STUDY OF BURNING OF SOLID BIOFUELS BY MODELING TOOLS

R. Zahorodniy, a graduate student

Ternopil National Pedagogical University

Energy technology combustion in boilers is largely dependent on the type of fuel used. Because now promising worldwide is the use of biofuels, as actual combustion process is research to identify ways to ensure its effectiveness.

It should be noted that biomass has certain characteristics that distinguish it from traditional energy sources. In addition, some of the characteristics of solid biofuels, such as density, particle size, moisture content, using crushing and compaction are subject to change. Therefore, in the operation of heating equipment to improve the efficiency of combustion of solid biofuels should take into account these characteristics.

The mathematical description of technology of solid biofuels should take into account the relationship of physical, chemical and electro-physical properties of the process. Therefore, the actual simulation is burning technology to analyze their characteristics.

The purpose of research - development of a mathematical model of the process of solid biofuels, reflecting the real physical and chemical processes that occur during combustion.

Materials and methods research. The basis of the modeling process laid the mathematical description of physical and chemical processes of solid fuel burning boilers cells in static mode, which most fully represented in the works of Professor V.Pomerantsev. Research of dynamic characteristics of combustion of fuel were based on scientific studies V. Krasheninnikov, P. Profosa and V. Baba.

Results. Burning solid fuel flows in the presence of physical and chemical processes:

- Motion components of the fuel mixture in the combustion chamber;

- The presence of turbulent diffusion and molecular precursors and reaction products;

- Heat transfer in gas flow of combustion products and flue gases;

- Convective heat transfer particles from burning gas environment;

- The process of heating the particles sublimation of volatile, transport and combustion of the gas volume.

Due to the complexity of aerodynamic and physical-chemical processes and their significant dependence on the three spatial coordinates, while creating a mathematical model adopted a number of assumptions, including:

- Combustion of volatile substances and afterburning products of incomplete combustion occurs in a gaseous environment;

- Reaction occurs on the surface of carbon spherical particles of the same size;

- Convective heat transfer from the system and diffuse thermal conductivity can be neglected.

In view of the accepted assumptions description combustion of solid fuel based on the laws of conservation of mass, energy and momentum, resulting from the first and second laws of thermodynamics.

The solution to this system of equations in general is impossible, so was the transition to the one-dimensional model with lumped parameters.

The system of equations must be supplemented by the equation burning rate initial mixture of components necessary to calculate the mass change, and the equation to calculate the concentration of nitrogen oxides in combustion in the combustion zone.

The analysis of the equations describing the combustion of solid biofuels suggests that further research to establish the values of input and control parameters and relationships between them. Therefore, it is reasonable for experimental research on the physical simulation model and solid fuel boilers.

Thus, further research is necessary to analyze the dynamics of the combustion process based on models developed in order to provide energy saving cooking process biofuel mixture to heat generators.