MULTICRITERIA ANALYSIS OF LIQUID FUEL CHARACTERISTICS

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Abstract: The paper presents the results of alternative liquid fuels combustion tests in small-sized gas turbine engines (SGTE). The key characteristics have been established: engine thrust; static pressure in the inlet channel; static pressure in the compressor; total pressure in the compressor, combustion chamber, and turbine; turbine speed; air temperature at the inlet, inside the compressor, at the turbine outlet, and at the nozzle exit. Noise and vibration characteristics have been measured during SGTE operation. Concentrations of anthropogenic emissions of CO, CO_2, NO, NO_2, N_2O, SO_2, CH_4, and C_3H_8 have been recorded. The efficient conditions of each fuel sample have been determined. Multicriteria analysis has been performed.

Keywords: liquid fuels; kerosene; small-sized gas turbine engines

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Figure Captions

Figure 1 Experimental setup: *1* — SGTE; *2* — SGTE control panel; *3* — SGTE control unit; *4* — SGTE fuel supply valve; *5* — storage battery; *6* — measurement unit; *7* — gas analyzer; *8* — gas analyzer probe; *9* — noise and vibration analyzer; and *10* — setup mnemonic diagram

Figure 2 Integral performance indicators of SGTE operating on different fuels at the maximum turbine-blade rotation frequency: *1* — TS-1 straight-run ("Achinsk"); *2* — TS-1 hydrotreating ("Achinsk"); *3* — mixture of TS-1 straight-run and TS-1 hydrotreating in proportion of 1 : 1 ("Achinsk"); and *4* — TS-1 commercial ("Arikon")

Table Captions

Table 1 Main physical and chemical properties of fuel samples at 300 K

Table 2 Key results of SGTE tests with different fuels at the maximum turbine-blade speed

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