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CONTROL THE EFFICIENCY OF FUEL USE FOR THE PROCESS OF DRYING AT THE PEAT BRIQUETTING PLANT

One of the main goals of the Energy Strategy of Ukraine until 2030 is to increase the efficiency of consumption and use of energy products [1]. To realize this goal, it is necessary to increase the harvesting and production own energy resources. Among the main regional types of fuel are milling peat and briquettes from it. The short-term perspective of increasing the production of peat briquettes is primarily due to the efficiency of the use of this resource at the peat plant. It is known that for the existing peat-briquetting factories in Volyn region, the raw material base is exhausted [2].

The production of briquettes is accompanied by the consumption of heat and electric energy, as well as the consumption of peat raw materials in the technological process. The most energy-consuming and metal-containing complex in the production of peat briquettes is the energy technological complex of peat drying process. In the steam tube dryer as the heat transfer agent is used steam. To minimize energy consumption for the drying process, it is necessary to determine the required amount of heat (kJ) for drying peat of certain physical and mechanical properties to the qualitative characteristics of the drying peat. This allow to direct into the dryer saturated steam with the required pressure and temperature.

According to [3], the specific heat consumption per 1 kg of moisture that is removed from the peat is composed of:

$$q = q_1 + q_2 + q_3 + q_5,$$

where q_1 – specific heat consumption for evaporation the moisture from the material, *kJ / kg of evaporate moisture;*

q_2 – specific heat consumption for heating the drying agent, *kJ / kg of evaporate moisture;*

q_3 – specific heat consumption for the heating the peat, *kJ / kg of evaporate moisture;*

q_5 – specific heat consumption to cover environmental losses, *kJ / kg of evaporate moisture.*

The loses of heat depends on the characteristics of the peat that enters the dryer and which is to be acquired when it comes out of the dryer. To obtain quality briquettes, press complex should receive peat with certain characteristics – the moisture content of the dry matter within 10%-20%, the temperature of the peat in the range of 60-80 °C. The temperature of the exhaust gas must not exceed 120 °C to ensure the fire safety. In accordance with the limit values of these limiting factors, the required heat consumption must also be in the minimum and maximum marginal limits.

If, in case of changing the disturbing influences (temperature, moisture contest, peat ash, etc.), the thermal energy consumption is less than the minimum or greater than the maximum value, then it is necessary to increase or decrease the supply of thermal energy to the dryer. Determination of the limit of heat consumption in accordance with the considered method of determining the allowable values of heat consumption may serve as a function of monitoring the consumption of FER (fuel and energy resources). The task of energy monitoring is to analyze information based on norms, rules, energy use regimes to ensure efficient use of energy resources, minimize negative impact, and determine the options for choosing energy saving measures. The monitoring of the peat drying process includes such basic functions as control,

evaluation, forecasting and analysis of the drying process of peat in certain operating of drying regimes, press' and dryer's loading and productivity (Fig. 2).

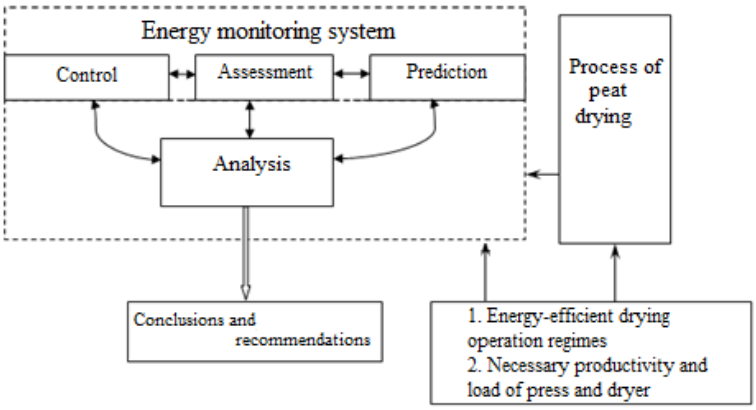

Figure 2 – Block diagram of the energy monitoring system for peat dryer operation process

The implementation of this scheme is as follows. For certain values of the physical and mechanical properties of peat for the necessary, according to a particular situation at the plant, loading of drying installations and presses (depending on the demand for products, seasons, etc.) the energy-efficient drying operation regimes are determined. Energy-efficient regimes consider the level of required heat energy consumption and, accordingly, the waste of steam that income to the dryer. Necessary values of control effects from the control system are sent to the executive mechanisms of the drying process. The current energy consumption values are fed into the energy monitoring system. Also, an energy-efficient energy consumption data are sent from the system of determination optimal drying regimes. Current data in monitoring system is comparing with the optimal ones. Based on these data, the estimation of indicators, analysis of possible deviations is carried out. By the set of data that were received in the system, it is possible to develop a system that can predict the further process progress of the drying process. The system, based on existing data, can formulate a model that can predict the averaged data of the physical and mechanical properties of peat of the whole trolley. And, accordingly, determine the optimum level of energy consumption and the values of the control parameters of the drying peat from one trolley. In addition, the presence of an energy monitoring system allows to predict the usage of FER for drying process, to analyze further technical solutions for improving the drying process, to create the energy-efficient measures at the plant.

References

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