |
| | Molecular formula | ClO2 | Appearance and property | Yellow red gas with irritation smell, able to diffuse along ground. The solution with concentration lower than 10% is used and restored. |
| | Molecular weight | 67.45 | Vapor pressure | 9.9℃/97.2kPa(explosion) |

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| | Melting point | -59℃ | Solubility | Not soluble in water |
| | Density | relative density(water=1)3.09(11℃)；relative density(air=1)2.3 | Stability | unstable |
| | Hazard label | | Major utilities | Used as bleacher, deodorant and oxidizer |
| Hazardous characteristics | hazardous characteristics: strong oxidizing property. Can react explosively with many chemicals. sensitive to heat, shock, hit, and friction and easy to decomposite for explosion. combustion (decomposition) product: hydrogen chloride | | | |
| Toxicity | No record | | | |
| Health hazard | invasion ways: inhalation, ingestion。<br>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. | | | |
| Emergency response to leakage | 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 not be used again, and the left gas shall be eliminated with technical treatment. | | | |
| Protection measure | Respiratory system protection: 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.<br>Eye protection: wear chemical safety glasses<br>Body protection: Wear anticorrosive working clothes.<br>Hand protection: when it is possible to contact this substance，wear chemical preventing gloves if its possible to contact toxics.<br>Others: smoking is prohibited at working site. Take a shower and change clothes after work. Maintain good sanitary habit. | | | |

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| First aid measure | Skin exposure: 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.<br>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.<br>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.<br>Ingestion exposure: The person swallowing it by mistake shall rinse the mouth, drink eat or egg white. Rush to the hospital immediately.<br>Fire-fighting method: cut off gas source. Spray water to cooling container. If possible, move the container from fire field to open area. |
| Package, storage and transportation | Self-generated and self-used chlorine dioxide is absorbed with water. Stored temporarily in tank with the storage volume of $10m^3$ |
| Environmental standard | US, work shop sanitary standard $0.3mg/m^3$<br>The Soviet Union(1975) The maximum allowable concentration in water is 0.4mg/L |

Sulfuric acid, sodium chlorate, methyl alcohol, hydrogen peroxide used in the production and methane and chlorine dioxide generated in production have strong toxicity, inflammability and oxidization. The accident concerning above substance may impose adverse impact on nearby environmental and people. In considering the hazard and storage amount of above substance it is determined that the methyl alcohol solution is the material leakage assessment factors with the risk types including fire, explosion and poisoning.

### 4.1.3 **Risk type**

The accident of this project may happen during the process of transportation, storage and use of hazardous chemicals, the risk types identified as following:

(1) loading, unloading and transportation process

Sulfuric acid, sodium chlorate, methyl alcohol, hydrogen peroxide used in this project is transported on road with special vehicles. The major risks during loading, downloading and transportation process are:

① Traffic accident of transporting vehicles may cause leakage of material, poisoning of

driver and ambient people, pollution of ambient water, and leading to environmental damage and human death and injury.

② During loading and unloading process, the mistake of operators may cause leakage of material, the concentration of toxic and harmful substance higher limit, and eventually cause poisoning of operators.

(2) Storage and production process

The hazardous chemicals such as sulfuric acid, methyl alcohol, hydrogen peroxide used in production are mainly stored in iron tanks. The major risks during storage and production process are:

① Methyl alcohol liquid is easy to volatile. Though it will not cause fire or explode，the solubility of methyl alcohol steam in water and body liquid is extremely high, so it will diffuse in human body after inhalation, causing damage to eyesight or even losing eyesight. In serious case, it may cause bradycardia, hyperspasmia or shock etc.

② Methyl alcohol is quick to cause fire, with extremely high temperature and strong fire force, hard to distinguish. So its fire may burn people and factory and equipment.。

③ Leakage of large amount of methyl alcohol will form explosive mixture with air if no controlled in time. Major explosion may happen when the mixture reaches explosion limit, or meet static spark or collision spark.

## 4.2 Environmental risk prevention and emergency response measures

China insists the guidelines of “focusing on prevention and safety first” on safe production, with the work focus on prevention, implementing effective risk prevention measure will reduce the probability of accident, minimize the damage caused by accident and reduce impact of accident on air, water and ecology. Strict environmental safety management shall be implemented during regular management and complete emergency response measure shall be prepared to quickly respond to accident, excavate people and conduct emergency monitoring and rescue.

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

General layout and construction design shall considerate 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 escorters 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 hard 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 operation**

“Ban on safe production of ministry of chemical industry” (41bans) 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 □□ 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 prepared at production positions;

(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 provided.

### 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 provided near storage tanks and emergency material such as lime and sand shall be prepared.

### 4.2.5 Management system of hazardous chemicals

① Purpose: enable the work of storage, maintenance and transportation of hazardous article and chemical is conducted in order to maintain their quality and ensure safety.

② Scope: all hazardous chemicals (sulfuric acid, methyl alcohol);

③ Storage area and environment: the storage area shall avoid sunshine, ventilate and prevent moister. The warehouse shall be in normal (temperature of 5□35□, relative humidity of 45%-85%) environment.

④ Storage specification: prevent fire, water and pressure. Fixed point, position and quantity; first come, first leave. Article shall be put on shelf or cardboard for insulation, prevent rust of package barrel. No power or fire is allowed in warehouse of hazardous chemicals. Different hazardous chemicals with opposite protection and fire-fighting methods shall not be stored in the same warehouse and the same storage room.

⑤ Disposal of hazardous chemicals: package barrel, plastic bag, and bottle containing hazardous chemicals shall be managed strictly after use and recycled and registered by material supplier. Disposal of inflammable and explosive substance must be conducted after application and approved by safety department and safety protection measure shall be stipulated. Strengthen recycling management of waste metal. All metal containers with hazardous property shall be stored in special area of factory and recycled by material supplier.

⑥ Safety measure: the maintenance of hazardous chemicals shall follow the principle of “three far away and one prohibition”, i.e. far away from fire source, far away from

water source and far away from power source, mixed storage is prohibited. Hazardous chemicals and inflammable and explosive substance shall be stored in designated area and taken care of by specially designated people. Fire-fighting facilities shall be prepared according to the standards issued by fire-fighting department, and checked once a month to ensure its normal functions. The people taking care of hazardous chemicals warehouse shall select those with strong sense of responsibility, special training, understanding the property of hazardous chemicals and safety management knowledge. They shall also in charge of the management of protection articles and tools

### 4.2.6 Emergency response measures

(1) Leakage of sulfuric acid

① Leakage of sulfuric acid: Evacuate people in leakage polluted area to safe area, and insulate polluted area to limit entry and exit. Emergency response people are suggested to ware 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 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 steam. 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 skin contacting sulfuric acid. 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 of three 0.5% Bupivacaine or other local anesthetic into eye. The suffered with sulfuric acid into mouth shall not vomit. Do not put anything to the mouth of people

with coma, after wakening 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, give the 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.

## 4.3Emergency response and rescue plan and monitoring

4.3.1 Emergency response plan

□1□Countermeasures and measures concerning chemicals risk prevention

(1) The chemical risks of the enterprise mainly happen during the storage, transportation and use of hazardous chemicals, thus the enterprise will strictly follow "Regulations on the Management of Hazardous Chemicals" (Order of State Council No.344 in 2002) and "general guidelines for storage of common hazardous chemicals" (GB15603-1995).

a. The storage area complies with fire-fighting and safety requirements.

b. Complete system of specific person production responsibility. Clarify responsibilities and strengthen inspection of inflammable and explosive areas with key chemicals, key warehouses and key equipments.

c. Staffs working in warehouse shall receive special training and take poison with certificate. Warehouse keeper shall check the warehouse three times a day, i.e. check after starting work, during work and before leaving: check whether the stacking is firm, whether the package has leakage, whether the power is safe. Problem shall be treated as soon as possible to eliminate risks.

d. Establish industrial health, environmental monitoring and management system. Manage the normal running of the factory. In case of accident, emergency poison-prevention monitoring, poison-prevention command and rescue the poisoning.

e. Check the lighting protection devices of the tank made of metal regularly.

f. All pipelines conveying chemicals shall conduct stress test and shall be put into operation after it is sure that there is no leakage. Nondestructive inspection of pipelines shall be regularly conducted.

g. Liquid chlorine tank shall equip with corresponding gas sensor alarming system and emergency gas washing facilities. Operators shall prepared gas mask and emergency oxygen cylinder.

h. weather cock measuring wind speed and wind direction as well as emergency alarming facilities shall be provided in the chemical factory.

(2) Accident in waste water treatment station □□□□□□□

The enterprise stipulates “emergency response plan for waste water treatment accident”. The following steps shall be followed in case of accident in waste water treatment station.

**Step one:** after the accident, water supply and drainage workshop shall immediately call enterprise’s environmental protection office and production control room. And production control room shall call the General Director of emergency rescue command (or the Vice General Director in the absence of General Director). The General Director shall order people to go the accident site and impalement different emergency treatment according go the above natures of the accidents.

① For the accidents of direct emission of waste water without effective treatment caused by the abnormal running of aerobic waste waster treatment facilities for the failure of coarse grilling, fine grilling, water inflow pipelines and equipment:

A. If the failure can not be recovered within 24 hours, with the arrangement of emergency rescue command and approval of General Director, the chemical wood pulp and chemical reed pulp production line shall be stopped until the recovery of the failure.

B. If the failure can not be recovered within 48 hours, with the arrangement of emergency rescue command and approval of General Director, the all pulp making production lines shall be stopped until the recovery of the failure.

② The accident of waste water emission without meeting relevant requirements for more than 24 hours caused by the improper control of waste water treatment technique: the failure cause shall be immediately identified. And with the arrangement of emergency rescue command and approval of General Director, the chemical wood pulp and chemical reed pulp production line shall be stopped until the recovery of the failure.

③ The accident of waste water emission without meeting relevant requirements for more than 24 hours caused by high load of pollutants in waster water entering waste waster treatment station for the abnormal emission of waste water from related production workshop: the failure cause shall be immediately identified. And with the arrangement of emergency rescue command and approval of General Director, the production line in related workshop shall be stopped until the recovery of the failure.

④ Abnormal emission of waste waster after aerobic treatment:

A. For the accident waste water emission without meeting relevant requirements caused by high load of pollutants in waster water entering waste waster treatment

station for improper control of waste water treatment technique: the failure cause shall be immediately identified. And with the arrangement of emergency rescue command and approval of General Director, the chemical and mechanical pulp workshop shall decrease production and emit the waste eater from chemical and mechanical pulp workshop directly to gutter for aerobic treatment or stop the production of chemical and mechanical pulp workshop.

B. If the accident is caused by the failure of chemical pulp equipment: the failure cause shall be immediately identified. And with the arrangement of emergency rescue command and approval of General Director, chemical and mechanical pulp workshop shall decrease or stop production.

**Step two**: after the accident, environmental protection office shall immediately report to Yueyang Environmental Protection Bureau.

**Step three:** the operation can only be restarted after the treatment of accident and after the confirmation of emergency rescue team.

(3) Failure of precipitator

The emergency response plan for failure of precipitator is as following.

**Step one:** after the accident, water supply and drainage workshop shall immediately call enterprise's production control room. And production control room shall call the General Director of emergency rescue command (or the Vice General Director in the absence of General Director). The General Director shall order people to go the accident site and impalement different emergency treatment according go the above natures of the accidents.

□ in case of the following failure, the equipment with failure shall be turned off immediately and can not be restarted until the failure is recovered:

A. Electrical failure

a. The heat release of rectifier transformer is increasing largely, or obvious flashover, arc discharge and shock is found in the equipment.

b. Large current rush caused by out of control of power supply device.

c. Fire of electrical equipment.

d. Other situations threatening human and equipment safety.

B. Mechanical failure

a. Short circuit of the electricity field
b. Heterospolar distance is decreased largely in electricity field and arc discharge is continuous.
c. Lime emission system is stopped for failure.

 according to the actual situation, the equipment shall be turned off and can not be restarted until the failure is recovered:

A. Electrical failure
a. The heat release of rectifier transformer is increasing
b. Leaning excitation of power supply device
c. The heat release of controllable silicon cell is increasing
d. The insulation value at the high pressure part is low when starting the equipment.

B. Mechanical failure
a. The ash bucket blocks ash
b. The boiler burns oil.

**Step two**: the treatment after the stop of electric precipitation device:

The workers on duty shall immediately report to the workshop to require it to operate with lower pressure.

The head of the furnace team on duty shall be informed.

Turn off the round plate valves at the inlet and outlet of electricity field to prevent direct emission of smoke

The head of electric precipitation team shall contact related people to repair the electricity field

Restart the electric precipitator as soon as possible

If the above two types of failure can not be recovered within 24 hours, the head on duty shall inform Vice factory manager of heat and power factory and emergency rescue command, and the spare boiler can be used.

**Step three:** the operation can only be restarted after the treatment of accident and after the confirmation of emergency rescue team.

4.3.2 Emergency monitoring

The principles of “prevention first, active move and focusing on prevention” shall be followed to prepare well for the emergency monitoring. The monitoring people shall

prepare to go to the site at any time, and laboratory shall prepare to analyze and test at any time will all site test instruments ready for monitoring. It shall be ensured that the people are ready to go to the site and conduct monitoring work. The items which can be measured at the site shall be measured at site. For items which can not be measured at the site, the sample shall be taken to laboratory for immediate alalysis to ensure the timely report of data and provide basis for emergency measure, thus to prevent accidental emission and damage.

The focus of emergency monitoring of this programme is air pollution

(1) emergency monitoring of air

Monitoring points are set near polluted area and nearby residential area. The focus of Air emergency monitoring points is at the downwind area 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 specification and standards, meeting the validation of data.

(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, reform the public to stop using water before the elimination of danger.

4.3.3 Emergency response guarantee measures

(1) Fund guarantee: YUEYANG FOREST □ PAPER shall prepare certain pollution accident emergency fund specially used for purchasing 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, self-rescue and mutual rescue.

4.3.4 Treatment of pollution accident

After the environmental emergency is under control, 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 of duty, 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 and pacified, 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. Public communication mechanism concerning environmental protection

## 5.1 Major issues concerned by the public

(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 Public communication plan on environmental protection

(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 measures, 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) Mail box and reception office shall be set to accept long-term supervision of the public, correct and manage the issues proposed by the public.

(4) The contact telephone (0730-8590552) and contact person (Mr. Zhao, head of Safety and environmental protection department of YUEYANG FOREST □ PAPER shall be provided and released to the society, thus to create a channel to communicate with the public during the construction and operation stage.

# 6. Environmental supervision and monitoring plan

## 6.1. Environmental supervision plan

The key of environmental protection is environmental management. As experience proves environmental management is an important part of enterprise management just like plan management, production management, quality management, technology management and finance management. Good and effective environmental management plays an important role in improving environmental benefit, economic benefit and social benefit.
Environmental benefit takes environmental protection as goal, takes clean production as method and take develop production and economic benefit. Thus the environmental management shall be strengthened to ensure the “three wastes treatment” facilities to run normally, thus to realize harmonious development of economic benefit, environmental benefit and social benefit as well as virtuous circle.
YUEYANG FOREST □ PAPER has established relatively complete environmental management system. According to the productin organization and requirement of environmental protection, there is a Vice GM responsible for the environmental management of the whole factory and the supervision of the operation of environmental protection facilities. Environmental protection office is set as the full-time environmental protection department. The head of Environmental protection office assist the work of above Vice GM. The specific tasks of environmental protection include the reductin and control of SW, control and treatment of waste gas, control and treatment of waste water as well as noise control.

## 6.2. Purpose of environmental monitoring

With the increase of the public awareness on environmental protection, the impact of the programme construction on environmental quality of nearby area are high concerned, thus the environmental monitoring and management become more important. In order to ensure the pollutants emission after the completion of the programme meets the requirements in national environmental protection policies and EIA report, the factory must ensure effective environmental management and environmental monitoring by monitoring agency

or qualified unit, thus to realize harmonious development of economic benefit, environmental benefit and social benefit.

## 6.3. Environmental monitoring plan

The environmental monitoring includes two stages: monitoring during construction period and monitoring during operation period with the purpose of full and timely understanding the pollution trends of proposed project, understanding the impact degree and scope of project on local environmental quality, reporting feedbacks to environmental protection authorities, thus to provide scientific basis for environmental management of project.

### 6.3.1 *Environmental monitoring plan at present*

At present, Yueyang Forest & Paper Co,Ltd. regular monitoring the wastewater outfall of each workshop and the whole plant, 5 times a week,monitoring indicators include CODcr,SS,pH,Flow.

In the other hand, Yueyang Forest & Paper Co,Ltd. commissioned the Environmental Monitoring Center of Yueyang City to monitor the wastewater from wastewater treatment station both input and output with the primitor flow amount, pH value, $COD_{cr}$, $BOD_5$, the SS, TP,TN, ammonia nitrogen.The outfall of the whole plant has been monitored also. The frenquence of monitoring is 1 times each season and 2 days each time.

6.3.2 Environmental monitoring plan in construction period

***Environmental monitoring plan in*** construction period is in Table 6-1

Table 6-1 ***Environmental monitoring plan in*** construction period

| Monitoring period | Environmental factor | Monitoring point | Monitoring item | Monitoring frequency | Estimated expense |
|---|---|---|---|---|---|
| construction period□1 year□ | Construction dust | Two points as east of plant boundary | TSP | Once two months | 3000 |
| | Construction waste | / | / | / | / |

| | | | | | |
|---|---|---|---|---|---|
| | Construction noise | One point at each side of plant boundary | LeqdB(A) | Once two months | 2000 |
| | Subtotal | | | | 5000 |
| Operation period | Waste water | Outlet of waste water station | $COD_{Cr}$, $NH_3$-N, SS, Volatile phenol | Once three months | 10000 |
| | Subtotal | | | | 15000 |

6.3.3 Environmental Monitoring during Operation

1) Consciously accept the annual routine testing, and monitoring indicators and frequency, sampling time and other factors should be on request, additionally, the enterprise should pay fee according to the national pollution monitoring and technical regulations.

2) Consciously maintain the normal operation of online monitoring equipments. Monitor the discharge situation according to the regulations of relevant laws and "environmental monitoring and management" and save the original monitoring data. The result of automatic monitoring should link to environmental protection competent department, and the enterprise should provide equipment security management.

3) consciously accept the sample detecting and total amount accounting testing, and help with the sampling and sample delivery.

4) Consciously collect the record of annual environmental monitoring and management. Provide monitoring data to administration department and World Bank according to the commitment in environmental management plan.

***Table 6.3-2 list of annual monitoring plan during operation period***

| Monitoring period | Environmental factor | Monitoring point | Monitoring item | Monitoring frequency | Estimated expense |
|---|---|---|---|---|---|
| Operation period | Waste water | Outlet of waste water station | $COD_{Cr}$, $NH_3$-N, SS, Volatile phenol | Once three months | 10000 |
| | | | AOX, dioxin | Once a year when the provincial monitoring station has the ability; must be monitor at acceptance. | 30000 |

| | | | | | |
|---|---|---|---|---|---|
| | Surface water | 100 m downstream from Outlet of waste water station | $OD_{Cr}$, $NH_3$-N, Volatile phenol | Once six months | 15000 |
| | Underground water | Well of farmer | Color degree, total hardness, sulphate, ammonia nitrogen, $COD_{Mn}$ | Once three months | 15000 |
| | | Monitoring well of white sludge slag yard | | Once three months | 15000 |
| | Waste gas | Exhaust-funnel of boiler and soda furnace | $SO_2$□$NO_x$□$PM_{10}$ | Once three months | 40000 |
| | Air | One point at upstream and three point at downstream of plant boundary | $H_2S$□$NH_3$ | Once six months | 10000 |
| | noise | One point at each side of plant boundary | LeqdB(A) | Once three months | 2000 |
| | Subtotal | | | | 137000 |

### 6.3.4 **Independently monitoring plan of demonstration project**

Monitoring validation for demonstrative project must be done independently; enterprises should fully co-operate with the monitoring, and provide relevant support. When dioxin base line, workshop section control, performance testing are being carried out, enterprise should provide necessary support, afford expense for synchronous monitoring extra but necessary indexes, and connect with the synchronous monitoring organization. The expense of independent monitoring of demonstrative project should be calculated separately.

### 6.3.5 **Special monitoring**

Special monitoring, such as environmental acceptance monitoring, enterprise will carry out completion acceptance monitoring according to relevant regulations, and rely on environmental speech monitoring according to the requirement of acceptance management agencies. Based on the guidelines of environmental acceptance monitoring, arrange the control measure of production and capacity. Special monitoring fee is listed in intangible assets of enterprise business expenses, calculated independently.

### 6.3.6 M**onitoring plan under normal production situation**

This technical renovation program include the renovation of chemical reed pulp production line and chemical wood pulp production line, and a new oxygen preparation

workshop and a chlorine dioxide workshop. The production process of each workshop will generate environmental factors such as water, gas and noise. Separate environmental monitoring plan is stipulated for each environmental factor such as water, gas and noise.

①Monitoring of water environment

(1) Monitoring of waste water

After the completion of the programme, water samples shall be collected at each workshop. Sampling port or sampling valves shall be provided at design stage. The waste emission sign shall be set at emission outlet, indicating the name of major polltants and waste water emission amount. Flow gauge, and COD or TOC monitor shall be installed. The production situation shall be recorded when sampling. The focus of waste water monitoring is the general outlet of waste water treatment station and outlet of each workshop. The monitoring at the workshop can reflect the clean production level and normal emission of the workshop.

Waste water outlet and waste water flow gauge shall be provided for pulp making workshop and paper making workshop to monitor the flow amount of waste water on line. The quality of waste water shall be monitoring once a day. The sample shall be collected for continuous 24 hours, with the monitoring items includes pH, $COD_{cr}$, SS.

The pH value for the emitted water from chemical water treatment station of heat and power station shall be analyzed once a day. The flow amount of recycling cooling water from heat and power station is monitored automatically and samples are collected manually to analyze COD, SS, TDS, TP and ammonia nitrogen.

The water from waste water treatment station is monitored with automatic sampling device to sample for continuous 24 hours and monitor on line flow amount, pH value, $COD_{cr}$ (or TOC). In addition, $BOD_5$, the SS, TP and ammonia nitrogen are measured and analyzed after regular multiple points sampling.

(2) Monitoring of underground water

Two underground water monitoring wells are set in the production area of the factory and another two underground water monitoring wells are set in lime residue storage yard. The quality of underground water is monitored once a year, with the major monitoring items of pH value, COD, petroleum and volatile phenol according the water flowing direction in residue storage yard and production area of the factory.

②Monitoring of air environment

Sampling port or sampling valves shall be provided at design stage. The on-line smoke monitor shall be equipped on furnace to monitor TSP, $SO_2$ and $NO_x$. Manual ampling shall be conducted once a season to monitoring the concentration of smoke TSP, $SO_2$ and $NO_x$ , and smoke emission amount.

③Monitoring of sound environment

Monitoring shall be conducted once a year to monitoring the key noise sources, noise at the office area and at the factory boundary, thus to ensure the sound quality meet the requirement after the completion of the programme.

④Monitoring of SW

The water ratio of sludge from sludge dehydration room of waste water treatment station shall be monitored once a day. And the ratio of organic matter and inorganic matter shall be measured irregularly. The working procedure of sedimentation pool and secondary sedimentation pool shall be adjusted according to sludge dehydration situation to ensure the dehydration rate to meet relevant requirements.

Soluble test shall be conducted irregularly on de-inked residue to test the composition of heavy metal such as $Cr^{6+}$, Hg, Cu, Zn, Pb, Ni, Cd, As.

According to the requirement of the World Bank, the programme shall submit a semi-monitoring report to Ministry of Environmental Protection who will submit the same to the World Bank every half year during the operation of the programme.

6.3.7Emergeny monitoring plan

The principles of “prevention first, active move and focusing on prevention” shall be followed to prepare well for the emergency monitoring. The monitoring people shall prepare to go to the site at any time, and laboratory shall prepare to analyze and test at any time will all site test instruments ready for monitoring. It shall be ensured that the people are ready to go to the site and conduct monitoring work. The items which can be measured at the site shall be measured at site. For items which can not be measured at the site, the sample shall be taken to laboratory for immediate analysis to ensure the timely report of data and provide basis for emergency measure, thus to prevent accidental emission and damage.

# 7. Training

## 7.1. The training of environmental management person

7.1.1Add new training for environmental protection part-time or full-time staff during constriction period

Departments commissioned by the construction units have qualified for the training project construction and supervision units of environmental protection full-time and part-time staff. Training object is the full-time management personnel and engineering technical leader in the construction and supervision units. Teaching contents include: regulations, files and the requirements on environmental protection and soil conservation in Sichuan Province and China; the environmental protection measures designed by enterprise in the construction period; environmental protection guide in the construction phase. Course instructors may be the EPA, environmental protection design principal in the environmental design departments and the experts of the environmental assessment unit and monitor unit.

7.1.2 Add new training for environmental protection part-time or full-time staff during operation period

The new training added for environmental protection part-time or full-time staff is organized and conducted by environmental protection department, the enterprise can employ environmental experts from universities, research institutes and operation management units to class lessons, or the staffs can also take part in short training classes, see Table 94.

Table 7.1 Training fee list of staffs during project construction and operation period

| stage | trainees | Number of people | Content of training | time | cost □ten thousand□ |
|---|---|---|---|---|---|
| Construction period | Person in charge of construction units, Jinfu company full-time staff and environmental protection management person | 4 | Laws, regulations; environmental countermeasures and environmental requirements of construction period; | training 3~7 days before construction | 1.5 |

| | | | | | |
|---|---|---|---|---|---|
| | Supervising engineer | 2 | period; environmental guide for the construction period | | 0.75 |
| Operation period | Environmental management person | 1 | Laws, regulations; environmental countermeasures and environmental requirements of construction period; environmental guide for the construction period | Training 7~14 days before operation | 0.25 |
| | Environmental staff | 2 | Laws, regulations; environmental countermeasures and environmental requirements of construction period; environmental protection facilities maintenance; monitoring data collecting and analysis | | 0.5 |
| | person who take emergency measures | 2 | Risks compaction; risk prevention measures, emergency plans | | 0.5 |

| | | | | | |
|---|---|---|---|---|---|
| | Daily training of employees | All production and management person | The summary, communication, report of the whole factory, workshop, group organization | Convened regular or temporary | 1.5 |
| total | | | | | 5 |

## 7.2. Exchange of information

Environmental management requires that it is necessary to exchange information within the organization in different departments and different posts, at the same time the organization should notify relevant information to outside (related party, as the public). every month must have one formal meeting, All information exchange should have a record and on file. External information exchange every half year or one year for once, information exchange with cooperation unit must form meeting minutes and on file

## 7.3. Records

A perfect record system must be established to ensure the effective operating of the environmental management system. Records of several aspects must be saved:

1) Requirement sin laws, regulations and relative standards
2) License file
3) Environmental factor with its environmental impact evaluation and measures for mitigation
4) Training
5) Engineering construction progress
6) Monitoring data
7) Information of related parties
8) Approval examines and verify
9) Review

In addition, necessary control must be done to the records mentioned above, include: characteristic, collection, catalogue, archiving, storing, management, maintain, inquiry, storage life, treatment, etc.

# 8. Occupational health and safety

## 8.1. Setting of occupational health organization

YUEYANG FOREST □ PAPER CO., LTD is a leading enterprise in paper industry and it has complete occupational management organization. Its occupational management organization is as the following.

The enterprise established occupational safety and health management network and set up the "occupational safety and health committee" with the legal representative as the first responsible person and with occupational safety and health office under its leadership. The occupational health work at the enterprise level is under production department. There are four engineering responsible for the management of occupational safety and health in the enterprise, distributing of personal occupational disease prevention articles, occupational safety and health education and keeping occupational health material.

Enterprise worker's hospital has 82 staffs and 50 beds, dealing with the health monitoring work and rescue of acute occupational poisoning victim.

In addition to technical operation procedures, the enterprise also stipulated "Operation documents on environmental and occupational safety and health management", established complete occupational health rules, systems and operation procedures, such as "occupational safety and health checking method", "emergency plan for occupational hazardous accident", etc. Moreover, the enterprise also organizes emergency response exercise on fire-fighting, safety and occupational poisoning accidents. Staffs are encouraged to strictly follow the occupational health rules, systems and operation procedures of the enterprise. This plays an important role in protecting worker's health, reducing or eliminating occupational disease.

The production department will stipulate occupational disease hazard factors monitoring plan at the beginning of each year, and entrust Yueyang Disease Control Center to measure each occupational disease hazard factor through random inspection. The results

shall be recorded in occupational health documents and reported to the related leader of the factory.

## 8.2. Occupational health education

The occupational health education is responsible jointly by production department and the workshops. All operators shall received occupational safety and health training before taking the position and regular or irregular occupational safety and health training after taking the position.

In addition, blackboard newspaper is set in the factory to publicize laws, regulations, rules, systems and operation procedures concerning occupational disease prevention, guiding the workers how use occupational disease prevention equipments and personal occupational disease prevention articles, thus to improve the self-protection awareness of the workers.

## 8.3. occupational health protection articles

In order to reduce the impact of occupation disease hazard factor on human health and protection worker’s health, personal occupational disease prevention articles shall be regularly distributed to workers contacting hazardous substances, such as protective helmet, working clothes, working boots, glovers, flex sleeve, earflap, filter style gas mask, anti-dust respirator of Xianglao II type, protective glasses and heat protective clothing.

In summary, YUEYANG FORESTRY & PAPER has complete occupational health management organization and management system, which is able to meet the demand for occupational health management after the completion of this renovation and expansion programme. However, the material concerning occupational disease hazard supervision show that some occupational disease hazards have not been controlled effectively, thus the enterprise shall focus on production technology innovation and construction of occupational health protection facilities in order to minimize the possibility of morbidity of occupational disease.

# 9. 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 beat 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.

# 10. Budget for environmental management plan

**Table 10-1 the Budget for environmental management plan during construction period**

| Item | | Budget for construction period (10,000 yuan) | Source of fund |
|---|---|---|---|
| Operation of environmental management agency (including salary, administration and transportation expense) | | 20 | Construction fund |
| Water quality monitoring | Laboratory analysis | 15 | |
| | Salary for sampling | 20 | |
| | Total for water quality analysis | 50 | |
| Air quality and noise monitoring | Laboratory analysis | 10 | |
| | Salary for sampling | / | |
| | Total air and noise monitoring | 10 | |
| Other expanses on monitoring | | 5 | |
| Budget for supervisor | | 5 | |
| Operation of environmental protection facilities | | 100 | |
| Total budget for construction period | | 235 | |

**Table 10-1 the Budget for environmental management plan during operation period**

| Item | Budget for operation period (10,000 yuan/a) | Source of fund |
|---|---|---|

| | | | |
|---|---|---|---|
| Operation of environmental management agency (including salary, administration and transportation expense) | | 20 | Self-financing |
| Water quality monitoring | Laboratory analysis | 15 | |
| | Salary for sampling | 20 | |
| | Total for water quality analysis | 50 | |
| Air quality and noise monitoring | Laboratory analysis | 10 | |
| | Salary for sampling | / | |
| | Total air and noise monitoring | 10 | |
| Other expanses on monitoring | | 5 | |
| Operation of environmental protection facilities | | 100 | |
| Budget for training | | 15 | |
| Total budget for operation period | | 240 | |