



## Rugged LXI System Provides Test Cell Manufacturer with High Accuracy DAQ for Jet Engine Testing



Globalization and steady growth in the number of commercial airline passengers is driving the need for long-distance travel and challenging commercial aviation manufacturers to design more efficient jet engines—in particular, to meet the demand for improved fuel efficiency. Using data acquisition testing housed inside robust test cells, manufacturers research and develop the latest innovative technology, designs and materials for next generation jet engines. Utilizing test cells, aviation manufacturers can thoroughly review performance, safety and efficiency under a wide variety of simulated conditions.

VTI Instruments serves a test cell manufacturer that is well-known for building large-scale turbine test cells designed for high channel count research and development—a necessity for jet engine testing. The test cell manufacturer provides a unique variety of complete engine testing as well as maintenance, repair and overhaul (MRO) services to original equipment manufacturers (OEMs) in the aerospace, commercial aviation



## CHALLENGES

- Acute accuracy required
- 500+ channel system
- Harsh test cell environment
- Temperature range: -20° C to 50° C
- High acoustics
- Varying moisture levels
- Cabling cost

## BENEFITS

- Extreme system protection
- Accurate measurements (within 0.2° C)
- Reduced footprint
- \$200,000 saved in cabling
- Reduction in installation time
- Mixed-sensor support with one system
- Seamless integration into application code

and power markets. Standing behind the performance of its turnkey solutions, the test cell manufacturer takes pride in providing exceptional customer service and support, meaning test cells are delivered on-time and within budget to OEMs. For more than 10 years, VTI Instruments has provided the test cell manufacturer with exceptional test solutions—delivered with customer satisfaction in mind.

## THE CHALLENGE—ACHIEVING ACCURACY IN A HARSH ENVIRONMENT

To meet specific requirements while building a new test cell for a commercial aviation jet engine, the test cell manufacturer needed a highly accurate and rugged measurement system with more than 500 channels. Both time and money would be saved by placing the data acquisition system in close proximity to the jet engine during the test. This positioning would simplify setup, reduce cabling and installation costs and minimize errors induced by a harsh electrical environment. However, the measurement instruments would be exposed to an extremely harsh environment that required a rugged solution. Inside the test cell, ambient temperatures would range from -20° C to 50° C, acoustics could reach up to 150dB, and moisture levels would vary depending on test conditions. The environment posed a risk and challenge to acquiring accurate measurements—and to jet engine manufacturers, accuracy means the difference in bringing increased efficiency to new jet engine designs.

## THE SOLUTION—REDUCE RISK WITH PROVEN ACCURACY AND RELIABILITY

VTI Instruments' reputation is built on its demonstrated ability to deliver extremely precise measurements, which are critical to manufacturers seeking increased efficiency and accuracy in their test systems. The test cell manufacturer chose VTI Instruments to both design and build a data acquisition system for the new test cell due to the company's reputation for delivering high reliability products with superior measurement accuracy, and also because VTI Instruments proved it had the expertise to build the solution.

VTI Instruments quickly designed and manufactured a high performance, environmentally-protected data acquisition system by leveraging its trusted and popular EX1000 series. VTI mounted its EX1000 series hardware inside a NEMA4 rack to protect the instruments from damage and errors caused by harsh environmental conditions inside the test cell. Within the NEMA4 rack system, nine EX1000A-TC units, four EX1000A units and three EX10SC units were placed in a 19-inch rack suspended by shock mounts. The shock suspension system gave the inner sub-frame complete shock isolation and vibration protection. With this solution, VTI Instruments provided a rugged turnkey test system at a competitive price point and helped the test cell manufacturer further reduce its investment risk.



With fully integrated signal conditioning, the EX1000 series collects a wide variety of measurements, including voltage and temperature, coming from RTDs, thermocouples, pressure transducers and load sensors. Each signal path has complete end-to-end self-calibration which can be performed as often as desired, allowing the user to increase accuracy by quickly adjusting the measurement instruments to current environmental conditions. With LXI compliant features, like built-in Wired Trigger Bus hardware and IEEE-1588 synchronization, the modular EX1000 data acquisition system supports easy integration and synchronization of multiple devices with scalability for high channel count applications.

For the new test cell, VTI Instruments provided full application programming interface (API) support, which integrated seamlessly with the test cell manufacturer's existing equipment and software. By integrating the EX1000A, EX1000A-TC and EX10SC into a full-feature measurement system, VTI Instruments provided exceptional accuracy and repeatability through fully integrated signal conditioning and embedded end-to-end self-calibration.



## THE RESULT—A TURNKEY SOLUTION FOR JET ENGINE TESTING

VTI Instruments reduced risk and lowered overall costs by building a data acquisition system that could remain inside the test cell. By listening to the test cell manufacturer's needs, VTI Instruments successfully and rapidly delivered a rugged measurement



system that utilized LXI products and integrated it into the customer's existing setup. VTI Instruments assumed ownership of the manufacturing and project management process, delivering and supporting a test solution that surpassed performance and environmental requirements.

When it comes to thermocouple accuracy, VTI Instruments stands above the competition. The EX1000 series provides exceptional accuracy for temperature measurements typically within 0.2° C. Overall, the solution reduced uncertainty for the manufacturer, posing less risk to the project schedule, lowering overall costs, reducing wiring for about \$200,000 in cost savings, decreasing manufacturing and installation time, and providing more accurate data acquisition protected by a NEMA4 rack for a harsh test cell environment.

VTI Instruments delivers precision instrumentation for electronic signal distribution, data acquisition, and monitoring. The company continues to lead in the development of open standards for test and measurement along with scalable, modular products that maximize performance in a small footprint. With nearly two decades of experience primarily in the aerospace, defense and power generation markets, VTI helps customers maintain a competitive edge and preserve the integrity of their brand.

