NASA Glenn's Single-Stage Axial Compressor Facility Upgraded

NASA Glenn Research Center's Single-Stage Axial Compressor Facility was upgraded in fiscal year 2003 to expand and improve its research capabilities for testing high-speed fans and compressors. The old 3000-hp drive motor and gearbox were removed and replaced with a refurbished 7000-hp drive motor and gearbox, with a maximum output speed of 21,240 rpm. The higher horsepower rating permits testing of fans and compressors with higher pressure ratio or higher flow. A new inline torquemeter was installed to provide an alternate measurement of fan and compressor efficiency, along with the standard pressure and temperature measurements. A refurbished compressor bearing housing was also installed with bidirectional rotation capability, so that a variety of existing hardware could be tested. Four new lubrication modules with backup capability were installed for the motor, gearbox, torquemeter, and compressor bearing housing, so that in case the primary pump fails, the backup will prevent damage to the rotating hardware.

The combustion air supply line for the facility inlet air system was activated to provide dry air for repeatable inlet conditions. New flow conditioning hardware was installed in the facility inlet plenum tank, which greatly reduced the inlet turbulence. The new inlet can also be easily modified to accommodate 20- or 22-in.-diameter fans and compressors, so a variety of existing hardware from other facilities (such as Glenn's 9- by 15-Foot Low-Speed Wind Tunnel) can be tested in the Single-Stage Axial Compressor Facility. An exhaust line was also installed to provide bleed capability to remove the inlet boundary layer.

To improve the operation and control of the facility, a new programmable logic controller (PLC) was installed to upgrade from hardwired relay logic to software logic. The PLC also enabled the usage of human-machine interface software to allow for easier operation of the facility and easier reconfiguration of the facility controls when necessary. Finally, a new health-monitoring system was installed to measure shaft speed, shaft movement, and machine vibration on all of the rotating equipment. The system also provides automatic alarms and shutdown of the equipment when required.

An integrated systems test for checkout of the facility was completed on June 17, 2003. Research testing resumed on June 30 with data obtained in support of the Ultra-Efficient Engine Technology Project's Compressor Casing Treatment Project.

Find out more about this research http://facilities.grc.nasa.gov/

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