Experimental study of the effect of hydrogen addition to fuel on combustion instability

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Perspective development of aircraft gas turbine engines and gas turbine power plants created on their basis are associated with the creation of low-emission combustion chambers. The most promising approaches for reducing the pollutant emissions in exhaust gases are the combustion of an "ultra-lean" fuel-air mixture and the use of alternative fuels with a lower carbon fraction. In the coming decades, such a fuel will be a methane-hydrogen mixture.

The main problem in the development of combustion chambers that implement the above concepts is the instability of their operation due to occurring of high-amplitude pressure pulsations. The lack of methods that allow predicting the occurrence of self-oscillations with high accuracy leads to the use of predominantly experimental methods for studying the instability of combustion chambers. Therefore, this paper is devoted to an experimental study of the hydrogen addition effect in methane-hydrogen fuel on the pulsation parameters of the combustion chamber. Pressure pulsations in the combustion chamber were recorded using a Kistler 6021A high-temperature dynamic pressure sensor.

The spectra of pressure pulsations obtained as a result of the study showed a significant fuel composition effect on both the amplitude and the frequency of gas self-oscillations.