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Analysis on environmental management facilities and measures of hazardous waste disposal enterprises

Jin-bo Wang
Shaanxi Sanqin Environmental Protection Technology Co., Ltd, Xi'an, China

Abstract. This paper mainly studies the environmental protection facilities in enterprises with centralized disposal of hazardous waste from the project construction, daily maintenance and operation, archive management, full-chain management of hazardous waste, safety and environmental protection emergency and other aspects based on the long-term experience in operation management, and analyzes the specific practices of compliance management in accordance with relevant laws, regulations and technical specifications, so as to ensure stable operation of enterprises and reduce business risks.

Keywords. Environmental management, wastewater, waste gas, hazardous waste.

In recent years, the requirements for enterprise management and the cost of illegal behaviors have been improved with the revision and promulgation of relevant laws and regulations, such as Solid Waste Disposal Act, by the Ministry of Ecology and Environment. It is vitally important for enterprises, as the hazardous waste operating unit and waste-producing unit, to sort out, establish and implement a complete environmental management system during production and operation to ensure that their production and operation activities meet the standard specification.

1. Basic concept of hazardous waste

According to relevant laws in China, hazardous waste refers to the solid waste with hazardous characteristics, which is listed in the Directory of National Hazardous waste or identified according to the hazardous waste identification standards and methods specified by the state. Hazardous waste is a kind of special solid waste produced in production and life. Different from general solid waste, it can be the solid waste, liquid waste and gaseous waste placed in containers, with one or more characteristics of corrosivity, toxicity, ignitability, reactivity or infectivity.

(1) Pollution of the atmosphere

In the operation, storage, transportation, treatment and disposal of the whole-process management, hazardous waste will spontaneously evaporate and be sublimated under a certain condition, and that containing organic components will be decomposed by microorganisms to release toxic and harmful gases. If the waste is not treated by technical means and equipment in an up-to-standard way and is just discharged in the environment in an inorganized way, it is bound to directly pollute the ambient air. Moreover, if hazardous waste is directly exposed to the ambient air, its fine particulate matter, affected by ambient atmospheric conditions, will be spread by the wind into the ambient air and cause pollution directly.

(2) Pollution of the soil

The whole-process management of collection, transportation, storage, treatment and disposal of hazardous waste shall be based on the specifications. However, there is still non-standard operation due to the influence of subjective and objective factors, which will make the liquid, semi-solid and solid hazardous waste containing heavy metals, dioxins and other harmful components into the soil in such forms as fluid, dust and particles, and the toxic and harmful components are then spread through the food chain.

(3) Pollution of the water body

For lack of management and attention, hazardous waste will be directly discharged or flow with rain and molten snow into rivers, lakes and seas and thus pollute the surface water; harmful components in the hazardous waste will then infiltrate the soil with leachate and thus pollute the groundwater. In most cases, the levels of the two types of pollution will be irreversible.

(4) Effect on people's health

In the long-term exposure to hazardous waste, if there are no effective labor protection measures, it will directly enter the body by the mouth, nose, skin and eyes and have deleterious effects, such as poisoning, cancer, abnormality and mutation.

(5) Constraints on sustainable development

Problems of environmental pollution, such as ambient air, water body and soil, which are caused by the failure to treat hazardous waste or to treat and dispose of it in accordance with the specifications, will become the constraints on economic development.

2. Management of project construction

During the project construction, it is necessary to make detailed consultation and survey, find mature, stable and less environmentally polluting technologies, and ensure the up-to-standard disposal of waste gas and wastewater, and find professional design units to design to ensure the plane layout is standard and meets the national and industrial regulations. Project approval, supervision and acceptance shall be subjected to the national laws and regulations.

The construction of disposal workshops and warehouses shall comply with relevant regulations, disposal workshops and warehouses should be equipped with leakproof cofferdams or collecting ditches and accident emergency lagoons with the volume meeting the requirements, to ensure that no impact will be caused on the external environment in the event of leakage; anti-corrosion and anti-seepage measures should be taken on the ground, ditch walls and lagoon walls.

In addition to completing the construction of the main building and equipment according to the specification, sewage stations and incineration workshops should also be provided with online monitoring rooms and discharge outlets in line with the specifications, and online monitoring equipment should be installed according to the local environmental protection monitoring requirements and accepted by relevant units organized by the enterprises after installation. Waste gas sampling platforms and ports in the plant should meet the *Technical specifications for emission monitoring of stationary source*, and the discharge outlet identification plate should meet the *Graphical signs for environmental protection*.

3. Management of environmental protection archives and data

Environmental protection archive data are an important part of enterprise archive management, and must be managed by a specially-assigned person. Efforts should be made to complete the dynamic and static archive management of enterprises.

Static archives: business license of enterprises, hazardous waste business certificate, sewage discharge permit, HSE and other evaluation reports and replies from the examination and approval departments, management system, safety and environmental event emergency plan and record opinions, various drawings (architectural drawings, process design drawings, equipment drawings, fire drawings, pollution prevention and control design drawings, floor plan of the plant and so on), supervision data, completion drawings, and various acceptance and contract data.

Dynamic archives: hazardous waste management plan, reporting and registration, hazardous waste transfer forms, pollutant discharge execution report, self-monitoring plan and test report, disclosure management, emergency drill record, training record, analysis and test record, equipment overhauling and maintenance record, instrument calibration record, internal inspection record, incident report record, documents issued by the government departments and so on.

In addition to the above management requirements, the operation and maintenance of information platforms is also one of the important tasks of archive management. To ensure the timely and accurate uploading of platform data, the management department, firstly, should establish an account list (including the website address, user name, password, information input frequency and so on) for each platform; secondly, it should specially assign a person to enter and check data; thirdly, it should master the functions and methods for using each platform through training to ensure that the business will not be affected by the error or omission of the filled information.

4. Management of wastewater treatment facilities

Wastewater treatment facilities must be designed, executed, installed and debugged by professional units according to the quantity and quality of wastewater, so that they can meet the requirements for the up-to-standard treatment of wastewater pollutants. Suitable disposal processes are chosen according to the characteristics of wastewater and the cost of disposal to treat them separately. According to years of operating experience, domestic wastewater and general production wastewater are biochemically treated in the stage of pretreatment by iron-carbon micro-electrolysis to achieve up-to-standard discharge. landfill leachate and physical and chemical process production wastewater are mainly treated by triple effect evaporation and DTRO membrane, and the produced water after treatment will be reused for production with the excess water discharged. All sewage treatment devices are automatically controlled by DCS, so that the drugs are added and the water inlet and outlet rates are controlled automatically.

Wastewater treatment workshops should be planned rationally and equipped with independent temporary drug storage areas and dosing areas; different kinds of drugs are stored separately and those with incompatible properties are kept apart. Inflammable and explosive raw and auxiliary materials should be stored in independent storage warehouses and well managed, and MSDS technical information instructions should be posted at each drug storage site. The process pipelines for different media should run clearly, and should be marked with different colors. Sign plates should be set up for different wastewater treatment facilities.

Perfect wastewater facility operation instructions and process flow diagrams are prepared for public management. Wastewater should be tested according to discharge requirements before discharge and is allowed to be discharged only after it passes the test, synchronous samples should be taken and retested during exterior discharge of wastewater to ensure that the discharged wastewater is up to standard, and relevant records should be made; the maximum daily discharge should be determined according to the EIA report, disposal capacity of devices and allowable pollution loads, and the production of wastewater treatment workshops should be properly arranged. The compliance of water discharge from sewage stations with requirements should be determined according to the registration of the sewage discharge permit and the sewage discharge permit execution report on the registration of the sewage discharge permit on a regular basis.

After accepting online monitoring rooms and discharge outlets, the enterprise shall sign an operation and maintenance service contract with a qualified online monitoring operation and maintenance unit, and the latter shall carry out the operation and maintenance according online monitoring operation and maintenance requirements. While completing the up-to-standard discharge of wastewater, the unit shall ensure the normal operation of online monitoring facilities of wastewater and make relevant operation and maintenance records.

5. Management of waste gas treatment facilities

Waste gas treatment facilities must be designed, executed, installed and debugged by professional units according to the quantity and quality of waste gases, so that they can meet the requirements for the up-to-standard treatment of waste gases; waste gases produced in different links, such as inorganic waste gas, organic waste gas and foul gas, must be collected and treated separately. Measures, such as anti-corrosion, anti-wear and preventing fly ash blockage, should be taken for incineration flue gas purification devices. Priority should be given to control hazardous waste with high contents of fluorine, chlorine, sulphur, phosphorus and nitrogen before entering incinerators to inhibit the production of fluorides, chlorides, sulfides, phosphides and nitrogen oxides; then, waste gases in the incineration flue gas should be purified, of which acid waste gases should be neutralized with suitable alkaline chemical materials in the tower reactor, and nitrogen oxides should be removed by selective non-catalytic reduction; bag dust collectors are preferred; heavy metals and dioxins should be adsorbed by activated carbon or porous adsorbents before entering the bag dust collector; sewage stations, warehouses and disposal workshops should select suitable disposal processes according to their process characteristics, such as foul smell, HCL, particulate matters, non-methane hydrocarbon, benzene, methylbenzene, xylene and sulfuric acids, and basically select the combination of acid and alkali washing, low-temperature plasma, activated carbon adsorption, UV-photolysis and so on, so as to ensure the up-to-standard discharge of waste gases.

Different waste gas treatment facilities and pipelines should run clearly and be identified completely; facilities and production units must be operated synchronously, and the discharge of waste gases should be monitored regularly during operation; the pH of the dosing tank should be maintained according to the pH of the waste gas in contact; the department where facilities are located replaces the activated carbon and inspects UV-photolysis and low-temperature plasma equipment on a regular basis, which ensures the normal operation of waste gas disposal facilities. Indicators for ambient air quality around the plant should meet the requirements of GB 3095.

Incineration flue gas online monitoring facilities are used to monitor the oxygen content, carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen oxide and other important emission indicators on line in real time, and are networked with the competent administrative department of environmental protection in their location; flue gas emissions are monitored regularly according to the methods and frequencies prescribed in the national standards, and, when the monitoring indicators are unqualified, the operating conditions should be adjusted in time or the facilities are shut down and checked, so that the system is operated normally under the premise of up-to-standard discharge of flue gas and the indicators of flue gas pollutants meet the requirements of GBl8484.

6. Standardized management of hazardous waste

According to *Evaluation Indicators for Standardized Environmental Management of Hazardous Waste (Hazardous Waste Operating Unit)*, standardized management of hazardous waste shall be completed from the following aspects:

(1) Responsibility system for the prevention and control of hazardous waste environmental pollution

The producing unit shall establish and improve a responsibility system for environmental pollution prevention and control, and set up a leading group with clear leading responsibilities. Then, during the implementation, it shall take measures to prevent and control environmental pollution and post responsibility information on prominent positions such as the storage, treatment and disposal facilities to indicate the links where hazardous waste is produced, the hazardous characteristics and other contents.

(2) Hazardous waste identification system

According to the requirements of specifications, standard hazardous waste identification marks, warning signs and labels should be set up in facilities and places where hazardous waste is collected, stored, transported, utilized or disposed of. Relevant systems for temporary hazardous waste warehouse management should be developed, and site identifiers, brand names, safety notice boards and occupational health notice boards should be hung on prominent positions on the site; complete label information should be filled in as required.

(3) Hazardous waste management plan system

Hazardous waste producing and operating units shall carry out online dynamic reporting and registration and fill in the annual management plan in a timely and truthful manner, and revise and report major changes to the management plan in time.

(4) Hazardous waste reporting and registration system

The type, quantity, flow, storage, utilization and disposal of hazardous waste shall be reported comprehensively and accurately, with the reported data consistent with those in the account and management plan.

(5) Hazardous waste source separation system

Industrial waste is sorted out and stored separately according to its type and quantity, of which the general industrial solid waste, such as waste sand stripes and sand trays, is stored separately; the hazardous waste is stored separately according to its hazard, physiochemical properties and quantity, so that it is stored in different partitions and in special containers; incompatible hazardous waste should be separated according to its type and characteristics.

(6) Hazardous waste transfer recording and approval system

Before transferring hazardous waste within a province, the producing unit shall report to the hazardous waste transfer plan to the local environmental protection department for approval, and transfer the hazardous waste after receiving the approval; before transferring hazardous waste from a province to another, the producing unit shall obtain the approval of the environmental protection departments of both the transferring site and the receiving site and then transfer the

hazardous waste according to the transfer plan. The hazardous waste transfer forms shall be filled in truthfully according to the actually transferred hazardous waste.

(7) Hazardous waste business certificate system

Hazardous waste that needs to be outsourced shall be treated by qualified hazardous waste operating units (consistent with reported and registered data, data in the EIA and transfer forms and so on).

(8) Emergency plan recording system

The hazardous waste emergency plan shall be prepared according to *Guide for Hazardous Waste Operating Units in Preparing Emergency Plan*, and updated as required. Emergency drills shall be carried out on a regular basis in strict accordance with the emergency plan.

(9) Hazardous waste business training system

Business training shall be given to the management personnel and staff engaged in the collection, transportation, storage, utilization, disposal and other work of hazardous waste.

(10) Management system of hazardous waste storage facilities

Temporary storage facilities for hazardous waste shall meet the requirements of *Standard for pollution control on hazardous waste storage*. Temporary hazardous waste rooms shall be anti-corrosive and seepage-proof and used for emergency treatment, and closed collecting ditches shall be set up around the crust-covered ground.

7. Management of soil pollution prevention

Enterprises shall establish the soil pollution hazard investigation systems and plans according to the *Soil Pollution Prevention and Control Law of the People's Republic of China*, and shall organize the investigation on time and adopt the principle of closed-loop management in the rectification and tracking of hidden troubles; they shall carry out tests on soil pollution prevention and control, and submit the test results to the local environmental protection departments, while ensuring information disclosure; in places where equipment, facilities, and buildings (structures) are dismantled, soil pollution prevention and control scheme, including emergency measures, shall be formulated and submitted timely to the local environmental protection department for filing.

8. Self-test management

Enterprises shall develop their monitoring schemes according to the actual process conditions and the national laws and regulations, and the content shall involve the disorganized and organized gas discharge outlets of the plant, inlet and outlet of the sewage station, groundwater in the landfill area, soil, waste gas discharge outlet of the incineration system and other positions; the test content shall be determined according to the national laws and regulations, industrial laws and regulations, and requirements of local ecological environmental protection bureaus, and reviewed; after passing the review, it shall be filed at the environmental protection department; upon the completion of the test scheme, a qualified third party shall be entrusted to implement it as required.

9. Environmental emergency management

Before project operation, enterprises shall carry out risk evaluation on emergency environmental incidents, analyze whether there may be fire, explosion, leakage and other situations during the production and operation, and entrust a third party to prepare an emergency plan for emergency environmental incidents as required and file it at the local government; in case of major changes to disposal process and equipment, a new plan shall be prepared and filed in time. Enterprises shall organize emergency drills regularly according to the emergency plan, so that employees can master the disposal methods for various accidents in the emergency plan and their respective responsibilities, so as to ensure that the overall risk resistance of enterprises can be improved during production and operation.

Enterprises shall develop the emergency management organization structure and emergency system, build emergency teams for emergency environmental incidents, and carry out training on the emergency disposal process; they shall establish a double prevention mechanism, and manage risks at different levels, where they set up emergency material warehouses according to the risk assessment levels to provide emergency materials, and specially assign a person to manage the materials in and out from the warehouses, regularly check and maintain materials and timely supplement the materials consumed, so as to ensure the normal use of materials.

10. Conclusion

In conclusion, hazardous waste disposal enterprises shall complete environmental management well. From the beginning of the project construction, enterprises must select suitable disposal processes according to the national laws and regulations to ensure the up-to-standard discharge of wastewater, waste gas and other pollutants, and warehouses and disposal workshops must be seepage-controlled as required and equipped with cofferdams, emergency lagoons and other hardware facilities. During operation management, enterprises must strictly control the operation of wastewater disposal facilities and waste gas disposal facilities to ensure the up-to-standard discharge of these pollutants. They shall cooperate positively with intermediaries, such as online operation and maintenance units of sewage stations, online operation and maintenance units of incineration flue gas, and third-party monitoring units, to ensure that the work of intermediaries is true and reliable, thus playing a positive role in supervising and guiding the up-to-standard discharge of enterprises. It is

significant for hazardous waste disposal enterprises to complete environmental management well, which is related to people's wellbeing and the environment. In particular, with the deepening of the concept of "green development", it is necessary to complete environmental management well, and reduce the impact of hazardous waste disposal on the environment by effective environmental management.

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