

Present Situation and Development Prospect of Garbage Power Generation Technology in China

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Key words: waste generation; status; generation technologies; advantage; effectiveness; problems; countermeasures; prospects

Abstract: This paper describes the overview of foreign and domestic garbage power generation profile, and then were introduced three ways trash generation, namely landfill gas power generation, waste incineration power generation and waste gasification power, then this paper describes a comprehensive benefits and advantages of waste generation and waste generation, and for the presence of waste generation questions put forward corresponding countermeasures, and finally, the prospects of waste generation were discussed.

Introduction

Waste as an inevitable product of human industrial production and daily life, has been a serious threat to urban environment and human health, the environmental pollution is increasingly serious and is growing at a rate of 10% per year. Statistics show that China's urban per capita annual output of waste 400kg, the country's major cities with an annual output of 1.5×10^8 t, urban living garbage storage capacity has reached 6×10^9 t, the occupation of land area of 5×10^8 m², and the annual growth rate of 8% to 10% of the rate of growth. 2010 annual output of urban waste in China is about 250000000 t. Overrun rubbish, forcing people to take positive measures, science reasonably to be processing and utilization, the reduction, resource, harmless^[1].

Garbage power generation is to achieve comprehensive utilization of waste through a special process. Can not only solve the garbage piled up, also can recycle the waste of energy, saving non renewable resources, and supply electric power shortage. Garbage power generation has become an important development direction of garbage disposal.

Status quo of garbage power generation technology

Industrial developed countries are the most commonly used 2 types of garbage power generation model: first, the garbage sanitary landfill, landfill gas, biogas as fuel for fuel burning power generation; two is directly to garbage as fuel, burning garbage power generation. The former because of in landfill after anaerobic digestion (fermentation), so-called biochemical method. The latter uses garbage combustion chemical energy into heat energy, so that incineration method.

Many countries adopt different waste disposal methods according to their own economic and technological development level, natural conditions, garbage characteristics and environmental policies. At present, there are more than 140 landfill gas power generation in the world, and it can be used to reclaim 5142000000 m³ from 4817 landfills all over the world^[2]. The United States has more than 180 garbage power plants, Germany has more than 50 garbage power plant, Japan has

built 149 garbage power plant, Japan, Switzerland, Denmark and Holland and other state-owned 50% ~ 80% of the waste incineration treatment.

China's garbage power generation started relatively late. In 1988, China built first garbage power plant in Shenzhen, the introduction of 3 sets of 150t/h MITSUBISHI heavy Martin type incinerator, 3 evaporation capacity of 13t/h double boiler tube natural circulation boiler, and the 4000kW turbine generator set in Hangzhou power plant. In China for the establishment of a garbage power plant and imported from abroad boiler waste basically is grate, expensive and in the low calorific value, high moisture waste, in order to ensure the boiler of normal combustion must add fuel oil, higher operation cost and economic benefits. The development of China's national conditions of the incinerator, to achieve low pollution and high efficiency combustion is currently being studied by many scientific and technological personnel, which is a comprehensive performance of the combustion technology. In 1998, Zhejiang University and Jinjiang Hangzhou group jointly developed this technology to Yuhang power plant, the original 35t/h chain furnace into a fluidized bed incinerator, single furnace daily processing waste 150 ~ 200t, has achieved good economic and social benefits.

Garbage gasification power generation is the direct waste into combustible gas as fuel for power generation. Gasification technology of MSW Gasification, pyrolysis, gasification, etc.. Garbage gasification is the process of generating gas by the organic components in the waste gas and the gasification agent in reducing atmosphere. The main gas produced by gasification is hydrogen and carbon monoxide, and the secondary gas composition is water, methane and carbon dioxide. Gasification and melting technology actually contains garbage in 450 ~ 640 Deg. C gasification and carbon containing ash in more than 1300 DEG C melting combustion process and the two process organically combine to form a whole. Pyrolysis gasification technology combined with innovative high temperature decomposition technology and traditional high temperature dependent gasification technology. There is no traditional boiler, but the simulation of the chemical process in the formation, the waste gasification. Anti fire gasification is the first garbage disposal technology in China^[3]. The characteristics of the technology mainly garbage anti fire gasifier gasification agent to enter from the top of the gasifier in, so that the furnace oxide layer in reducing layer above, produced by the combustion of water vapor and dry distillation gas does not directly to the outside of the furnace output, but with the preheated gasifying agent together through the oxide layer and reducing layer and the ash layer from the bottom of a discharge, so that the dry distillation gas dioxins and other harmful substances decomposed at high temperature under the action of, also produce clean gas.

Advantages of garbage power generation

Waste resources are very rich in China, more than 660 national city garbage collection total annual capacity of 140000000 T, the annual growth rate of 10%. According to estimates, China's urban residents per capita annual production of garbage 400kg. Beijing City, which generates 13000 t per day of waste, Shanghai City, 12000 t per day of garbage. In many parts of the garbage piled up, take up a lot of land. Garbage power plant can be transformed into electricity, electricity and steam for the city.

The main methods are direct incineration, incineration and landfill gas generation by waste pyrolysis and gasification. In addition, the use of garbage derivatives to power generation, super power generation technology and alkali metal thermoelectric conversion waste electrical appliances have gradually attracted domestic attention. Each region can choose the appropriate power generation technology according to their own situation. The method of direct incineration of

garbage in china.

The electricity price of garbage power generation is higher than that of traditional power generation technology. The State Council formulated the preferential policies for comprehensive utilization of resources, garbage power grid electricity can be ancillary fees preferential price, and exempt units Internet access, thus reducing the power generation cost of garbage power generation enterprises^[4]. China power grid management regulations, the construction of renewable energy power generation projects, in the case of the power grid capacity must allow the nearest Internet, and the acquisition of all Internet power.

Comprehensive benefits of garbage power generation

First of all, garbage power has a huge environmental benefits. With the continuous expansion of the scale of the city, the urban living garbage is increasing, and the phenomenon of the city of garbage is everywhere. A lot of garbage piled up, not only affect the appearance of the city clean, but also pollute the environment, breeding bacteria, infectious diseases^[5]. Although the simple landfill of waste less investment, large amount of treatment, simple and convenient, but this method can not make the volume of waste reduction, the need to take up a lot of land resources, and if not handled properly, it is likely to cause two pollution. And the waste incineration power generation, can make the garbage can be more secure, and can produce a certain economic benefits. After the waste is burned, it can reduce the volume of 90%, reduce the quality of 75%, the high temperature of combustion can remove a large amount of harmful substances and unpleasant smell in the rubbish. Of course, after the burning of the flue gas is to be treated to meet the standards before they can be discharged into the atmosphere. And then combined with the landfill treatment, will greatly reduce the capacity of the landfill can be greatly reduced, so that both the conservation of land resources and the protection of the environment.

Secondly, garbage power has certain economic benefits. In recent years, China's electric power industry is facing a huge challenge. Power supply is tight, while demand is growing at high speed, the natural resources such as coal oil is increasingly exhausted, and the distribution of resources is uneven, so that the power grid to invest a lot of money for long-distance transmission^[6].

Finally, garbage power has significant social benefits. Garbage power generation can provide more jobs for the community, improve the environment, improve the living standards of residents. In line with the basic requirements of building a harmonious society, it can also promote the development of related industries, such as garbage classification and recycling, and promote scientific and technological progress, so as to improve the competitiveness of our enterprises in the world.

Conclusion

Through the discussion of this paper, we have a certain understanding of garbage power generation as a new energy project, which effectively saves coal resources, protect the environment and promote the sustainable development strategy, which can accelerate the construction of a resource-saving and environment-friendly society.

Acknowledgements

This work was financially supported by the National Natural Science Foundation of China (Grant No. 51474093)

Reference

- [1] Chunxi Li, Zhaobo Du, Jianqiang Gao, et al. Present situation and development prospect of garbage power generation technology[J]. Boiler Manufacturing, 2003,4: 47-49. In Chinese
- [2] Jin Zhong, Gengfu Zhu. Overview of waste power generation technology [J]. China Resources Comprehensive Utilization, 2006, 1 (0).In Chinese
- [3] Bing Liu. Research on the application of [J]. Energy Technology for Waste Generation, 2010 (6): 25-28.In Chinese
- [4] Baofeng Zhang. Advantages and existing problems of waste generation [J]. Northwest Power Technology, 2005, 42-43.In Chinese
- [5] Yingjiang Wang. The market prospect of urban garbage power generation [J]. Guangdong Technology, 2009, 12: 115.In Chinese
- [6] Yajun Xiang,Xiaotong Zhang, Xiaona Guo. On the advantage of waste generation resource utilization [J]. Power Grid and Clean Energy, 2010 (6): 72-74.In Chinese