

E1786 v3

JINAN NORTH SUBURB THERMAL POWER PLANT HEAT SUPPLY  
RECONSTRUCTION & NETWORK CONSTRUCTION PROJECT  
SHANDONG PROVINCE, CHINA

ENVIRONMENTAL MANAGEMENT PLAN

OCTOBER 2007

SHANDONG ACADEMY OF ENVIRONMENTAL PROTECTION SCIENCE  
RESEARCH & DESIGN

## **Abbreviations**

CC-----	Construction Contractor
EIA-----	Environmental Impact Assessment
EP-----	Environmental protection
EPB-----	Environmental Protection Bureau
EMP-----	Environmental Management Plan
EMPs-----	Environmental Management Plan and Environmental Monitoring Plan
EPMs-----	Environmental Protection Measures
EMO-----	Environmental Management Office (Organization)
ESE-----	Environmental Supervision Engineer
JNSTPP-----	Jinan North Suburb Thermal Power Plant
PMO-----	Project Management Office
RAP-----	Resettlement Action Plan
SEPA-----	State Environmental Protection Agency
WB-----	The World Bank

Three components included in the proposed project, are:

- (1) Reconstruction of No.2 & 5 units;
- (2) One heat exchange station for heat supply coverage  $200 \times 10^4 \text{m}^2$ ;
- (3) Heat supply network with total 28.1km long.

Hence, in this EMP, three chapters are divided as follows:

Chapter one: Units reconstruction and heat exchange station;

Chapter two: Heat supply pipelines construction

Chapter three: Environmental management plan based on current environmental issues.

## **CHAPTER ONE**

JINAN NORTH SUBURB THERMAL POWER PLANT  
HEAT SUPPLY UNITS RECONSTRUCTION  
ENVIRONMENTAL MANAGEMENT PLAN

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# 1 Introduction

## 1.1 Project Description

### 1.1.1 Project background

JNSTPP is located at west of Xicheng Village of Tianqiao District of Jinan City, is one of the major heat supply sources for the north area of Jinan City, and was the pivot construction project of Shandong Province and Jinan City about 20 years ago. Its detailed location is shown in figure 1-1. The whole plant covers 380 acres. The first-period project was completed by the end of 1993, with 3×12MW steamer power units and 1×5MW postposition power unit, and 3×130t/h high-pressure coal boilers, and a compatible cement plant with capacity 20×10<sup>4</sup> t/a was put into operation in 1994. The second-period project was built in 2003 and 2006, to enlarge 1×220t/h circular sulfuration bed boiler, and one 1×50MW pumping condensed heat supply unit. Its total capital asserts is RMB 5.7×10<sup>8</sup> Yuan, designed annual power generation capacity 3.56×10<sup>8</sup> kW.h, and annual heat supply amount 580×10<sup>4</sup> GJ.

Nowadays, JNSTPP has three heat supply lines with total 30km length, and 60km long water network spreading all markets, and communities. It has provided heat for 36 large or medium enterprises, and hundreds of governmental departments, with total heat supply coverage about 460×10<sup>4</sup>m<sup>2</sup>. By the end of 2006, JNSTPP has total power capacity 91MW, three high-pressure boilers and one high-temperature and pressure boiler.

With the development of the city, increase of heat need and development at north of Jinan, heat load in increasing rapidly, fuel consumption is rising as well so to prick up environmental pollution. JNSTPP is proposing to utilize WB loan to reconstruct its two units to supply heat with circular hot water, and construct water network.

This document is a part of EIA required by WB, whose purpose is to ensure all mitigation EPMs arisen from EIA to be implemented.

### 1.1.2 Project components and schedule

Three components included in the proposed project, are:

- (1) Reconstruction of No.2 & 5 units;
- (2) One heat exchange station for heat supply coverage 200×10<sup>4</sup>m<sup>2</sup>;
- (3) Heat supply network with total 28.1km long.

Total budgets is about RMB 78.7 million Yuan, and project schedule is shown in table 1-1.

**Table 1-1 Project schedule**

No.	Construction components	Construction time
1	Units reconstruction	May 2008
2	Heat exchange station construction	May 2008
3	First-period pipelines construction	From May to October 2008
4	second-period pipelines construction	From May to October 2010

### 1.1.2.1 Units reconstruction

To reconstruct pumping condensed steamer units to make it operate under low vacuum, and back pressure reaching up to 0.059~0.078Mpa, circular cooling water temperature reaching up to 80~90℃ to directly supply central heat.

### 1.1.2.2 Heat exchange station

It will build a new heat exchange station within plant, heat supply coverage  $200 \times 10^4 \text{m}^2$ , equipment of circular water system is connected with establishments at exchange station so to switch as alternatives for each other.

In the course of startup and close of steam units, two systems need to switch for heat supply stable. Before starting steam units, heat supply system at exchange station is working until units work in full load condition, then to switch back to circular water heat supply system.

When steam units work under low load, and circular water temperature reduces, that cannot ensure heating need, then it is to switch heat supply system at exchange station to supplement heat to keep water network temperature requirement.

### 1.1.2.3 Heat supply network

Heat supply network is at north of Xiaoqing River, between Wuyinshan road and Lishan road, total pipelines length 28.1km. It will construct during two periods, of which the first-period is from May to October 2008, and the second-period is from May to October 2010.

## 1.2 EMP purpose, action program and requirement

### 1.2.1 Purpose

The propose project will bring about impact on air, water, acoustic and ecological environments during construction; and also impact on acoustic setting during operation. In order to effectively carry out EPMS arisen from EIA, this EMP is to single out contents of all mitigation measures and environmental management plan and monitoring plan, it functions as follows.

(1) To determine EP objectives and EPMS

Jinan EPB, EIA team and design sector will define, exam, and determine EP objectives so to bring forth effective mitigation measures to be included in engineering design.

(2) To be a directive document for environmental management

After approval by WB, this EMP will be provided for construction supervision sector, environmental supervision sector and other relevant sectors during construction and operation.

(3) To define each responsibility and function

In this EMP, each sector's responsibility is determined for communication.

(4) To define environmental monitoring plan during construction and operation

## **1.2.2 Action program and requirement**

With effort of WB officials, specialists, EIA team, and Jinan EPB, the general EMP objective of this project is set to keep sustained development, and improve Jinan environmental quality, and to alleviate adverse impacts to the lowest extent.

Specific action is: (1) to bring forth EMP and implement it; (2) to bring forth pollution control strategy to minimize adverse impact.

Specific requirement: (1) to exam all monitoring result during construction and operation; (2) to carry out all EPMS according to regulated procedures.

## **1.3 Basis for EMP**

### **1.3.1 Basis**

#### **1.3.1.1 Chinese laws, regulations**

- (1) "Environmental Law of P.R.C."(1989);
- (2) "EIA Law P.R.C" (2002);
- (3) "Cleanness Manufacture Enhancement Law P.R.C." (2002);
- (4) "Law of Prevention of Water Pollution in P.R.C."(1996);
- (5) "Law of Prevention of Air Pollution in P.R.C." (2000);
- (6) "Law of Prevention of Solid Waste Pollution in P.R.C." (2004);
- (7) "Law of Prevention of Noise and Vibration Pollution in P.R.C." (1996);
- (8) "Detailed rules of implementation of the Law of prevention of air pollution of the P.R.C." (1991);
- (9) "Detailed rules of implementation of the Law of prevention of water pollution of P.R.C." (1989);
- (10) "Environmental protection classification management catalogue of construction project" (2001);
- (11) "Shandong Environmental Protection Ordinance" (2001);

- (12) “Methods to implement ‘EIA Law P.R.C.’ in Shandong” (2005);
- (13) “Methods to implement ‘Law of Prevention of Solid Waste Pollution in P.R.C.’ in Shandong”;
- (14) “Detailed rules of implementation of the law of prevention of noise pollution in Shandong Province”;
- (15) “Shandong Provincial Water Pollution Prevention Rules”;
- (16) “The fifteenth “five years” environmental protection plan of Shandong Province”;
- (17) “Detailed opinions of Shandong Provincial Government regarding further implementing scientific view to reinforce environmental protection” (No. 72 in 2006);
- (18) “Notice of provincial government office regarding management of EIA and “three contemporary” of environmental protection establishment of construction projects”;
- (19) “Cultural Relics protection Laws of P.R.C.”(2002).

#### **1.3.1.2 WB policies**

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

#### **1.3.1.3 Project Basis**

“Jinan North Suburb Thermal Power Plant heat supply with circular water project feasibility research report”.

### **1.3.2 Pertinent criterions**

#### **1.3.2.1 Environmental quality criterion**

- (1) Ambient air quality

Air environment quality is to be judged according to the Class II of “Ambient air quality standard” (GB3095-1996), seen in table 1-2.

**Table 1-2 Ambient Air Quality Standard adopted in this EIA ( unit: mg/m<sup>3</sup>)**

Pollutants	Standard value(mg/m <sup>3</sup> )			Criterion source
	An hour average	Daily average	Yearly average	
SO <sub>2</sub>	0.50	0.15	0.06	II-class of GB3095-1996 “Ambient air quality standard”
TSP	—	0.30	0.20	
PM <sub>10</sub>	—	0.15	0.10	
NO <sub>2</sub>	0.24	0.12	0.08	

(2) Surface water

Water quality of Xiaoqing River is evaluated based on the Class V of “environmental quality standards for surface water”(GB3838-2002), seen in table 1-3.

**Table 1-3 Criterion for surface water (unit:mg/l)**

Evaluated factors	OD	BOD <sub>5</sub>	H <sub>3</sub> -N	TP	Criterion source
Standard value	40	10	2.0	0.4	“environmental quality standards for surface water”(GB3838-2002)

(3) Ground Water

It is to be judged based on the Class III of “Quality Standard for ground water” (GB/T14848-93), seen in table 1-4.

**Table 1-4 Standard value for ground water (unit:mg/l, pH excluded)**

Pollutants	III-category of □GB/T14848-93□
pH	6.5-8.5
Total rigidity CaCO <sub>3</sub> □mg/L□	□450
Sulfide (mg/L□	□250
COD <sub>m</sub> □mg/L□	□3.0
Fluorid□mg/L□	□1.0
Total bacteria number□mg/L□	□3.0
Chloride□mg/L□	□250
Nitrate□mg/L□	□20
Nitrite□mg/L□	□0.02
NH <sub>3</sub> -N□mg/L□	□0.2

(4) Noise

Water network construction of JNSTPP is mainly along the Xiaoqinghe north Road, a I-level main road, its traffic noise is to be judged based on 4-class of “Standard of environmental noise of urban area” (GB3096-93), 70dB(A) at daytime and 55dB(A) at night; and the rest are to be judged based on 2-class criterion, 60dB(A) at daytime and 50dB(A) at night.

**1.3.2.2 Pollutants emission/effluent standards**

(1) Noise

During Construction, construction noise is to be judged based on “Noise limits for construction site”(GB12523-90), seen in table 1-5.

**Table 1-5 Construction noise limits (unit: dB(A))**

During construction	Major noise sources	Noise limits	
		Daytime	Night
Earth and rocks	bulldozer□grab□trucks etc.	75	55
Piling	All kinds of pile drivers	85	Construction forbidden
Structure	Concrete mixer□muddler□electric saw	70	55

West boundary of JNSTPP is near Beijing-Shanghai Railway, so its noise is to be limited IV-class standard of “Standard of noise at boundary of industrial enterprises” (GB12348-90), 70dB(A) at daytime and 55 dB(A) at night; and the other boundary noise limited within II-class standard, 60dB(A) at daytime and 50 dB(A) at night.

### (2) Exhaust emission

JNSTPP has three coal boilers, one sulfuration bed boiler. The first three were built in 1993, so its exhaust emission is to follow the I-period standard of “Emission standard of air pollutants for thermal power plant” (DB37/664-2007); and the sulfuration bed boiler was built in 2003, so its exhaust emission is to follow II-period standard of the above-mentioned criterion (GB13271-2001) according to Jinan EPB document “Approval regarding 220t/h recycled sulfuration bed boiler”, seen in table 1-6.

**Table 1-6 Exhaust emission criterion for JNSTPP boilers**

Pollutants	“Emission standard of air pollutants for coal-burning oil-burning gas-fired boiler” GB13271-2001 II-period	“Emission standard of air pollutants for thermal power plant” DB37/664-2007 I-period
	mg/m <sup>3</sup>	mg/m <sup>3</sup>
SO <sub>2</sub>	900	1200
NO <sub>x</sub>	--	800
Dust	120	200

### (3) Waste water

JNSTPP discharges its wastewater into Xiaoqing River directly. In December of 2006, “Integrated discharged standard of water pollutant of Xiaoqing River basin in Shandong Province” was issued, in which,

*“All organizations who discharge wastewater into Xiaoqing River, except for city or town wastewater treatment plant, should follow the relevant regulation in the Table 1 in terms of wastewater pollutants concentration, and also follow the regulations in table 2, 3, or 4 according to phase”.*

Hence, JNSTPP is to apply its wastewater in the above-mentioned criterion in the important areas of DB37/656-2006, detailed values are list in table 1-7.

**Table 1-7 Wastewater discharge standard (unit:mg/l, pH excluded)**

Pollutants	pH	SS	CODcr	Oil	Fluorid	Arsenic	Sulfide	Volatile hydroxybenzene
Standard value	6.0-9.0	70	100	5	10	0.2	1	0.5

### (4) Solid wastes

JNSTPP solid wastes are to follow “Standard for pollution control on the storage and disposal site for general industrial solid wastes” (GB18599-2001).

## **2 Major Impacts and Mitigation Measures**

### **2.1 Major impacts and mitigation measures during construction**

Seen in table 2-1.

### **2.2 Major impacts and mitigation measures during operation**

After No.2 & 5 units reconstruction, new increasing pollution source is noise at heat exchange station, due to heat exchanger, hot water pump, water supplementing pump, etc., noise level in the range of 85~100dB(A), yet, after some measures of noise elimination and vibration reduction, noise may reduced to 80dB(A) or so, which will bring about little impact on surroundings so the base noise at the plant is still the major factor to acoustic environment.

**Table 2-1 Major environmental impacts and mitigation measures during construction**

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

### 3 EMP

#### 3.1 Setup environmental management organization (EMO)

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

##### 3.1.1 EMO during construction

In order to ensure rightness and effectiveness of environmental management, particular environmental management office should set up, shown in table 3-1.

**Table3-1 Environmental management team during construction**

Personnel	Number
Team-leader	1
Ambient air supervisor	1
Noise supervisor	1
Solid wastes supervisor	1
Hot on-line worker	1

##### 3.1.2 EMO during operation

Units EM relies on current environmental management system. In order to advance EM standardization, JNSTPP has set up an environmental management system in which plant director is a team leader, and vice-plant director is responsible for details, taking production sector as major EMO, and establishing monitoring station at running sector. Each sectors of plant will coordinate with each other to be responsible for environmental management work. Appointed environmental engineer and plant monitoring station will be responsible for implementation of EMP. The system is illustrated in figure 3-1.

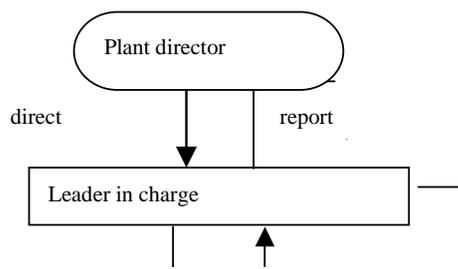
##### 3.1.3 Environmental management duty and responsibility

###### 9.1.3.1 During construction

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

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

Air, noise and solid wastes supervisor should inspect sites to check mitigation measures implementation, to arrange monitoring, and to report the results to team leader.



**Figure 3-1 Internal EMO at JNSTPP**

Hot on-line employee should record and tidy complaints calls, and report to leader, also to let public know how to solve problems.

**3.1.3.2 During operation**

Internal environmental protection leadership team at JNSTPP is responsible for EM work during operation, and each member's duty and task is determined as follows.

- (1) Plant director is the head of team, to be responsible for legal duty;
- (2) Vice-director and General senior engineer are to carry out national, industrial, and local environmental laws, regulations and orders, to strictly implement "three contemporary". They are to periodically call for team meeting, summarize environmental protection work, and also to map out environmental protection plan. They also will examine pollution treatment plan in details, check coal slag and crushed coal reutilization, to direct and coordinate relevant sectors in HTTTP.
- (3) Vice-general senior engineer directs and examine implementation of national policy, regulations and orders, to technically check EPMs and program, to supervise environmental establishments running and maintenance, to check and accept examination and repairing. He is also to coordinate each sector's duty and tasks, and to bring forth detailed suggestion.
- (4) Production sector is to carry out national, industrial, and local environmental laws, regulations and orders, and identify and evaluate. Under the leadership of the team, it is to organize, coordinate internal environmental protection supervision management, and to map out long-term EP plan, yearly EP plan, and environmental monitoring periodical plan, and also responsible for these plans' implementation. It is responsible for environmental establishments running and maintenance, to pay attention to deal with dust, noise. To participate all EPMs' stipulation, approval, and examination, to supervise "three contemporary". Following "Thermal power industry environmental monitoring management regulation", and "Thermal power plant environmental monitoring technical regulation", to examine, supervise and direct daily EP works. To build and perfect EP files, and to learn all reutilization condition, and to check EP special fund status; and to assist investigation of pollution accidents and conflicts. To organize new projects monitoring study and train, and carry out new projects' monitoring.
- (5) Senior engineers office is responsible for pollution accidents and conflicts investigation and dealing, to write accidents report.
- (6) Construction office is in charge of design, construction, test and examination of new environmental treatment project. And also to be responsible for full-course

management of “three-contemporary” of new, enlarging and reconstruction project.

- (7) Running sector is responsible for environmental establishments running, to set up healthy environmental establishments running rules. To submit full-time employee at ash site on-duty, for daily management of reutilization at ash. To responsible for environmental establishments running statistical work.
- (8) Safety sector is responsible for safety of environmental establishments running, pollution treatment and reutilization, and for heavy pollution accidents survey, analysis and dealing.
- (9) Financial sector is to ensure environmental protection special fund implemented.
- (10) Planning sector is to determine coal consumption plan and find low-sulfur coal source, to supervise coal quality and coal storage site.
- (11) Training center is to organize relevant employee to learn environmental knowledge and consciousness.
- (12) Administration sector is responsible for environmental information and knowledge education.

### **3.2 CC’s management**

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

- (1) To choose strong CC to ensure EMP implementation.
- (2) To ask CC and engineering supervisor to be trained in terms of EP and environmental management before construction.
- (3) All EPMs mentioned above should be included in the bidding document and finally in the contract with CC.
- (4) To ask CC to monitor its environmental activities, and provide daily or weekly record for their environmental achievement. PMO and construction supervision team will examine and audit.
- (5) 1 or 2 full-time environmental employee is necessary for CC, have to be trained to fit for their task.
- (6) During construction, CC should communicate and negotiate with local residents, to set up notice board to notify construction time, activities. Meanwhile, CC should provide contact and phone number for complaints and suggestion.

## **4 Environmental Monitoring Plan**

### **4.1 Objectives**

Environmental monitoring plan includes two phases so to fully, timely learn dynamic pollution status of the project, to learn environmental quality change, affected scope; and dynamic environmental quality condition so to report to local sector in charge, to provide scientific basis for environmental management.

## 4.2 Monitoring components

### 4.2.1 During construction

Based on pollution characteristics, it is necessary to setup monitoring system to ensure all measures implemented. Monitoring methods will adopt state or sector relevant criterions and regulations; detailed monitoring contents are list in table 4-1.

### 4.2.2 During operation

Only noise at heat exchange station need to be monitored, and will delegate Jinan environmental monitoring station, and boundary noise of JNSTPP can substituted since station is within the plant. Detailed monitoring plan is shown in table 4-2.

**Table 4-1 Environmental monitoring plan during construction**

No	Factor	Locations	parameters	Frequency	Implementer /supervisor	Cost (×10 <sup>4</sup> Yuan/a)
1	air	Each for construction sites, interior residents area, offices	TSP	One-term/two-month, 2days/term, twice/d, occasional check when dry	Qualified environmental monitoring station/local EPB	0.7
2	noise	Boundary of construction sites and plants	Leq	Once/term at day and night, and one-term/one-month		0.8
3	Solid wastes	Construction sites	Names, amounts, and destination	Once/month		0.1
4	sum					1.6

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

No	factor	locations	Parameter	Frequency	Implementer/ supervisor	Cost (×10 <sup>4</sup> Yuan/a)
1	Noise	Boundary of JNSTPP	Leq	Once at day and night /quarter	Qualified environmental monitoring station/local EPB	1
2	sum					1

## 5 Environmental Protection Supervision Plan

Seen in table 5-1.

**Table 5-1 EP supervision plan**

JNSTPP EMP

Phase	Supervisor	Supervising contents	Supervising purpose
Cons-truc-tion	Shandong EPB Jinan EPB Jinan Cultural Relics Bureau	<ol style="list-style-type: none"> <li>1.To check EP preliminary design and EMP;</li> <li>2.To exam recovery of temporary land occupation and vegetation, and settings;</li> <li>3.To exam dust and noise pollution control and decide construction time;</li> <li>4.to exam pollutants emission;</li> <li>5.To exam domestic wastewater and oil water discharging;</li> <li>6.Disposals handling</li> <li>7.To exam if cultural relics found</li> </ol>	<ol style="list-style-type: none"> <li>1.To carry out “three contemporary”.</li> <li>2.To ensure temporary land occupation meet EP demands.</li> <li>3.To reduce impacts on local environment. And to follow relevant standards and regulations.</li> <li>4.To ensure river water quality not to be polluted.</li> <li>5.To ensure sights and land resources not to be destroyed so to cause soil and water loss.</li> </ol>
Opera-tion	Jinan EPB	<ol style="list-style-type: none"> <li>1.To exam EPMs implementation;</li> <li>2.To exam EMP implementation;</li> <li>3.To check if environmental quality of sensitive targets meet pertinent criterions.</li> </ol>	<ol style="list-style-type: none"> <li>1.To carry out EMP</li> <li>2.To carry out monitoring plan</li> <li>3.To truly protect environment</li> <li>4.To strengthen environmental management, and to protect people’s health</li> </ol>

## 6 Environmental staffs training

### 6.1 Environmental staffs training during construction

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

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

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

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

### 6.2 Environmental staffs training during operation

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

**Table 6-1 Environmental training plan**

Project	Phase	Participants	Number	Time	Cost $\times 10^4$ Yuan
No.7&8 Reconstruction project	construction	Project owner	1	2007-2008	1
		CC's environmental leader	1		1
		Environmental supervisor	1		1
		Emergency staff	1		1
	Operation	Environmental management staff	1	After project built	1
		Environmental staff	1		1
Total			6		6

## 7 Budgets for EMPs

Seen in table 7-1.

**Table 7-1 Budgets for EMPs**

Aspects		Annual budget □×10 <sup>4</sup> Yuan/y□	
		During construction	During operation
EMO's running	Salary	8	4
	Administrative cost	4	2
	Transportation cost	3	1.5
	Sub-total	15	7.5
monitoring	Air quality monitoring	0.7	-
	Water quality monitoring	□	0.8
	Noise monitoring	0.8	0.2
	Solid wastes management	0.1	-
	Sub-total	1.6	1
Environmental staffs training		4	3
total		32.1	

## **CHAPTER TWO**

JINAN NORTH SUBURB THERMAL POWER PLANT  
HEAT SUPPLY NETWORK WITH CIRCULAR WATER  
ENVIRONMENTAL MANAGEMENT PLAN

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# 1 Introduction

## 1.1 EMP purpose

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

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

## 1.2 Project description

### 1.2.1 Project background

According to “Jinan City Heat-supply Overall Plan (2005-2020)”, a whole heat-supply network will be built, including central, eastern, Konggang, and western hot-water orbicular network system, The network would cover the whole city to meet the heat supply need. The major heat source will come from Jinan West Suburb Thermal Power Plant, Jinan North Suburb Thermal Power Plant, Shandong Huangtai Thermal Power Plant, Huandian Zhangqiu Power Generation Limited Corporation, and Southern Thermal Power Plant, Linuo Stokehold will be adjustive heat sources, to come into being western, central, eastern, and southern, total four orbicular heat supply network systems, and details shown in figure 3-3. Proposed project involves pipelines construction at north of Xiaoqing River, area between Wuyingshan north road and Lishan road, a part of north central heat supply network.

### 1.2.2 Project components

Heat supply network is at north of Xiaoqing River, between Wuyinshan road and Lishan road, total pipelines length 28.1km. It will construct during two periods, of which the first-period is from May to October 2008, and the second-period is from May to October 2010.

It is to adopt three steps to provide heat with hot-water pipes network, of which the highest water temperature of the first-step hot-water pipes network is 130°C, and of recycled water is 80°C, water supply pressure 1.5 MPa, and circular water pump flying distance 120m, and the second hot-water network system exchanges heat with the first hot-water network at heat exchange station, after that the temperature of water maximum can reach up to 120°C, recycled water is 70°C, water supply pressure 1.5 MPa, and circular water pump flying distance 120m as well; and hot-water will exchange heat at the user heat supply station, and the temperature for users at the end of whole hot-water network is maximum 80°C, and of recycled water is 60°C.

It will adopt separate pressure to transport heat, and to setup heat exchange station between users and thermal power plant. This heat exchange station is established within JNSTPP, land coverage 1200m<sup>2</sup>, one-level frame structure, installed with exchanging heater and all kinds of pumps, and relevant electric equipment, control system and so on. High temperature water will be exchanged at station to send lower temperature hot water to users with second-level circular heat pump. Two workers are on-duty one shift, four-shift within three rotations in a day at the station, total 8 workers, assigned by JNSTPP.

① East pipeline network scheme

It starts at the first station at interior to lay out 2×DN900mm main heat supply pipelines, along Xinzhao road toward south and north to separate two lines, of which one lays along Qinghe north road toward east to passing by Xincheng Village, Lanxing Chemical Plant, Li Village, Nanxu Village, Beixu Village, Shandong Normal University, Gaijia Valley, Shizizhang Village to Lishan north road, and after that to connect with all residential zones branch pipelines; another lays along Xinzhao road toward north till Zhaojia Village, then to lay branch pipelines at each sub-section to connect with water supply network at all residential zones.

② West pipeline network scheme

It starts at heat exchange station, to lay out 2×900mm heat supply main pipelines toward west, then along Qinghe north road west-toward, passing by Biao Mountain and separating two directions, of which one main pipelines 2×800mm lay along Biaoshan road, passing Lian road toward west till Wuyingshan north road; another 2×500mm main pipelines lay along Qinghe north road west-toward till Wuyingshan north road, and lay branch pipelines at each sub-section to connect with water supply network.

Pipelines direction shown in figure 1-1.



## **1.3 Basis for EMP**

### **1.3.1 Basis**

Same as chapter one.

### **1.3.2 Pertinent criterions**

#### **1.3.2.1 Environmental quality standard**

Same as chapter one.

#### **1.3.2.2 Pollution emission/effluents standard**

(1) During construction

Construction noise is to be judged based on “Noise limits for construction site” (GB12523-90).

Emission at construction site is to follow standard in table 2 of “integrated emission standard of air pollution” (GB16297-1996).

(2) During operation

No pollution produced along pipelines.

## **2 Major impacts and mitigation measures**

### **2.1 Major impacts and mitigation measures during construction**

Seen in table 2-1.

### **2.2 Impacts on environment and mitigation measures during operation**

Seen in table 2-2.

**Table 2-1 Impacts on environment during construction**

Environmental factors		Potential impacts	Mitigation measures	Implementer	Supervisor
Eco-system	Land occupation	No permanent land occupation except exchange station 1200m <sup>2</sup> □	To recover land in time and greening along roads	CC	Jinan Thermal Power company, Jinan EPB, and WB
		Temporary land occupation	<input type="checkbox"/> to plan whole construction site instead of arbitrary layout. <input type="checkbox"/> to remove temporary buildings and clear sites right after construction ends.		
	Soil and water loss	Earthwork huge, about 38×10 <sup>4</sup> m <sup>2</sup>	<input type="checkbox"/> To separate dig and fill back so to speed pace, earthwork filled back possibly, and disposals should be sent to designated places to pile up. <input type="checkbox"/> To adopt measures at disposals sites, and to avoid digging at rainy days; to ensure disposals sites have certain distances away from sewers and river <input type="checkbox"/> To cover materials and disposals at sites during windy and rainstorm.		
			<input type="checkbox"/> To utilize old roads possibly, and well design construction temporary roads to prevent vegetation from being pressures. <input type="checkbox"/> to work within the scope of red-line, and to prevent piled earth and materials into farm nearby <input type="checkbox"/> To advocate, educate and to supervise at the sites, to let construction workers know that it is forbidden to cut woods, or destroy vegetation or plants arbitrarily.		
Biodiversity	To destroy and disturb plants due to clearance, pressure and etc, and to force animals move their habitats due to noise from transportation and machines, and people's living	<input type="checkbox"/> to sprinkling water on the road and construction sites, especially loose and dry surface land. <input type="checkbox"/> To plan transportation routes and timetable to avoid driving in the flourishing area, traffic concentrated area, and residential area and some sensitive places. <input type="checkbox"/> Periodically checking sites and monitoring TSP at sensitive spots to timely adopt measures when exceeding standard. <input type="checkbox"/> To punish politically and economically when against operation regulations and no correction.			
Dust	Earthworks, transportation, loading and unloading, disposals naked in the air, when dry, no rain, windy, severe impact on ambient air	<input type="checkbox"/> To adopt advanced with low noise techniques instead of backward high-noise one. <input type="checkbox"/> To limit machines speed in-and-out, to maintain machines, and vehicles periodically. <input type="checkbox"/> To reasonably schedule construction timetable, to avoid continuous work with high noise. <input type="checkbox"/> To follow operation regulations, possibly not to use whistle to direct. <input type="checkbox"/> To periodically monitoring noise level, and bring out treatment measures.			
Noise	Mechanical noise and transportation noise may disturb people's life	<input type="checkbox"/> To set up deposit tank at sites to ensure waste water at sites meet standard before discharging. <input type="checkbox"/> To possibly utilize use current already life establishments nearby.			
Surface water	Oil from leakage, drip or running out of with rain, domestic sewage from construction workers	<input type="checkbox"/> To particularly collect discarded package bags and disposals of sand, materials, steels, and to clean workstation in time. <input type="checkbox"/> Environmental sanitary sector will collect domestic garbage periodically.			
Social environment	Solid wastes	Construction disposals and domestic garbage by constructors	To manage construction sites well.		
	City sights	Road digging, disposals and materials temporarily affect city sights.	<input type="checkbox"/> To plan traffic flow well in advance, and put notice board at sites to let public know construction time, contents, <input type="checkbox"/> To say regret and ask understanding, leave contacts and hot-line number.		
	Residents life	Temporary pause of power, water, gas due to construction brings about inconvenience to people's life	If any found, to stop construction and notify cultural sector to the sites and protect sites.		
	Cultural relics	Cultural relics may be found			
Public safety	Professional health and sudden accidents to cause injure and death				

**Table2-2 Impacts on environment and mitigation measures during operation**

Environmental factors	Potential impacts	Mitigation measures	Implementer	Supervisor
Ambient air	JNSTPP will supply heat for $200 \times 10^4 \text{m}^2$ , and save coal 48726t annually, which will greatly improve Jinan City air quality.		JNSTPP	Jinan EPB
Social environment	Proposed project can save energy, reduce pollution, meet heating need at the east of Jinan City, to provide high-quality heating so to improve people's life, and strengthen city impression, and advance local economy development.			

### 3 EMP

#### 3.1 Setup environmental management organization (EMO)

##### 3.1.1 EMO during construction

In order to ensure rightness and effectiveness of environmental management, JDTPCLC has set up particular environmental management office, shown in table 3-1.

**Table 3-1 Environmental management team during construction**

Personnel	Number
Team-leader	1
Ambient air supervisor	1
Noise supervisor	1
Solid wastes supervisor	1
Hot on-line worker	1

##### 3.1.2 EMO during operation

EM is relied on current environmental management system of JNSTPP.

#### 3.2 Environmental management duty and responsibility

##### 3.2.1 During construction

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

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

Air, noise and solid wastes supervisor should inspect sites to check mitigation measures implementation, to arrange monitoring, and to report the results to team leader.

Hot on-line employee should record and tidy complaints calls, and report to leader, also to let public know how to solve problems.

##### 3.2.2 During operation

EMO is responsible for heat supply network and exchange station running well balanced. Its major tasks is to inspect pipelines, to find leakage and repair in time, and to periodically examine and maintain equipments at exchange station to ensure all environmental establishments running well; and to supervise all EPMs request in this EIA.

### **3.3 CC's management**

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

- (1) To choose strong CC to ensure EMP implementation.
- (2) To ask CC and engineering supervisor to be trained in terms of EP and environmental management before construction.
- (3) All EPMS mentioned above should be included in the bidding document and finally in the contract with CC.
- (4) To ask CC to monitor its environmental activities, and provide daily or weekly record for their environmental achievement. PMO and construction supervision team will examine and audit.
- (5) 1 or 2 full-time environmental employee is necessary for CC, have to be trained to fit for their task.
- (6) During construction, CC should communicate and negotiate with local residents, to set up notice board to notify construction time, activities. Meanwhile, CC should provide contact and phone number for complaints and suggestion.

## 4 Environmental Monitoring Plan

### 4.1 Objectives

Environmental monitoring plan includes two phases so to fully, timely learn dynamic pollution status of the project, to learn environmental quality change, affected scope; and dynamic environmental quality condition so to report to local sector in charge, to provide scientific basis for environmental management.

### 4.2 Monitoring components

#### 4.2.1 During construction

Based on pollution characteristics, it is necessary to setup monitoring system to ensure all measures implemented. Monitoring methods will adopt state or sector relevant criterions and regulations; detailed monitoring contents are list in table 4-1.

#### 4.2.2 During operation

After pipelines constructed, there is no emission, wastewater, and solid wastes produced.

## 5 Environmental Protection Supervision Plan

Seen in table 5-1.

**Table 5-1 EP supervision plan**

Phase	Supervisor	Supervising contents	Supervising purpose
Cons-truc-tion	Shandong EPB Jinan EPB Jinan Cultural Relics Bureau	<ol style="list-style-type: none"> <li>1.To check EP preliminary design and EMP;</li> <li>2.To exam recovery of temporary land occupation and vegetation, and settings;</li> <li>3.To exam dust and noise pollution control and decide construction time;</li> <li>4.to exam pollutants emission;</li> <li>5.To exam domestic wastewater and oil water discharging;</li> <li>6.Disposals handling</li> <li>7.To exam if cultural relics found</li> </ol>	<ol style="list-style-type: none"> <li>1.To carry out “three contemporary”.</li> <li>2.To ensure temporary land occupation meet EP demands.</li> <li>3.To reduce impacts on local environment. And to follow relevant standards and regulations.</li> <li>4.To ensure river water quality not to be polluted.</li> <li>5.To ensure sights and land resources not to be destroyed so to cause soil and water loss.</li> </ol>
Opera-tion	Jinan EPB	<ol style="list-style-type: none"> <li>1.To exam EPMs implementation;</li> <li>2.To exam EMP implementation;</li> <li>3.To check if environmental quality of sensitive targets meet pertinent criterions.</li> </ol>	<ol style="list-style-type: none"> <li>1.To carry out EMP</li> <li>2.To carry out monitoring plan</li> <li>3.To truly protect environment</li> <li>4.To strengthen environmental management, and to protect people’s health</li> </ol>

**Table 9-9 Environmental monitoring plan during construction**

No.	Environmental factors	Locations	Parameters	Frequency	Implementer/supervisor	Cost ( $\times 10^4$ Yuan /a)
1	Ambient air	Each at construction site, Shandong Normal univ. and Jinan City mental disease precaution center	TSP	One-term/two-month, 2days/term, twice/d, occasional check when dry	Qualified environmental monitoring station/local EPB	2.5
2	Noise	Each at construction site, Shandong Normal univ. and Jinan City mental disease precaution center	Leq	Once/term at day and night, and one-term/one-month		1.2
3	Solid wastes	Construction sites	Names, amounts, and destination	Once/month		0.3
4	sum					4.0

## 6 Environmental staffs training

In order to ensure environmental management fluently moving, it is necessary to map out effective, technical training to all staffs, and to introduce the significance of the project, and also to do different training according to positions. Detailed environmental staffs training plan is shown in table 6-1.

**Table 6-1 Environmental staffs training plan**

Project	Phase	Participants	numbers	Sub-total	Time	Cost ( $\times 10^4$ Yuan/y)
Heat supply network project	construction	Environmental staff at project owner	2	2	2007□2008	2
		CC's environmental management leaders	3	3		3
		Environmental supervisor	Each for CC and project owner	2		2
		Emergency staff	1	1		1
	operation	Environmental management staff	1	1	After it built	1
Total	□	□	9			9

## 7 Budgets for EMPs

Seen in table 7-1.

**Table 7-1 Budgets for EMPs**

Aspects		Annual budget□ $\times 10^4$ Yuan/y□	
		During construction	During construction
EMO's running	Salary	16	2
	Administrative cost	8	1
	Transportation cost	5	0.7
	Sub-total	29	3.7
Environmental monitoring	Air quality monitoring	2.5	-
	Water quality monitoring	□	
	Noise monitoring	1.2	
	Solid wastes management	0.3	
	Sub-total	4.0	
Environmental staffs training		8	1
total		45.7 $\times 10^4$ Yuan/a	

## **CHAPTER THREE**

### **JINAN NORTH SUBURB THERMAL POWER PLANT ENVIRONMENTAL MANAGEMENT PLAN**

## CONTENT

<b><u>1 CURRENT ENVIRONMENTAL IMPACT ANALYSIS</u></b> .....	<b>3</b>
<u>1.2 CURRENT ENVIRONMENTAL ISSUES</u> .....	3
<u>1.3 MITIGATION MEASURES</u> .....	3
<b><u>2 CURRENT ENVIRONMENTAL MANAGEMENT CONDITION</u></b> .....	<b>5</b>

# 1 Current environmental impact analysis

## 1.1 Current environmental impact analysis

Current environmental impact analysis and mitigation measures are shown in table 1-1.

## 1.2 Current environmental issues

- (1) Current  $\text{SO}_2$  concentration and amount from boilers' chimney cannot meet pertinent requirement.
- (2) Loose management, for example, switchboard cabinet cannot keep closed timely and so on.
- (3) JNSTPP has three coal boilers, and it has two kinds of means to remove ash by water and air pumping. It has to prepare hydraulic removing ash site while air system in disorder condition, which may cause severe environmental problems in summer dry days. JNSTPP is setting out reconstruction for air pumping to transport ash, and will all adopt dry means to remove ash.
- (4) The environment of coal storage site is poor, especially in dry days, a large amount of dust produced, so it is necessary to install sprinkling water equipment.

## 1.3 Mitigation measures

- (1) In order to meet standard, JNSTPP is going to install desulfurizing equipment at three coal boilers, to choose Na-Ca double alkali technique, and using limestone as major desulfurizing detergent, NaOH as assistant detergent. Scale formation will not occur due to using NaOH as absorbent, operation safe and reliable. Moreover, the reaction speed between NaOH and  $\text{SO}_2$  is faster than that between  $\text{Ca}(\text{OH})_2$  and  $\text{SO}_2$ , so it can reach high desulfurizing ratio under low liquid-gas ratio. This project is under construction, and assuming complete by the end of this year. After above measures, concentration of dust and  $\text{SO}_2$  will meet requirement of I-period of "Emission standard of air pollutants for thermal power plant" (DB37/664-2007).
- (2) JNSTPP should reinforce in management, to enhance ash site management, especially at dry days, to use sprinkling water to deal with, meanwhile, it should fastening pace to finish air-pumping ash system for three boilers to remove internal ash as soon as possible, furthermore, it should sprinkle water at coal storage site at poor days.

**Table 1-1 Current project environmental impact and mitigation measures**

Type	Major pollution	Mitigation measures and effect	implementer	supervisor
emission	Boilers' gas	SO <sub>2</sub> , dust <input type="checkbox"/> coal boiler adopts tri-field static dust-catcher, and sulfuration bed boiler adopts mixture of coal and limestone to desulfurizing and four-field static dust catcher., C <sub>dust</sub> 414mg/m <sup>3</sup> <input type="checkbox"/> C <sub>SO<sub>2</sub></sub> 3691mg/m <sup>3</sup> , C <sub>NO<sub>x</sub></sub> 384mg/m <sup>3</sup> , dust and SO <sub>2</sub> cannot meet criterion. <input type="checkbox"/> On-line smoke monitoring system to help with management.	JNSTPP	Jinan EPB
	dust	Unorganized emission <input type="checkbox"/> Cover transportation vehicles <input type="checkbox"/> Sprinkle water on loose soil and earth on surface ground.		
	Dust at coal site	Unorganized emission To adopt air-pumping to remove ash possibly instead of water.		
Waste-water	Major wastewater include acid-alkali wastewater from chemical water treatment installation, wastewater from cooling tower, acid-washing wastewater from boilers, washing ash wastewater, and domestic sewage.	<input type="checkbox"/> Reuse anti-filtration wastewater to wash ash; <input type="checkbox"/> To neutralize chemical wastewater before discharging into Xiaoqing River; <input type="checkbox"/> Boiler's wastewater discharges into Xiaoqing River <input type="checkbox"/> Domestic wastewater goes septic tank before discharging into Xiaoqing River.	JNSTPP	Jinan EPB
Solid wastes	Coal dust and slag	90% to be reutilized by Renhe construction materials company		
Noise	All kinds machines noise level in 85~103dB(A)	After all kinds of noise elimination, west boundary noise near railway can meet <input type="checkbox"/> -class standard of "Standard of noise at boundary of industrial enterprises" (GB12348-90), and the rest boundary noise also can meet II-class standard.		

**Table 1-2 Current environmental issues and proposed mitigation measures**

No.	Major pollution	Pollution prevention measures and effect	Implementer	Supervisor
1	Current dust and SO <sub>2</sub> cannot meet standard	<input type="checkbox"/> Adopt double alkali technique, and use limestone as major desulfurizer, dust catching coefficient reach over 90%, and dust concentration in the smoke <200mg/m <sup>3</sup> , desulfurizing coefficient over 95%, SO <sub>2</sub> concentration <1200mg/m <sup>3</sup> <input type="checkbox"/> set low nitrogen burner, NO <sub>x</sub> concentration <450 mg/m <sup>3</sup>	JNSTPP	Jinan EPB
2	Temporary ash site cause pollution during dry days	On-going reconstruction of air-pumping system to stop water usage		
3	No sprinkling system at coal storage site	To setup sprinkling system at coal storage site		
4	Loose management	To close safety door timely when necessary		

## **2 Current environmental management condition**

### **2.1 Current environmental management condition**

(1) An environmental management leadership team has been set up, so EMO is relatively wholesome.

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

(2) Jinan city EPB and environmental monitoring station, and enterprise to co-work on monitoring work, so its environmental monitoring organization is right.

Smoke on-line monitoring equipment has been installed on No. 7&8 units, and it is to strictly follow “Smoke emission continuously monitoring technical regulation for thermal power plant” (HJ/T75-2001). In order to fully learn pollution condition, HTTPP has entrust Jinan city environmental monitoring station to monitor its boilers emission, ash water and noise.

### **2.2 Environmental Monitoring**

#### **2.2.1 smoke on-line monitoring system**

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

#### **2.2.2 Jinan Environmental Monitoring Station Routine task**

In order to fully learn pollution condition, JNSTPP has entrusted Jinan city environmental monitoring station to monitor its boilers emission, ash water and noise.

##### **(1) Wastewater**

At outlet of wastewater at ash site, one monitoring points is set up, and to adopt methods recommended in “Surface water quality standard” and “water and wastewater monitoring and analysis methods”, to sample once each year, and each for two days at 7:00am, 11:00am, 14:00pm, 17:00pm, 20:00pm, 22:00pm.

##### **(2) Noise**

Under normal condition, it is to monitor noise at 1m away from the four boundaries of the plant. One day a year for daytime and nighttime, monitoring time can be set at

10:00am and 22:00pm.

### 2.2.3 Internal monitoring

#### (1) Major responsibility and duty

Internal monitoring station is to monitor pollutants concentration to the environment, work environmental noise, and dust, also to periodically maintain and check equipments. It is to take part in environmental accidents survey and pollution control work; and to perfect all regulations and environmental monitoring files. It is to evaluate environmental quality, and to finish temporary environmental monitoring tasks assigned by the above sector. Its main apparatus are list in table 2-2, and monitoring plan seen in table 2-3..

**Table 2-2 Major apparatus at internal monitoring station**

No.	Apparatus or equipment name	Model	Purpose
1	Electrical analysis scale	BS210S	weight
2	COD constant temperature heater	TH-12 model	COD
3	Spectrophotometer	752 model	monitoring
4	Acid	PHS-3C model	pH
5	Electrical constant temperature dryer	CS202	dry
6	Ion activator	PXS--215	monitoring
7	Smoke continuous monitoring equipment	--	monitoring
8	Noise level meter	AWA6218 model	noise
9	Oil concentration meter	CMA-220	monitoring
10	Coal quality analyzer	---	For coal
11	Other regular equipments	--	--

**Table 2-3 JNSTPP environmental monitoring plan**

No	Factor	Locations	Parameters	Frequency	Implementer/supervisor	Cost (×10 <sup>4</sup> Yuan/a)
1	Exhaust gas	at chimney exit	SO <sub>2</sub>	Daily continuous	Jinan environmental monitoring station/Jinan EPB	2
1	Exhaust gas	at chimney exit	SO <sub>2</sub> □dust□NO <sub>2</sub>	A day /term, one term/year		2
2	Waste water	Outlet at ash site	pH□COD□SS□NH <sub>3</sub> -N□F <sup>-</sup> □As	Two days/term, one-term/year		2
3	Noise	1m away from plant boundary	Leq	Once at day and night /quarter		1
1	Waste water	To set one monitoring point at outlet of Xiaoqing River and ash site, and monitoring recycled water.	pH□SS□CO□D□oil□F <sup>-</sup> □As□S <sup>2-</sup> □etc	Once/ten-day except As once/month, recycled water one-term/month, two-days/term	Internal monitoring station/Jinan EPB	4
2	Interior of plant	Names, amounts, and destination	Once/month	Interior of plant		0.5

## 2.3 Environmental management suggestion

- (1) JNSTPP should conform to EA requirement, to gradually settle all environmental management relationship, and to periodically develop EA, continually improve environmental management level while holding industrial environmental management work.
- (2) It should strengthen environmental establishments running management, to ensure all environmental establishments in good running condition and designed efficiency, and ensure all pollutants to meet pertinent criterions.
- (3) To reinforce safety and environmental protection education to staffs, and carry out all labor protection measures, to raise workers' safety and environmental consciousness to ensure staff health and safe.
- (4) To adopt mature, effective risk-precaution measures to establish emergency precaution program, and to strictly control monitoring control reporting measures, to prevent and reduce accidents, body injure and environmental accidents. To carry on safety production examination monthly, quarterly, to emphasis on multi-production, traffic, and involved foreign work safety management, and to implement safety measures, to stop management bug and to eliminate weak points so to absolutely stop accidents occurrence.
- (5) Enterprise should, according to its own industrial characters, strengthen communication with local community, to publicize its description, energy-saving countermeasures, and pollution condition to the society.

- (6) To faithfully carry out greening within the area of plant and its surrounding, to enlarge green areas to beautify environment and clean air.

