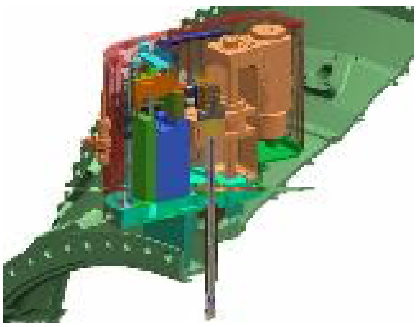
Case Study

High Temperature Two Axes Traverse System

Description

CAD Model



Installation Model

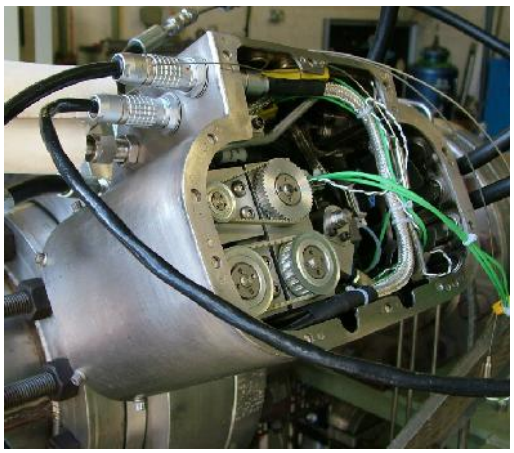
One of the key sets of parameters assessed during development testing of an aero gas turbine is validation of the aerodynamic flow through the turbine, to correlate predicted and measured pressures, temperatures and velocities. This is traditionally achieved by using a 2 axes (radial and yaw) traversing system with a 3 or 5 hole aerodynamic probe, on a cold flow turbine rig, where typical gas temperatures are only 500K and turbine pressures less than 5 bar. In order to reduce the product development time and cost, and rely more on actual engine hardware, this has lead to a reduced number of test rig development programmes and an increasing number of heavily instrumented real engine tests, resulting in a smaller and harsher environment for test instrumentation.

The challenge was to produce a probe traverse system that could collect the required turbine data from an engine at full operating conditions. Quadratec worked closely with other technology companies to supply 2 HP and IP turbine traversing systems. The design was based around an existing Quadratec 2 axes system, but modified to provide 100 mm radial movement and 360 deg yaw within a much smaller footprint, whilst achieving the same positional accuracy of +/- 0.05 mm and +/- 0.25 degrees.

The system was enclosed in a small environmental chamber, operating in a high temp (600K) “C” duct around both turbines. Speed, radial and torque load capabilities were changed for this application, to bring the requirements into line with that of a real engine.

The traversers, with water cooled chambers, were mounted to the casing via water cooled baseplates, to eliminate thermal conduction. A double seal arrangement with a pressure balance was used to prevent hot gas ingress. The 3 hole probe was also water cooled and fitted with a platinum / rhodium thermocouple. The system proved highly successful and provided excellent real engine test data.

Mini Configuration



Installation