WHITE PAPER

WHY CALIBRATE?

The Importance of Sensor Calibration for Dynamic Measurements

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Why Calibrate?

Even in the business of Test and Measurement, the sound practices of calibration, verification and maintenance are often an afterthought. As a manufacturer of calibration systems and a provider of calibration services, the questions often arise: Why should I calibrate my sensors? How often do I have to?

While annual recalibration is an excellent answer, the real question is "What is the cost of failure?" If you make a measurement and later find out that the sensor (or measurement channel) was bad, what is the cost of invalidating that data or retaking it (if even possible)? The answers to this question run the range from a low to an extremely high cost of failure.

For example, if the test is a simple learning experiment in a university measurements course, the cost of retaking the data may be negligible. In fact, many professors design measurement courses and instructions so students will make mistakes. This requires students to take measurements and offer an analysis a number of times. Learning from mistakes does a wonderful job of deepening our understanding and reinforcing proper techniques.

In more standard tests with easy access (and re-access) to the test structure coupled with redundancy in the measurement channels, the cost of a single bad measurement is also not high. For example, a single point in a large modal survey or a single channel in a test that will be set up for a number of days. This often is the case in typical modal analysis on automotive structures. However, you can begin to see that costs escalate rapidly depending on certain factors. What if the test structure is a prototype costing tens of millions of dollars? What is the financial carrying cost of holding onto this prototype for another day? With aerospace structures, the price can be extraordinary.

Another extreme category is for one-time tests. Here telemetry is often involved and there is only one chance at the data: like a rocket launch, building implosion, certain large scale explosive tests, etc. Here the measurement has to be right. Channels are checked, double checked, calibrated, re-verified and data is backed up concurrently. You name it and a pre-test verification is planned.

A final category is those measurements made for legal purposes. Health and human exposure measurements used in legal proceedings for noise or vibration also need to withstand the scrutiny of the legal system in assuring that the measurement and resulting analysis are correct. In fact, the difference between correct measurements and "suitable output" highlights one of the major design and performance differences in the microphone industry. A communications microphone is designed to provide an intelligible output over a variety of environments and situations, where a measurement grade microphone is designed to give an accurate output related to the amplitude, frequency content and phase. In addition to the importance of calibration, acoustic instruments like sound level meters have type certification to ensure the necessary accuracy of the complete measurement channel.

Regardless of your cost of failure, there is commonality among all these measurements: the need for credible, ISO 17025 accredited, responsive, and timely calibration. Some organizations choose to expand their capabilities in-house, while others outsource to local metrology houses or vendors. Whichever your specific choice, be sure you know, trust, and audit their calibration expertise. Are you calibrating? And how often?

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