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Technical and Managerial Requirements for POPs Hazardous Waste High-temperature Incineration Disposal

I. Overview

On November 11, 2004, Stockholm Convention on Persistent Organic Pollutants (hereinafter referred to as "the Convention") entered into force officially in China. As stipulated by Article 6 of the Convention, all contracting parties should take necessary administrative and legal measures to reduce or eliminate emissions from inventory and wastes. The Convention demands that all contracting parties, including China, should promulgate and implement national implementation plans specified by the Convention, take effective actions and measures and perform all obligations under the Convention to eliminate, reduce and control persistent organic pollutants (hereinafter referred to as "POPs").

On April 14, 2007, the State Council approved the National Implementation Plan of the People's Republic of China for the Stockholm Convention on Persistent Organic Pollutants (hereinafter referred to as "National Implementation Plan"). According to the National Implementation Plan, there are an estimated 4,000-6,000 tons of pesticide POPs wastes. These include 2,600~4,500 tons of DDT wastes; and about 1,500 tons of HCB, chlordane and Mirex. In the production sector, pesticide POPs wastes with ascertained locations and quantity amount to 2,228~2,458 tons. In 2006-2008, the Pollution Prevention Department of the Ministry of Environmental Protection organized a "national survey on persistent organic pollutants", and confirmed over 2,000 tons of wastes in the production sector and an estimated 11,000 tons of wastes in the circulation sector. The survey indicates that POPs wastes are basically stored in the open air or toughly fenced, causing pollution to surrounding waters and soils and threatening the health of residents around.

In order to fulfill the obligations under the Convention and meet the requirements of the National Implementation Plan for the control and disposal of POPs wastes, the Foreign Economic Cooperation Office (FECO) under the Ministry of Environmental Protection worked together with the United Nations Industrial Development Organization (UNIDO) to launch the China POPs Waste Environmentally Sound Management and Disposal Project (hereinafter referred to as "China POPs Waste Disposal Project") of Global Environment Facility (GEF), which supports the environmentally sound management and disposal of POPs from discarded pesticides.

Based on the characteristics and its features of the generation and distribution of pesticide POPs wastes, the disposal capacity of existing facilities of China and the effectiveness and practicality of high-temperature incineration in waste disposal, we choose high-temperature incineration as one of the major disposal methods for POPs wastes.

II. Purpose for compilation and scope of applicability

This Specification is prepared based on existing research findings and practice domestically and abroad and through experiments and engineering demonstration to meet the needs of implementing the POPs Waste Disposal Project, assess and screen enterprises engaged in high-temperature incineration of POPs wastes, put the whole process of high-temperature incineration of POPs wastes under standard management, avoid environmental pollution and accidents during the process of disposing POPs wastes and promote the management and safe disposal of POPs wastes.

This Specification stipulates the technical and managerial requirements to be met in facility construction, operation and pollution control by enterprises engaged in high-temperature incineration of POPs wastes, applicable to the capability assessment, screening and supervision by environmental authorities of enterprises engaged in high-temperature incineration of POPs wastes, as well as the guidance of said enterprises in disposing of POPs wastes in an environmentally sound manner.

III. Standards Cited

The articles in the following Standards shall become articles of the Standard when cited hereinafter. The standards that no date marked, the new versions shall be used when the above mentioned standards are revised.

GB5085.1-7 National Identification Standard for Hazardous Wastes

GB13015 Control Standard on Poly Chlorinated Biphenyls for Waste Slags

GB15603 Rule for Storage of Chemical Dangers

GB15562.2 Graphical Signs for Environmental Protection-Solid Waste Storage

GB18484 Pollution Control Standard for Hazardous Wastes Incineration

GB18597 Pollution Control Standard for Hazardous Wastes Storage

HJ□□□□ Technical Specification for Poly Chlorinated Biphenyls Incineration Disposal

HJ/T20 Technical Specifications on Sampling and Sample Preparation from Industry Solid Waste

HJ/T176 Technical Specifications for Centralized Incineration Facility Construction on Hazardous Waste

HJ/T298 Technical Specifications on Identification for Hazardous Waste

HJ/T365 Technical Guideline of Monitoring on Dioxins Emission from Hazardous Waste (including medical waste) incinerators

HJ561 Technical Specification of Performance Testing for Facilities of Hazardous Waste (including Medical Waste) Incineration

Regulation on the Safety Management of Hazardous Chemicals (No.344 of State Department)

Manifest method for hazardous waste transfer (No.5 of SEPA)

Pollution Source Monitoring Management Measures (No.246,SEPA,1999)

Contingency Plans Formulation Guidelines for Hazardous Waste Operation Unit (No.48,SEPA, 2007)

IV. Definitions of Terms

4.1 Persistent Organic Pollutants

These are organic pollutants with toxicity and bio-concentration persistent in the environment and hard to decompose. The first pollutants to be controlled as specified by the POPs Convention include 12 organics of aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene, polychlorodiphenyl, DDT, PCDD and PCDF.

4.2 POPs Wastes

These are wastes composed of POPs, or containing POPs or contaminated by POPs. For the purpose of this Specification, POPs are pesticide wastes with a POP concentration equal to or greater than 50ppm.

4.3 Incineration

The term shall mean the process of destruction and detoxification of hazardous waste through the means of burning.

4.4 Incineration Amount

The term shall mean the weight of hazardous waste burnt in incinerators per hour.

4.5 Incineration Residue

The term shall mean the solid ignited residue, fly ash, and solid substances from tail gas purification treatment facilities after burning of hazardous waste.

4.6 Ratio of Ignition Losses

Refer to the percentage representing the proportion of the incinerated residue after the ignition losses compared with the original. The computational method is as follows:

$$P = \frac{A-B}{A} \times 100\%$$

P-- Ratio of Ignition Losses, %;

A--Mass of dried original incineration residue at room temperature, g;

B--Mass of incineration residue cooling to room temperature after 600C°(±25 C°)3h ignition, g.

4.7 Residence Time of Flue Gas

Refers to the residence time of flue gas caused by combustion in the area from last combustion air injection port or the outlet of the combustion chamber to secondary combustion chamber or the outlet of high-temperature combustion zone

4.8 Incineration Temperature

Refers to the temperature in the center of the combustion chamber outlet of the incinerator

4.9 Combustion Efficiency

Refers to the percentage representing the proportion of the concentration of CO_2 to that of the total CO_2 and CO in the gas from the flue, the computational method is as follows:

$$CE = \frac{[CO_2]}{[CO_2]+[CO]} \times 100\%$$

CE--Combustion efficiency, %;

[CO_2]& [CO]--concentration of [CO_2]& [CO] separately in the exhaust caused by combustion.

4.10 Destruction and Removal Efficiency(DRE)

Refers to the percentage representing the proportion of the organic matter reduced after incineration

The computational method is as follows:

$$DRE = \frac{Wi - W_0}{Wi} \times 100\%$$

DRE-- Destruction and Removal Efficiency, %;

Wi- the weight of certain organic matter in the incinerated material;

Wo- the weight of the organic matter corresponding to Wi in flue gas emissions.

4.11 Dioxins

The term is the general name for polychlorinated dibenzo-p-dioxin and polychlorinated dibenzofurans.

4.12 Toxicity Equivalent Quantity of Dioxins (TEQ)

The term Toxicity Equivalency Factor of dioxins shall mean the ratio of toxic dioxin compound to 2,3,7,8-tetrachlorinated dibenzo-p-dioxin in terms of binding affinity performance to Ah receptors. TEQ of dioxins can be calculated with the following formula:

TEQ= ∑ (toxic dioxin compounds concentration x TEF)

V. General Configuration and Unit Design Requirements

5.1 General requirements

5.1.1 High-temperature incineration facilities used for disposing of POPs wastes must comply with the requirements of the Technical Specifications for Centralized Incineration Facility Construction on Hazardous Wastes (HJ/T176).

5.1.2 They also meet the requirements raised by the environmental impact assessment.

5.2 General requirements for high-temperature incineration facilities

5.2.1 High-temperature incineration facilities for POPs waste disposal should include a pre-processing and feeding system, an incineration system, a flue gas purification system and technique water processing system, an automatic control and monitoring system, residue processing unit and relevant auxiliary systems.

5.2.2 Auxiliary facilities such as the reception and analysis unit, cache unit and analysis unit should be included for the least. Supporting facilities such as the electrical system, feeding/drainage and firefighting system, construction and structure, heating, ventilation and air-conditioners and other auxiliary facilities should be included.

5.3 Requirements for unit design

5.3.1 Analysis and detection unit

The laboratories of enterprises engaged in POPs waste disposal should be capable of:

(1) Analyzing and detecting regular hazardous wastes.

(2) Sampling as specified by the Technical Specification on Sampling and Sample Preparation from Industrial Solid Wastes (HJ/T20), equipped with relevant tools and instruments used for sampling of POPs wastes before and after reception.

(3) Conducting compatibility testing and equipped with relevant instruments. The compatibility test typically requires the use of a stirrer (turbine stirrer, magnetic stirrer and low-speed stirrer, etc.), a thermometer, a viscosity meter, a pressure gauge, a pH gauge, appropriate containers and a reaction gas collection device, etc.

(4) Besides, the laboratory should be equipped with instruments capable of analyzing the physical properties of POPs wastes, such as the shape, viscosity, heat value and volume; the contents of POPs substances, main organics, halogen, S, N, P and heavy metal.

5.3.2 Storage unit

5.3.2.1 For the storage of POPs wastes, the requirements of GB18597 and the requirements for the storage of hazardous wastes in HJ/T176 must be met.

5.3.2.2 The construction of the major facilities of the storage site should be carried out based on the estimated total stock capacity, waste classifications, supporting facilities requirements and current site conditions. Functional zones in the storage unit can be classified into the waste unloading zone, the storage zone, the pre-processing zone and the service zone.

5.3.2.3 Storage warehouses and storage tanks should be built separately according to the types and estimated quantity of POPs wastes. Besides, POPs wastes should be classified into storage sites of cement blocks, soil, other solid wastes, sludge and other liquid wastes.

5.3.2.4 Ventilation and gas purification systems should be set in the waste storage site and can operate continuously. The air in the storage warehouse should be purified before being discharged or incinerated by the incinerator to put the warehouse under micro-negative pressure.

5.3.2.5 The gas monitoring device should be installed in all sections of the warehouse for regular detection of VOCs and typical hazardous ingredients in the air. The monitored data should be sent to the automatic control center, and an alarm system should be set.

5.3.2.6 Workstations should be set in the automatic control center to display and record warehouse equipment,

facility performance parameters and the quantity, status and locations of all kinds of wastes entering and exiting the warehouse. According to actual needs, automatic control over the operation of critical systems and the storage warehouse should be determined.

5.3.2.7 Industrial TV surveillance and storage recording systems should be set at key locations of the storage warehouse.

5.3.2.8 A complete firefighting system equipped with fire pre-alert, monitoring and firefighting apparatus shall be built at the storage warehouse in accordance with GBJ16 and GBJ140.

5.3.2.9 The storage warehouse should be equipped with loading equipment such as the crane, electric grab bucket, small forklift and small loader. Movable solid material belt conveyors can be made available if necessary. Special containers and instruments needed for waste storage should be available.

5.3.2.10 Articles and materials needed for handling an emergency should be available in the storage warehouse, to allow for possible contingencies such as outage, liquid leak and ventilation system failure.

5.3.2.11 A detection sample preparation room should be set in the storage warehouse service area, and water supply/drainage and ventilation facilities in the preparation room should be considered during design.

5.3.3 Pre-processing system and transmission system

5.3.3.1 The waste pre-processing and feed system should include the material crushing device, the sludge dehydration device, liquid filter device, material mixing device, waste transmission device and other auxiliary devices.

5.3.3.2 Large-volume containers and packages receiving POPs wastes are manually crushed or crushed by machine, as the case may be.

5.3.3.3 The crushing site should be fenced with steel plates, with a dust hood set on it.

5.3.3.4 Wastes from emulsion POPs should be transmitted by special pumps to pressurizing and heating devices through the metering device to lower viscosity and increase liquidity before entering the atomizing burner.

5.3.3.5 All pre-processing devices should be operated under the gas hood, and the gas exported should be evacuated or introduced into the burning system for incineration.

5.3.3.6 Sorting devices should be used to allow separate disposal of soils and large stones in solid wastes, and other wastes should be sorted and classified for the purposed of disposal.

5.3.3.7 Before incineration, POPs wastes should be mixed according to their ingredients (chlorine content) and thermal values, and the wastes should be mechanically mixed by the mixing device during the mixing process.

5.3.3.8 POPs wastes should be classified into liquid wastes, container wastes and bulk wastes and transmitted accordingly. Measures should be taken at liquid wastes transmission and unloading sites to prevent splashing and leakage. Buckets or containers for POPs wastes should be placed on pallets for transmission by the forklift. Unpackaged bulk solid wastes or slag should be transmitted into the burner using the closed conveyance belt or spiral conveyor.

5.3.3.9 Collection facilities used to prevent scattering should be set at the lower part of the channel through which POPs wastes are transmitted.

5.3.4 Feed system design

5.3.4.1 Solid, semi-solid and liquid wastes should be separately placed in the feeding unit.

5.3.4.2 For the feeding of solid and semi-solid wastes, the feeding funnel, metering device and spiral propeller should be set.

5.3.4.3 For the feeding of liquid wastes, the transmission pump1, the sprayer, the metering device, valves and pipes should be set.

5.3.5 Incineration system design

5.3.5.1 For the incineration technique, the rotary kiln incinerators should be used. The temperature of the

primary rotary kiln incinerator should be kept between 900-1,000 ℃. The temperature of the secondary reformer should be kept between 1,200-1,250 ℃, whose capacity should ensure that the temperature of the flue gas incinerated stays above 1,200 ℃ for at least 2 seconds.

5.3.5.2 Heat preservation measures should be taken for the walls of the rotary kiln and the shells of the incinerators to ensure their surface temperatures stay below 200 ℃. An infrared scanner connected to a computer or any other device capable of effectively determining the shell temperature should be used to effectively detect and record the temperature of the incinerator shell during operation.

5.3.5.3 When the inlet of the rotary kiln incinerator is closed, the intersection of the rotary kiln and the secondary reformer and repair door should meet the air tightness requirements of the system.

5.3.5.4 An automatic control system for the main parameters such as the incineration temperature, pressure and flue gas flow should be set for the incineration system to ensure the feeding system can be automatically cut off when any parameter exceeds the upper or lower limit.

5.3.5.5 The incinerator system and high-temperature flue gas duct should be made of high-aluminum fireproof materials resistant to acid gases, high temperature and corrosion.

5.3.5.6 For slag incineration and fly ash disposal, collection, transmission, packaging and temporary storage devices and facilities shall be set.

5.3.6 Flue gas purification system design

5.3.6.1 The chlorine-containing flue gas generated by the incineration of POPs wastes should be purified using a combination of techniques such as wet quenching, alkaline solution spraying, active carbon absorption and fabric filter dust removal, or other efficient dioxin removal techniques.

5.3.6.2 For flue gas quenching, the Venturi expander should be used, to dramatically lower the temperature of the flue gas below 200 ℃ within one second. Heat resistance measures should be taken for structural parts at the inlet before the flue gas contacts the sprayed water, to prevent high-temperature flue gas from damaging the connection between the equipment and pipes.

5.3.6.3 Acid and temperature resistance measures must be taken for the quenching device and relevant flue gas pipes.

5.3.6.4 Special alkaline spraying devices should be used for the flue gas from quenching to remove acid from the flue gas using alkaline solutions such as NaOH. The solution sprayer should be easy to remove for cleaning. The spraying device and pipes must be made of corrosion-resistant materials, and the solution should be provided by the special mixing system.

5.3.6.5 A special device can be used to absorb chloride ions from the flue gas and purify them for the production of chloride products through the HCL recycling process.

5.3.6.6 Active carbon powder injected for full contact with the flue gas or any other dioxin removal technique should be adopted to ensure the dioxin content of the flue gas discharged is below the emission limit.

5.3.6.7 Before injecting active carbon powder, lime powder can be injected to absorb residual acid substances and excessive water.

5.3.6.8 For flue gas purification, the fabric filter should be used to remove dust, with a necessary filter area designed to be not less than 1.1 times the maximum flue gas volume. In principle, electric dust removal devices may not be used for removal of dust from the flue gas. The temperature of the flue gas before it enters the fabric filter should be such that dew condensation does not occur, and reheated directly or indirectly after quenching or acid removal.

5.3.7 Automatic control and online monitoring system design

5.3.7.1 When the incineration system starts, the automatic control device should be able to take full control of the storage, pre-processing, incineration, flue gas purification and industrial sewage treatment devices, and continuously monitor and record the important operation condition parameters and operation status of feeding, incarnation and flue gas processing equipment.

5.3.7.2 Upon an emergency, the emergent parking system should be started in the master control room or local control locations.

5.3.7.3 The on-site industrial TV surveillance system should monitor the storage warehouse, the material transmission process and important locations along the incineration line.

5.3.7.4 The automatic monitoring system for the operation line of the POPs waste incineration system should be capable of online monitoring of pollution factors such as flue dust, sulfur oxides, nitrous oxides and HCL and oxygen, CO and CO_2 indicators. The monitoring results should be displayed and recorded, and the operating conditions should be controlled. Besides, the requirements of the local environmental protection administration authorities for transmission of online monitoring data should be met.

5.3.7.5 When any main operating condition parameter exceeds the set value, the online monitoring system should automatically cut off the system to stop feeding.

VI. Operating and management requirements

6.1 General operating requirements

6.1.1 POPs wastes operation entities may not start operation until acquisition of the license in accordance with the Administrative Measures on Hazardous Waste Operation License; any entity may not engage in the centralized disposal of hazardous wastes without obtaining the hazardous waste operation license.

6.1.2 The said entities must employ trained technicians, executives and an adequate number of operators.

6.1.3 Sound systems should be available to ensure safe disposal of POPs wastes.

6.1.4 Turnover funds and auxiliary raw materials necessary for the normal operation of the incineration plant should be available.

6.1.5 Institutions and personnel responsible for determining and assessing the results of POPs waste disposal should be available.

6.2 Specific requirements for POPs waste management

6.2.1 Waste reception

6.2.1.1 Management requirements

(1) For reception of POPs wastes, the hazardous waste transfer manifest system should be seriously implemented.

(2) The incineration plant has the responsibility to assist the transport entity in handling breaking, leakage or other accidents with respect to POPs waste packages, if any.

(3) Upon delivery, POPs wastes should be carefully checked for their quantities, types and identifications, as well as consistency with the POPs waste transfer manifest.

(4) The incineration plant should timely register the wastes received.

6.2.1.2 Operation requirements

(1) To receive POPs wastes, an entry pre-check zone should be set in the incineration plant to facilitate pre-check and verification by receiving personnel of the arriving wastes based on the transfer manifest.

(2) Upon pre-check, the POPs received should be checked for compliance with the following requirements for packaging containers and auxiliary materials:

(i) Structural design: the package and packaging structure are selected based on the dimensions, shape, weight, volume and loading requirements of the POPs wastes. Packing materials should be steel plates, plastic products incapable of chemical reaction with POPs or other impenetrable materials.

(ii) Capacity: of rigid packaging materials should have high capacity. The container should be highly attachable to the contained. For example, POPs contaminated soils contained must be tightly compressed; for liquid wastes, some room should be reserved. For example, the gap between the bucket top and the liquid surface should be over 100mm; flexible packaging materials should be sufficiently flexible.

(iii) Air-tightness: leakage-proof plastic bags or double-layer packaging materials must be used to ensure the wastes are air-tight and firmly bound.

(iv) Strength: packaging materials with the appropriate strength should be chosen according to the weight and hardness of the wastes packaged and vibrations and frictions during transportation.

(v) Auxiliary materials and apparatus of the packaging container: pads, threads, sand, wooden plates and sawdust can be used to reduce vibration, wobbling, friction and tilting during waste transportation.

(3) The pre-checked vehicle-mounted POPs waste weighting balancer should meet the dimensions requirement for weighting with the entire vehicle, and the weighting accuracy of the balancer should be such that the accuracy of weighting with the entire vehicle can be ensured.

(4) The weighting balancer should be able to automatically display, process, store and print data.

(5) An unloading zone should be set in the storage or temporary storage warehouse, and the unloading zone should meet the following requirements:

(6) Steel plates with cofferdams should be laid on the floor at the unloading site to prevent POPs from scattering to cause contamination; the unloading zone should be equipped with cranes, forklifts and transfer vehicles as well as necessary conveyance belts; the unloading zone must be equipped with emergency apparatus and first-aid kits.

6.2.2 POPs waste characteristics analysis

6.2.2.1 POPs waste analysis and identification capabilities should be available, including analytical detection and sample preparation, and instruments and equipment needed for analysis and identification should be available.

6.2.2.2 The following characteristics of POPs wastes should be analyzed after their delivery:

(1) Physical properties, including shape, viscosity, thermal value and dimensions;

(2) Contents of POPs wastes;

(3) Halogen contents;

(4) S, N, and P contents;

(5) Heavy metal elements and their contents;

(6) Contents of other main organics.

6.2.2.3 The data of POPs waste characteristics should be sorted and entered into the waste management system for storage.

6.2.3 Waste pre-processing

6.2.3.1 After being mixed, solid wastes should be incinerated. Wastes are mechanically mixed by the mixing device based on the mixing scheme.

6.2.3.2 Before being processed, POPs wastes should be pre-processed. These include package removal, separation, solid mixing, crushing of one-off packaging materials and liquid filtering.

6.2.3.3 Mutual compatibility should be considered for the collocation of hazardous wastes to avoid negative effects after mixing the incompatible hazardous wastes.

6.2.3.4 Necessary waste mixing schemes can be made for a certain two or more single wastes based on their main ingredients and technical conditions of the incineration device, to achieve the best, most economical and efficient results.

6.2.3.5 Upon pre-processing operations, the air-purifying full-facial mask respirator should be worn. It is strictly prohibited to touch any POPs waste without protection.

6.2.3.6 Certain pre-processing measures should be taken for the wastes based on the characteristics of the

wastes before their disposal. These wastes must be crushed on special sites after the ventilation equipment is started.

6.2.3.7 In the case of semi-solid and liquid wastes, solid and liquid should be separated, and viscosity reduction should be carried out in the steel plate seepage-proof slot, and any waste spilled out of the slot should be timely cleaned up.

6.2.4 Incineration facility operation

6.2.4.1 When the system starts, the quenching and flue gas treatment device should be started before the incineration device is started.

6.2.4.2 During incineration, the temperature should rise slowly, while the rotary kiln and secondary reformer are heated simultaneously, with the temperature of the flue gas at the outlet of the secondary reformer as the benchmark. When the temperature of the incinerator begins to rise, the cellar should be made to rotate continuously at a rate higher than 0.1r/min.

6.2.4.3 The minimum feeding temperature should be set, which should be no lower than 850℃.

6.2.4.4 The temperature of the primary reformer should be kept between 850~1,000 ℃, and the temperature of the secondary reformer should be kept above 1,200 ℃.

6.2.4.5 The induced draft fan creates a negative pressure to guarantee normal operation of the system so as to ensure a micro-negative pressure of -5 to -20Pa around the inlet of the incinerator.

6.2.4.6 The temperature of the flue gas at the outlet of the secondary reformer should be live displayed linked with the environmental administration authority as required and recorded throughout the process.

6.2.4.7 Before the rotary kiln operates, the temperature of the cellar walls should be checked, to make sure it is below the limit. If any local temperature of the cellar wall is excessive, the system must be shut down for overhaul.

6.2.4.8 By adjusting the feeding rate and the rotation speed of the rotary kiln, keep solid wastes in the incinerator for not less than 30min, and make sure the rates of removal and combustion of POPs in the slag comply with relevant specifications.

6.2.4.9 When solid and semi-solid POPs wastes are incinerated at full load, the average contents of POPs substances may not exceed 20%. When spraying POPs containing liquid from the liquid feeding inlet, the feeding volume should be controlled based on the POPs concentration, and the POPs feeding rate may not exceed the designed load of the equipment. When solid, semi-solid and liquid POPs wastes are incinerated together, the feeding rate of POPs wastes should be controlled as required above.

6.2.4.10 The quantity and feeding rate of the POPs wastes put into the incineration system should be continuously or regularly recorded (with an interval of not more than 30min).

6.2.4.11 It is strictly prohibited to put POPs wastes into the incineration system without opening the bypass flue gas duct and treating the flue gas. The emergent emission duct is opened only upon emergency, and feeding must be stopped before its opening.

6.2.4.12 In the case of removing slag by water sealing or washing, the water content of slag should be lower than the limit specified for the slag treatment process. In the case of dry ash removal, water should be sprayed to absorb heat and prevent the ash from generating dust.

6.2.4.13 Devices of the slag and flying ashes treatment systems should be kept sealed. The fly ash treatment system should be pneumatic or mechanical, and the fly ash storage tank should be regularly checked. Packaging and cleanup should be timely.

6.2.4.14 The fly ash and slag generated from incineration should be controlled and disposed of as hazardous wastes.

6.2.5 Flue gas purification

6.2.5.1 The flue gas from incineration must be treated before being discharged. All the indicators of the flue gas emitted should comply with the Hazardous Waste Incineration Pollution Control Standard (GB-18484).

6.2.5.2 Before starting, check all the nozzles of the flue gas quenching device, to prevent ineffective spray of

the Venturi device from damaging the flue gas purification equipment.

6.2.5.3 Preparation of the alkaline solution must be finished before feeding to the incinerator to make sure the solution concentration meets the specification and is transmitted to the spraying nozzle of the alkaline absorber.

6.2.5.4 The quantity of the active carbon or lime powder injected by the absorptive purification system should be controlled, to ensure the effectiveness of absorptive removal, while minimizing the load on the fabric filter.

6.2.5.5 The temperature of the quenched flue gas should be kept above 130 ℃, to prevent subsequent dew condensation in pipes and dust removal equipment, and the configuration of the flue gas reheating system should be considered based on facility requirements.

6.2.5.6 During operation, focus should be laid on the observation of variation of pressure at all parts of the flue gas quenching and purification system, such as abnormal pressure before and behind the Venturi device caused by nozzle congestion or abnormal water supply, abnormal pressure before and behind the fabric filter caused by a broken fabric filter or failure to remove dust. Any problem identified must be timely settled.

6.2.6 Automatic control and online monitoring

6.2.6.1 When the incineration system starts, the automatic control device should be able to take full control of the storage, pre-processing, incineration, flue gas purification and industrial sewage treatment devices, and continuously monitor and record the important operation condition parameters and operation status of feeding, incarnation and flue gas processing equipment.

6.2.6.3 The on-site industrial TV surveillance system should monitor the storage warehouse, the material transmission process and important locations along the incineration line, and when necessary, the monitoring records should be kept.

6.2.6.4 The automatic monitoring system for operation of the incineration system should enter the online monitoring status, to display, record and control the working conditions.

6.2.6.5 Make sure the linked automatic feeding system cuts off the system to stop feeding when any of the main working condition parameters exceeds the limit. s

6.2.7 Plant environment protection

6.2.7.1 Sewage from the incineration plant should be reused after treatment. The quality of the reused water should comply with the Domestic Water Quality Standard (CJ25.1). When sewage needs to be directly discharged into waters, its quality should meet the maximum allowable emission concentration value specified by the Sewage Comprehensive Emission Standard (GB8978).

6.2.7.2 The noise in the incineration plant should meet the specifications in the Urban Area Ambient Noise Standard (GB3096) and the Industrial Enterprise Plant Noise Standard (GB12348), and the control of noise sources in structures should comply with the Industrial Enterprise Noise Control Design Specification (GBJ87).

6.2.7.3 The control and treatment of stinky pollutants in the incineration plant should meet the relevant specifications of the Stinky Pollutants Emissions Standard (GB14554).

6.2.8 Professional health and labor safety

6.2.8.1 The professional health in the incineration plant should comply with the Industrial Enterprise Design Health Standard (TJ36), the General Provisions on Safety and Health During Production (GB12801) and the Interim Provisions on Professional Safety Supervision in Productive Construction Projects.

6.2.8.2 The incineration workshop, the transformer room, the storage warehouse and the fuel warehouse should be designed as per fireproof level 1 to meet the Architectural Design Fireproof Specification (50016-2006). The setting of firefighting equipment should comply with the Architectural Fire Extinguisher Setup Specification (GBJ140), and the firefighting equipment should be regularly checked and timely replaced.

6.2.8.3 The pressurized container in the incineration plant should be designed and checked according to the

Pressure Container Design Specification, and heat preservation insulation coatings should be applied to high-temperature equipment such as the incinerator and residual heat furnace and pipes.

6.2.8.4 The metal enclosure of all normal dead electrical equipment should be earthed or connected to neutral, and equipotential bonding should be carried out for steel structures, exhaust pipes and iron guardrails in the plant.

6.2.8.5 Emergency lights should be set along main passages.

6.2.8.6 Protective shields should be set for the naked transmission parts or moving parts of all mechanical equipment, and where protective shields can't be set, protective guardrails should be set, and certain space for operation and activity should be reserved around to avoid injuries by machinery.

6.2.8.7 In all production structures, operating platforms, slide walks, guardrails and handrails facilitating walk should be set, and the height and strength of the guardrails should comply with the specifications of the State on labor safety and health.

6.2.8.8 Relevant protective facilities should be available upon equipment installation and repair.

6.2.8.9 Warehouses storing combustible materials that are to be treated should be separately set, and materials of different physical and chemical properties should be stored in different locations.

6.2.8.10 Flameproof equipment should be used for the electrical appliances and lightings in the rooms storing combustive and explosive materials in the storage warehouse, and should comply with the Design Specification for Electrical Devices in Explosion and Fire Risk Environments (GB50058-92).

6.2.8.11 Waste storage and incineration equipment should be sealed to prevent dust and odor from scattering.

6.2.8.12 Ventilation equipment should be mounted in all structures generating dust, poisonous and hazardous substances, and ventilation and deodorization facilities should be in good condition.

6.2.8.13 Conspicuous safety signs should be set in all locations involving the risk of accidents in a way compliant with the Safety Colors (GB2893) and Safety Signs (GB2894).

6.2.8.14 The incineration plant should take relevant lightning and flameproof measures, whose design should comply with the Building Lightning Prevention Design Specification (GB50057) and the General Provisions on Production Equipment Safety and Health Design (GB5083).

6.2.8.15 During the construction of the incineration plant, measures favorable for the prevention of professional diseases and protection of labor health should be taken.

6.2.8.16 Professional disease prevention equipment and protective articles should be kept in good condition and may not be disassembled or put out of use without authorization.

6.2.8.17 Necessary sanitation facilities such as dressing rooms, bathrooms and toilets should be set in the plant.

6.2.9 Detection, assessment and evaluation system

6.2.9.1 The effectiveness of POPs wastes disposal should be regularly checked and assessed, and when necessary, improvement measures can be taken.

6.2.9.2 The operation and safety conditions of facilities and equipment in the incineration plant should be regularly checked and assessed to eliminate any safety threat.

6.2.9.3 The POPs waste disposal procedure and operation by personnel should be regularly assessed as to their safety, and when necessary, effective improvement measures can be taken.

6.2.9.4 New and technically modified incineration facilities must be subject to a performance test, and the test report should be submitted to the competent environmental administrative authority for approval before such facilities can be commissioned. The procedure and method of the performance test should be subject to the Technical Specification on Hazardous Wastes (Including Medical Wastes) Incineration Facilities Performance Test (HJ561-2009).

6.2.9.5 A contingency plan should be made for the incineration plant. For the preparation of the contingency plan, refer to the Guide to Preparation of Contingency Plan by Hazardous Waste Operator (No.48 bulletin of the National Bureau of Environmental Protection, 2007), and the contingency plan should include the following for the least:

(1) A contingency plan for accidents during POPs waste storage.

(2) A contingency plan for accidents during POPs waste transportation.

(3) A contingency plan for failures and accidents of the incineration facilities and equipment. S

6.2.10 Takeover and operation registration system

6.2.10.1 In order to ensure safe and orderly production in the incineration plant, a strict takeover system must be established, which includes:

(1) Takeover of production facilities, equipment, tools and auxiliary production materials;

(2) Takeover of POPs wastes;

(3) Takeover of operation logs;

(4) The takeover personnel should complete the takeover on site;

(5) Before takeover of the operation log, the takeover personnel should inspect the site together;

(6) If the takeover procedure fails to be completed, timely report to the production and management directors;

(7) The takeover personnel should verify the articles and operation log and sign to confirm.

6.2.10.2 The incineration plant should in detail record the types, quantity of POPs wastes collected, stored, used or disposed of every day as well as the final destinations of the POPs wastes, occurrence of any accident or any other abnormality, and keep the transfer manifest that needs to be archived under the relevant provisions on hazardous waste transfer manifests. The log and report of POPs wastes operation should be kept along with the transfer manifest.

6.2.10.3 The operation conditions, maintenance of production facilities in the incineration plant and POPs waste incineration should be recorded, and these records should include:

(1) POPs waste transfer manifest record;

(2) POPs waste reception and registration record;

(3) Number plate, source, weight, time of entry and time of departure of the transport vehicle of POPs wastes;

(4) Control parameters of the operation of the production facilities;

(5) Disposal of ash and slag generated from the incineration of POPs wastes;

(6) Repair of production facilities;

(7) Environmental monitoring data;

(8) Production accidents and handling.

6.2.11 Personnel training

6.2.11.1 The incineration plant should provide theoretical and practical training to operators, technicians and administration personnel in relevant laws & regulations, professional skills, safety protection and emergency handling.

6.2.11.2 The training should cover the following aspects:

(1) General requirements

(i) Familiarity with the laws and regulations governing POPs waste management;

(ii) Command of knowledge in terms of the hazards of POPs wastes;

(iii) Clarification of the importance of sanitary handling of POPs wastes and environmental protection;

(iv) Familiarity with the classifications and packaging identifications of POPs wastes;

(v) Familiarity with the process of operation in the POPs waste incineration plant;

(vi) Command of knowledge in the use of labor safety protection facilities and equipment and personal health measures;

(vii) Familiarity with the emergency operation procedure in the event of leakage or any other accident.

(2) Training for POPs waste incineration disposal operators and technicians also includes:

(i) Specific operations in the reception, transport, storage and feeding of POPs wastes and safe slag disposal;

(ii) Normal operation of the disposal equipment, including the start and shutdown of the equipment.

(iii) Operation and inspection of the control, alarm and indication systems, and corrective operations when necessary;

(iv) Optimal operation temperature, pressure and air combustion volume, and conditions for maintaining normal operation of the equipment;

(v) The emissions from POPs waste incineration should meet the technical requirements;

(vi) Inspection and elimination of equipment failures;

(vii) Manual operation and accident handling upon accident or emergency;

(viii) Daily and regular maintenance of equipment;

(ix) Equipment operation and maintenance logs, and logs and reports of leakage and other accidents;

(x) Technicians should master the relevant knowledge in POPs waste incineration and the basic operation principles of the disposal equipment.