7. Assessment of Measures for Pollution Prevention and Treatment

7.1 Assessment Measures for Sewage Protection and Treatment

7.1.1 The Quality and Quantity of Sewage

The quality and volume of sewage entered into the sewage treatment station refers to the following table

Table 7.7-1 A table for the water quality and volume entered into the sewage treatment station

Order No.	Name of Shops	Volume of Sewage m^3/d	Density of pollutant (mg/I)		
			CODcr	BOD5	SS
1	Bleaching, hot grounding, pulp making	11000	5000	2300	1800
2	Material stock	225	600	200	1400
3	Papermaking	8500	850	450	400
4	Domestic Sewage	240	400	200	200
Total		19965	3128	1463	1202

In accordance with the volume of sewage to be treated by the sewage treatment station, the treatment capacity is designed at 22000 m3 per day.

7.1.2. The Requirements of Density for Sewage Discharged

The sewage is drained into Gan River after being treated in the sewage treatment station. The environmental quality for surface water within this catalogue of assessment shall comply with <<The Environment Quality Standards for Surface Water >> (GB3838-2002) standard of IV class; The drained sewage shall meet the <<The Standard of Sewage discharged from Paper-making Industry>> (GB3544-2001), for details refers to the Table 7.1-2.

Table 7.1-2 Maximum Allowable Discharge Limitations

Items	Maximum permissible discharge limitations
pH	6---9
BOD5	68mg/L
CODcr	332mg/L
Suspended matter SS	100mg/L
Discharged water volume	137m3 /t

7.1.3. Introduction of Feasibility Study Report on Sewage Treatment

In the feasibility study report the two stages of biochemical treatment process has been designed for the treatment of sewage, the process flow chart can be referred to the table 7-1, and the outcome of treatment refers to the table 7.1-3, in order to deal with the difficult situation of higher

density of pollutants and harder abatement of the sewages.

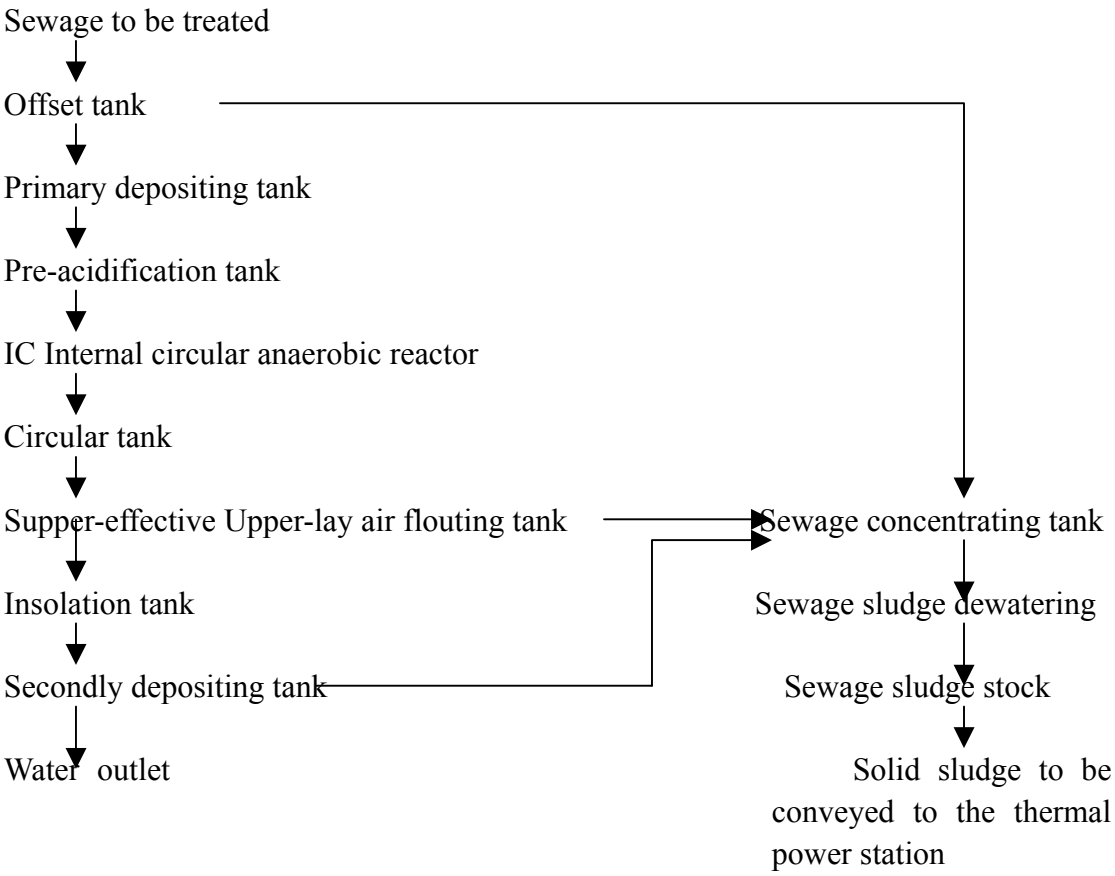


Figure 7-1 Sewage Treatment Flow Chart

Table 7. 1-3 The Water Quality at the Outlet of the Sewage Treatment Station
Unit: mg/L(except pH)

	PH	BOD5	CODcr	SS
Outlet water	6--9	57.1	326	96
Standard of Discharge	6--9	68	332	100

7.1.4. The Review and Modifications of the Proposal on Sewage Treatment

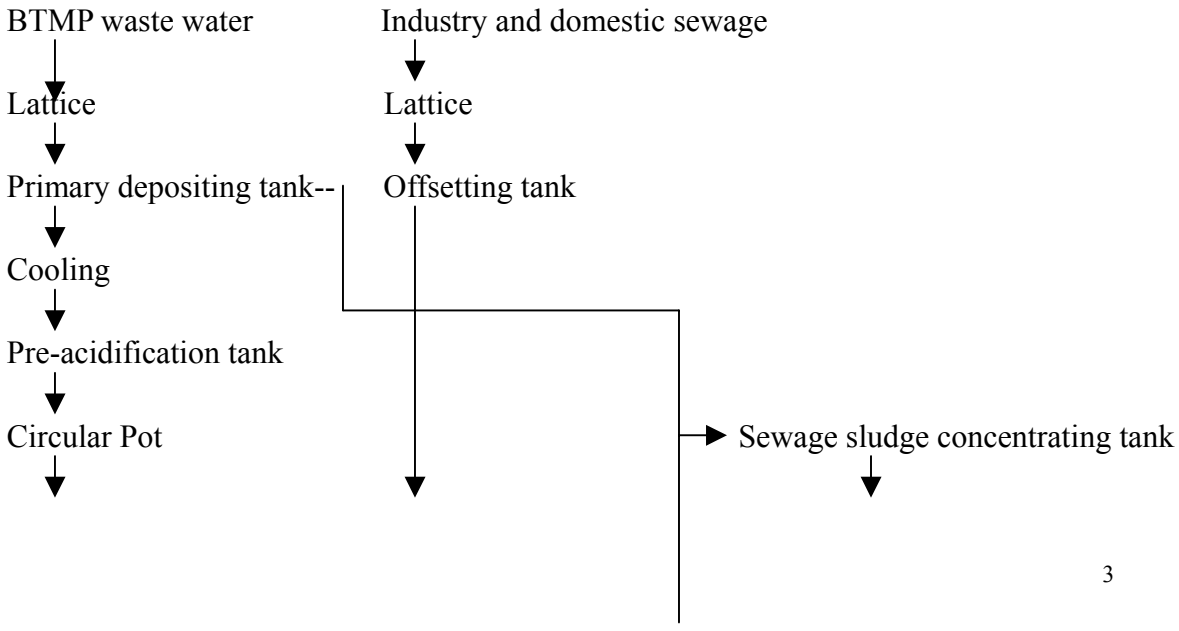
It is feasible in general that the anaerobic and rich oxygen biochemical process is used, according to the feasibility study report, the process of oxygen-rich oxygen is adopted to treat sewage drained from papermaking industry. The anaerobic oxygen will be utilized in the internal circular reactor; and rich oxygen is used in insolation tank. On the situation of sewage discharged from the enterprises it is said in the assessment report that some modifications shall be done in the following aspects:

1. In terms of the source of wastewater its total volume discharged from the BTMP shop accounts for 55.1% of the total amount. The ratio of contamination accounts for 88.07% of the total amount. The IC reactor is considered as a high efficient anaerobic reactor. The process that all the sewage shall enter into the pre-acidification tank before it gets into IC

reactor will increase the investment for not only the facilities but also its running cost. In addition, it will affect the stable operation of the IC reactor. Therefore it is wise to separate the sewage discharged from BTMP workshop and other sources. The sewage from BTMP shop shall be treated with anaerobic oxygen and rich oxygen while other sewages from other sources shall be treated with good oxygen only.

2. The sewage from BTMP shop is at high temperature, which is not suitable for entering pre-acidification tank directly. The solution therefore will be that a cooling tower is added before the pre-acidification stage. IC reactor acts as an anaerobic oxygen treatment system with very strict pH requirements. And the installation of a circular tank before the IC reactor can be adopted for the adjustment of pH values.
3. A great amount of methane will be produced in IC reactor during the course of separating gas from liquid. The capacity of methane is about 15000 m3/d. In this circumstance the methane pot will be added and a system shall be installed, which can make use of the methane available.
4. An automatic control system shall be equipped to control the points such as the liquid level of acidification tank, the pH values for sewage in the circular pot, the flow ratio of raw sewage into IC reactor and methane level in the methane storage pot, owing to the large scope of the sewage treatment station and the purpose of reducing the cost of the chemicals, running fee, keeping higher stability in running the station.
5. In consideration of adjusting the discharge standard of sewage specified by the feasibility study report close to the specifications designated by the State, and with no specific requirement for the discoloring, it is suggested that the mixed depositing tank be installed in order to gain the effectiveness of discoloring, depositing and abating down of the organic pollutants by adding some flocculants and coagulants.
6. For the sake of reliability sewage treatment station shall be equipped with emergent tank, the capacity of which shall accommodate the amount of sewage for more than half a day, so as to be sure that no sewage would enter into the Gan River directly in case sewage treated is still not up to the specifications and/or the failure of the facilities.

Based on the suggestions mentioned above it is said in the assessment report that the process used in sewage treatment station shall be as follows, see Figure 7-2.



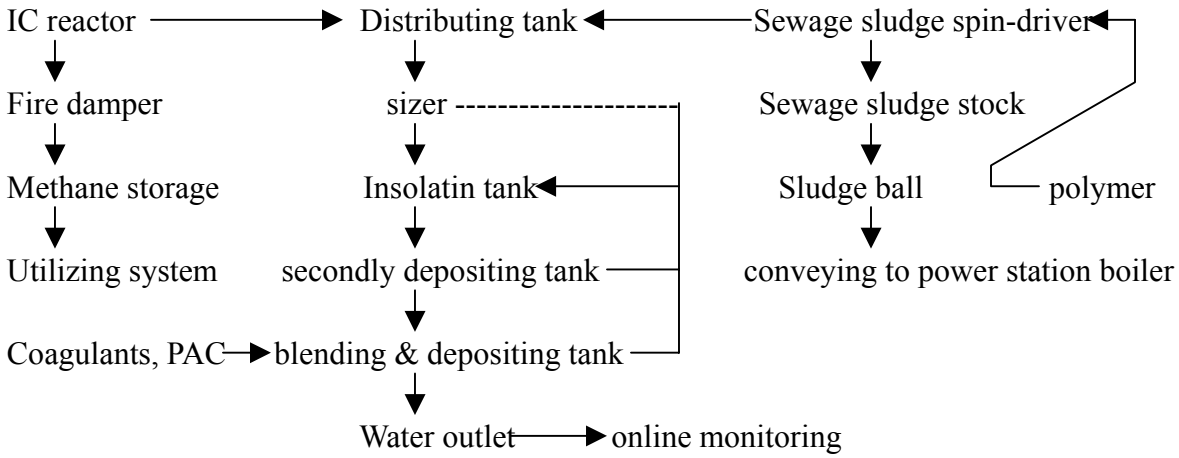


Figure 7-2 The Sewage Treatment Process Flowchart Proposed by the Assessment Report

Table 7. 1-4 shows the deriding rate of all the pollutants after the readjustment of the process design. An online monitoring system shall be installed at the outlet of the sewage treatment station in an effort to monitor the statute of sewage treatment procedures and to be supervised by the government and the public.

Table 7. 1-4 The specifications of outlet water treated with the readjusted Process

Unit: mg/l (pH)

	PH	BOD5	CODcr	SS
Water before the readjustment	6--9	57.1	326	96
water after the re-adjustment	6--9	30	300	60
Discharge Criteria	6--9	68	332	100

The Specification indicating the pollutant volume, abating volume and discharge volume in wastewater sees the Table 7. 1-5.

Table 7. 1-5 The rating of pollutants contained, abated and discharged in wastewater

	Volume Of waste Water m3/d	Pollutant Volume		Separated Volume		Discharged Volume	
		T /d	T /a	T /d	T /a	T /d	T /a
CODcr	19965	62.45	21233.2	56.46	19197.2	5.99	2036
BOD5		29.21	9931	28.61	9727.4	0.60	203.6
SS		24.00	8159.3	22.8	7752	1.20	407.3

7.1.5 Investment Estimation and Running Cost

The investment on equipment will be 19 million; shops and foundations will be 15 million; the design, installation and commissioning will be 3 million, resulting in total of investment of 37 million RMB.

The running cost will be estimated as follows: chemicals for the treatment of sewage and sludge will cost 2.5 million Yuan/year; salaries for personnel 0.34 million Yuan/year; power cost 3 million Yuan/year; the maintenance, repairing and replacement of parts 0.2 million Yuan/year; the total running cost sums to be 6.04 million Yuan/year.

7. 2 Means to Treat Exhaust Gas Emitted from Boilers in the Thermal Power Station

7.2.1 The Introduction and Review of the Feasibility Study Report on the Exhaust Gas Emitted from Boilers in the Thermo Power Station

Introduction of the Proposal

The emission from the coal burning in boilers (240t/h) in the thermal power stations is mainly composed of ash smoke and SO_2, the details of the ash smoke released from coal-fired boilers refers to the Table 7. 2-1.

Table 7. 2-1 The Details of Exhaust Gas Emitted from Boilers

Boilers	Volume of Ash ash smoke Nm3/h	Pollutants	Density mg/Nm3	Volume Kg/h	Smoke Temperature at at the Outlet
1X240t/h	275771	Ash smoke	22800	6287.6	132 ℃
		SO_2	3200	882.5	

The feasibility Study Report suggests that the flow boilers shall be used, in which coal is mixed with limestone during burning process so as to get de-sulfurised. The high voltage electrostatic reciprocator will be adopted to purify the ash emission. The ash emission after being purified will be channeled into atmospheres through the120m high chimney. The reciprocation process flowchart is referred to table 7-3; and the designed efficiency parameters refer to Table 7. 2-2.

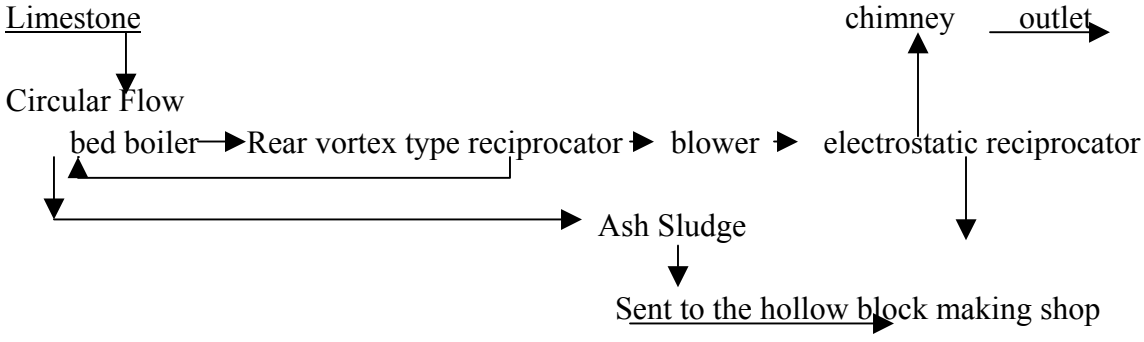


Figure 7-3 Process Flowcharts for Boiler Desulfurization and Reciprocation

Table 7. 2-2 A table of designed efficiency parameters

Names	Purifying Efficiency (%)	Designed Drainage Density (mg/Nm3)	Allowable Drainage Density (mg/Nm3)	Executive Standards for Emission
Ash gas	99.2	176	100	<The Emission Standard for Coal fired Power Station> (GB13223-1996)
Sulfur Dioxide	90	327	1200	

The Analysis of the Desulfurization by Means of Circular Flow Boiler

The circular flow boiler (CFB) is characterized as one of the latest technologies used for generating electricity industry by burning pure coal. The coal to be burned for this project is the mixed one supplied by both "Bayi" Coal Mine and Shang Zhuang Coal Mine in Fengchen City, with 1.6% of sulfur in the mixed coal. A certain amount of limestone ($CaCO_3$) is to be added to circular flow boiler camber (CFBC) and it acts as a kind of desulfurer to absorb SO_2 from the ash emission and to meet the demand of desulfurization. In addition, this boiler has a better suitability for coals (the coal has at least the thermal values of 5860kJ/kg, the water content can reach as high as 50%, ash content 76%, sulfur content 7%), greatly reduced the chances of creating NOx (burning temperature is between 850--920℃) has been greatly reduced. It has higher possibility of re-utilization of ash sludge (lower burning temperature, looser sludge in outlet, which can be used for making cement, blocks and surfacing) and etc.

The de-sulfurizing efficiency of limestone ($CaCO_3$) in the boiler chamber is mainly related to Ks, the temperature in the chamber and the granularity (d) of limestone. With the increase of amount of Ks, decrease of the granularity (<0.7mm) of limestone ($CaCO_3$), the increase of activeness of limestone ($CaCO_3$), the efficiency of desulfurization will be then raised. There could exist the best temperature for the reaction of desulfurization between different coals with limestone, normally the temperature is between 850--900℃.

The feasibility study Report specifies the desulfurizing efficiency by adding of calcium in the boiler is set as 90%, which we think is on the high side. The reasons are: limestone (CaCO3), acting as absorbent and being entered into the chamber in which the temperature is between 850--1100℃, is decompounded into CaO and CO2, and CaO then reacts with SO2 in the exhaust gas resulting in $CaSO_3$. Although limestone ($CaSO_2$) gets circulated many times inside the boiler chamber, creating continuously CaO and CO_2, this kind of reaction is with both gas and solid. The probability of reaction is rather low and contact time is rather short. The ratio of desulfurization shall be about 55%--65% in accordance with the relative information released from both home and

abroad.

Efficiency Analysis of Electrostatic Reciprocator

The high voltage electrostatic reciprocator is widely used in the power generating industry in China. The dried electrostatic reciprocator has a higher working efficiency theoretically. Normally it can be up to more than 95—99%. This kind of reciprocator is more likely influenced by a variety of factors such as the temperature and humidity of the exhaust gas, the physical and chemical features of ash, the granularity of ash, specific resistance and etc, at the same time it is also affected by the operation and structures of electrical dust collector (such as polar-plate type, polar line type, vibrating type, polar match and supply voltage……..) and etc. Vapor and SO_2 contained normally in the exhaust gas emitted by boilers is beneficial for the reciprocation efficiency, while $AL2O_3$ and SiO_2 in the exhaust gas tend to lower the reciprocation efficiency. The circular flow boiler for this project is with comparatively lower ratio of sulfur content, relatively higher content of Al_2O_3 and SiO_2 in exhaust gas. Therefore it is rather difficult for the purifying efficiency of the electrical dust collectors to meet the requirements set by< The Regulations of Pollutants Emitted into atmospheres by coal-fired boilers in power stations> (GB13223--1996) and to comply with the total volume controlling consent in facing with so many influential factors.

If the process proposed by the feasibility study report is adopted to the desulfurization and reciprocation the density of emission in both SO_2 and exhaust gas will have difficulties to meet the relative standard.

7.2.2 The Proposals of Modifications on the Designed System of Desulfurization and Scrubbing

The Proposal of Modifications on Desulfurizing System

The dried desulfurization process is generally acceptable. Its flowchart is rather simple on one hand, and on the other hand it can avoid the complicated flowchart needed for desulfurization and possible secondly pollution.

In order to solve the problems of low efficiency of desulfurization resulting from the long contact time between SO_2 and CaO in exhaust gas and the difficulty in creation of reactant (CaSO4) we suggest that the process be applied by which aqueous solution is to be sprayed into the exhaust gas to activate the reaction to rest of CaO, in addition to the normal practice of spraying calcium into boiler chamber for better desulfurization in order to increase the desulfurization efficiency. This process can be explained as the means of activation after adding calcium into the chamber. It has many characters such as mature technology, reliable running, no wastewater drained, less area covered.

The basic principle of this process is: in the first phase, the limestone (CaCO3), acting as absorbent and being entered into the boiler chamber in which the temperature is between

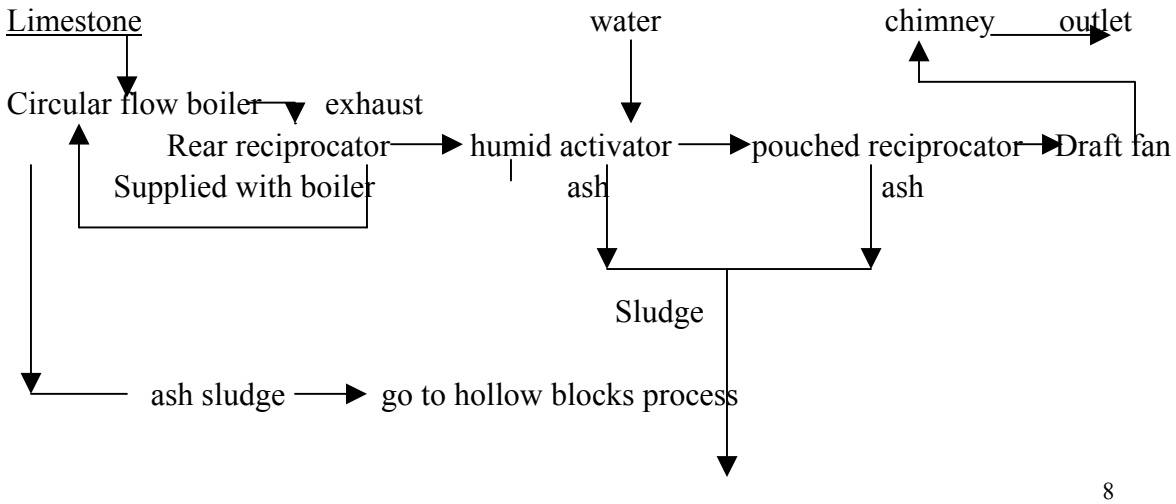
850--1100℃, is decompounded into CaO and CO_2, resulting in then CaO reacting with SO_2 in the exhaust gas and forming $CaSO_2$. This kind of reaction takes place with both gas and solid, and has low ratio of utilization of calcium. The CaO, which remains no reaction, will be carried along with exhaust gas into the rear duct of boiler. The ratio of desulfurization in this phase is about 60%--70%. In the second phase, water is to be atomized into fine drops and sprayed into the humid activator in the rear parts of boiler, in which those drops meet with CaO still left in exhaust gas, then resulting in $Ca(OH)_2$. They react with SO2 in exhaust gas and create $CaSO_3$. Solid powder is turned out in the humid activator as the product of the desulfurization. Blowers expel the exhaust gas emitted from humid activator into atmosphere through a chimney. The desulfurizing efficiency during the two processing stages can reach as high as 75—85%.

The Proposed Modifications of the Reciprocating System

It is understood that the application of pouched reciprocator for scrubbing exhaust gas has obvious advantages in order to overcome the disadvantages resulting from such factors as low efficiency in the process of scrubbing by using electrical dust collector.

In comparing pouched reciprocators with electrical ones, the advantages embodies in the following aspects: particulate collecting ratio can generally reach up to 99.9% and the emission density can be controlled within 50mg/Nm3, sometime even up to 10mg/Nm3. The powered ash features will not influence the pouched reciprocator such as compositions of exhaust gas, ash density, disperse degree of granularity, specific resistance and so on. The fluctuation of boiler load and exhaust gas volume has little affect on the pouched reciprocators. Collecting dust on one hand, with the residual SO2 in exhaust gas going through the filtering pouch on which a lay of powered ash has been lines so that the desulfurating efficiency can gain as high as 5—10%. Therefore the utilization of the pouched reciprocators also benefits the desulfurization on the other hand.

As a result, the utilization of pouched reciprocators can obtain not only much better reciprocating outcome but also the higher reciprocating efficiency of the whole system as well. The prevail emission regulations then can be perfectly met in terms of reciprocation and desulfurization. The flowchart refers to Fig. 7-4. The desulfurizating result by using circular flow reciprocator and cotton pouched reciprocator sees the table 7. 2-3. The content of pollutants in exhaust gas emitted by boilers, the amount abated and the amount emitted refer to the table 7. 2-4.



⟶ Go to hollow block process

Conveyed by air

Fig. 7-4 The Proposed Process Flowchart for Desulfurization and Reciprocation for Boilers

Table 7. 2-3 A table of Efficiencies of Desulfurization and Reciprocation by using Circular flow bed + pouched Reciprocators

Name	unit	Designed Efficiency	Designed Emission density	Allowable Emission density	Emission Executive Standards
Exhaust gas	Mg/Nm3	99.7%	64.8	100	<The Standards for Pollutant Emitted into atmosphere by Coal fired Boilers
Sulfur Dioxide	Mg/Nm3	85%	480	1200	

Table 7. 2-4 The content of pollutants in exhaust gas from boilers, the amount abated and the amount emitted

Items	Volume of exhaust smoke Nm3/h	Volume created		Volume abated		Volume Emitted	
		t/d	t/a	t/d	t/a	t/d	t/a
Ash smoke	275771	150.7	51245	150.24	51091	0.453	154
SO2		210.2	7208	18.0	6131	3.17	1077

7.2.3. Other Requirements for Boiler Reciprocation

The monitoring holes and relative facilities shall be made available in boiler chimneys for permanently sampling in accordance with the regulations set by GB/T16157-1996. And the online monitoring devices for continuously measuring soot in the exhaust gas, the density of sulfur dioxide shall be installed and the estimation of costs shall be integrated into the budget for boiler desuflurization and reciprocation.

7.2.4. The Estimation of Investment and Running cost

7.2.4.1 Major Facilities and Equipment

(1) Pouched Reciprocator

Type and size:	low voltage, pulse, long pouch F=3000m2
Quantity:	1 unit
Control Devices:	1 set
Ash emptier;	1 set
Compressed air:	4 m3/min x 0.5Mpa

(2) Humid Activator

Type and size:	Dia. 6.0 x 15.0 m
Quantity:	1 unit
Material:	Q235-A
Nozzle for atomizing;	4—5 pieces
Pump for atomizing;	8.0 m3/h x 0.4 Mpa 2 units (one for spare)
Control device for atomizing;	1 set
Compressed air for atomizing;	3.0 m3/h x 0.5 Mpa
Ash emptier:	1 set

(3) Air flow Conveying System

Pump in convey tank:	2 sets
Target tank:	1 unit
Cotton pouch ash collector:	F= 200 m2 1 unit
Compressed air for conveying:	80 m3/h x 0.7Mpa
Blower:	1 unit

(4) Limestone System

Tank for limestone:	V=50 m3 I unit

(5) Blower

Specification:	Q=486000 m3/h P=3500 pa

7.2.3.1 Budget Estimation and Raw Material

(1) Manufacturing cost:	24 million Yuan
(2) Foundation Engineering:	6 million Yuan
(3) Limestone:	1500 Yuan/h
(4) Power:	700 kw/h
(5) Compressed air:	6 m3/min
(6) Water:	8 m3/h

Construction cost: 30 million Yuan; running cost: 15 million Yuan/year

7.3 Control Measures for Potential odd and Surface Pollutants

7.3.1 Horrible Smell from Sewage Treatment Stations

The odor caused by sewage treatment stations is with acidic flavor resulting from solving acidification CODcr and from sulfured hydrogen deoxidized from vitriolic and sulfite hydronium.

The following points shall be considered in the design of sewage treatment stations in order to prevent the influence of the odor: 1, the shops for dehydrate and storage of sewage sludge shall be housed and ventilating system shall be installed into theses houses. The air shall be sprayed and scrubbed before it is fanned outside. 2, the screwed type press shall be adopted in hydrating of sewage sludge. The operation shall be carried out on the condition of fully closed with tightness. 3, the dehydrating of anaerobic oxygen sludge shall not be carried out in the place for sewage sludge. Special slots for anaerobic oxygen sludge shall be available, by which it can be recycled by the design institution. Additionally the necessary forestation area shall be set and bamboos and high trees with big leaves shall be planted around the sewage treatment stations so as to stop and absorb the odor from the sewage treatment station. Investment of 0.5 million Yuan shall be given to the foul smell control system in sewage treatment station.

7.3.2 Systems for Coal Unloading, Storage, Conveying and Pulverization

According to the engineering analysis there will be a certain amount of fly ash contaminations during the unloading and stacking of coal in the coal yard, the ratio of fly ash will be 0.85t/d, which also disperses in no order. The coal yard shall be half closed so as to minimize the environmental affect on the plant and its surroundings, with the wall facing south fully closed. At the same time the spraying system shall be established in the coal yard. The closed coal conveying system shall be adopted and the means of collecting powdered ash during the pulverization by way of negative voltage collectors and cotton pouches shall be used. The density of the collected ash shall be less than 50mg/Nm3 at its outlet.

7.3.3The Disposal of Powdered Coal Ash and the Ash from Pouched Reciprocators

It is likely to cause contaminations by non–order fly ash during the disposal of powdered coal ash, therefore closed devices shall be installed in the outlet and the powdered coal ash cooled down is conveyed to the block making procedure by closed pots. The fly ash collectors at the unloading hoppers shall be installed. The conveying of coal sludge by belt conveyor shall be considered.
It is proposed that the powdered ash shall be carried to the block making shop by air conveying as the powdered ash collected by humid activators and pouched reciprocators is very fine and fly-prone and normal conveying means will not be suggested.

7.3.4 The Stocking and Conveying Systems for Bark and Wood Dust

The tree skins and wooden dust left in the shop during the material preparing shall be carried to the thermal power station by lorry according the original design. In this case the establishment of houses for stocking those tree skin and dust shall be considered in the design layout. The warehouse shall be of closed type structure so that no fly ach occurs during the operation of conveying the tree skin and dust. The ventilation devices shall be installed in the houses as well and the lorry shall be modified and refitted for this special transportation and to ensure that no contamination occurs during the course of transportation as well.

7.4 Disposal Measures for Solid Waste

The solid wastes created by this project to be designed are mainly composed of the following three

parts: the first part is tree skin and dust in the material preparing section; the second part is the waste sludge created by sewage treatment station; the last part is the powdered coal ash and coal sludge produced by boilers in the thermal power stations.

7.4.1 The Disposal of Bark and Dust

The waste sludge coming from sewage treatment stations and tree skin and dust are to be entered into circular flow boilers. With reference to the design specifications for circular flow boilers the ratio between waste sludge and coal does not exceed 1:8; the ratio between tree skin and dust and coal is no more than 1:16; the daily coal consumption is 840 t and the daily output of waste sludge is 94.7 t (50% water rating); the daily output of tree skin and dust is 41.8 t. The design requirements for boilers thus can be complied with. This process of combustion for disposal of the tree skin and dust from the treatment plants and waste sludge from sewage treatment stations is adopted currently by the Pacific Ocean Paper Making Company in Chang Shu City and Yue Yang Paper making Company, Hunan, China.

7.4.2. Comprehensive Utilization of Powered Coal Ash

The fly ash and coal sludge produced by the circular flow boilers, which is loose, are very good constructional materials. The powered coal ash and sludge, with a great amount produced, can be considered to make shallow blocks for construction of buildings. Also sludge turned out by boilers, sands, and cement can be utilized for making hollow blocks for wall construction, which not only can dispose powered coal ash but also save cash flow for transportation of the ash and raise the economic efficiency as well. The volume of such a hollow block made of powered coal ash is equal to that of 11 solid bricks made of normal clay, the former is also up to all the specifications for construction of buildings and can be used to build houses with less labor and working hours. The important points are the energy saving, and reduction of use of the resource, which will otherwise be used to make clay blocks. It is an environment friendly project, which is encouraged by the state.

A set of dried ash sludge collecting system shall be established and at the same time the storage houses for powered coal ash and coal sludge shall also be considered to be available as the dried ash sludge has stronger activeness than that of wet ash sludge during the collecting operation. In accordance with the regulations <The Control Standards for Disposal of Contamination in Solid Waste Storage and Handling Yards in Normal Industries> the storage houses shall be built with means of preventing the penetration and stopping penetrated liquid from leaking away, and also with fully closed structure. The storage house for sludge shall be built with half closed structure, with the fully closed structural wall facing south and also with roof. The ash house shall have the capacity for accommodation for 70 hours and the sludge house for 90 hours.

A production line with annual capacity of 0,2 million of hollow blocks may be established according to the ash sludge volume estimation made by Chen Ming Paper Making Company. It is estimated that the plant shall make the total investment of around 40 million Yuan.

To make better use of the powered coal ash comprehensively a new technology shall be adopted therefore. That is: a burning agent shall be added into boiler combustion chamber and cement then

will be created directly. By application of this new technology the adhesive particulate matter can be formed in the course of pulverizing together between coal and the burning agent. The mass, momentum and heat transformation has high efficiency during the operation of “Adhesive Combustion” in the boilers, resulting in forming the unique thermal working condition of “Rapid Combustion and Cooling ”. It is regarded as the ideal combustion process for cement production, by which high activate Ballet cement cam be produced thanks to the existing coal fired boilers. This is the solution to the major problem that the domestic researchers had spent a few decades on and had not found what they wanted. It got successful now in the application inside the coal-fired boiler in power stations and has been considered as a great breakthrough in the field of cement combustion technology, which has supplied the gap of creating process of making high Ballet cement in the world. It is also an efficient way out for powered coal ash as well.

By adopting the above processes all the solid waste can find effective utilization and be disposed appropriately. Little contaminations will be occurred during the secondly utilization.

7.5 The Policy to Prevent Noise

7.5.1 Means preventing noise contamination

The boiler vents can be categorized into two: the first is used to ensure the safety of boilers and release pressure; the second is used for boiler when it is in it’s starting up and during the idle time. The second category is used more frequently than the first one.

Normally the terminals of the empting ventilation devices are of pipe ends and holes, their sections are of circular type, therefore this empting falls into the type of free dispersed flow. The pressure of the air before going outside is very high and drops down rapidly back to environmental pressure once it gets out of the nozzles while the volume will increase accordingly. The effective way to control the jetting noise is to use all kinds of absorbing silencers, including the majority of the types of small hole jetting, throttle and step-down, multi-hole dispersing and other compound ones. The silencers are characterized in controlling or lowering the noise at its source. This assessment report suggests that those silencers be used such as the types of throttle & step-down, small-hole jetting and damping compound. Their structure includes a lay of throttle & step-down and a lay of compound with many holes of 3 mm in diameter. A damping and noise-absorbing barrel is fitted to the outside the lay with small-holes to increase its safety and to enhance the ratio of noise absorbing. Noise absorbing material is to be waterproof fine glass wool, which has high noise absorbing efficiency. The noise level can be as low as 30 db after the noise is absorbed.

7.5.2. The Control of Noise by Other Equipment

The noise is mainly coming from the facilities and equipment in those locations such as pulp making workshops, papermaking workshops, sewage treatment stations, water supply treatment plants and thermal power stations. Top priority shall be given to lower level of facilities and equipment in purchase. Additionally isolated casings and other means shall be taken for noise absorbing and vibration reducing in order to minimize the noise impact on the surrounding environment. The following means shall be proposed so as to enhance the effectiveness for noise

level controlling:

(1) Top priority shall be given to those facilities and equipment with low level of noise in their purchase.
(2) The anti-vibrating, noise-separating casings and silencers shall be installed in the machines and equipment with high level of noise.
(3) The closed structures shall be adapted to the workshops for material preparing, pulp-making. The noise-proof materials shall be used to make windows and doors that are of solid structures. Also the closed structures will be applied to those shops housing the machines with very high level of noise such as sewage treatment stations and thermal power stations. And structures and material, which have good noise proof effectiveness, shall be used.
(4) With consideration of the layout of the plant, a vast area with arboreal trees shall be set around the plant in an effort to protect the environment by absorbing noise.
(5) The office buildings and living quarter shall be located far from the noise resources.
(6) The necessary noise proof devices shall be provided to the workers and operators.

The total investment in the noise control engineering will be about 2 million Yuan.

7.6. Forestations

The promotion of forestation shall be made not only to prevent the environment within the plant but also realize the purpose of purifying the ambient air in the plant and stop the noise from traveling around. It is benefit to reduce the impact on the surrounding environment in terms of the air quality. The planning of the project shall be done with a general view and its layout shall be appropriate and reasonable, with as maximum area of forestation as it is available in the plant. The mixed planting of grass with trees and arbors with bushes shall be adapted to the forestation. The area for forestation for this project will be about 0.39 million m2, accounting for 30% of the total area. The total investment in the forestation is 8 million Yuan.

7.7 Regulations of Environmental Conservation During the course of Construction

7.7.1 Policy to prevent water contamination

It is proposed that a simple depositing tank be dug on site, into which the sludge water created by blending concrete and removing underground water is channeled. The water in the tank shall be pumped outside before it gets deposited. Direct draining is not permitted.

The domestic sewage created by the personnel living on site and the water after being used for lorry washing shall not be drained randomly. The public water closet shall be set on the site, in which gird shall be installed to remove the coarse particulate matters.

7.7.2. Policy to prevent powered ash

(1) The specific places for concrete blending shall be set aside and ash-proof and ash-control by installing baffles and keeping the ground wet.

(2) In case cement is stored in jars, in the lower outlet of which shall be ash-proof by using bags in order to avoid the cement fly everywhere.
(3) The roads on site shall be kept clean and wet to reduce the flying ash caused by lorry passing by.

7.7.3. Policy to control the noise created by machines on site

The machinery creating low level of noise on the site shall be selected. The operation shall be carried our in accordance with the regulations set by GB12523—90. The following limitations shall be met and controlled for the machinery used on site during the various stage of operation:

(1) Earthwork: earth mover, grabs, loaders and etc,	during late nights 75 dB(A)
	during night 55dB (A)
(2) Pile-driving: all kinds of pile drivers	during late night 85dB (A)
	no working in the nights
(3) Fitting: cranes, elevators and etc.	during late nights 65 dB(A)
	during nights 55dB (A)

After the above measures have been taken the impact on the surrounding environment by the noise created by operation shall be reduced. Basically no impact by the operation during the nights can be found to the surrounding environment.

7.7.4 The Control of Solid Waste

There are two kinds of solid waste mainly: one is the residual earth left over after the earthmoving engineering has been finished and the rubbish from the construction work; the second is the domestic rubbish cause by the personnel during their daily life (such as those form the dinner rooms on site).

(1) The means for disposal of construction waste and rubbish: there is a large volume of solid waste created by the operation in the project. The operation of store and disposal of the solid waste has been strictly controlled. The special organization, Administration Department for Controlling Sludge and Earth, has been appointed for supervision. The solid waster created by engineering construction on site shall be stored appropriately and taken away by the employment from the environmental hygienic companies. The solid waste created by the engineering will cause no serious affect on the surrounding environment on site.

(2) The means for disposal of domestic waste and rubbish: special workers shall collect the waste and rubbish on site. The waste shall be taken away by the employments from the environmental hygienic companies. The cleaning work shall be done afterward by the same people. No rubbish shall be dropped everywhere on the ground and the environment shall be protected.

7.7.5. Intensify of the Management on site

(1) Management on site shall be intensified. The operators and other staff shall be kept well informed of the regulations on safety and the environmental protection. Their awareness of environmental protection shall be raised as well. Their contribution to the environmental protection on site shall be appreciated as a whole.

(2) Special persons are pointed to be in charge of the control of contamination on site in order to gain effective contamination control and to ease or avoid the affect on the environment.

8 The Analysis of the Total Volume

8.1 The feasible analysis of the total volume consent

The following table 8. 1-1 shows the calculated results for both the pollutants to be discharged by the project and their permissible standards. With reference to different environmental character and situations in different sections, Nanchang Municipal Environmental Protection Bureau has specified and issue the consent of total control volumes for main pollutants caused by this project, which is listed in the column of The Permissible Total Volume in the following table 8. 1-1

Table 8 1-1 The permissible discharged density and volume for main pollutants

Pollutant Consent		Unit	Actual discharges	Standard permissible	Permissible Total Volume	Accounting for permissible values %
SO_2	Primary discharged density	mg/Nm3	3200			
	Discharged density after desulfurization	mg/Nm3	480	1200		40.0
	Discharged volume after desulfurization	T/h	0.132	0.556		23.9
		T/a	1080		1080	100
Ash smoke	Primary discharged density	mg/Nm3	22800			
	Discharged density after reciprocation	mg/Nm3	68.4	100		68.4
	Discharged volume after reciprocation	T/a	154		154	100
CODcr	Primary discharged density	mg/L	3128			
	Discharged density after treatment	mg/L	300	332		90.4
	Discharged volume after treatment	T/h	0.25	0.28		89029
		T/a	2036		2036	100

The following solutions can be found from the calculated results listed in the above table 8.1-1:

(1) After the thermal power stations being built, the reciprocating efficiency of exhaust gas coming out from boilers reaches 99.7%, the desulfurizing efficiency reaches 85%, the annual amount exhaust gas emitted from thermal power stations is 154 t, SO2 is 1080 t, those figures comply with the total volume control consent for this project set by Nanchang Environmental Protection Bureau. The actual discharged volume accounts for 100% of the control consent.

(2) The actual discharged densities of SO2 and exhaust gas from thermal power stations are 480 mg/Nm3 and 68.4 mg/Nm3 respectively, which meet with the prevail standards for pollutants discharged into atmospheres specified for thermal power stations, which account 40 % and 68.4% of the standard permissible values. The actual discharged volume of SO2 is 0.132 t/h, which comply with the permissible values calculated according to the discharged standard for thermal power stations <GB 13223—1996>, accounting for 23.9% (0.556 t/h) of the permissible discharged volume.

(3) Upon the completion of sewage treatment station, the treatment efficiency for CODcr reaches 90.4%, the annual discharged volume of CODcr from sewage treatment station is 2036 t, those figures can meet the total volume control consent for this project set by Nanchang Environmental Protection Bureau. The actual discharged volume accounts for 100% of the control consent.

(4) The actual discharged density of CODcr from sewage treatment station is 300 mg/L, which can meet the currently prevail standard (GB 3544--2001) for sewage drained from papermaking industry, accounting for 90.4% of the standard permissible value. The actual discharge volume of CODcr is 0.25 t/h, which can comply with the permissible discharged volume calculated from the discharged standard for sewage from papermaking industry, accounting for about 89.29% of the permissible discharged volume.

It shall be mentioned here and understood that the standard for pollutants discharged into atmospheres by thermal power stations is currently under modifications by the State Environmental Protection Bureau. The new standard for permissible discharged density of exhaust gas SO2 will has limitations of 400 mg/Nm3 and 50 mg/Nm3. The more strict limitation will be applied also to the permissible discharged volume of CO2. After the new standard is in force, the emission of exhaust gas SO2 from thermal power station in this project will face the fact that the volume and values will be beyond the limitations set by the old standard. In order to comply with the new standard for emission form thermal power stations the reciprocating efficiency for thermal power station shall be upgraded to more than 99.8% and the desulfurizing efficiency shall be upgraded to 87.5% or select coal with sulfur content less than 1.0%.

8.2 The Origin Analysis of Total volume Consent

The emitted consent of the total volume for main pollutants set for by Jiangxi Chen Ming Papermaking Company shall be originated from the original one distributed to Jiangxi Papermaking Company with reference to the " The Approval of the Application on the changes about Construction Site of the Technical Innovation Project for Jiangxi Papermaking Company in the News Papermaking industry" and " The Guideline specified by < On the Approvals to the Report on the Environmental Contamination caused by the technical Innovation Engineering in the News Papermaking System for Jiangxi Papermaking Company Limited>. The Nanchang Environmental Protection Bureau approved the discharged total volume for Jiangxi Papermaking Company and its discharged statue are shown in the following table 8. 2-1.

Table 8. 2-1 A Table of the Control Total Volume Consent and its discharged statue by Jiangxi

Papermaking Company

	Exhaust Gas	SO2	CODcr
Control Total Volume Consent (before the year 2005)	3500 t/a	3000 t/a	20000 t/a
Control Total Volume Consent (before the year 2005)	2500 t/a	2500 t/a	6120 t/a
Actual discharged Volume (before the year 2002)	1472 t/a	4038 t/a	8420 t/a

It can be read from the above table that the SO_2 volume discharged by Jinagxi Papermaking Share Company Limited (JPSCL) in the year 2002 has exceeded that granted to this company by Nanchang Municipal Environmental Bureau (NMEB) while the total volume of CODcr and the emitted exhaust gas is less than the total control consent.

By adding the total volume discharged by Jiangxi Chen Ming Papermaking Reliability Company (JCMPRCL) to that done by Jiangxi Papermaking Liability Company Limited, the sum of the total discharged volume of exhaust gas and CODcr is still smaller than that set for Jiangxi Papermaking Comapny while that of the total discharged volume of SO2 exceeds the total control consent.

Although Nanchang Municipal Environmental Protection Bureau has granted the total consent to the new projects it is still impossible now at present stage to separate its respective consent from the total consent set for Jiangxi Papermaking Share Company Limited. A certain amount of the discharge volume set for Jiangxi Papermaking Share Company Limited shall be reduced, with the targeted amount of reduction 2118 t/a, in order to make sure that Jiangxi Chen Ming Papermaking Liability Limited Company will get its total volume consent, in an effort to keep the sum of the total amount of discharge volume for both Jiangxi Chen Ming Papermaking Liability Limited Company and Jiangxi Papermaking Share Company Limited the same as that for the original Jiangxi Papermaking Share Company Limited.

Figure 5-5 Graph of Equivalent effectiveness of Exhausting Noise while Failure of Function in Noise Absorbing

Figure 5-3 Contributing Values of Annual Average Density of SO_2 for the New Projects

Figure 5-4 Contributing Values of Annual Average Density of PM_{10} for the New Projects