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EXPERIMENTAL STUDY OF MAGNETIC FIELD EFFECT ON THE SWIRLING COMBUSTION OF GRANULLATED RENEWABLE FUELS

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ABSTRACT

The main aim of the recent experimental research is to provide a cleaner and more effective combustion of different types of granulated renewable fuel (wood pellets and straw pellets), using the non-uniform downstream decreasing magnetic field effect on the swirling flame dynamics, mixing rate of combustion species, heat production rate and composition of polluting emissions.

The experimental study of the magnetic field effect on the swirling flow dynamics and composition of the products is carried out, using the experimental device that is composed of the gasifier and water-cooled sections of the combustor, downstream of which the swirling flow field is developing. The upper part of the gasifier was inserted into an axyalsymmetric magnetic field that was created by the coil of electromagnet.

The magnetic field effect on the flame formation and fuel burnout was estimated, providing the complex measurements of the combustion and emission characteristics at the different stages of the swirling flame flow formation by varying the magnetic field strength. The complex measurements of the flame characteristics include the local measurements of the flame temperature, using the Pt/Pt-Rh thermocouples, flame composition and velocity, using the gas analyzer Testo 350 XL and the rate of heat production with continuous data monitoring and recording, using the date recording plate PC-20.

The experimental study of the magnetic field effects on the swirling flame formation and combustion characteristics of the granulated renewable fuel has shown that the magnetic field can be used as a tool to control the field-enhanced mass transfer of the paramagnetic oxygen in a field direction, determining the variations of combustion dynamics and composition of polluting emission towards the higher magnetic field induction.

Keywords: granulated renewable fuels, magentic field, swirling combustion.