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THE INFLUENCE OF THE RAW MATERIALS COMPOSITION ON CHARACTERISTICS OF WOOD PELLETS FIRING RESEARCH

O.O. Opryshko, N.O. Opryshko, I.S. Zubkov

Upgraded biomass fuel, pellets and briquettes are becoming more and more popular in our country. A study on the use of fuel pellets were carried out in the Soviet Union. these products were considered for the rational use of waste. In 2014, the situation in the energy market has changed dramatically due to conducting of combat operations in areas of coal mining in the Donbass. This contributed to the widespread implementation in enterprises boilers for solid fuels including biomass fuel, that is the use of local resources.

It should be noted that the problem of the optimal composition of the wood pallets is debating. So given that the availability of raw materials in pallets of bark and branches increases the ash content and reduces fuel value, but on the contrary is stated that the presence of bark in pallets increases furnace efficiency. There is plenty of bark during the procurement and processing of industrial wood. The study of the feasibility of wood recycling in pellets has practical interest.

The aim of the study is to establish the dependence between the pellets composition and individual pellets burning time.

Materials and methods. Samples were obtained in May 2014 during the harvesting of pine timber. There were bark, sawdust from shredded branches and stem. Diameter of branches ranged from 40 to 20 mm. In all cases, the pine-needles were cut. All samples were obtained from a tree, which age was 38-40 years. Within 4 months samples were dried in the open air in the hangar without direct sunlight floating at a temperature of 20 ± 8 ° C. The thickness was less than 2 cm for drying, samples were mixed up periodically to prevent decay. Samples of pellets with a diameter of 8 mm were received in October 2014 using industrial equipment. Granules were obtained according to DIN 51731 (Germany). For experiments we used samples with weight 0,6 ± 0,05 g. Before the study samples were further dried in a heat oven at 100°C for 12 hours. As standard samples of domestic granules

(diameter 8 mm) were used, without pine needles, bark and branches in its composition.

Research was carried out in the installation, created on the basis of a muffle furnace. Installing allowed to change the temperature in the chamber in the range 100-900 ° C. 12-mm hole was at the top of the installation. The sample was placed into the chamber through a hole using a steel suspension. Smoke came out from the chamber through the hole. In the back of the installation was a hole for air access. The temperature was controlled with a thermocouple. The distance from the sample to thermocouple was about 5 cm.

The process of burning was observed through a hole in the door of the muffle furnace. Since the investigated samples had small geometric dimensions and hole diameter for follow-up was about 10 mm, observations were carried out with a camcorder. Note, that time of pyrolysis (the time when the pellet was enveloped in flame), and time of burning coke (the time of disappearance of flame to cease emitting light in the optical model) were recorded separately. After combustion of the sample suspension was retrieved from chamber. The chamber was aired for 0.5 minutes. In the case of mechanical destruction of the sample during the putting of the sample into the chamber, research was stopped. For each group of wood pallets research was carried out for 4 times. New sample was placed in the chamber after setting the required temperature. The temperature at which the sample began spontaneous combustion was determined during further calibration study. It was found that spontaneous combustion occurred starting from 500°C after heating the sample. With increasing temperature the time of ignition decreased. At 700 °C spontaneous combustion lasted for several seconds. Therefore, for research in the chamber we maintained temperature of 700 ± 20 ° C.

Additionally, it was determined the total moisture content of samples, their density, and percentage of the ash material weight.

Results. It has been shown that the standard technology of making granules will provide samples of the branches and bark with almost the same density than samples obtained from sawdust from pine trunk.

It was found that pyrolysis time for all samples ranged from 50 to 55 seconds during their transformation into ashes. However, given the fact that time of placing the sample in the chamber could vary to 2 seconds, it was concluded that there were no actual relation between the granules composition and pyrolysis time for pine pellets.

It was shown that the presence of bark in fuel pellets composition leads to an increase in length of operation with longer combustion of coke. The intermediate result for pellets from pine branches was due to the presence in its composition of bark.

Conclusions.

1. The pyrolysis time didn’t depend on what part of wood pellets were created.

2. The presence of bark in fuel composition can increase the duration of its coke part of burning for one-third.

3. Bark and branches of wood, is an advanced material for making fuel pellets for stoves and fireplaces, where not intensive but lengthy process of decay is necessary.