# Virtual Control and Research System of Gas Turbine Engine Characteristics

Overview

The Virtual System of Gas Turbine Engine Lab is designed for simulation of operation of gas-turbine engines and studying the parameters variation depending on the engine power conditions. The Virtual System of Gas Turbine Engine laboratory is based on the NI sbRIO-9627 real-time controller by National Instruments company. The controller contains a gas turbine engine mathematical model which allows the generation of real signals coming from the built-in sensors GTE, as well as data acquisition system implementing the data acquisition and processing. This provides an opportunity to realize the gas-turbine engine intelligent automatic control system and implement the integration of power plant control and flight condition of the aircraft.

Special software in combination with a real-time controller give opportunities to research the values of parameters at different points of the GTE in different modes of operation. Study of the engine power conditions was carried out on the basis of the virtual model of its automatic control system. The virtual model of the engine automatic control system is developed in the LabVIEW graphical programming environment.
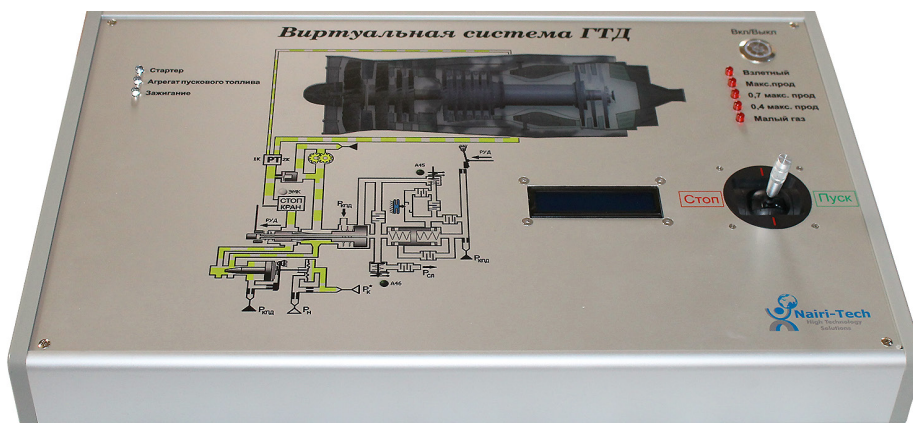

Software Features

- Possibility to input of environmental conditions (altitude and aircraft flying speed, temperature and air pressure at the intake to the engine)

- Possibility of changing the throttle position from the software or from the test bench

- Indication of the engine start system devices operation

- Graphical and numerical indication of measured parameters in real time mode

- Parameters recording to the .tdms file

Hands-on Works

1. Gas-turbine engine overview, design and operation.

2. GTE sensor locations and measurement system.

3. The study of GTE automatic control system.

4. Calculation of gas-turbine engine performance.

5. Measuring and analysis of results.

6. Calculation of GTE specific fuel consumption.

7. Modeling the operation of the GTE virtual control system.
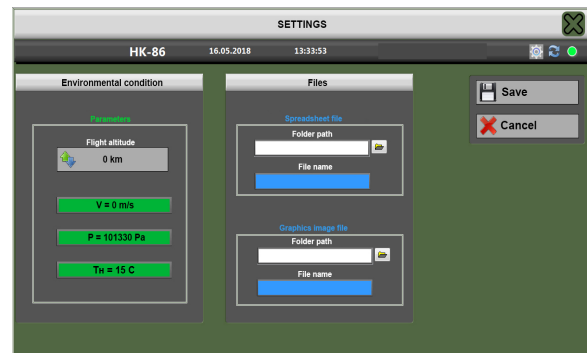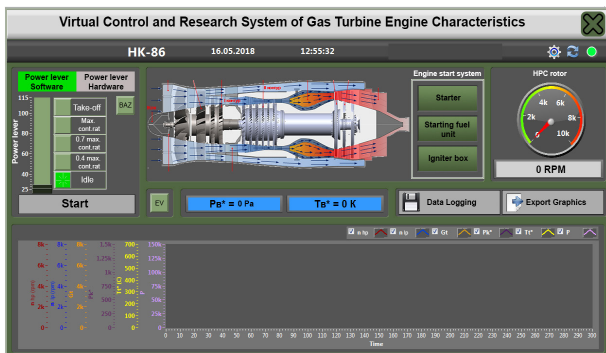
Principle of Test Bench Operation

Gas-turbine engine input control is carried out by changing the power lever angle. Power lever angle is related to fuel consumption rate in the combustor chamber. The Virtual System of Gas Turbine Engine Lab allows reproducing all modes of engine operation from idle power rating to take-off. Disturbance input is carried out by setting the altitude and aircraft flying speed, as well as the air pressure and temperature at the intake to the engine. Output parameters are low and high pressure compressor RPM, turbine gas temperature, compressor exit pressure, fuel consumption and thrust.

NAIRI-Tech
High Tech Solutions