

# Experience in carrying out experimental studies for a dual-circuit burner using methane-hydrogen mixtures

O.V. Kolomzarov<sup>1</sup>, V.Y. Abrashkin<sup>1</sup>, N.I. Gurakov<sup>1</sup>, D.V. Idrisov<sup>1</sup>, A.S. Semenikhin<sup>1</sup>, A.S. Savchenkova<sup>1</sup>, D.V. Radin<sup>1</sup>, I.V. Chechet<sup>1</sup>, N.I. Fokin<sup>2</sup>, N.O. Simin<sup>2</sup>

<sup>1</sup> Samara National Research University, 34, Moskovskoye shosse, Samara, Russia, 443086

<sup>2</sup> Joint-Stock Company Power Machines - ZTL, LMZ, Electrosila, Energomasheport (JSC Power Machines), St. Petersburg, Russia, 195009, st. Vatutina, d. 3, Lit. A  
[kolomzarov@gmail.com](mailto:kolomzarov@gmail.com)

An experiment is a procedure performed to support, disprove, or confirm a hypothesis or theory. The study of processes in the burner device can be attributed to diffuse systems, that is, systems in which it is impossible to clearly distinguish individual phenomena. Therefore, experimental systems must combine and ensure accuracy, safety, repeatability of results, fixing or maintaining the specified parameters during the experiment in a narrow range in order to obtain high-quality results.

Experiments are carried out at the premises of the SEC FDR, which, among other things, are used to validate and verify computational mathematical models designed to describe combustion processes in both individual elements and the whole combustion chamber.

This paper presents the features of carrying out experimental studies using hydrogen-containing fuel, since the carrying out of experiments and the preparation of an experimental base when using hydrogen requires stand retrofitting and can make adjustments to the characteristics determination methods.

The article provides a detailed description of the air supply system, fuel supply system and measuring equipment arrangement, which is used during tests. A natural gas/hydrogen mixing system is shown. The measures that have been taken to ensure safe operation with hydrogen-containing fuels are listed.

Changes and additions that were made to the experimental procedures are also mentioned. The aspects of the choice and combination of experimental equipment for carrying out research of the burner are described.

As a test object, a burner device with a two-circuit fuel supply system for the pilot zone (diffusion combustion) and the main zone (premixed) was considered. Combustion takes place inside a quartz tube, which makes it possible to exclude air mixing and to make photo and video recording of the combustion process.

In conclusion, the results of photofixation and the characteristic of lean blowout obtained on the actual experimental setup with various hydrogen fractions are presented.