



Improving Bench-Top Wind Tunnel Calibration Automation & Characterization of Bench-Top Wind Tunnels

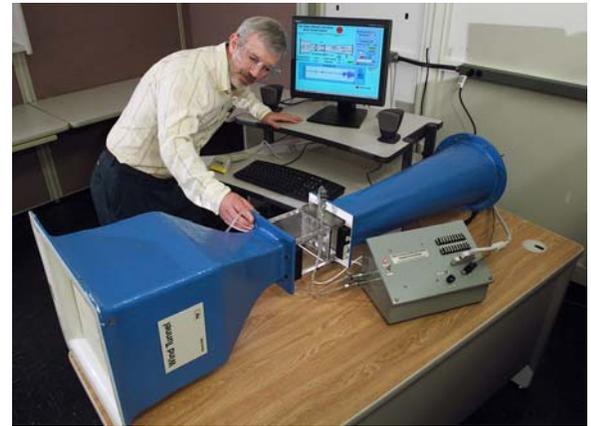
Need to Improve Accuracy and Calibration Time

Through a joint effort between ORNL and US Air Force Metrology and Calibration (AFMETCAL) program bench-top wind tunnels were improved. USAF Precision Measurement Equipment Laboratories (PMEL) calibrate over 1000 anemometer probes a year. Precision air velocity measurement is required to support a variety of environmental systems and weapon maintenance systems. The regional PMEL's utilize bench-top wind tunnels as standards to perform anemometer calibrations. As manufacturers continue to tighten the uncertainty specifications in anemometer products, it is essential for USAF to maintain standards that have appropriate Test Uncertainty Ratio (TAR). In addition, the work load is such that automation is needed to allow the calibrations to be completed in a timely manner.

Wind Tunnel System Upgrades

The initial portion of the upgrade for the bench-top wind tunnels was to improve the process instrumentation; absolute pressure, humidity, temperature, and differential pressure. Beside the improvement to the instrumentation, the data were read into a high accuracy data acquisition board in a personal computer. To increase the efficiency and accuracy of the calibration process, the entire measurement process was automated via a personal computer, remote blower control, and software-driven calibration. The data acquisition system automatically recorded, displayed, and archived the data as well as served as the user interface and storing pertinent calibration information.

Wind Tunnel with User Interface

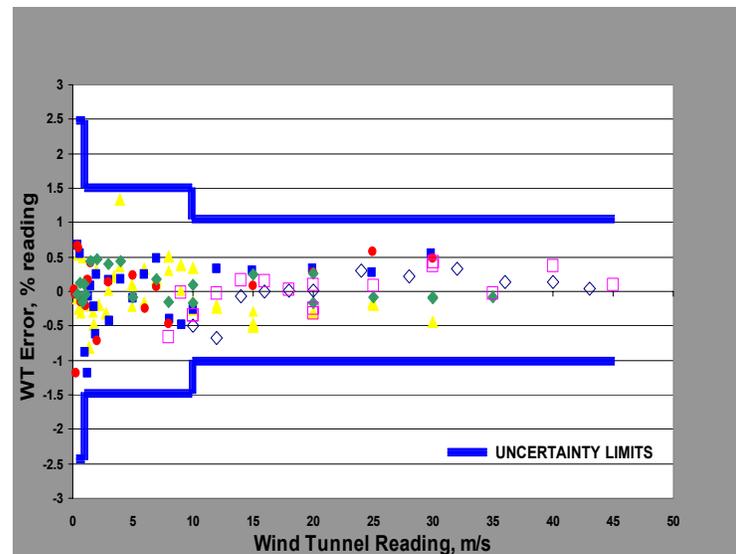


Features

- Reduction in flow uncertainty by at least 20% and up to 300% at some flow conditions
- Automation reduced calibration time by a factor of three (3) to four (4)
- Laser Doppler Velocimeter (LDV) characterized wind tunnel for best probe location and flow profiles
- Improved historical calibration data retrieval
- Easy to use and short training time

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LDV Calibration & Comparison to Pitot Tube