

TYPES OF WASTE FOR BIOMASS

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Abstract

The situation with the actual consumption of biomass for energy and biofuel production in Ukraine is actually the opposite of the potential structure. The powerful development of energy use of by-products and waste in Ukraine is hindered by a number of barriers. Among them, the most significant are the lack of agricultural producers with equipment for harvesting the appropriate types of biomass, the complexity of organizing the "harvest-supply" chain, the general underdevelopment of the biofuel market (lack of a biofuel exchange) and some others].

Keywords: biomass, biogas, fuel, gas turbine, steam turbine, cogeneration plant.

Introduction

Analysis of the structure of biomass consumption for energy needs indicates the need for a wider use of biomass of agricultural origin and energy crops. In parallel, woody biomass from so-called additional sources should be involved in this process, in particular waste from pruning and uprooting of perennial agricultural plantations, as well as biomass from the reconstruction and restoration of field shelterbelts and other protective forest belts [1]. The aim of the work is to highlight theoretical data on biomass waste, the prospects for their energy potential and approaches that will allow in the future to more effectively and efficiently create and implement projects that are already fully used in European countries today.

Research results

Biomass is one of the most promising renewable energy sources, but its use in Ukraine is limited, despite the positive trend in recent years. The basis of biomass is organic carbon compounds, which, when burned, release heat when combined with oxygen. The initial energy of the "biomass-oxygen" system occurs under the influence of solar radiation in the process of photosynthesis, which is a natural variant of the conversion of solar energy. Using chemical or biochemical processes, biomass can be transformed into other types of fuel or into final energy. During the combustion of biomass or its derivatives, the organic carbon contained in it and oxygen from the atmosphere react to form carbon dioxide and water. The process is cyclical, because the carbon dioxide released during combustion can participate in the production of new biomass. Thus, biomass is a renewable energy source [1].

One of the main advantages of biomass energy use is its multivariability both in terms of energy conversion technologies and in terms of its final use. Biomass can be used for energy purposes by direct combustion (wood, straw), as well as in the processed form of liquid (rapeseed oil esters, alcohols, liquid pyrolysis products) or gaseous biofuels (biogas from agricultural and crop waste, sewage sludge, organic part of solid household waste, products of solid fuel gasification). Conversion (transformation) of biomass into other types of energy carriers or final thermal or electrical energy can occur by physical, chemical and biochemical methods [1].

It should be noted that a number of biomass energy conversion technologies are commercial and widely tested. These include, for example, transesterification of oil crops (biodiesel production), fermentation of sugar and starch crops (bioethanol production), pyrolysis of lignocellulosic biomass, methane fermentation (biogas production). A number of other technologies, such as the production of 2nd generation bioethanol from agricultural lignocellulosic raw materials or the production of biodiesel from microalgae, are at various stages of development and may occupy their niche in the future [1]. The origin of biomass can be quite diverse, starting from waste and residues from agriculture, the food industry, households and ending with

municipal waste. Wood waste in forestry, woodworking and pulp and paper industries is also a source of biomass. For biomass production, special energy crops that give rapid mass growth (willow, poplar, plane tree), or certain varieties of herbaceous plants (miscanthus, millet, sorghum, etc.) are also used. Energy crops also include rapeseed and sunflower for the production of liquid motor fuels. For the purpose of energy use, corn and sorghum can also be grown for the production of solid biofuels and biogas. An important source of biomass is livestock waste (manure, manure, other waste), as well as municipal waste (sewage sludge, household waste, organic fraction of solid household waste, etc.), which can be used for the production of solid biofuels and biogas [2].

According to the Bioenergy Association of Ukraine, as of 2018, the energy potential from biomass is 23 million tons of CO.

Table 1 - Energy potential from biomass

Type of biomass	Theoretical potential, million tons	Potential available for energy	
		Share of theoretical potential, %	million tons
Straw of grain crops	32,8	30	3,36
Rapeseed straw	4,9	40	0,68
Corn grain production waste (stalks, cobs)	46,5	40	3,56
Sunflower production waste (stems, baskets)	26,9	40	1,54
Secondary agricultural waste (sunflower husks)	2,4	100	1,00
Wood biomass (firewood, logging residues, wood processing waste)	8,8	96	2,06
Wood biomass (deadwood, wood from protective forest belts)	8,8	45	1,02
Biodiesel (from rapeseed)	-	-	0,39
Bioethanol (from corn and sugar beets)	-	-	0,82
Biogas from agricultural waste	1,6 billion m ³ CH ₄	50	0,68
Biogas from solid waste landfills	0,6 billion m ³ CH ₄	34	0,18
Biogas from wastewater (industrial and municipal)	1,0 billion m ³ CH ₄	23	0,19
Energy crops: willow, poplar, miscanthus (1 million hectares*)	11,5	100	4,88
Energy crops: corn for biogas (1 million hectares*)	3,0 billion m ³ CH ₄	100	2,58
TOTAL			23

*Assuming cultivation on 1 million hectares of unused agricultural land

The main components of this potential are crop by-products (total 10 million tce or 44% of the total biomass potential) and energy crops (total 7.5 million tce or 32% of the total potential).

According to UABIO forecasts, in the period 2020-2050, the use of woody biomass in Ukraine will remain at the same level, but the share of using straw, stalks, sunflower husks, agricultural residues, energy crops, liquid biofuels, and solid household waste for energy production will increase. This forecast is based on calculations that show that the potential of woody biomass and sunflower husks in Ukraine in 2020 has already been used by more than 90% [3].

Conclusions

One of the main values of bioenergy is that it has a positive impact on the environmental situation, as the use of bioresources allows for the utilization of organic waste, reduces environmental pollution, and provides alternative energy.

LIST OF REFERENCES

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