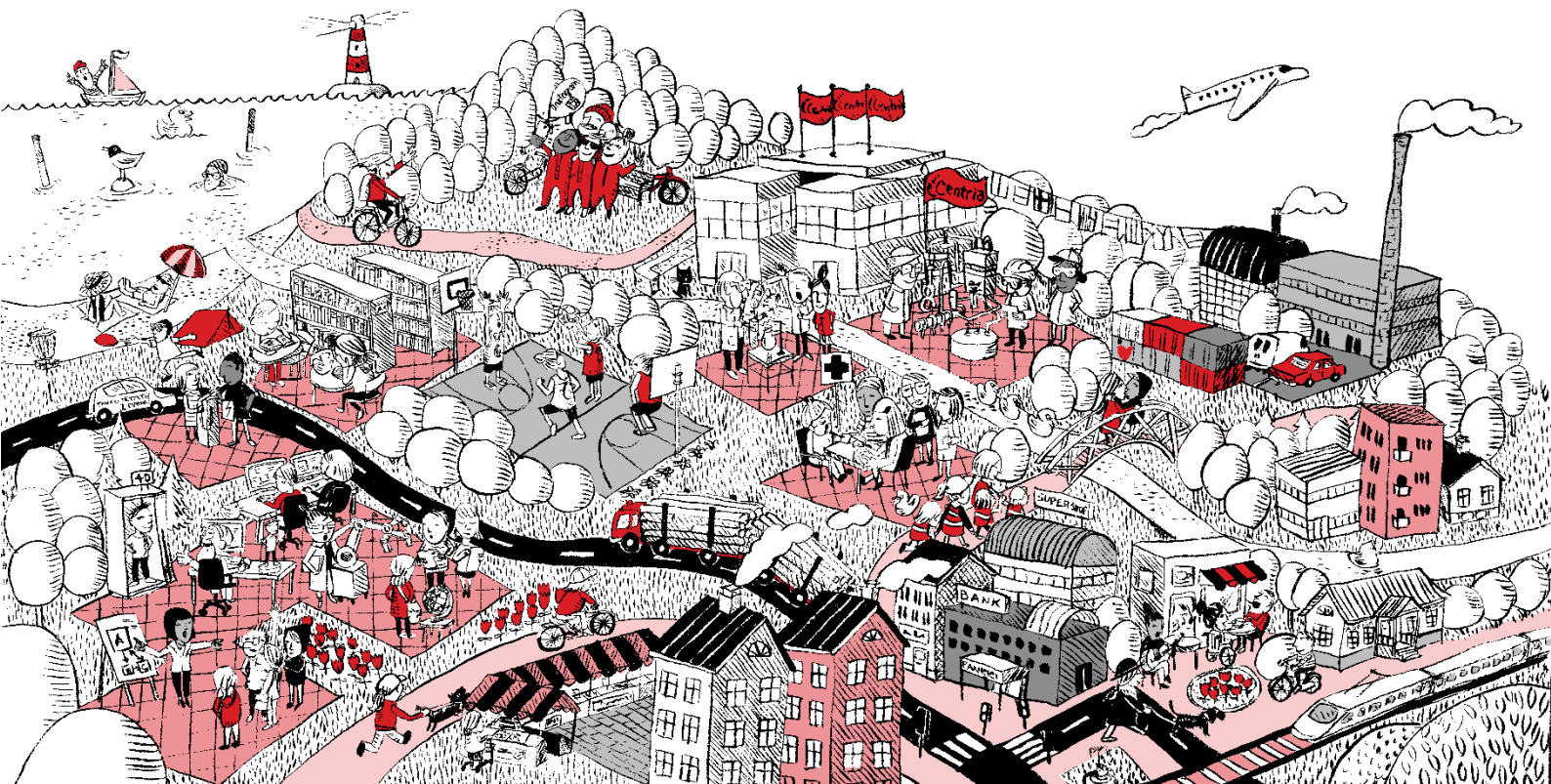


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RECYCLING OF HOUSEHOLD WASTE

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ABSTRACT

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<p>The recycling and disposal of household waste is very important in the current era of rapid development. Many countries are in a leading position in the field of waste recycling, such as Sweden's detailed waste classification system, and the popularization of waste recycling knowledge, while having a complete recycling process. Germany is in the lead in the regulation of waste recycling. The first recycling system, such as the dual-track recycling system, provides lessons for other countries to develop waste recycling.</p> <p>Landfill gas and waste incineration and other domestic waste recycling and treatment technologies, as well as the treatment of landfill leachate, are very important to the development of the waste recycling industry. At present, most developing countries still have many problems in the waste treatment process, such as immature technology and the inability of citizens to classify and dispose of them correctly. These problems hinder the development of the waste recycling industry.</p>		
Key words Household waste, landfill gas, waste incineration		

CONCEPT DEFINITIONS

Lt

gas production rate of landfill gas, $m^3/t \cdot a$

K

Gas production rate constant, $1/a$

T

time, a

L0

Maximum anaerobic gas production of waste, m^3/t

Lt

The landfill gas production volume in year t, m^3/a ;

L0

Maximum gas production of waste anaerobic fermentation, m^3/t ;

Rt

The amount of waste landfilled in year t before the landfill is closed;

Tt

the time from the operation of the landfill to the t year;

K

The gas production rate constant of the filled waste, $1/a$;

N

the operating life of the landfill;

ABSTRACT
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1 INTRODUCTION

With the continuous exchanges and learning of various countries in the world, the new century is a century of rapid economic and industrial development. With that comes the continuous improvement of people's living standards, but at the same time, the total amount of waste produced in people's lives continues to increase. The division is becoming more complex, which poses new challenges to the waste recycling and processing industry. In daily life, people begin to pay more attention to domestic waste, but the majority of people still understand the specific waste classification and post-processing of domestic waste, which is a hardship for the popularization and promotion of waste recycling. In recent years, China has opened 46 waste sorting pilot cities and implemented laws and regulations suitable for local conditions, which shows the government's determination and goal to solve the waste disposal problem. The development of waste recycling and classification in China is relatively late compared to some countries, and many countries have already had very advanced experience in related fields, such as Sweden's producer responsibility system, economic incentive policies and Germany's dual-track recycling system. The production responsibility system is a recycling program first introduced by Sweden. At the source of production, it places requirements on producers and at the same time restricts consumer behaviours. The cost of waste removal in Sweden follows the principle of charging by volume, and family generates less garbage, the lower the fees that need to be paid. In addition to the waste bins for residual waste, there is another separate waste collection system, especially for the collection of sales packaging waste. This is the so-called "dual track recovery system". These successful measures have been tested in practice. It is of great significance to China's current waste collection and classification work. General education on waste collection and sorting in Sweden is very effective. It took a generation to improve the basic quality from children to citizens. In order to deepen the local people's basic knowledge of waste recycling, people can distribute waste recycling knowledge questionnaires to investigate people's knowledge of waste recycling. By investigating 49 random samples, it can be found from the survey results that people attach great importance to waste collection, but their understanding of common sense on waste recycling is still incomplete, especially the latest policies, which proves that the popularization of common sense is still imperative. For waste recycling technology, the work focuses on the landfill gas, waste incineration power generation, as well as the permeate problems in composting and landfill. The landfill gas technology and waste incineration technology have been provided. The power supply and the daily use of natural gas have also found the importance of waste classification. Reasonable waste classification treatment can alleviate the permeation problems caused by landfill and composting on the one hand, and on the other hand, it can also reduce the generation of waste incineration and the harm

caused by harmful gases to the environment. These technologies are an active exploration of the use of waste, hoping to turn waste into treasure, and solve the problem of waste placement while solving resource problems. Some successful foreign experience can help the current stage of development, and the domestic history of waste development and the difficulties encountered by related technologies at present. The article puts forward some relevant insights to increase people's attention to garbage recycling, deepen the understanding of garbage recycling, and contribute to my country's garbage recycling and processing industry.

2 HOUSEHOLD WASTE

Solid waste generated in people's daily life or activities that provide services for daily life, as well as solid waste that is regarded as domestic waste by laws and administrative regulations. Mainly include household waste, market trade and commercial waste, waste in public places, street cleaning waste, and corporate waste.

2.1 Domestic waste classification

Domestic waste classification reduces the workload of waste recycling to a certain extent. Domestic waste classification reduces the amount of waste entering the final disposal facilities such as landfill and incineration, reduces materials that are not conducive to landfill or incineration disposal, improves the effect of waste composting, and is conducive to the normal operation and pollution control of domestic waste treatment and disposal facilities. It is convenient to recycle the useful substances in the waste. Domestic waste classification can reduce the pollution of recyclable materials, improve the purity of recyclable materials, and reduce the workload of sorting recyclable materials. Mixed collection is likely to cause the mixing of high-water content and easily degradable kitchen waste and toxic and harmful substances in domestic waste. The collection container and back-end treatment can be according to the nature of different types of waste, which can reduce environmental pollution. (Zhang & Zhang 2020.)

2.1.1 Recyclable waste

Recyclable waste includes paper, metal, plastic, glass. Through comprehensive treatment and recycling, pollution can be reduced and resources can be saved. For example, every ton of waste paper recycled can produce 850 kilograms of paper, saving 300 kilograms of wood, and reducing pollution by 74% compared to equivalent production; for every ton of plastic beverage bottle recycled, 0.7 tons of secondary raw materials can be obtained; for every ton recycled scrap iron and steel can make 0.9 tons of good steel, which saves 47% of the cost compared with ore smelting, reduces air pollution by 75%, and reduces water pollution and solid waste by 97%. (Zhou & Lv 2018.)

2.1.2 Kitchen waste

There are many types of kitchen waste and it is not easy to dispose. It is a blind spot for many households' waste recycling and disposal, but at the same time kitchen waste is generated every day. Therefore, the effective classification of kitchen waste is very important. Correct classification can greatly reduce the workload of subsequent recycling. Kitchen waste includes leftovers, bones, vegetable roots, vegetables and other waste. This kitchen waste use biotechnology to process compost onsite and produce 0.3 tons of organic fertilizer per ton. (Gan & Sun. 2014)

2.1.3 Hazardous waste

Hazardous waste includes waste batteries, waste fluorescent tubes, waste water silver thermometers, expired medicines, etc. People often dispose of hazardous waste in inappropriate ways, which has a harmful effect on the environment. For example, the various heavy metals in the battery and the mercury, lead, and acid-base substances contained in the battery have a serious impact on the environment; the organic solvents contained in some cleaning chemicals and some petrochemical products that cannot be degraded by nature, especially some insecticides contain carcinogens, which have an impact on human health.

2.1.4 Difficult to recycle waste

In addition to the above-mentioned types of waste, bricks, ceramics, muck, toilet waste paper and other waste that are difficult to recycle are generated in daily life. These waste often cannot be handled correctly, and can be sent to a special garbage collection station for landfill, thereby reducing the harm to the environment.

3 DOMESTIC WASTE COLLECTION TREATMENT TECHNOLOGY

The recycling of domestic waste is to make the waste that cannot be used directly become effective in an appropriate way. Domestic waste may have no use value for a family, but it may be a raw material for the development of another field. The recycling of domestic waste is to collect and sort these waste that are of no use value to avoid environmental pollution, and at the same time extract useful or reusable parts as raw materials for other production and life. This can reduce the generation of domestic waste and alleviate the problem of shortage of international resources. (Pu & Fan 2017.)

The popularization of household waste recycling is also a change of concept. China vigorously popularizes the concept of green sustainable development. This should not only be a slogan, but should also be implemented. The recycling of household waste is an interpretation of the concept of sustainable development. The sorting and recycling of waste in daily life will invisibly strengthen people's understanding of the concept of sustainable development. For example, the secondary recycling of household paper is a direct protection of trees and an intuitive manifestation of resource conservation. (Pu & Fan 2017.)

3.1 Common disposal methods of domestic waste

China's waste treatment industry started late, but after years of continuous development, it has begun to take shape. The rapid increase in the amount of waste is a necessary path for urbanization, and a wide variety of waste has become a burden for urban development. Many cities have encountered the problem of nowhere to put waste in the development stage, but after continuous development, waste has become a new type of energy with great development potential. This proves that as long as waste is handled correctly and the understanding of waste is deepened, waste is misplaced. The purpose of waste disposal is to reduce waste. After initial treatment, waste is more suitable for subsequent treatment. Waste treatment usually follows the principles of reduction, harmlessness, resource utilization, saving money, and saving land. (Zhang & Zhang et al 2020)

3.1.1 Landfill treatment

Landfill disposal is the most common waste disposal method in China. Its advantage is that it can treat a large amount of municipal waste at one time. At the same time, landfill is also the final treatment method of waste generated by other waste treatment processes. The direct landfill of waste is to put the waste directly into the pit dug in advance and cover it with fillers. As time goes by, the decomposition of microorganisms and the physical and chemical reactions, the goal of reduction and harmlessness is finally achieved. But at the same time, the direct landfill treatment of waste has also produced some drawbacks. The landfilled waste will produce a large number of bacteria, viruses, and a large amount of biogas will be produced after fermentation, which poses certain safety risks; landfill waste will also produce waste leakage and Causing harm to the scarce groundwater resources. (Huang.2021.80-81)

3.1.2 Composting

The domestic waste is piled up into piles, stored and fermented at 70°C, and the organic matter is decomposed into inorganic nutrients with the help of the ability of microorganisms in the waste to decompose. After composting, domestic waste becomes hygienic and odourless humus. It not only solves the problem of waste disposal, but also achieves the purpose of recycling. However, the amount of compost of domestic waste is large, and the nutrient content is low. Long-term use can easily cause soil compaction and deterioration of groundwater quality. Therefore, the scale of compost should not exceed a reasonable volume. (Zhao & Zhang & Xu.et dl. 2020.186-189)

3.1.3 Recycling

The recyclables in domestic waste, including paper, metal, plastic, glass, etc., are treated as resources by relevant factories, and they are returned into resources that can be used by human society. Recycling has solved some waste disposal problems and alleviated the problem of resource shortage. Recycling is an ideal method of waste disposal, and it is also the direction that China is currently working on. Currently, 48 pilot cities have implemented waste classification regulations, which provides favourable conditions for waste recycling. (Zhou & Lv. 2018)

3.2 Waste recycling experience in other countries

Sweden handles approximately 4.66 million tons of domestic waste each year, and the national average annual waste generation per capita is 467 kg. In Sweden, almost all domestic waste is recycled, processed and treated, or used as energy. Among the domestic waste in Sweden, 1.615 million tons were recycled, which accounted for 34.6% of the total; the biological treatment of organic waste into compost, biogas or compost was 757,000 tons, accounting for 16.2% of the total. The incineration treatment volume converted into heat and electric energy was 2.263 million tons, accounting for 48.5% of the total; 31,000 tons of landfills with no use value, accounting for only 0.7% of the total. (Han & Lu.2021.87-90)

3.2.1 Complete legal and institutional system

Residents of Sweden, like residents of other EU countries, need to pay for the waste they generate. Garbage contractors use truck transportation to collect domestic garbage at fixed garbage points. Waste removal and transportation fees follow the principle of charging by volume. The less waste generated by the households, the lower the fees that need to be paid. In addition, the waste after classification is much less than the total amount of unsorted waste, which has led to a high level of enthusiasm for classification. (Zhang & Jenny.74-76)

In Germany, the waste recycling rate of plastic bottles is as high as 97%. At present, all countries are facing the problem of a sharp increase in the total amount of waste and difficulty in promoting classification measures. In order to solve similar problems, more than 40 countries have implemented a beverage deposit refund system, and Germany is a leader in this field. (Kang & Zhu 2019.)

Germany's plastic bottle deposit refund system was put into trial operation in 2003. Consumers will pay an additional fee when buying recyclable bottles. The refund of the deposit is also very simple. In most supermarkets, a recycling station for recycled beverage bottles is set up. People only need to put the used recyclable bottles in the recycling machine to get the deposit refund. Such a deposit system greatly improves the recycling rate of plastic bottles. (Kang & Zhu 2019.)

In 1991, the world's first bill to treat packaging waste, the "Avoid and Utilize Packaging Waste Act" was implemented in Germany. The bill stipulates that product manufacturers are primarily responsible

for the pollution caused by product packaging, and companies must pass their own or entrust a professional third-party company to recycle product packaging. The passage of this bill directly promoted the birth of the German dual regulation recycling system. (Zhang & Jenny.74-76)

3.2.2 Mature waste collection culture

Sweden's waste treatment is at the world's leading level, and its successful experience is mainly in the utilization of waste resources and complete and orderly waste sorting. However, in addition to a complete process, the most important thing is the executor of waste recycling. Detailed waste classification naturally puts forward higher requirements for people's environmental protection quality and actions. The Swedish government attaches great importance to the education of national environmental protection concepts. It has taken a whole generation of people to cultivate the national environmental protection awareness. The method of cultivating from children has completely changed most of the people, making the concept of sustainable development of environmental protection a habit. (Zeng .2008.64-65)

3.3 Domestic waste recycling technology

With the continuous acceleration of China's urbanization and the rapid improvement of residents' living standards brought about by the continuous economic development, the amount of urban domestic waste generated has continued to increase. The resulting waste placement problems and the resulting pollution problems will affect the environment and the human body. Health causes serious problems. Domestic waste recycling technology not only solves the problem of waste resettlement, but also provides a considerable energy supply to a certain extent. Landfill gas and waste incineration power generation provide convenient conditions for urban electricity consumption and residents' use of natural gas.

3.3.1 Landfill gas technology

Landfill sites will produce degradation products-landfill gas. Its main components are CH₄, CO₂, and a small number of other gases, such as H₂S, N₂, etc. The source of landfill gas is waste, so it is a renewable energy source and belongs to biomass energy. In the 1970s, the technology of biogas landfill power generation began to develop continuously. The purpose is to control the impact of the odour of landfills

and the diffusion and migration of landfill gas on human habitation. After rational utilization and development, components become a cost-effective energy source. (Liu, Tang & Nie.2000.72-76)

Landfill biogas power generation includes biogas collection, biogas refining, power generation, power transformation (boosting), power transmission, etc. At present, most landfill plants can maintain the CH₄ content in the landfill site at 35%-60%. In this interval, the biogas fuel generator has the highest power generation efficiency. The biogas generated in the landfill passes through the vertical biogas collection well, the horizontal biogas collection pipe and the branch pipe, and is collected into the main pipe and removed by the condensate remover. After cooling and filtering, the water is pressurized by the biogas blower device to regulate the content of biogas components. The biogas that meets the requirements is burned to generate electricity through a gas generator, and the combusted gas is discharged into the atmosphere. The power is boosted and merged into the urban power grid network to enter thousands of households. (Liu, Tang & Nie.2000.72-76)

There are generally the following ways to use landfill gas. The low calorific value gas produced is used directly, or steam is used as a heat source. Power generation after purification. After purification, purification and other processes, it enters the city's gas pipeline network as an energy source. After purification, liquefy it into natural gas or use it as industrial raw material

The first stage is the aerobic stage, which usually occurs when the waste is just landfilled. At this time, the oxygen in the landfill site is continuously consumed and carbon dioxide is continuously produced. The sign of the second stage is to consume all oxygen, enter anaerobic fermentation, and the concentration of H₂, CO₂ reaches the maximum, and no methane is produced. In the third stage, methane began to be produced, the concentration continued to increase, H₂ was consumed, and the concentration of CO₂ continued to decrease, and finally reached a stable value. In the fourth stage, the concentration of CH₄ and CO₂ is basically at a steady state. (Novak & Kovar.2011.877-888)

3.3.2 Scholl Canyon gas production rate calculation model

The expression of the gas production rate model is determined by the gas production rate of anaerobic fermentation of organic matter in the landfill site. When the gas production rate reaches a peak, the gas production rate then gradually decreases exponentially. (Guo & Yun. 2003.)

Its mathematical expression is. $L_t = kL_0e^{-k_t}$

L_t . gas production rate of landfill gas, $m^3/t \cdot a$

K. Gas production rate constant, $1/a$

T. time, a

L_0 . Maximum anaerobic gas production of garbage, m^3/t

Practical application of gas production rate model in gas production estimation, under normal circumstances, a landfill treatment site can continuously produce gas for decades, but as for about a year, the rate of birth can reach the highest peak. Therefore, the gas production rate is estimated by the gas production rate model, and the time before the peak can be ignored. The time unit for calculating gas production is generally a year, and the gas production of landfill gas at a time point is the superposition of the gas production of each year. (Guo & Yun. 2003.) Therefore, the gas production of landfill gas in a certain year can be expressed by the following formula.

$$L_t = kL_0 \sum_{t=1}^n R_t e^{-kTt}$$

L_t . The landfill gas production volume in year t, m^3/a ;

L_0 . Maximum gas production of garbage anaerobic fermentation, m^3/t ;

R_t . The amount of waste landfilled in year t before the landfill is closed;

T_t . the time from the operation of the landfill to the t year;

K. The gas production rate constant of the filled garbage, $1/a$;

n. The operating life of the landfill;

3.3.3 Landfill Biogas Treatment System

A biogas desulfurization and decompensation system, a biogas cooling and filtering system, and a biogas pressurization system. Biogas desulfurization treatment system. The biogas desulfurization and decompensation system consist of a condensate removal device and an adsorption desulfurization device. The source of biogas comes from domestic waste, which causes the biogas to contain a large amount of harmful water, dust, H₂S, NH₃, etc. These harmful components cannot be effectively eliminated, which will cause the pipelines and power generation devices through which the biogas passes to be corroded, which will seriously affect related equipment. (Guo & Yun. 2003.)

The biogas cooling and filtering system includes biogas coolers, water coolers and biogas filters. The biogas cooler reduces the temperature of the passing biogas to 15 °C so that the water in the biogas can be analysed, and the water in the biogas can be analysed at the same time. The filter system contains activated carbon components and the purpose is to absorb the dust in the biogas, to prevent the pipeline interruption when the biogas passes through the pipeline, affecting the flow of the biogas. (Guo & Yun. 2003.)

The biogas pressurization system consists of a biogas analyser and a biogas pressurization fan. The generation of landfill gas and oxygen affect the normal operation of the generator. The biogas components supplied to the generator after treatment by the biogas pre-treatment system are as follows. CH₄ 45-50%, H₂S below 20 ppm, and moisture below 10%. Normally, in order to ensure the normal operation of the generator and confirm whether the biogas composition meets the standard, it will be measured before entering the pressurized fan. After the qualified biogas is compressed by the pressurized fan, it can be burned and generated by the generator. (Guo & Yun. 2003.)

3.3.4 Biogas treatment equipment

The condensate removal device CSV (condensate separate vessel) is a device for removing condensate water from landfill gas, with a cylindrical appearance. The condensate removal device made of polyethylene HDPE material has the characteristics of high density and high strength. When the amount of water stored in the device reaches the limit, it can be pumped out by the CSV pump, so as to ensure the normal operation of the device CSV. (Zhang. 2015.172-173)

The desulfurization device uses a desulfurizer to remove harmful components such as H₂S and silanol in the biogas to prevent damage to the biogas pipeline and increase the operating life of the device. The traditional desulfurizers include cast iron shavings desulfurizer, which is made by adding 0.5-1.0% lime or soda ash of the weight of the former two with a weight ratio of 1.1 cast iron shavings and sawdust. Exposure to the air and direct sunlight accelerates the oxidation process. The oxidation of iron filings usually takes about half a year. The TG and TTL-1 desulfurizers developed by China in recent years are a new type of high-efficiency desulfurizer with a strip shape with a diameter of 4-6 mm and a length of 5-15 mm. The raw materials are sulfuric acid waste slag and converter steelmaking red mud, and a certain amount of alkali and binder are added to it, which is finally completed by grinding and other processes. The cost of TG type and TTL-1 type desulfurizers as new desulfurizers is higher than other desulfurizers, but their sulphur capacity is high, resistance is small, and they are easy to regenerate. Compared with traditional desulfurizers, they have higher essence rate and less pollution. At the same time, new desulfurizers It also has the advantages of low bulk density, high pH value, and strong hydrolysis resistance. It is not only suitable for the desulfurization of landfill gas, but also used with other combustible gases. (Zhang. 2015.172-173)

3.4 Leachate Treatment Technology of Domestic Waste Landfill Site

With increasing attention to domestic waste, the number of landfills has been increasing. People have discovered that the leachate of domestic waste landfills has high concentration and complex composition. If the leachate is not properly treated, it will seriously affect the landfill. The treatment of waste permeate is affected by its own water quality, and is also closely related to the composition of the landfill, the operating time of the landfill, and the treatment technology of the permeate. At present, the leachate treatment technology is based on different principles, mainly physical, chemical and biological treatment. (Wang & Heng. 2020.48-52) At present, the process technologies used in landfill leachate treatment mainly include the "biochemical treatment + membrane treatment" process, the "pre-treatment + two-stage membrane treatment" process and the "biochemical treatment + advanced oxidation" process. (Huang. 2021.80-81)

3.4.1 The importance of waste classification to the treatment of permeate

Whether the amount of water in the permeate can be reduced is crucial to the management of the permeate. Waste classification has a huge impact on the composition of the permeate. The main source of waste permeate is the water brought by the waste in the landfill and the water generated during the decomposition of the waste, as well as the rainfall of the landfill and the infiltration of groundwater into the landfill. At the same time, this also puts forward requirements for the drainage and anti-seepage work of the waste landfill. Under normal circumstances, most of the water in the permeate is free water and water generated when the waste is decomposed. According to statistics, most of the water in landfill sites is due to the illegal disposal of kitchen waste. If the waste can be classified at the source, and the kitchen waste can be classified, transported and treated separately, the amount of water in the waste will be reduced. decrease very much. The current Egyptian classification separates the kitchen waste from the waste collection and transportation system, which can effectively reduce the total amount of waste permeate. (Huang, Liao & Chen 112-113)

TABLE 1 Quality of fresh-landfill leachate from (Huang, Liao & Chen 112-113)

COD/ (mg/L)	BOD ₅ /(mg/L)	NH ₃ -N/(mg/L)	TN/ (mg/L)	pH
25000	15000	2800	3000	6-9
20000	10000	1500	2000	6-9
28000	18000	1660	2820	6.14-6.48

TABLE 2 Quality of aged-landfill leachate from (Huang, Liao & Chen 112-113)

COD/ (mg/L)	BOD ₅ /(mg/L)	NH ₃ -N/(mg/L)	TN/ (mg/L)	pH
6000	3500	800	1000	——
2400	264	1959	——	8.14-8.71
1700-1800	340-360	1000-1100	——	8-9

According to the above Table 1 and Table 2, what can be find is that the landfills are classified by operating time, which can be divided into short-term permeate and long-term permeate. Under normal circumstances, landfills under five years produce short-term permeate, and landfills over five years produce long-term permeate. Depending on the operating time, the composition of the permeate in the landfill site has also been changed. The data in the query table can find that the short-term leachate has a low pH value, and the COD, BOD₅ concentration and BOD₅/COD values are all high. The long-term leachate pH value is relatively alkaline, the COD, BOD₅ concentration and BOD₅/COD value are low, and the ammonia nitrogen concentration is relatively high. (Huang, Liao & Chen 112-113)

The water quality of the landfill leachate is related to the composition and nature of the landfilled waste. When the landfill is mainly buried waste, it becomes slag, fly ash, and a small amount of kitchen waste leftover residue from other waste incineration. Research data shows that the main physical components of the slag produced by the incineration of domestic waste are molten slag, glass, ceramics, etc., as well as some unburned materials (accounting for about 1.5%). The chemical composition of the slag from the domestic waste incinerator is mainly SiO_3 , Al_2O_3 , CaCO_3 , MgO , etc., with a pH value of 8-13, which is alkaline. (Huang, Liao & Chen 112-113)

3.5 Waste incineration power generation technology

The composition of urban waste is determined by the degree of urban economic development, residents' living standards and living habits. With the rapid economic development in the past ten years, the total amount of waste generated by residents has become higher, and with technological innovation, the fuel and food structure used by urban residents has changed. The ash content in the waste has dropped significantly, and the water content has been significantly reduced. Under these favourable conditions, the low calorific value of arc hid continues to increase. On the one hand, urban waste incineration power generation provides objective energy, and on the other hand, it achieves the purpose of harmlessness and reduction of waste. Many cities in China, including Beijing, Shanghai, Shenzhen, Suzhou, Wuxi, and Changzhou, have completed preliminary designs for the proposed waste-to-energy plant. Beijing's first waste-to-energy project has been officially approved by the State Planning Commission. A waste-to-energy plant in Gaoantun, Chaoyang District, will soon rise to the largest waste-to-energy station in China, with a processing capacity of 1300t/d and an annual power generation capacity of 136GW· h. (Lu. 2010.138-141)

The domestic waste is temporarily placed at the waste disposal point and transported to the waste storage of the power station by the waste truck of the environmental sanitation department. After crushing and magnetic separation in the waste storage, the waste is grabbed into the conveyor belt using the crane grab, and then transported to the waste hopper in the deaeration room. The feeder sends the waste in the bucket into the furnace for incineration and power generation. (Sister, Shchepillo & Nefedova. 2006.210-214)

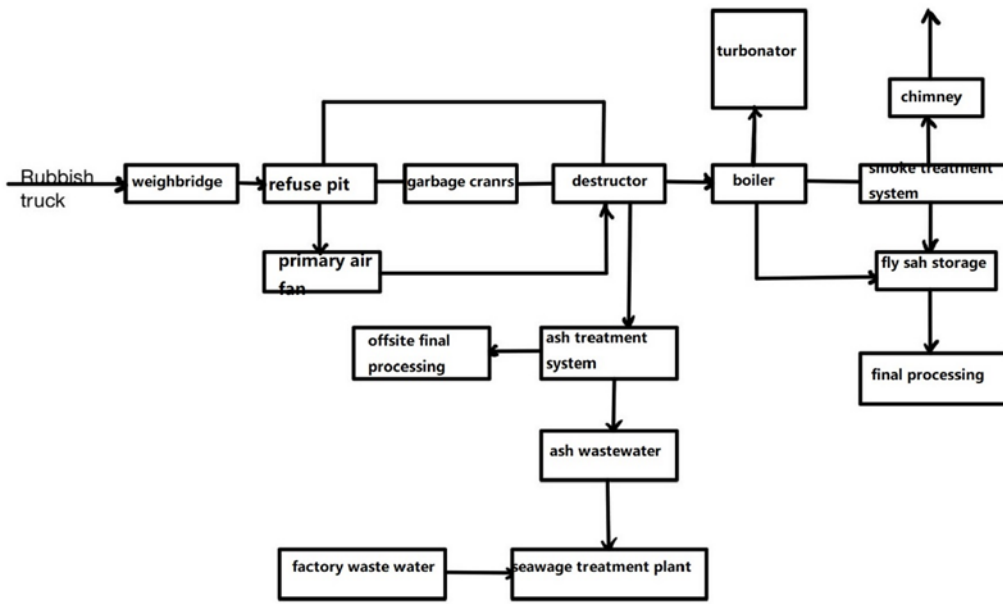


FIGURE 1. Main process flow of waste incineration power generation From(Wang & Tian.2002)

According to Figure 1, domestic waste is regularly transported into the power plant by waste trucks, and is automatically discharged into the waste dump after being measured by the weighbridge located in the plant area. During production operation, the waste is transferred to the waste hopper in front of the furnace by the bridge grab crane, and is continuously and evenly sent into the incinerator by the waste feeder. At the same time, the auxiliary fuel coal with qualified particle size will be fed into the large steel coal hopper in front of the furnace by the coal conveying belt after being measured, and then sent to the furnace for combustion after being measured by the belt weighing coal feeder in front of the furnace. The whole furnace is composed of a membrane water-cooled wall, and a water-cooled air distribution plate and a hood are arranged at the lower part. The combustion air is divided into primary and secondary air. The preheated primary air enters the dense phase area through the small holes of the hood to start the combustion of the fuel and blow the material away from the air distribution plate. The secondary air is fed into the furnace in layers from the secondary tuyere above the bed. The flue gas collides with the anti-wear layer of the furnace roof through the suspension section, and some coarse materials return to the dense phase area. The flue gas only carries fine materials out of the furnace and enters the high-temperature cyclone separator. After the flue gas entering the high-temperature cyclone separator is separated by the cyclone, the fine materials are returned to the furnace through the return device and then cyclically burned. After separation, the clean flue gas containing a small amount of fly ash flows through the upper exhaust port, passes through the heater and the rear heating surface, and is discharged from the boiler body. The slag produced by the combustion of the mixed waste and coal slag of the boiler

is discharged from the arranged slag discharge port, directly dropped to the slag cooler, cooled and transported to the slag warehouse, and then transported for brick making. The high-temperature flue gas produced by the boiler undergoes heat exchange on the heating surface to produce superheated steam, which is finally connected to the steam main pipe for power generation. The flue gas enters the main flue gas purification system through the waste heat boiler. The main flue gas purification system consists of a reaction tower, a bag filter, an induced draft fan and a flue pipe. After the soot and harmful components in the purified flue gas are reduced to the emission concentration allowed by the environment, they are discharged into the atmosphere through the chimney. (Wang & Tian.2002)

The waste enters the furnace and mixes with air and then burns fully. Because the cracking of organic matter in the waste needs to be completed at a high temperature and has sufficient residence time, the design temperature and flue gas residence time in the incinerator are kept at 850 °C and 3-5 s respectively. So that the harmful components in the waste (dioxin, etc.) can be fully cracked and incinerated in the furnace without producing new harmful substances. The volume after incineration can be reduced by 50-80%, and the combustible waste collected by classification can even be reduced by 90% after incineration. Combining incineration treatment with high temperature (1650-1800 °C) thermal decomposition and melting treatment can further reduce the volume. (Wang & Tian. 2002.36-38)

Green power three-drive grate furnace, the three-drive reverse-pushing grate adopts a self-developed drive mechanism. There are three sets of independent drive devices (called "three drives") corresponding to the drying zone, combustion zone and burnout zone. According to the actual needs of the waste transfer in each area during the waste incineration process, separate joint adjustments are carried out to control the moving speed of the grate slices, and do not interfere with each other. Through the automatic control combustion control system, the independent moving parts of the grate are combined into an organic whole, which can automatically complete the waste from feeding, drying, burning, burning to slagging according to the recognized furnace temperature (or boiler evaporation). In the incineration process, the furnace temperature is stable and the fluctuation range is small, which fully meets the requirements of 850 °C for 2s, and minimizes the generation of dioxin. At the same time, the grate piece of this green power three-drive grate furnace uses a special alloy. This special alloy has been proven in practice and has good high temperature resistance, wear resistance and corrosion resistance, which improves the service life of the grate piece to a certain extent. (Yan. 2018.156-152)

Japan JFE Super Reciprocating Grate Furnace, this furnace ensures sufficient grate area for waste burning treatment, and improves the mixing effect by increasing the gap between each layer to help the full combustion of waste. The radiant heat of the flue gas is used to strengthen the drying of the waste in the furnace and is equipped with an intermediate partition. The waste of other furnaces is too thick to cause insufficient combustion. Each section of the grate of this furnace uses an independent drive mechanism to achieve the optimal control of the thickness of the waste layer. Excellent feeding performance improves the efficiency of waste incineration and ensures the working efficiency of the generator. (Yan. 2018.156-152)

3.6 Treatment of Flue Gas Pollution from Domestic Waste Incineration for Power Generation

For waste recycling, treatment and energy reuse, domestic waste incineration power generation is very convenient and efficient. The waste is classified and burned for power generation. This way, domestic waste is efficiently used in power plants, which seems to solve the problem of a large amount of waste treatment. However, a large number of flue gas pollution problems are generated during the incineration process. The flue gas pollution obviously hinders the construction of the urban environment and the power generation cost of power plants, and it is also not conducive to the continued development of incineration power generation technology. Therefore, technologically processing flue gas and reducing the emission of flue gas pollutants are the prerequisites for ensuring the incineration power generation technology, and then promoting the optimization and development of the industry's overall flue gas pollution control technology. (Sun. 2020.171-172)

3.6.1 Dioxin Control Technology

Dioxins are the collective name of polychlorinated dibenzodioxins (PCDD or dioxins) and polychlorinated dibenzofurans (PCDF or furans). Dioxins are very toxic and are emitted into the atmosphere. Dioxins can be adsorbed on particulate matter, settle in water bodies and soil, and then enter the human body through the food chain. One ten thousandth of a gram of dioxins will cause serious harm to human health. Therefore, the problem of dioxins disposal is urgent. (Chen & Li. 2012.89-93)

3.6.2 The 3T principle in the combustion furnace

Common dioxin pollution control technologies mainly include in-combustion control and post-combustion smoke control. The in-combustion control is mainly to reduce the number of dioxins produced at the source when the combustible is burned, and the post-combustion control is mainly to control the combustion after the flue gas is discharged, the dioxin component is further removed in order to reduce the emission of dioxin. (Wu, & Liao. 2020.78-79)

The production of dioxin is closely related to the combustion conditions in the combustion furnace. Combustion temperature, residence time, oxygen content and location in the waste, waste pre-treatment, fuel supplementation, and oxygen supply are common influencing factors, among which temperature and residence time. In the flue gas treatment process, these three conditions are usually controlled to reduce dioxin emissions. The principle of these treatment processes is the 3T principle. Normally, the dioxin is 850 °C will be destroyed. However, if the particulate carbonaceous material needs to be completely burned, the temperature in the furnace must be above 1000 °C. At the same time, it is necessary to ensure a certain residence time. At 1000 °C, the gas residence time in the furnace must exceed 1 s. at 850 °C, it must exceed 2 s. In addition, in order to ensure the full mixing of air and fuel and meet the necessary conditions for waste combustion, the turbulent Reynolds index set in the factory should exceed 10,000. The oxygen content affects the formation of dioxin, and the combustion of waste with too low oxygen is insufficient. Excessive oxygen content will promote the production of dioxin, so 3-6% oxygen content is the appropriate ingredient content. (Wu, & Liao. 2020.78-79)

3.6.3 Fly ash treatment of tail gas emission

In theory, as long as people can capture or separate the fly ash particles in the exhaust gas before it enters the post-combustion zone, it will effectively reduce the generation of dioxins. There are two main methods of flyback processing technology in the industry, namely the curing method and the stabilizing method. This method refers to mixing and reacting fly ash with corresponding chemical reagents, and finally achieves the effect of removing harmful substances in the flyback. At present, most factories choose to add cement and liquid chelating agent to the flyback to produce a chelating effect between heavy metals. Another treatment method is wet chemical treatment. This method uses a strong acid to mix with the tail gas to analyse the heavy metal group, and then add the corresponding reagents to produce the corresponding strong oxides and sulphides, through filtering to achieve the purpose of removing harmful substances. (Fang. 2017.264)

3.6.4 Semi-dry + wet deacidification

The semi-dry deacidification process is a system of lime and water digestion, which is atomized and sprayed into the reactor through an atomizer to react with acid gas. The semi-dry deacidification system is the first purification system arranged in the flue gas purification room to receive the flue gas from the boiler outlet. The interior of the semi-dry deacidification system mainly includes a lime reef preparation system, a semi-dry deacidification system, rotating physical and chemical equipment and corresponding control systems. The common process is that the lime slurry (concentration about 15%) delivered by the lime slurry preparation system is sprayed at high speed in the sprayer and sprayed into the flue gas treatment system in a very fine mist (40-50/am). At the same time, spray temperature-adjusting water into the flue gas treatment system to control the flue gas outlet temperature of the deacidification tower within the set range. After a series of chemical reactions, most of the acid gas in the flue gas will be effectively deal with. The scrubber equipment is usually set after the bag filter and before the SCR system to further remove the acid gas in the flue gas and cool the flue gas. After cooling, the moisture in the flue gas is condensed. (Wardenier, Liu & Nikiforov. 2019.715-724)

The wet scrubber is usually divided into a cooling part and an absorption and dehumidification part, and the flue gas first passes through the cooling part. The cooling liquid in the cooling part is sprayed upwards, the purpose is to reduce the temperature of the flue gas to 60-70C°, while the cooling liquid absorbs acid gases such as HCl and SO₂ in the flue gas. In the absorption and dehumidification part, the absorption liquid is sprayed from the flue gas above the absorption and dehumidification part through atomization, and is fully mixed and absorbed in the filling layer with the flue gas, and the purpose is to absorb untreated acid gases such as HCl and SO₂. The hand sanitizer remaining after absorption is drained into the sink at the lower part of the dehumidification section. (Wardenier, Liu & Nikiforov. 2019.715-724)

4 LANDFILL LEACHATE TREATMENT TECHNOLOGY

The treatment of leachate in urban waste landfills has always been a very difficult problem in the design, operation and management of landfills. Leachate is the product of the gravity flow of liquid in the landfill, mainly from precipitation and the internal water content of the waste itself. Since many factors in the liquid flow process may affect the properties of the leachate, including physical factors, chemical factors, and biological factors, the properties of the leachate vary within a considerable range. The leachate will corrode the anti-seepage layer of the landfill, and then enter the ground, the groundwater layer will be polluted, and finally affect the surrounding geological environment. In the landfills of many mountainous cities, because of the height difference, for low-lying locations, seepage liquid has a huge impact on the environment. (Wang & Heng. 2020.171-172)

4.1 Adjust pH value

The leachate produced in the landfill site in the landfill is generally stored in a regulating tank with a pH value of 8-13, which is alkaline. The function of the biochemical pond is to prevent the pH value from drastically changing. When the leachate produced by the waste in the landfill site is too alkaline, the biochemical pond will not be able to perform its due regulation and the next chemical process cannot be continued. The function of the equalization tank is to prevent the generated leachate from exceeding the adjustment limit of the biochemical tank itself, so that the pH value of the leachate is in an appropriate range. (Huang & Liao. 2021.112-113)

4.2 Biological law

The common methods of biological method include anaerobic biological treatment and aerobic biological treatment. Compared with other methods, anaerobic biological treatment has lower cost, less energy consumption, simple operation, and less residual pollutants. The biogas derivatives produced in the method have a certain recovery value. At present, the main commonly used are up flow anaerobic sludge bed (UASB), internal circulation anaerobic reactor (IC), anaerobic fixed bed reactor (anaerobic filter AF) and anaerobic composite reactor (UBF). At that time, the concentration of COD components produced in the anaerobic treatment was too high, and the ammonia nitrogen could not be removed. Therefore, it

was necessary to perform aerobic treatment on the residue to facilitate the discharge work. (Huang & Liao 2021.112-113.)

Common aerobic processes include aerobic treatment processes including oxidation ditch, A/O process, SBR process, etc. The aerobic process can reduce COD and ammonia nitrogen in the leachate through biodegradation. The most widely used aerobic process is the denitrification pre-A/O process, which has the advantage of strong biological denitrification ability. The denitrification reactor is set at the front end of the process, and the good oxidation reactor is set at the back end to reduce BOD and perform nitrification. Therefore, through this sequence, the organic matter in the original wastewater can be used directly as the organic carbon source during the denitrification reaction, and the nitrate in the mixed solution containing nitrate returned from the aerobic reactor is denitrified to nitrogen. The aerobic nitrification reaction is set at the back end of the process to thoroughly clean up the untreated clean organic residues. At the same time, the organic matter after the aerobic reaction treatment does not meet the emission standards in all aspects and still needs further treatment. (Chen, Yuan & Bai. 2005.1-4)

4.3 Physical treatment method of landfill leachate

Common physical methods include membrane method and flocculation sedimentation. With the continuous research of landfill leachate technology, many technologies have been developed and advanced. Among them, membrane technology is currently one of the most successful application technologies and the best response in application practice. Including ultrafiltration, nanofiltration and reverse osmosis, the use of membrane technology has the advantage of better effluent quality and can meet higher emission requirements. It is in line with today's green and sustainable development concept, and also in line with the requirements of leachate treatment. The molecular L diameter of ultrafiltration (UF) sieve is 0.001-0.02 μm , which will not trap the salt contained in the leachate, and is used to separate microbial cells and sediments from the sewage. In view of this feature, the design combines ultrafiltration and aerobic biochemistry to replace the traditional secondary sedimentation tank with ultrafiltration. This combination is the membrane biochemical reactor (MBR). Nanofiltration (NF) is a pressure-driven membrane separation process between reverse osmosis and ultrafiltration. The sub-L diameter range of nanofiltration membranes is about a few nanometres, which is relatively different from other pressure-driven membrane separation processes late. (Jiang. 2008.130)

Nanofiltration membranes have a higher rejection rate for multivalent ions and organics with a molecular weight above 200, but a lower rejection rate for monovalent ions. In terms of intercepting organic matter

and salt, reverse osmosis membrane can remove all salts and organic matter, while ultrafiltration membrane has no interception effect on salt and low-molecular organic matter. Nanofiltration membranes can retain low-molecular-weight organic matter and polyvalent salts of sugars, and the rejection rate of monovalent salts is only 10% to 80%, which has considerable permeability. The rejection rates for divalent and multivalent salts are both above 50% to 90%. (Jiang. 2008.130)

The flocculation sedimentation produced in the physical method is by adding a coagulant to the water. After the action, the colloids of the suspended solids collide with other particles to agglomerate, and finally agglomerate together to form a flocculation sedimentation. At the same time, because of the increasing number of particles, their size and the mass keep getting bigger and the sinking speed keeps increasing. Most of the flocculation and sedimentation are caused by the alum blooms in the water and the organic suspended solids and activated sludge in the domestic sewage. By adding a coagulant to produce flocculation and sedimentation, part of the heavy metals and some organic matter in the leachate can be removed. Some organic matter has been degraded, but some salts and ammonia nitrogen cannot be fully removed, and chemical methods are needed to help. (Huang. 2021.116)

4.4 Chemical methods to remove hydroxyl radicals

Common chemical methods to remove hydroxyl radicals include Fenton reaction, ozone oxidation and electrochemical oxidation technology. Hydrogen peroxide is catalysed by divalent iron ions. It can be efficiently decomposed to produce hydroxyl radicals with strong oxidizing ability and high electronegativity or electrophilicity. The organic matter in the water will be mineralized and removed. At the same time, there is also the reaction product $\text{Fe}(\text{OH})_3$, which can be used as a colloid. Adsorb small molecule compounds to help the removal of pollutants. (Chen, Yuan & Bai. 2005.1-4)

Ozone oxidation process mostly uses air and oxygen containing low concentrations of ozone to treat wastewater. Ozone is used as a catalyst because of its easy decomposition in the air and needs to be made on site. Using ozone to oxidize cyanide, the first step is to oxidize cyanide to slightly toxic cyanate. The ozone requirement is theoretically 1.84 times the cyanide content; the second step is to oxidize cyanate to carbon dioxide and nitrogen, and the ozone requirement in theory, it is 4.61 times the cyanide content. In addition, ozone can also decompose pollutants such as sodium alkylbenzene sulfonate (ABS), proteins, amino acids, organic amines, lignin, humus, heterocyclic compounds and chain unsaturated compounds in wastewater. At the same time, the heavy metal ions present in the leachate, such as iron

and manganese ions, are oxidized by ozone and can also be isolated in the water. The advantages of the ozone oxidation method are that the reaction is fast and convenient, and the operation is simple and easy to use, and its side reaction products have no impact on the environment. However, the ozone method has high power consumption and high cost for industrial production. (Huang. 2021.116)

Ammonia nitrogen is a nutrient in water bodies, which can lead to water eutrophication. It is the main oxygen-consuming pollutant in water bodies and has great harm to aquatic organisms and humans. Electrochemical oxidation method, the process is to first generate a strong oxidant through the anode reaction, and then the strong oxidant reacts between the anode and the ammonia nitrogen in the electrolyte solution to cause a reduction reaction. (Huang. 2021.116)

5 DISCUSSION

There are several representative questions in the survey questions, from which we found that there are some problems in the public's understanding of garbage collection. The masses are not yet familiar with the specific classification of domestic waste. Most people only know the types of garbage, but are not familiar with the classification and disposal of specific garbage. The classification of wet and dry waste has been popularized, and the effect is very good, but currently there are too few pilot cities. For example, in the fourth question, the following types of garbage are not recyclable, and the answers are scattered. It can be seen that people still have doubts about what kind of garbage can be recycled and cannot accurately judge.

TABLE 3 What colour trash can be put into the smoke

What colour trash can be put into the smoke?	
A blue trash can	10.53%
B green trash can	21.05%
C Yellow Gray trash can	52.63%
D red trash can	15.79%

C option is the correct option.

TABLE 4 What is the incorrect statement below

What is the incorrect statement below?	
A After the abandoned cans dissolve	21.05%
B waste glass can be recycled	43%
C waste tablecloth is a colorful waste of	10.53%
D wet trash can	21%

B option is the correct option.

People do not understand waste collection, people's understanding of waste collection only stays on the literal meaning, and they do not really understand the necessity of waste collection. The first thing to do in waste collection is waste classification. The workload of waste classification is heavy and cumbersome. If many waste are sorted together at the waste collection station, it will inevitably lead to low recycling efficiency and not a long-term solution. This shows the necessity and urgency of popularizing knowledge of waste collection and classification. If people want waste collection to go to millions of households, then the popularization of proper recycling knowledge is urgent. Other countries have also experienced the difficulties China are encountering now. Sweden's waste recycling utilization rate has

reached an astonishing 99%, which shows that Sweden has to go further in the field of waste recycling. At the beginning of the waste collection work in Sweden, it took a full generation to cultivate the awareness of national waste sorting. The government's training of national waste sorting awareness started from childhood. They first introduced this concept to schools and educate children.

Incomplete infrastructure related to waste collection and the development of waste recycling is relatively compared to some developed countries, which has led to the limited coverage of infrastructure in many cities in China, incomplete infrastructure, and there is no correct charging regulations.

The relevant management regulations for waste collection are not perfect, Pan Gong, head of the E20 Environmental Platform Solid Waste Research Centre, said that according to incomplete statistics, more than 300 cities in China have implemented a municipal solid waste disposal fee system to a certain extent. Some local laws and regulations related to waste charging have been promulgated in various places. For example, the "Administrative Measures for the Collection and Use of Urban Domestic Waste Disposal Fees in Hainan Province", "Interim Measures for the Collection and Management of Municipal Domestic Waste Disposal Fees by Shanghai Units", and "Administrative Measures on Municipal Domestic Waste Disposal Charges of Guangdong Province". However, there is no law or regulation that uniformly stipulates waste disposal charges, and the charging system is still in its infancy. Only when a truly mature waste collection regulation system is built can waste collection be truly popularized. It is only when the relevant work units carry out the recycling work that there are laws to be followed and all laws must be followed. For waste collection fees, the purpose is not to increase fiscal revenue, but to let citizens understand the importance of waste collection through fees, and use economic means to promote the realization of waste classification and reduction goals.

Lack of a complete waste recycling industry system, at present, judging from the situation of seizures, the seizure status in most cities is less than 50%, and the environmental sanitation department cannot carry out seizure's door to door. The collection rate in Urumqi is less than 30%, the collection rate in Beijing does not exceed 50%, and the collection rate in Guangzhou is relatively high, but it does not exceed 70%. In addition, the waste disposal fee standard is relatively low. Even if the current collection standard is levied in full, the collected waste disposal fee can only compensate for about 40% of the waste disposal operation cost. Government support cannot continue.

Lack of a complete waste recycling industry system, and the industry chain of waste classification has not been established for a long time. Without the industrial chain for profit, there is no mature market

mechanism. Without a mature market, it is impossible to attract qualified companies to participate. It is not enough to rely solely on government support for capital investment. This cannot make the waste recycling industry sustainable and profitable. Waste recycling cannot be achieved by a short-term effort, which shows that a complete industrial system is urgent for waste recycling. (Wang & Jin. 2008)

6 CONCLUSION

The survey questionnaire obtained 49 samples, including college students, middle school students, and practitioners. The scope of the sample was expanded as much as possible to avoid the limitations of the survey results, resulting in inaccurate sample results.

China's common sense and policies on domestic waste are not popularized. Although the recycling infrastructure of various cities has been built, people do not know much about the waste that is put in the trash bins of various colours, which shows that most people cannot make the best use of the recycling bins. Most people do not know much about the implementation of the new policy and the penalties for violating relevant regulations. From this aspect, people can find that China's policy implementation has not been fully implemented. The enforcement of penalties should be strengthened to be very effective. For example, many cities are recruiting volunteers. Volunteers are responsible for explaining the classification of waste at recycling points and regulating waste disposal. To a certain extent, this can help China go through the transition period smoothly.

The habit of the masses has a long way to go. The development of the habit of sorting and putting out waste cannot be achieved overnight. Young people are familiar with new things quickly, but the elderly is not yet fully accustomed to sorting a wide variety of waste, which requires young people to help them. Everyone is aware of the urgency of waste collection, Therefore, the prospects for contemporary citizens to develop the habit of waste collection are very optimistic.

China should continue to strengthen the publicity of garbage collection at the source, formulate a system of resource recycling activities, raise citizens' awareness of environmental protection, and require citizens to sort according to requirements before disposing of garbage, so as to better realize the harmlessness, reduction and resources of urban domestic garbage. China promotes the development of municipal solid waste incineration technology. At the same time, biogas power generation from municipal solid waste landfills reduces greenhouse gas emissions while also improving local economic benefits. However, there is more leachate in the landfill, and the water level is constantly increasing. On the one hand, it reduces the amount of biogas produced, and on the other hand, it also reduces the power generation of the unit. China should continue to strengthen the adaptive research and industrial development of landfill biogas, and accelerate the application and promotion of landfill biogas power generation technology.

REFERENCES

- Chen, S.X. & Li, X.B. 2012 Research Progress of Dioxin Control Technology in Domestic Waste Incineration and Power Generation. *Environmental Science and Management*. 89-93
- Chen, X.M., Yuan P S., & Bai Z G. 2005. Treatment Technology of Leachate in Municipal Waste Landfill Site. 1-4
- Fang, P.P. 2017. Research on flue gas pollution control technology for household waste incineration power plants. *Electricity and technology*. 2017. 264
- Gan, H., Sun, X., & Xiao, Y. 2014. Pollution analysis and control strategy of food waste fertilizer utilization based on aerobic composting[J]. *Environmental Engineering*, 97-101.
- Guo, X.X., Yun, S. 2003. Discussion on the Design of Landfill Gas Collection and Drainage Engineering of Municipal Solid Waste Landfill Site. *Proceedings of the 3rd International Conference on Methane & Nitrous Oxide Emission Reduction Technology*. 520-524
- Han, Y.L. Lu, X. 2021. The Enlightenment of "Swedish" Domestic Waste Classification Management Experience to my country[J]. *Journal of Hebei Institute of Environmental Engineering*. 87-90
- Huang, H.L. 2021. Study on optimization of leachate treatment in municipal solid waste landfill[J]. *Energy saving and environmental protection*. 80-81
- Huang, X.F., & Liao, X.L. Chen Y. 2021. Research on Technical Transformation of Leachate Treatment in Domestic Waste Landfill under the Situation of Waste Classification. *Guangdong Chemical Industry* 112-113
- Jiang, T. 2008. Talking about the treatment technology of leachate in urban waste landfill. *Technology Information*. 130
- Kang, L., & Zhu, K. 2019. Enlightenment of Japanese and German waste classification management experience to China. *Journal of China Academy of Environmental*. 64-68
- Lin, Y.F. 2020. Research on the Status Quo and Countermeasures of China's Urban Waste Classification, Recovery and Resource Management. *Low carbon world*. 19-20
- Liu, F.Q., & Tang, W., Nie, Y.F. 2000. Summary of gas generation, control and utilization in municipal solid waste landfill[J]. *Chongqing Environmental Science*. 72-76
- Lu, Y.K., & P, X. 2010. Main problems and countermeasures of waste incineration power generation technology. 138-141
- Novak, P., & Kovar, L. 2011. diagnostics of landfill gas extraction system efficiency by instant sampling of methane emissions from landfill surface by flux-fox technology. 877-878
- Pu, Y.G., & Fan, R.G. 2017. Analysis on the Status Quo of Treatment and Disposal of Urban Domestic Waste in China. 95-98

- Sister, V., Shchepillo, L.V., & Nefedova, Y.A. 2006. Ways of improving the performance of energy-producing equipment at waste incineration plant. *Chemical and Petroleum Engineering*, 42, 210-214.
- Sun, X.Z.2020.Explore the flue gas pollution control technology of household waste incineration power plant. *Building Materials and Decoration*.171-172
- Wang, B., & Heng, Q.C.2020. Study on pretreatment + MBR + NF process for treatment of landfill leachate. *Yunnan Geographical Environment Research*.48-52
- Wang, F.C., & Tian, X.S.2002. Application of Waste Incineration Power Generation Technology in China. *China Power*.36-38
- Wang, G.L., & in Y P. 2008. The Causes and Countermeasures of my country's Rural Waste. *Modern economy* 10-11
- Wardenier, N., Liu, Z., Nikiforov, A., Hulle, S.V., & Leys, C. (2019). Micropollutant elimination by O₃, UV and plasma-based AOPs. An evaluation of treatment and energy costs. *Chemosphere*, 234, 715-724.
- Wu, N., Liao, D.X., & Xu. Z, Q. 2020. Main problems and countermeasures of waste incineration power generation technology. *Power system equipment*, 2020, 78-79
- Yan, M.F.2018.Research on Japanese Garbage Incineration Grate Furnace Technology[J]. *Sichuan Environment*,156-162
- Yang, H.2019. *Research on the Legal System of Recycling and Utilization of Domestic Waste in Rural my country*. Guangxi Normal University
- Zeng, X.Y.2008. See how the Swedes deal with domestic waste. *China Economic Weekly* 64-65
- Zhang, H.J.2015.Research on the Application of Landfill Biogas Power Generation Technology. *Theoretical Research on Urban Construction* (12).172-173.
- Zhang, S.P., & Jenny, S.T. 2015.Sweden Residents' Domestic Waste Management Experience and Innovation. *China Rural Science and Technology*, 74-76.
- Zhang, Y.T., & Zhang, J.W.2020. Analysis and Prospects of the Status Quo of Domestic Waste Treatment in China. *Proceedings of the Annual Science and Technology Conference of the Chinese Society for Environmental Sciences*
- Zhao, Y.H., & Zhang, Y.X., Xu, J.J.et dl. 2020.Resource utilization technology of aerobic composting of rural domestic waste. *Zhejiang Agricultural Sciences*,2020, 186-189.
- Zhou, C., Lv, B.2018.Calculation of the recycling rate of urban domestic waste in and its statistical data collection countermeasures. *China Environmental Management*, 70-76

APPENDIX 1

Waste collection knowledge question and answer

(1) Which of the following waste is domestic waste?

- A recyclable waste B cannot be recycled
C kitchen waste D harmful waste

(2) What such as harmful waste should be harmlessly treated?

- A chemical decomposition B incinerate
C biochemical treatment D production bolt compost

(3) Which of the following is not wet garbage?

- A fish thorn B leftover
C Whole Package Expired D Chicken Bone

(4) What are the following materials that are not available?

- A scrap wire scrap iron B leftover
C fishing D Chicken bone

(5) What is the incorrect statement below?

- A After the abandoned cans dissolve B waste glass can be recycled.
The C waste tablecloth is a colourful waste of D wet trash can.

(6) What waste belongs to expired drugs?

- A harmful waste B other waste
C cannot recover waste D kitchen waste

(7) If you do not submit urban life waste, order to reform, refuse to correct, how much fine for individuals every time?

- A 10 B 20
C 50 D 100

(8) What colour trash can be put into the smoke?

- A blue trash can B green trash can
C Yellow Gray trash can D red trash can

(9) What is the meaning of waste recovery?

(10) Do you have any knowledge of the latest waste collection policy?

