Research on Energy and Agricultural Alternative Energy Based on Crop Biomass Fuel Power Generation

Zhiyuan Li¹, Chaosong Fu² and Xing Lv²,*

¹National Investment Project Review Center, Jilin Provincial Development and Reform Commission, Changchun 130000, China.
²School of Economics and Trade, Jilin Engineering Normal University, Changchun 130052, China.

*Corresponding author e-mail: 728604791@qq.com

Abstract. The development and utilization of biomass energy based on crop biomass fuel power generation is of great significance for promoting China's ecological civilization construction, energy revolution and low-carbon economic development, and responding to the implementation of major national strategies such as global climate change. Based on the analysis of the status and trends of China's biomass energy development, this paper systematically analyzes the challenges China faces in developing biomass energy, and discusses the strategies and key technical directions for the future development of biomass energy. The research results can be Chinese students. The rapid development of material energy technology provides theoretical support.

1. Introduction
China is a large agricultural country with abundant biomass energy resources, mainly starch, sugar and cellulosic biomass. Starch and sugar raw materials are commonly used raw materials for ethanol production in China. Expired food is the main starch raw material for producing ethanol fuel in China; cellulose biomass is the traditional energy source for rural China. China's crop biomass resources alone are sufficient; China's livestock and poultry resources have an annual output of abundant dry matter, of which the quality of livestock manure produced by intensive farming is high, and the total annual discharge of industrial waste water in the country contains organic matter. About 10 million tons. With the expansion of the city scale and the acceleration of the construction of small towns, urban domestic garbage is increasing at an annual rate of 8% to 10%. It is estimated that the total amount of biomass energy resources available in the country can reach 1.5 billion tons of standard coal.

2. Overview and characteristics of biomass fuels
Biomass refers to any renewable or recyclable organic matter, including all animals, plants, microorganisms, and all organic matter excreted and metabolized by these living organisms. Generally, agricultural and forestry biomass, forestry waste, etc. are the main fuels, including corn biomass, cotton stalks, wheat stalks, rice straw, sugar cane bagasse, waste wood, and furniture factory waste. The fuel is a clean energy advocated by the state, and the cost of use is far lower than that of coal and
oil. It is clean and environmentally friendly, has high calorific value, high volatile content, high carbon activity, and ash is much lower than coal. The residual heat in ash is particularly low, and the burning rate can reach over 96%. In addition, its sulfur content, nitrogen content, etc. are much lower than coal, petroleum, etc., and are more suitable for use in biomass boiler fuels [1].

Figure 1. Biomass power generation fuel power generation agricultural replacement process

2.1. Crop Biomass Fuel Power Generation Technology
Biomass combustion power generation technology and supporting facilities in China's national conditions are accelerating, making the efficiency and operation time of biomass combustion power generation close to that of coal-fired power plants; mastering the slagging and corrosion characteristics of biomass burning devices, and improving biomass direct combustion projects Operational quality and reliability. Break through low-slagging, low-corrosion, low-pollution biomass direct-fired power generation technology, co-firing power generation measurement and detection technology and high-efficiency clean gas power generation technology, and achieve large-scale industrial application through technological equipment innovation. Accelerate the clean and environmentally friendly waste incineration power generation technology, actively build landfill gas power generation projects, promote the construction of biogas power generation projects according to local conditions, comprehensively utilize industrial organic wastewater and urban domestic sewage to produce biogas and generate electricity [2]. Improve the efficiency of biomass cogeneration, and actively promote the construction of biomass distributed energy systems.

2.2. Significance of alternative technologies for crop biomass fuel power generation
The development of biomass fuel infiltration power generation technology is necessary. The development of biomass fuel infiltration power generation technology is of positive significance for solving energy substitution problems, realizing energy diversification, ensuring national energy security, and reducing environmental pollution caused by fossil fuel use.

2.2.1. Comply with the strategic requirements of national energy development. With the rapid development of the economy, the limited reserves of fossil energy and the environmental problems brought about by the use of fossil energy directly affect the sustainable development of the world economy and the living environment of human beings. In order to reduce the dependence on primary energy and protect the living environment of mankind, the Chinese government has solemnly promised to the world to take the road of sustainable development in the 21st century, and to study,
formulate and begin to implement the 21st century sustainable economic, social and resource coordination development strategy. At present, China has already had relevant basic work, foreign technical conditions have matured, and it is transitioning to large-scale commercial development. China has also issued a series of preferential policies to support it [3].

2.2.2. Scientific approach to efficient use of biomass. Currently, in many rural areas of China, 30%-40% of biomass is used for cooking. It is used in direct combustion, and the heat utilization efficiency is only 5%-8%. Biomass is made into a molding fuel for power generation, and its efficiency can reach more than 35%. The use of biomass fuel power generation technology can solve the problem of lack of fuel and electricity supply, reduce the consumption of fossil fuels, and make the allocation of energy resources more reasonable. Therefore, biomass power generation is a scientific approach to the efficient use of biomass.

2.2.3. Seeking a new development path for many small thermal power plants in China. China still has a small thermal power plant with a total installed capacity of about 100 million kW. The average coal consumption for power generation is above 400gce, which is about 30%-40% higher than that of large advanced generator sets. It is both a major energy waste and a major environmental pollution. National industrial policies will limit and phase out small thermal power units. However, simply shutting down and eliminating will not only cause a lot of asset waste, but also affect local economic development and social stability. Biomass-forming fuel blending and power generation technology such as graduate materials has opened up a new way for technical transformation and reuse of small thermal power units [4].

3. Classification of alternative technologies for crop biomass fuel power generation technology

3.1. Crop biomass burning power generation technology
Crop biomass direct combustion power generation is the direct combustion of biomass in a boiler, which produces steam to drive steam turbines and generators to generate electricity. Key technologies for biomass direct combustion power generation include biomass, boiler corrosion protection, and fuel efficiency, and steam turbine efficiency [5].

3.2. Crop biomass burning hybrid power generation technology
Biomass can also be mixed with coal to generate electricity as a fuel, called biomass hybrid combustion power generation technology. There are two main types of mixed combustion. One is that the biomass is directly mixed with coal and put into combustion. This method has high requirements for fuel processing and combustion equipment, and not all coal-fired power plants can be used; one is the combustion of gas and coal produced by biomass gas, The combustion in this mixed combustion system, the generated steam is sent to the steam turbine generator set.

3.3. Crop biomass burning gas power generation technology
Biomass gas power generation technology refers to the conversion of biomass into gas fuel in a gasifier. After purification, it directly enters the gas engine to generate electricity or directly enters the fuel cell to generate electricity. One of the key technologies of gas power generation is gas purification. The gas produced by gas contains certain impurities, including ash, coke and tar. It needs to be removed by the purification system to ensure the normal operation of the power generation equipment.
3.4. Crop Biomass Biogas Power Generation Technology

Biogas power generation is a biogas utilization technology that has emerged along with the continuous development of biogas comprehensive utilization technology. Its main principle is to use the biogas-driven generators generated by anaerobic fermentation of a large amount of organic waste in industrial, agricultural or urban life to generate electricity. The equipment used for biogas power generation is mainly an internal combustion engine, which is generally modified from a diesel unit or a natural gas unit.

Figure 2. Biomass fuel power generation process

Waste-to-energy generation includes waste incineration power generation and waste gas power generation, which not only solves the problem of garbage disposal, but also recycles the energy in the garbage and saves resources. The waste incineration power generation uses the heat generated by the burning of waste in the incineration boiler. Heating to obtain superheated steam, driving the turbine to drive the generator to generate electricity. The waste incineration technology mainly includes layered combustion technology, and rotary combustion technology. The developed gas and incineration technology includes two processes: gas of waste and melt combustion of carbonaceous ash above 1300°C. The waste treatment is thorough, the process is clean, and some resources can be recovered. Is considered to be the most promising waste-to-energy technology.
Figure 3. Crop biomass fuel combustion decomposition process

4. Combustion replacement of crop biomass fuel

Biomass fuel combustion plays an important role in the entire energy utilization process, so that the fuel is fully burned, the maximum use of fuel, and the maximum heat generated are the issues that we must pay attention to. Biomass fuel power generation steam supply process, enters the boiler combustion, generates high temperature and high pressure steam, drives the steam turbine, and then drives the generator to generate electricity. The used and excess steam is transported to the heat users through the heat network pipeline. It can be seen that combustion is a core step in the process of energy utilization and steam supply.

4.1. Analysis of Combustion Process of Crop Biomass Fuel

The ratio of energy output to input in the production process actually reflects the energy efficiency problem. When the ratio is greater than 1, the energy efficiency is positive, there is net energy output, and the larger the ratio, the more net energy output. In the combustion process, it is important to increase the combustion efficiency and ensure that the net energy output is as much as possible. It has the relevant elements that need to be provided for combustion conditions, temperature, air, time, environment, etc. After the above factors are reached, the boiler needs to provide a sufficiently high temperature. The primary and secondary fans provide the oxygen required for fuel combustion, and the operator has sufficient time for full combustion, and the entire combustion environment needs to be greatly changed. In this way, the combustion can be fully ensured, and the combustion efficiency is greatly improved.

4.2. Biomass Forming Fuel Processing Technology

4.2.1. Biomass fuel processing technology is developing in a practical, efficient and low-cost direction. Whether biomass fuel processing technology can be widely used in production is inseparable from the practicality, efficiency and cost of the technology itself. Therefore, the future
development of biomass fuel processing technology will be based on practical, efficient and low cost of use. In terms of practicality, the cold forming compression technology will be mainly used, and the flat mode pressing technology will be mainly used in terms of high efficiency and low cost of use.

4.2.2. Biomass fuel processing equipment is moving towards mobile and automation. China's crop biomass resources are abundant, scattered and concentrated, and they are concentrated in fixed site processing. The transportation cost is too high and the economy is poor, which is not conducive to the promotion and application of crop biomass fuel processing technology. Therefore, biomass fuel processing equipment must be mobile to facilitate the use of thousands of households. At the same time, due to the uneven cultural level of the objects used in biomass fuel processing equipment, this requires that biomass fuel processing equipment should be able to be automated, and users can complete the processing of biomass fuel by simply completing the supply of raw materials. .

4.2.3. Biomass forming fuel power generation will develop steadily. In China, a large developing country with abundant biomass resources such as biomass and few fossil resources, with the breakthrough of low-cost, large-scale biomass fuel processing technology and blending power generation technology, molding fuel will first Industrial power generation, especially small thermal power and small heat and power enterprises have been widely promoted and applied. Therefore, accelerating the research on biomass-forming fuel power generation technology such as biomass burning in existing coal-fired power plants has greater practical significance and urgency in China.

5. Method for improving alternative technology for crop biomass fuel power generation

5.1. Strengthening the comprehensive utilization efficiency of biomass fuel power generation

Biomass resource utilization should take the path of integration and high value. In the research of high value, it is necessary to deeply understand the different vegetative tissues of biomass, the microstructure and evolution of different growth stages, and explore the evolution law of biomass structure. The effect of the poly feature. Integrating knowledge and research methods of more
disciplines, researching the hydrothermal transformation process of biomass in multiple dimensions and multiple perspectives, and gradually enriching and perfecting the theory and method of biomass hydrothermal catalytic conversion. Establish a diversified use of new ideas, and develop a distinctive technology and theoretical system for the efficient conversion of biomass resources into fuels, chemicals, materials and other products.

5.2. Strengthening the planning of biomass fuel power generation systems
The development of biomass energy technology must be combined with major national strategies such as beautiful rural construction and precise poverty alleviation. It is necessary to make overall consideration of various needs, and jointly consider energy, resources, environment, production mode, lifestyle, etc., organization and equipment of technology through industrial means; adopt market-oriented operation mode Integrate capital operations, technical services, and commodity trading into the development of biomass energy industry. It is necessary to transform the fragmented and individualized production and living patterns in rural areas, design, plan and centralize aquaculture and concentrated planting areas that are coupled with human settlements, and use rural waste recycling, resource utilization and energy utilization as control elements to achieve near waste. Zero emission and maximum use of resources, and build a new rural development model of coordinated development, coordinated development, and scale development.

5.3. Construction of a variety of biomass fuel power generation waste treatment energy system
We will build a comprehensive and comprehensive rural waste utilization system that integrates physical, chemical and biological transformation of intelligent and large-scale raw materials, change the traditional single disposal mode, enhance the integration of various biomasses, and realize the coordinated disposal of various wastes. It mainly includes: livestock and poultry manure - energy crop co-processing and energy utilization system, rural garbage - livestock manure - biomass waste co-processing etc., building a "metabolic co-production industry park" "To achieve the single project in the region to dispose of and use various types of rural waste, realize the full amount of coordinated utilization of various types of rural waste, convert agricultural and forestry waste into flammable gas, chemical raw materials, organic fertilizer and other resources, and improve the comprehensive utilization of rural waste." Effectiveness and economy.

6. Conclusion
At present, the situation of China's air pollution prevention and control is severe. As a clean and renewable energy source with low carbon and low sulfur, biomass can solve the pollution problem caused by the incineration of a large number of abandoned crops, and it can generate income for the residents. It is the country's further policy. Support efforts. Although there are still some problems in the biomass power generation industry, the uneven distribution of biomass energy and the lack of mature technology, but with the continuous improvement of relevant national policies and systems, the biomass power generation industry will move toward a better future and achieve clean energy use. The goal is to reduce emissions of polluting gases.

Acknowledgments
This work was financially supported by Construction plan of "two districts" in Jilin Province (2019-2022).

References
[1] Du Xiangyu, Zhou Dadi. China's science, green, low-carbon energy strategy. China Engineering Science, 2, 6, 2019, pp. 4-10.
[2] Qin Shiping, Hu Runqing. Roadmap for the development of China's biomass energy industry 2050. Beijing: China Environment Press, 6,10,2018, pp. 195-200.
[3] Xiao Gang, Ji Qinhong. "Bioenergy - The Gift of Sunshine and the Earth". New Energy Series. Wuhan University Press, 8,10,2016, pp.221-223.

[4] Zhang Zhiying, Lu Jiahua. "New Energy and Energy Saving Technology". Tsinghua University Press., 12,2017, pp. 216-219.

[5] Li Lianming, Meng Zhihao. "Agricultural waste optimization comprehensive utilization of power generation, steam supply key technology research and industrialization demonstration". Our research project, 06, 2016, pp.123-126.