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Analysis of Drying Process of Cherry Wood Chips in the Experimental Combined Dryer with Helio-collector

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Abstract

Drying is an important phase in the production of a renewable biomass into a solid biofuel (briquettes, pellets). The paper describes the technological and construction specifics of a combined biomass dryer with helio-collector and analyses parameters of the drying process on the example of the drying of cherry wood chips.

The idea of a combined biomass dryer has been materialised in the framework of the project which was implemented in the laboratory building premises of the State Agrarian University of Moldova in Chisinau. The experimental dryer was equipped with a passive solar system such as a simple three-section helio-collector. This collector heats the air which is then passed into the dryer. Calculations were done to determine the main drying parameters and the efficiency of the combined dryer. The dependence of the biomass moisture changes on drying time was observed at different locations of the solar-powered biomass dryer. Above all, the research was focused on monitoring the biomass moisture changes during the drying process. The moisture content of the cherry wood chips was observed in dependence of the drying time and at different locations of the drying chamber. Further parameters such as the relative air humidity and the air temperature were measured as well.

It was found that the combined biomass dryer with helio-collector works very well under the conditions of Central Moldova during the sunny period of the year from May till October without additional heat supply from the by-passed boiler. For the drying process acceleration it should be conducted continuously in order to increase its efficiency and to reduce its energy intensity.

Keywords: Biomass, drying chamber, heat energy, heat exchanger, helio-collector, material moisture, relative air humidity, reversible fan, temperature