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Measurement and Calibration of Centrifugal Compressor Pressure Scanning Instrumentation

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ABSTRACT

The compressor is a key component of a jet engine necessary to compress air for the combustion process. Research to optimize compressor efficiency through the understanding of air flow behavior has led to increased efforts in creating modern compressor test facilities. In collaboration with Honeywell, the High Speed Compressor facility at Zucrow Laboratories has built a centrifugal compressor test cell with instrumentation to measure the temperatures and pressures of the air flow. This facility conducts experiments to characterize the compressor performance at varying conditions. During prolonged experimentation cycles, it is difficult to acquire reliable pressure measurements of the flow, as pressure sensor “drift” increases the uncertainty of measurements over time. Pressure scanners must be calibrated periodically to maintain reliability and calibration services are costly. To reduce cost, a pressure calibration process was automated with the use of a CPC6000 pressure calibrator. LabVIEW visual instrument (VI) software was developed to interface with the calibrator and the Digital Sensor Array (DSA) pressure scanners. The CPC6000 determines the calibration range, and the VI software uses the calibrated pressure to overwrite the calibration coefficients of the DSA. The calibration coefficients that were outside of the calibration range were successfully overwritten by the VI software. The DSA was calibrated to measure pressures within 0.05% of full-scale measurement. Automating the calibration process will reduce the cost of periodic calibration by an external resource. It will also maintain repeatability in the uncertainty of the measurements through testing cycles that last beyond the 6 month guaranteed calibration period of the manufacturer.

KEYWORDS

Centrifugal compressor, Pressure Scanner, LabVIEW, Measurement, Calibration
