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# Harmless disposal technology of Hazardous waste from thermal power plants

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**Abstract.** The current environmental situation of hazardous wastes was described, and the current major hazardous waste disposal technologies were introduced. According to the national hazardous waste list and industrial production process, several typical hazardous wastes existed in thermal power plants are identified, and the common disposal methods of these hazardous wastes by the hazardous waste disposal units are introduced, which helps the relevant personnel of thermal power plants to identify hazardous wastes. Understand the harmless disposal technology of hazardous waste.

## 1. Introduction

Under the current situation, the state's environmental protection requirements for hazardous waste are becoming more and more strict, and the hazardous waste policy is continuously introduced [1, 2]. The new Environmental Protection Tax Law will be implemented in 2018 to stipulate the amount of hazardous waste tax. The new Solid Waste Pollution Prevention and Control Law (Revised Draft) (hereinafter referred to as the "Solid Waste Law") strengthens the environment for hazardous waste pollution. The legal responsibility and the introduction of hazardous waste into the content of the discharge permit management, the new "Solid Waste Law" further emphasizes that the hazardous waste generator is the primary responsible person for the management of hazardous waste, who is responsible for pollution, who is responsible for the production of waste, commission contract. The legal responsibility of the producer cannot be transferred.

It can be seen from the above policies that the current environmental protection policy has stricter requirements for hazardous waste management. The highest judicial authority has determined that illegal discharge, dumping, and disposal of hazardous wastes of more than three tons are serious environmental pollution, that is, illegal dumping and disposal of hazardous waste. The threshold is only three tons, and the harmless treatment of hazardous waste is imperative.

The state has also formulated a series of standards and methods to regulate hazardous waste management. In August 2016, the new National Hazardous Waste List began to be implemented to further clarify the identification methods of hazardous wastes and to refine the inclusion criteria and principles of hazardous wastes. In 2017, the Ministry of Environmental Protection released the national hazardous waste standardization management supervision and evaluation work plan during the 13th Five-Year Plan period, and the Ministry of Environmental Protection issued the "Technical Policy for Collaborative Disposal of Solid Waste Pollution Prevention and Control in Cement Kilns" to support the coordinated disposal of hazardous wastes in cement kilns [3, 4].



## 2. Harmless disposal of hazardous waste

The harmless disposal of hazardous wastes eliminates the pollution properties of hazardous wastes by means of incineration, landfill and materialization, and reduces or completely changes the shape of hazardous wastes or completely isolates them from the environment to avoid harm to the environment. The thermal power plant shall hand over all the hazardous wastes generated by the qualified hazardous waste disposal enterprises for harmless treatment. The hazardous waste disposal technology can be divided into pretreatment technology and final disposal technology, among which: pretreatment technology includes physical method, chemical method and curing/stabilization; final disposal technology includes incineration and safe landfill. At the current stage, China mainly uses incineration and safe landfill to carry out the final disposal of hazardous waste. Hazardous waste needs to be temporarily stored in the hazardous waste warehouse before being disposed of, and then classified and metered, and further processed according to the properties of the hazardous waste. It should be noted that the residue generated after incinerating the hazardous waste needs to be disposed of in landfill for disposal of hazardous waste. The process also needs to meet environmental requirements.

Curing is an important means of handling heavy metal waste and other non-metallic hazardous waste. By coagulating cement, lime, asphalt and other coagulants with hazardous wastes, the harmful substances contained in the hazardous wastes are sealed in solidified bodies such as cement, lime and asphalt without being leached, thereby stabilizing and harmless. , the purpose of reduction. At present, there is also a curing method for the stabilization of the medicament, and the stabilization of the medicament is a treatment technology developed in recent years for the disposal of heavy metal waste, including pH control technology, oxidation/reduction potential control technology and precipitation technology, and its mechanism of action is Under the action of certain chemicals, the chemical state of heavy metals in the waste is changed to make it stable without leaching.

The physicochemical treatment utilizes the physicochemical properties of hazardous wastes to separate or concentrate their harmful components for centralized treatment or comprehensive utilization. For solid waste, such as waste residue, common physical treatment processes include: compaction, crushing, and sorting. For liquid waste, such as waste liquid, common physical and chemical treatment processes include: sedimentation, air flotation, sorting, centrifugation, filtration, distillation, acid-base neutralization, redox, precipitation, and the like.

The incineration method is to subject the waste to proper pretreatment (classification and mixing, compatibility according to nature and calorific value, etc.), and then the waste and auxiliary fuel are added to the rotary kiln for incineration. The waste is gradually oxidized or pulverized by the rotary kiln, and the ash is in the kiln body. The bottom end is discharged and collected, and the exhaust gas needs to be deacidified and dedusted, and the ash needs to be landfilled. Rotary kiln incineration technology can be used to treat industrial waste and domestic waste in solid, liquid and gaseous states. It is currently the most widely used technology for handling solid waste/hazardous waste. The basic process of incineration is: pretreatment and compatibility - incineration - flue gas waste heat recovery - flue gas purification, emissions - combustion residues and fly ash landfill. Compatibility is a necessary technical process before entering the incinerator. After pretreatment, the hazardous waste needs to be first compatible. A variety of different hazardous wastes are suitable for entering the incinerator according to their respective water content, calorific value and compatibility. Material.

Landfill is a method of final disposal of hazardous waste. It is necessary to transport hazardous waste from a special transport vehicle to a hazardous waste disposal site for landfill. Whether hazardous waste can be landfilled requires prior identification of the concentration and pH of harmful components. Not all hazardous wastes are suitable for landfill, such as medical waste; wastes that are incompatible with the lining; they are reactive, Flammable wastes; liquid wastes with high water content are not allowed to be landfilled, and hazardous wastes that are allowed to be landfilled need to be pretreated before being landfilled, such as splitting, reduction, volume reduction, and stabilization. The Hazardous Waste Landfill Pollution Control Standard (GB18598) stipulates the entry conditions for landfill of hazardous wastes, the selection conditions of landfills, the design and construction of landfills, and the environmental protection requirements for operation, closure and monitoring. Refer to the implementation.

### 3. Classification of hazardous waste in thermal power plants

Hazardous waste refers to wastes listed in the national hazardous waste list or identified according to the national hazardous waste identification standards and identification methods. This definition summarizes the three attributes of hazardous waste: one is the inventory attribute, that is, the waste listed in the National Hazardous Waste List, which can be directly identified as hazardous waste; the second is the hazard attribute, that is, the hazardous waste often has specific hazard characteristics. It mainly includes one or several dangerous characteristics such as toxicity, corrosiveness, chemical reactivity, flammability and infectivity; the third is the state attribute, that is, the dangerous form is not defined, as long as the solid waste and liquid waste have dangerous characteristics or not Exclusion of hazardous properties can be included in hazardous waste.

According to the national hazardous waste list and the power plant production process, the main hazardous wastes generated by thermal power plants are: spent catalyst, waste mineral oil, waste resin, waste lead-acid battery, waste asbestos, waste chemical, terminal concentrated brine, wastewater crystalline salt. . The spent catalyst is a waste vanadium-titanium catalyst for denitration. After the life cycle of the catalyst for denitration, the denitration efficiency is greatly reduced, and the catalyst needs to be replaced, and the removed catalyst is a spent catalyst. Waste mineral oil: The lubricating oil of the rotating equipment has been operated for a long time, and the quality of the oil is deteriorated. It is necessary to filter or replace the oil. The replaced oil is waste mineral oil. Waste resin: The ion exchange resin is used to purify demineralized water and can be recycled for a long time. When the resin fails, it can't purify the qualified water for the unit to use. Its life reaches the limit and needs to be replaced. The failed resin is waste ion exchange resin. Waste lead-acid battery: Waste lead-acid battery replaced by UPS equipment, emergency equipment or other electrical equipment in thermal power plants. Waste asbestos: Most of the cabinets, tanks, towers, flue pipes and pipes on the outer surface of the thermal power plant need to be covered with a layer of asbestos for heat preservation. It has fire resistance, electrical insulation and heat insulation, and is an important fire prevention. Insulation and insulation materials. The replaced asbestos fiber is waste asbestos. Waste chemical products: Chemicals listed in the Hazardous Chemicals Catalogue are hazardous wastes after disposal, such as reagents and drugs that fail in chemical laboratories. End concentrated brine: After the water of the power plant is optimized by water saving and the wastewater is concentrated, there is still a part of the concentrated water at the end. This part of the wastewater is affected by the water quality and cannot be reused or discharged. The remaining concentrated water at the end contains a high concentration. Salt ions, or coal field spraying, ash slag mixing, or external transportation. Crystalline salt of wastewater: At present, the crystalline salt of desulfurization wastewater has not been inquired from the list of hazardous wastes, but it does not exclude the dangerous characteristics, which may adversely affect the human body or the environment. It needs to be managed and disposed according to the standards of hazardous wastes.

### 4. Typical hazardous waste disposal methods in thermal power plants

The spent catalyst can enter the waste catalyst recovery project, and the better quality waste catalyst can be revived by activation and other processes and reused. The waste catalyst with poor quality can be recovered by acid washing, alkali washing, roasting and the like. The generated waste can enter the landfill project and be landfilled by a process such as stabilization and immobilization.

The better quality oil can be disposed of in the waste lubricating oil recovery project and recovered through pretreatment, atmospheric distillation, rectification, vacuum distillation, refining and other processes. The poor quality oil can enter the solid furnace of the incineration project and be treated by incineration to achieve harmless and reduced disposal.

The waste resin enters the solid furnace of the incineration project and is treated by incineration to achieve harmless and reduced disposal. The ash and fly ash generated after incineration can enter the landfill project and be landfilled by a process such as stabilization and immobilization.

The waste lead-acid battery enters the waste lead-acid battery recycling project for disposal, and the lead paste, lead grid, and plastic are recovered through crushing, separation, pressure filtration, etc., and

the waste electrolyte is purified and concentrated by a membrane treatment process, and returned again. To the battery industry, resource utilization.

Asbestos waste disposal methods include direct landfill, melting, solidification and landfill. Different treatment standards and different disposal methods are used for asbestos waste from different sources. The waste asbestos produced by the power plant belongs to non-flying asbestos waste. In the process of collection, measures should be taken to prevent and disperse. In the intermediate treatment process, the crushing is prohibited. Because the melting point of asbestos is very high, it is not easy to burn. The final disposal method is generally selected for landfill disposal.

Waste chemical products enter the incinerator and are treated by incineration to achieve harmless and reduced disposal.

The low concentration of concentrated brine can enter the physical and chemical project and be reduced and harmlessly treated by evaporation and other processes. The high concentration of concentrated brine can enter the incineration project and be treated by incineration to achieve harmless and reduced disposal. The ash and fly ash generated after incineration can enter the landfill project and be landfilled by a process such as stabilization and immobilization.

The crystalline salt is mainly treated by landfill or is doped in a small amount into a incinerator for incineration.

## 5. Conclusion

At present, the country's environmental protection requirements for hazardous waste are getting higher and higher, and the threshold for illegal disposal of hazardous waste is low, and it is easy to cause environmental risks or even violate the law due to improper disposal of hazardous waste. Hazardous waste disposal requires large capital investment and high technical guarantee. Most thermal power plants do not have such conditions and can only be disposed of by special disposal units. When contacting the disposal unit, the power plant must verify the qualification, treatment scope and expiration date of the disposal unit, strictly implement the transfer order system during the disposal process, and track the final disposal method and disposal situation, so as to effectively prevent environmental risks. Therefore, it is very necessary for the relevant personnel of thermal power plants to understand the harmless disposal technology of hazardous wastes. The next step is to consider how to manage the whole process of hazardous wastes, and to carry out all-round identification, production, transfer and disposal of hazardous wastes. Thinking, comprehensively strengthen the management of hazardous waste in thermal power plants.

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