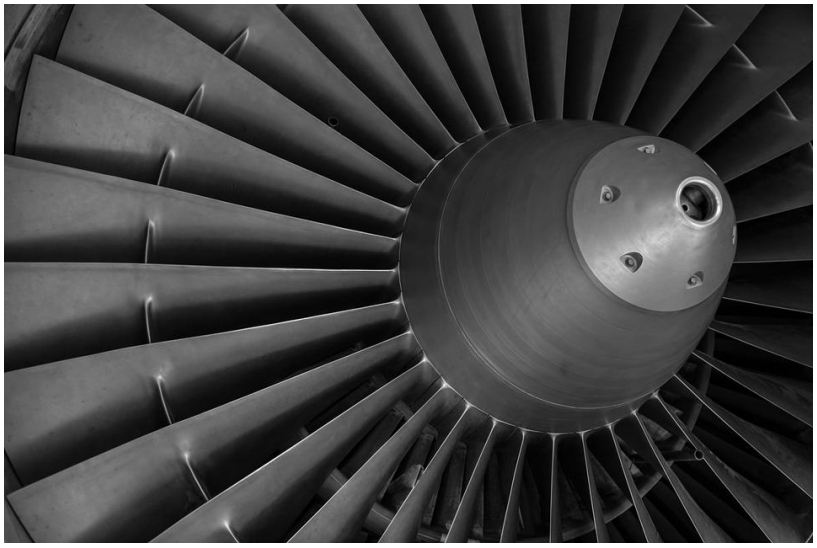
Scanivalve

Application Note

EVOLUTION MEASUREMENT

Gas Turbine Test Pressure Scanning – enhancing operational efficiency



THE CHALLENGE

APPLICATION: GAS TURBINE PERFORMANCE TESTING

The Application:

Gas turbines are high value, capital equipment around which plant or vehicle uptime is highly dependent. These turbines continually run at their optimum rotational speed, so relatively small performance changes can result in significant cost or even failure. General wear-and-tear, erosion and combustion damage eventually degrades the engine performance and an overhaul is deemed necessary. The engine is de-commissioned and installed in a secure test stand for testing and measurement. Testing is expensive, so ensuring good quality, valid data – every time - is essential.

The Measurement Challenge:

Accurate and effective pressure measurement within each stage of the turbine is necessary to optimise performance and ensure efficiency. Efficiency is usually determined by measuring combustion pressure during the development phase, during production build and during overhaul. Test pressures need to be measured at many annular tappings in the wall of the turbine, along its full length, between each compressor stage, from atmospheric pressure, at the inlet, to as high as 850 psi or more at the tail. The turbine is rotated under steady state conditions and readings are taken from each tapping for comparative purposes to determine overall efficiency data. Often the tappings will feed a manifold to determine an average pressure per annulus, but any leakage becomes hard to detect, so individual readings are more effective. High speed, synchronous data collection is necessary from the huge array of pressure tappings to ensure integrity of the collected data. Often multiple scanners (as 3000 channels of data per turbine is

not uncommon) of different ranges will be used axially, as well along the length of the turbine, positioned to measure the pressures radially around the walls for pressure distribution measurements to be made. Often the pressure sensors will be regularly checked, calibrated and zeroed to ensure accuracy and repeatability of the scanned pressure data in-situ between test points and data frames.

Typical Users:

Gas Turbine Facilities – R&D engineers, Production Test stand engineers. Repair, Service or Overhaul facilities. Test stand manufacturers also instrument their OEM test stands.

THE SOLUTION

SCANIVALVE DSA-SERIES PRESSURE SCANNER EXCELS IN THIS APPLICATION

- ✓ Intelligent Data Output
- ✓ Dedicated sensor for each channel (up to 16 channels)
- ✓ High Accuracy temperature compensated sensors
- ✓ Network-ready Ethernet for quick system integration
- ✓ Fast data collection for efficient test regime
- ✓ Quick set-up minimizes test downtime
- ✓ Simple operation
- ✓ Integral valves facilitate calibration, isolation & purging
- ✓ Proven long-term in-service operation
- ✓ Shock- and splash-resistant, rugged and reliable

The **Scanivalve** DSA (Digital Sensor Array), series 3217/8, pressure scanners are mounted on a test stand to collect the huge amount of data being generated under test. For stability and security the scanners are mounted on the test bed “strong-back” or “pylon” fixture enabling the tubing to the tappings to be as short as possible. Often the scanners are inverted to avoid any risk of condensation or moisture that could adversely affect critical and sensitive pressure readings. Because they are rugged, compact and reliable, in design, this makes them easy to install in close proximity to the pressure tappings on the turbine case, where temperature fluctuation or vibration may be an issue. Optionally, integral heating or cooling can be added to provide thermal environmental protection.

Multi-range calibrations offer application flexibility, each offering up to 16 channels of fully temperature-compensated pressure data, meaning that the system can be expanded quickly and easily with modular architecture. Identical pressure scanners are used at each stage of the turbine, though with different calibrated ranges. High-speed Ethernet data rates of up to 500Hz/channel maximise the amount of valuable data that can be gathered during a single test run. This data is collected in any desired Engineering Unit, presenting the test engineers with meaningful data for analysis. Shortening test runs can save the user significant time and cost.

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Multiple DSA scanners can be run in parallel on the same Ethernet platform to enable synchronous data to be captured along the full length of the working section of the turbine with scans being triggered externally by a switch once the turbine is settled under steady state conditions, or manually.

The **Scanivalve DSA 3217/8** is the defacto standard at this level with many thousands of units installed globally. These scanners offer singular or multi-range capability with individual ranges from 10" H_2O up to 850 psi or multi-ranges in the same scanner.

These scanners use high stability, high reliability control valves to direct pressures for normal measurement mode / calibration mode / purge mode offering MTBF times of many thousands of hours. This enhances operational efficiency and profitability by ensuring minimal downtime during the test period, not only for the test facility, but also for the turbine user.

In addition to pressure scanning, **Scanivalve** also offers the DTS Temperature Scanner product range, which is often used in this application to scan and measure many thermocouple temperature measurement points along the turbine, whether under test or in operation.

For more information:

Download the datasheets:

http://www.evolutionmeasurement.com/wpcontent/uploads/2016/11/DSA3217-18-Evolution-measurement.pdf

http://scanivalve.com/media/28067/dts4050_1606.pdf

Or talk to us about your requirements

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