Study on the Current Situation and Countermeasures of General Industrial Solid Waste Management in Beijing

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Abstract. Based on the present situation of general industrial waste management in Beijing as the research object, analyzed the 2008-2017, the trend of general industrial waste emissions in Beijing, several main waste disposal, the change of the quantity and the comprehensive utilization of the status quo, analysis of a series of problems, put forward three countermeasures of general industrial solid waste management.

1. Introduction
With the rapid development of economy and society, environmental problems caused by solid waste pollution begin to appear, affecting human health and destroying ecological security [1]. The interests of producers, consumers, recyclers, users and processors are involved in the whole process of solid waste generation, collection, storage, transportation, utilization and disposal. Reduction, recycling and innocuity are the basic principles of environmental management of industrial solid waste [2]. At present, China's industrial structure is heavy, and enterprises' enthusiasm for clean production is not high, and the intensity of solid waste generation is large. Waste reduction technologies can provide industry with long-term benefits such as waste reduction, promoting a positive public image, improving product quality, improving employee health and safety, cost savings, improved compliance, process and operational efficiency, and reduced debt [3].

As the largest developing country in the world, China has become the largest producer of industrial solid waste in the world, and its total output is also increasing, so it deserves attention [4, 5]. The output of industrial solid waste is generally related to the economic growth. From 2005 to 2015, the annual average growth rate of industrial added value is 20.1%, and the annual average growth rate of industrial solid waste output is 9.8%. Since the 13th five-year plan period, China's annual output has exceeded 3 billion tons. In 2015, China produced 3.27 billion tons of general industrial solid waste. With the continuous improvement of fine management level of solid waste, the problem of illegal transfer and dumping of general industrial solid waste has gradually changed from implicit to explicit and become increasingly prominent. The ministry of ecology and environment has a total of 111 problems under the supervision of the "waste clearance action 2018", among which 46 are illegal dumping and stockpiling of general industrial solid waste, accounting for 41%. Therefore, based on the actual situation of Beijing, this paper analyzes the current situation of general industrial solid waste management, sorts out the core problems of general industrial solid waste management, and puts forward the corresponding countermeasures, in order to provide reference examples for China's general industrial solid waste management policy formulation.
2. General industrial solid waste management status

2.1. Generation and disposal
From 2008 to 2017, the output of general industrial solid waste in Beijing increased slightly and then decreased gradually. In recent years, the decline trend tends to be flat, as shown in Figure 1.

As can be seen from Fig.1, the output of general industrial solid waste in Beijing reached a peak of nearly 12.69 million tons in 2010, and decreased to 6.3 million tons in 2017, down 50% compared with the peak. The main reason for the decline is coal to gas and steel enterprises capacity adjustment, and with the end of the major industrial structure adjustment, in the short and medium term will be slightly down or stable.

The pollution of industrial solid waste has the characteristics of concealment, lag and persistence, which brings great harm to the environment and human health. The proper disposal of industrial solid waste has become one of the important environmental problems in China's rapid economic development. The general industrial solid waste in Beijing is mainly used in a comprehensive way, with an average comprehensive utilization rate of 77.5% from 2008 to 2017. However, in recent years, the comprehensive utilization rate and the comprehensive utilization rate declined rapidly, and the comprehensive utilization rate decreased from 87.65% in 2014 to 74.12% in 2017. The main reason for the decline is the lack of statistical verification, the unclear understanding of the use and disposal methods of enterprises, and the purpose of using the way to report to evade the supervision. In addition, although the disposal rate of general industrial solid waste is low, the absolute amount of
terminal disposal is still huge and has been increasing rapidly in recent years, reaching nearly 5 million tons in 2017. In fact, the data based on the statutory environmental statistics system do not fully grasp the flow of waste, and the potential risks are high. It is expected that with the gradual standardization of general industrial solid waste management, the amount and rate of general industrial solid waste disposal in Beijing will still increase in a long period. Changes in the comprehensive utilization of solid waste are shown in Figure 2.

2.2. Main species and main producers
The change of industrial solid waste comes from the extensive management of industry, which not only enriched all kinds of toxic and harmful substances, but also enriched the unutilized metal and non-metal resources. From 2008 to 2017, the industrial added value of Beijing increased by 10.05% annually, but the output of industrial solid waste showed negative growth. In 2008, Beijing produced 11.5669 million tons of industrial solid waste, 7.3462 million tons of comprehensive utilization, 3.834 million tons of disposal, 385.4 million tons of storage, 0.09 million tons of emissions, and 97.62 percent of utilization. The main industrial solid wastes are: tailings, smelting waste residue, fly ash, slag and coal gangue; In 2017, Beijing produced 5.9902 million tons of industrial solid waste, with a total utilization of 4.4019 million tons and a total disposal of 1.5883 million tons. The main industrial solid wastes are: tailings, slag, fly ash, sludge, desulfurized gypsum and other wastes. Among them, fly ash and desulphurized gypsum are all comprehensively utilized. Tailings, slag, sludge and other wastes are all utilized and disposed of. It reflects the structural change of Beijing’s industrial development and the improvement of the management level of solid waste systematization, legalization and refinement.

From 2008 to 2010, bulk industrial solid waste tailings, smelting waste residue, fly ash, cinder and coal gangue are the main types of general industrial solid waste in Beijing, and the comprehensive utilization rate is high, but the proportion of production volume changes year by year, as shown in Figure 3.

![Figure 3. Trend of major industrial solid waste types in Beijing (2008-2010)](image-url)

With The 12th five-year plan started in 2011, smelting slag has no longer been the main industrial solid waste in Beijing, and the desulfurization gypsum has become the fifth major industrial solid waste. From 2011 to 2016, tailing, fly ash, slag, gangue and desulfurized gypsum accounted for 50.6%, 20.7%, 10.4%, 5.8% and 2.5% of the total production in Beijing on average. The proportion of tailings increased by 2.66% year on year. The proportion of fly ash increased by 10.7% year by year on average. Slag proportion averaged 28.9% year on year. The proportion of coal gangue decreased by 3.5% year by year. Desulphurization gypsum accounted for 9.8% of the average year. In addition, the
production of fly ash and desulphurized gypsum showed a decreasing trend, which decreased from 301.74 and 256,000 tons in 2011 to 107.59 and 36,000 tons in 2016, down 64.3% and 85.9% respectively. This also shows that coal to gas for the general industrial solid waste total reduction of significant results.

3. Main Existing Problems

3.1. Rough classification and distortion of statistical data to a certain extent
General sources of industrial solid waste statistics include environmental statistics, industrial solid waste declaration and registration, pollution declaration and registration, and pollution source survey. Environmental statistics is a statutory statistical system, which is basically consistent with the general census and classification of pollution sources. It divides general industrial solid waste into 11 categories, but the classification is limited to the types of bulk industrial solid waste, which is difficult to meet the increasingly refined requirements of environmental management. Industrial solid waste declaration and registration, sewage declaration and registration of general industrial solid waste into nearly 30 categories, but not fully used. In addition, as environmental statistics include all environmental pollutants such as water, gas, solid waste, etc., the typical investigation has the problems of incomplete statistical samples, unclear classification and insufficient verification strength, and finally only master the total quantity information, and there is a certain degree of distortion.

3.2. The unknown flow direction
The environmental statistics system mainly captures the quantity of waste, including the amount of waste produced, used, treated and stored. The department in charge of comprehensive utilization only keeps track of the amount of waste that has been declared for recycling. For a long time, hazardous waste has been the focus of industrial solid waste management. General industrial solid waste management has been neglected, and its treatment and disposal facilities are lack of overall planning and relevant systems. Environmental protection authorities also do not know the specific situation of end-use disposal facilities. However, on the other hand, there is a huge demand for general industrial solid waste disposal outside the part, the status quo of downstream disposal enterprises is unknown, and the potential risks are high. It is urgent to standardize terminal treatment and disposal facilities and improve the treatment and disposal capacity.

3.3. Lack of standards
One is the lack of detailed pollution control standards. The current standard content is single, the release time is early, has not adapted to the current new management situation. Generally, there is a lack of technical specification or emission standard for pollution prevention and control in detail of terminal treatment and disposal, and insufficient control over secondary pollution problems associated with terminal utilization and disposal. Second, the end comprehensive utilization product standard system is obviously insufficient, lacks in the comprehensive utilization product toxic harmful substance content standard. At present, China has initially formed an assessment system of comprehensive utilization, which gives preference to the economic policy of comprehensive utilization of products, but the existing assessment system lacks consideration for the prevention and control of toxic and harmful substances and the pollution in the utilization process.

3.4. Unclear division of responsibilities
First, the division of responsibilities is lack of detailed management system support. China stipulates that the competent department of environmental protection is responsible for unified supervision and management, but lacks relevant implementation rules. The administrative departments of development and reform, economy and informatization focus on the comprehensive utilization of solid and waste resources with industrial and economic policies as the starting point, while the administrative departments of commerce focus on the recovery of renewable resources. Second, the reduction and
recycling of general industrial solid waste is an important part of the circular economy, which also includes a number of types of renewable resources. But the general industrial solid waste management work on the insufficiency, then forms the selective management, the block division is obvious, the cooperation mechanism is not smooth.

4. General industrial solid waste management Strategy

4.1. Promote hierarchical management
First, in combination with the flow direction of general industrial solid waste, priority should be given to the control of relatively toxic and hazardous waste types that are difficult to get out of, so as to form a negative list for strict waste control and implement tracking and management of the whole process. Second, based on the characteristics of major types and major producers in Beijing, the source management of major producers should be strengthened to form a key control list of general industrial solid waste producers, and the main responsibility of source classification, reduction and resource utilization should be gradually compacting. Third, strengthen the management of waste flow, form a list of general industrial solid waste treatment and disposal facilities, and gradually carry out the assessment of facilities, according to the discharge of pollutants and waste treatment and disposal methods, form a negative list of waste disposal facilities, high-risk use of disposal facilities, general use facilities hierarchical management list. Fourth, because of the necessity and limitation of landfill resources, the list of wastes that can enter the landfill is made. Fifth, in view of the wide variety of industrial solid wastes and the great diversity in different regions, it is suggested to weaken the unified management. Under the framework of national laws, regulations and policies, local governments are encouraged to take measures in accordance with local conditions, improve the relevant management system and make it a national standard.

4.2. Strengthen the top-level system design
First, establish the source classification system, combine the disposal direction, form the general industrial solid waste classification catalogue, and according to the management needs, periodically refine and update. Second, we will strengthen the design of a statistical system for data at the source and at the end, further refine the system for reporting and registering industrial solid waste, and link it with the pollution discharge permit system. Third, promote the specialization of general industrial solid waste treatment and disposal, improve the relevant technical specifications and assessment methods for collaborative disposal, and establish a filing system for terminal treatment and disposal facilities, based on the integrity of project start-up procedures. Fourth, fiscal and tax policies should be given preferential treatment to encourage waste recycling, promote the formation of low value socialized market mechanism, and support the guaranteed disposal infrastructure. Fifth, clarify the management responsibilities of each department and improve the relevant management system. Sixth, we will strengthen basic research, gradually improve the technical specifications or emission standards for pollution prevention and control of terminal treatment and disposal facilities, and improve the standard system for resource-based products to prevent secondary pollution risks that resource-based products may bring.

4.3. Improve the utilization and disposal capacity
Formulate plans for the utilization and disposal of general industrial solid waste, strengthen industrial agglomeration, and guide the formation of a number of prominent and exemplary enterprises for the utilization and disposal of resources. Continue to promote the coordinated disposal of domestic incineration facilities and achieve seamless integration between source separation of industrial solid waste and disposal facilities at sanitation terminals. Through technical assessment, encourage capacity surplus hazardous waste incineration disposal facilities to coordinate the disposal of general industrial solid waste. Promote the coordinated disposal of industrial kilns, carry out special technical assessments of coordinated disposal facilities, and gradually improve the capacity of the cement
industry, the steel industry, the electric power industry, and brick and tile factories. Establish a point-to-point oriented utilization evaluation system, and gradually cultivate the formation of point-to-point oriented utilization capacity of production enterprises. We will continue to improve the capacity of foundation support facilities and promote the construction or expansion of general industrial solid waste landfills.

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