Smart sensors for high temperature turbine monitoring

David Wagman | March 06, 2019

A recent research project produced smart temperature sensors that can operate at up to 1,800° Celsius and pressure sensors that operate at temperatures up to 1,600° Celsius.

The sensors may lead to improved performance in monitoring gas turbines, combustion systems and more.

The temperature and dynamic pressure sensors developed through the research effort feature innovations in materials development, manufacturing processes and advanced packaging technologies.

The work was done by the Energy Department's National Energy Technology Laboratory (NETL) and Sporian Microsystems.

Researchers said that developing turbines and other advanced energy systems that can operate at extremely high temperatures boosts efficiency. Operating costs may be reduced, offering potential savings for consumers. On the downside, ultra-high temperatures also introduce challenges in developing sensors that can withstand such harsh environments.

(Learn more about temperature sensors and pressure sensors at Engineering360.)

Existing sensors used to monitor advanced power systems are expensive and have poor life spans under ultra-high temperature conditions, the researchers said. Sporian's sensor technology is made from polymer-derived ceramic materials, which may offer advantages that enhance performance and thermal stability, and incorporate smart functionality.

NETL offered specialized aerothermal rig testing in a simulated combustion environment to help Sporian advance toward increasingly higher temperatures and tests. Sensors were also tested at Southwest Research Institute's Pressurized High-Temperature Flow Facility.

Sporian next plans to work with the Air Force Research Laboratory on a follow-up demonstration of the sensor technology under full-engine conditions. Other collaborators for this testing effort include the Ohio Aerospace Institute and Propulsion Instrumentation Working Group.

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