Research on Pollution Control of Solid Waste in China

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Abstract. Solid waste is some solid and semi-solidified waste objects produced in production and other activities in our lives, typical of which are industry, agricultural, life and dangerous solid waste. Due to the restrictions on conditions and objects themselves, some objects cannot be used in production and will become waste in mankind activities, so the existence of solid waste is unavoidable. Therefore, it is impossible to stop the production of solid waste. However, it cannot be abandoned either. Instead, it is necessary to carry out proper disposal to effectively prevent secondary pollution.

1. Introduction
Pollution control of solid waste is a systematic and skilled task. During the process of pollution control, we have to fully master the properties of waste and corresponding technologies, or the effect of control will be impeded. Therefore, in the course of operation, relevant personnel must first understand the properties of solid waste and master the treatment methods.

Nowadays, with the rapid economic development, there is an increasing amount of solid waste, which has seriously disturbed people’s lives and their health. According to relative researches, with the continuous development of the economy, the annual production of solid waste in China is growing. In 2015, the amount of ordinary solid waste in 244 cities in China was 1.91 billion tons, with 28.018 million tons of hazardous waste, 689,000 tons of medical waste and 185.6 million tons of domestic waste. By 2017, domestic waste alone has exceeded 400 million tons in China. And the enormous volume of solid waste has become a major obstacle to controlling domestic waste. Besides, unlike water pollution, air pollution and noise, solid waste has a certain degree of structural tightness, which leads to an extension of solid waste pollution. If cannot be discovered and dealt with in time, solid waste will cause serious pollution to all resources in its vicinity. In addition, the degree of harm it causes is severer than other pollution, which will increase the difficulty of treatment. This also calls for the need of sophisticated technology to scientifically and effectively control solid waste [1].

2. Classifications of Solid Waste
Usually, garbage refers to solid waste generated in social activities, which can be divided into municipal solid waste, medical waste, and industrial waste. Industrial waste is further divided into general industrial waste and hazardous waste. In terms of the volume generated, industrial waste is the most, followed by municipal waste and medical waste. From figure1. Proportion of different solid waste.
2.1. **Industrial Solid Waste**
Industrial waste refers to all kinds of waste residue, sludge, etc. discharged into the environment during industrial production. If industrial solid waste is not safely disposed of according to environmental protection requirements, it will cause pollution to land, water and other resources.

2.2. **Hazardous Solid Waste**
Hazardous solid waste is mainly hazardous waste, which is characterized by reactivity corrosion, flammability, infection, radiation and toxicity, and mainly comes from companies that use hazardous materials.

2.3. **Medical Waste**
Medical waste mainly refers to infectious, toxic, harmful, pathological, drug-induced and chemical waste coming from disposable medical supplies used by health care institutions in related activities such as treating patients and preventing diseases.

2.4. **Municipal Solid Waste**
Municipal solid waste refers to the solid waste generated by people in their lives and in urban services, typical of which is leftovers, waste paper, beverage bottles, scrap metal, etc.

3. **Common Treatment Technologies for Solid Waste**

3.1. **Sorting**
The classification of solid waste is the main method for recycling and reducing it, which can sort out some valuable materials from solid waste and isolate the hazardous waste inside it. Besides, sorting can be carried out according to the granularity of different solid waste. The principle of sorting is to reasonably consider the difference in properties between different solid wastes. For example, sorting can be based on the magnetism or gravity of solid waste. Sorting methods for solid waste usually include manual screening, gravity sorting, magnetic sorting, etc. [2].

3.2. **Incineration and Pyrolysis**
Incineration refers to the decomposition of harmful substances in solid waste into harmless ones through deep oxidation and pyrolysis of solid waste. According to the current production of solid waste, it becomes increasingly inflammable. Therefore, incineration pyrolysis has gradually become the main method of solid waste treatment. Incineration has an advantage in that it can process a large amount of solid waste at one time and the use of special incineration facilities to treat solid waste can efficiently treat solid waste. However, this method has certain problems as well. For example, it consumes lots of
resources; the incineration equipment is damaged quickly; it is very likely to cause pollution to the atmosphere during decomposition. In addition, pyrolysis is also a technology for treating solid waste, which decomposes solid waste into gas, liquid or solid with high temperature in the absence of oxygen or anoxic state. This method consumes less energy than incineration.

3.3. Curing Technology

![Curing Technology Diagram]

Curing technology refers to the generation of solid output by adding solid materials to solid waste to contain it. The solid produced by this technique are relatively excellent in permeability resistance, dry-wet resistance and freeze-thaw resistance, which can be used as materials in construction or building roads. The worst situation is direct landfill. Typical curing techniques are asphalt curing, cement curing and glass curing shown in figure 2.

3.4. Biological treatment

Biological treatment refers to treatment of waste by the process of microbial metabolism, which is characterized by the ability to convert a part of harmful substances into harmless ones. For example, it is more common to use cockroaches to carry out solid waste treatment. The amount of cockroaches can be increased by artificial breeding. Scientific research has shown that earthworm can devour waste of two to three times their own weight in one day. Besides, the solid wastes that are eliminated by their sputum metabolism can be used as high-quality bio-fertilizers in agricultural production, thus improving the recycling of waste. And cockroaches have the same function. Microbial treatment technology has advantages in terms of low cost and simple operation, thus being suitable for wide-scale promotion.

3.5. Reuse

Some solid wastes are not pure wastes, which can be useful once again after processing instead. Therefore, by increasing the utilization of solid waste, we can not only control solid waste properly and reduce the damage to the environment, but turn waste into treasure, thus conforming to state thinking of improving the utilization of resources and increasing economic returns. For example, in these years, the
second use treatment of a wide range of garbage resources that has been popular in recent years, is actually to decompose some domestic waste that can be used again, add some biochemical agents and some auxiliary materials to it so as to promote chemical reactions to turn the garbage into use again. This method really turns waste into treasure [3].

4. Measures for Preventing Solid Waste Pollution
Solid waste undergoes a process of generation, collection, storage, transportation and treatment. In specific practice, we must ensure reasonable and effective supervision and management throughout the whole process and take measures to prevent and control pollution in each link to fundamentally reduce the environmental pollution caused by solid waste. In order to prevent solid waste from causing pollution, the most important thing is to recycle it, make it harmless and reduce its amount. Only in this way can we ensure the health and safety of mankind. To begin with, we must improve the level of clean production. In the specific operation, we should use advanced technology to reduce the amount of solid waste generated and curb the environmental pollution of solid waste from the source. When carrying out comprehensive utilization of solid waste, we should reuse solid waste that can be used, making waste into treasure, to achieve the recycling of solid waste and minimize the environmental pollution it causes. In addition, according to specific conditions, solid wastes that cannot be reused should be landfilled at appropriate locations that meet environmental protection requirements. We can plant some green vegetation on landfills, not only eliminating the pollution of solid waste but beautifying the environment. Finally, the incineration equipment is used to decompose the remaining harmful substances and completely remove them, which will protect the environment to the greatest extent and scientifically and effectively treat solid waste. The figure 3 showed the China’s harmless treatment capacity on domestic garbage.

5. Current Status of Solid Waste Pollution Control in China and Its Problems
5.1. Industrial Waste Pollution
Today, with continuous social and economic development, there is an increasing amount of solid waste with complicated composition generated in industrial production. If not safely treated according to environmental standards, industrial solid waste will not only cause serious pollution to land resources and water resources but have great harm to human. For instance, it can cause and increase diseases and
raise the incidence of serious diseases; it may cause serious harm to people’s health or the environment when the management doesn’t meet standards.

5.2. Municipal Domestic Garbage Pollution

Surveys have shown that the higher a city’s living standards, the more the garbage it produces. In cities with relatively low incomes, each citizen produces an average of about 0.5 kilograms of garbage per day, compared with 0.8 kilograms in middle-income cities and 1 kilogram in industrialized cities, which shows that higher development brings more demand. At present, China is developing at a high speed, and environmental pollution have become an urgent problem to be resolved.

5.3. Construction Solid Waste Pollution

Since the reform and opening up, China has kept launching various construction projects. In the process of construction, because there is no reasonable and effective solution for construction waste in the plan, those waste is simply piled up waiting for treatment after construction. However, construction firms usually forget to deal with the garbage they produce. Although they process waste in a planned way sometimes, they just discarded it outside the suburbs, which causes serious environmental pollution. Moreover, in China’s economic development, many people only value economic growth but ignore the pollution it causes to the environment. This problem has also led some cities to meet the dilemma faced by capitalism once, and more and more serious solid waste pollution becomes the main reason for blocking urban development [4].

6. Suggestions on the Treatment of Solid Waste Pollution in China

First of all, it is necessary to establish sound regulations and standards. Legislative management is a tough means in environmental management as well as a more effective measure used by the whole world. The National People’s Congress, the State Council, the Ministry of Construction, and the Ministry of Energy and Environment have all formulated a series of laws and regulations on the prevention and control of environmental pollution caused by municipal solid waste. However, there is a lack of strict law enforcement and supervision measures, and, in particular, relative supervision departments are too lenient and have no proper mechanism for rewarding and punishment, which have impeded law-based management and the enforcement of legal rules. Therefore, it is advisable to emphasize one standard in the laws and regulations related to the prevention and control of solid waste pollution and the comprehensive utilization of resources that the treatment of municipal waste is mainly based on recycling. Besides, detailed rules for effective implementation should be released as well.

Second, it is worthwhile to improve waste treatment capacity. Currently, the capacity of processing enterprises in many places cannot meet the needs of the society. Every year, there is a large amount of solid waste that needs to be transferred overseas to be completely processed. Moreover, due to the development of the economy, various enterprises are constantly emerging, which thus have brought more solid waste of more types. This has led serious environmental problems and thus calls for improved waste disposal capacity. Therefore, it is necessary to actively guide and help relevant companies to upgrade their technology and expand the scope of waste treatment. At the same time, scientific statistical analysis should be carried out on the types and output of wastes produced to strengthen companies’ processing capacity so as to meet the needs of the society.

Third, it is advisable to promote cleaner production, which is a new way of making a balance between promoting environmental protection and economic development. This requires a strategy of prevention to be involved in the whole process of production and providing products and services. Cleaner production helps improve the rational use of resources and reduce the harm to humans and the environment. Taking Beijing Jiaotong University’s transformation project for canteen stoves as an example, which has an investment of 620,000. After completion, this canteen can save 332,000 cubic meters of gas per year (about 403.1 tons of coal), reduce 717.9 tons of CO\textsubscript{2} emissions, and generate economic benefits of 760,000 yuan, indicating that cleaner production is the best choice for promoting industrial development and pollution control, and achieving sustainable development. This is because it
can control the production of industrial solid waste rationally by promoting “clean production”. Therefore, the implementation of a “clean living” that is consistent with sustainable development is the basis for reducing the amount of solid waste. This idea will lead to a series of benign changes in the social production structure. For instance, people’s quality can be comprehensively improved; and the deteriorating environment can also be changed.

7. Conclusion
Solid waste is an inevitable product of today’s social development, which can be caused by various reasons. If not treated in time, it will have a bad impact on the environment and pose a threat to humans. Under such circumstances, we must pay attention to the prevention and control of solid waste and adopt different measures for different types of solid waste, which can ensure reasonable treatment and thus effectively protect the environment. On the basis of sound social and economic development, scientific and rational control of solid waste is to protect the environment and human lives.

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