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Analysis of Alternative Fuel Briquettes and Pellets Made From Biomass (in the Case of Uzbekistan)

S. U. Madarova [1]

[1] Department of "Mubarak Oil and Gas Production".

Annotation:

This article discusses the general concepts of fuel briquettes and pellets made from biomass, highlighting their potential, raw materials, and composition. It emphasizes the increasing demand for energy sources in Uzbekistan, particularly in remote areas during cold winters. The study explores how biomass energy, a renewable resource derived from organic waste, can serve as a sustainable alternative to traditional fuels. The production of fuel briquettes and pellets from biomass is considered an effective solution to meet rural energy needs, reduce deforestation, and contribute to energy security and environmental protection. The paper also covers the types of pellets based on their raw materials and the environmental benefits of expanding biomass fuel production. The implementation of biomass-based alternative fuels is seen as a promising direction for Uzbekistan's energy sector.

Keywords: Biomass, briquette, fuel, pellet, wood waste, energy resource.

Currently, the need for energy sources in our Republic is increasing year by year. Providing heat in the cold winter days in remote districts and villages of our republic is one of the urgent issues.

Experts in the field are waiting for solutions to global problems such as preventing global environmental disasters, preventing climate change and global warming, and ensuring the country's energy security, along with the sustainable development of the economy.

In our republic, serious attention is paid to the issues of energy saving and energy efficiency improvement. In particular, the Decision of the President of the Republic of Uzbekistan dated February 16, 2023 "On measures to accelerate the introduction of renewable energy sources and

energy-saving technologies in 2023" is important in our country. The use of renewable energy sources, especially biomass energy, is an effective and promising way to save traditional fuel and energy resources [1].

Biomass is organic waste belonging to flora and fauna and is a classic renewable energy source. It can be processed by physical, physico-chemical and biological methods to obtain liquid, gaseous and solid alternative fuel. Biomass sources include crop waste, cottonwood, various wild grasses, fallen leaves, coal dust, municipal solid waste, industrial waste, livestock residues, forest products, as well as timber processing and shipping, wood Examples are wood, paper pulp, charcoal, chicken manure, animal excrement, coal dust and other waste from the production of materials. Biomass sources of this type are very common sources of energy. According to experts' calculations, biomass energy can meet (15-19) percent of Uzbekistan's energy needs. Production of fuel briquettes from biomass allows for continuous energy supply to consumers located in rural areas, that is, far from centralized energy supply [2].

To get one cubic meter of firewood, 3-4 average trees are cut. If an average amount of 3 cubic meters of firewood is used to heat the house of one rural family in winter, this will "cause" 9-12 trees to decrease every year. So, as the number of people grows year by year, the number of trees is rapidly decreasing. By making an efficient energy stove, we make our house warmer, and at the same time, reduce the cost of firewood and thereby help nature. But there are ways to further reduce the cost of firewood and eliminate it altogether. One of them is fuel briquettes. Fuel briquettes are environmentally friendly products, raw materials for their preparation are available everywhere in unlimited quantities. One average (family) farm can provide itself with 500 kg of fuel briquettes due to its waste. Fuel briquettes are obtained naturally from plant waste without chemical treatment. Therefore, the negative impact on the environment when burning is relatively small. According to the calculations of international experts, the heat capacity of briquettes is equal to 4.5-5 kW/kg, which is 1.5 times more than that of firewood, that is, it can be equated to coal. Imagine, when burning 500 kg of fuel briquettes, 800 kg of firewood, 240 m3 of gas, 250 l of diesel fuel, 500 kg of coal, 340 l of fuel oil give heat. At the same time, the use of fuel briquettes not only preserves trees and plants in our country, but also significantly saves money spent on firewood [3].

Figure 1. Necessary raw materials and materials for biomass fuel briquettes and pellets

Types of pellets: Pellets are conventionally divided into types depending on the compressed raw material. A brief description of them is given below:

Pellets of the first grade (white) are made from different types of clean wood without bark impurities. They are distinguished by the lowest ash content - 0.5% and the best calorific value - up to 5.4 kW / kg.

The second type of fuel contains different impurities, so it has a darker color than the first type. It also includes cereal straw pellets. Impurities almost do not affect the calorific value of fuel, but its ash content is high - 1-1.5%.

Type 3 pellets with an ash content of 2.5-3% are made from all types of agricultural waste. The heat of combustion of such fuel is also very high - at least 5 kW / kg. Burning pellets is safer than wood and coal.

From an environmental point of view, expanding the production and use of pellets reduces a large number of different wastes, which has a very beneficial effect on the environment.

Cane Pellets: In all respects, fuel pellets made from cane have good advantages over peat pellets, as well as pressed straw. In addition, cane pellets burn with less sulfur and carbon dioxide, which has a positive effect on the environment. Such fuel does not have an unpleasant smell and can be used as a natural adsorbent.

This type of fuel is widely used for heating fireplaces and boilers in private houses. According to the calorific value, cane pellets are less than wood pellets, but the price of such fuel is significantly lower [4].

Currently, the production of fuel briquettes has been launched in some regions of our Republic. In particular, in the Kashkadarya region, the unitary enterprise "Kashkadarya regional coal supplier" belonging to the Uzbekkomir joint-stock company is currently producing cylindrical fuel briquettes from coal powder with a radial hole in the middle. This type of briquettes has a radial hole in the middle. Briquettes of this type satisfy the fuel demand of the residents of our region to a certain extent.

Currently, in our Republic, at the "Angren coal briquette" factory, products are made taking into account the physical and mechanical properties of coal. Compared to coal, the advantages of coal briquettes are numerous:

- firstly, the burning time is three times longer, it emits the same heat from the beginning to the end of the burning process, which means that the briquette does not leave ash over time and does not contain harmful inorganic impurities;
- secondly, according to its technical characteristics, coal briquettes are in no way inferior to coal. In addition, production of fuel briquettes and pellets has been launched in Fergana and Gulistan.

For the first time in Uzbekistan, the production of solid fuel pellets from waste was launched in the Khojaly region of Karakalpakstan. Its annual production capacity is 12 thousand tons. Pellets are made from straw of various cereals, corn stalks, leaves of almost all plants, wood waste and household waste. The plant is another joint project of the Ministry of Energy and the Korean Energy Agency, and the produced product serves to develop alternative fuels and energy saving in our country. This solid fuel product, which is considered one of the types of alternative fuel, is used for heating homes and social sphere objects [5].

In the Republic of Uzbekistan, "Biofuel Company" produces alternative fuel pellets and briquettes from various agricultural and industrial wastes. The main raw materials are peat, straw, cellulose, grass, hay, sunflower husks, pulp, algae and tree waste.

Figure 2. Briquettes for burning fireplaces and stoves

The production of biomass briquettes helps to recycle biomass resources and effectively alleviates the problem of energy shortage [6].

Alternative fuel can be obtained using pyrolysis and burning of local raw materials using a non-traditional method. The pyrolyzer device enables the production of fuel and thermal energy, as well as activated carbon. Briquetting of the resulting product, i.e. activated carbon, is achieved under high pressure using a jack. It is desirable to prepare fuel briquettes and pellets under high pressure from wood charcoal produced during thermo-chemical processing of organic waste. Making alternative fuel briquettes and pellets from a mixture of animal excreta, especially cattle manure and straw waste, is a high-efficiency use of renewable energy sources. Biomass processing is also environmentally friendly and sustainable energy.

All of the above analyzes show the need for effective use of biomass in the Republic of Uzbekistan. In the future, reserves of natural fuels such as gas, oil, coal, fuel oil are decreasing on our planet. Therefore, introduction of the use and development of alternative fuel briquettes and pellets from biomass takes an effective place not only for our Republic, but also in the energy market of the whole world.

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