

from experience

The Importance of Instrument Calibration

Process systems are loaded with instrumentation performing critical measurements of pressures, temperatures, flows, weights, and many other data points. Unfortunately, time, along with normal wear-and-tear and even electrical or mechanical shock, can degrade instrument accuracy. Instruments that are out of calibration (which is the comparison of an instrument with a known standard) can lead to significant issues including waste, recalls, and safety. Since the costs to fix these issues can quickly add up to be much higher than the cost of calibration, it is important to stay on top of calibration for improved product quality.

In the old days, the standard used for calibration was 10 times the accuracy of the measuring device. Today, however, the advanced technology of current instruments has made this goal almost impossible to achieve for electronic measurements. Instead, the International Society of Automation (ISA) states that a good rule of thumb is to ensure the instrument standard be four times more accurate than the instrument being checked. Traceability is another important element that comes into play. Traceability is accomplished by ensuring that testing equipment is routinely calibrated by a higher level reference standard, at the proper calibration interval. This means the test equipment used in the shop are routinely sent out to a standards lab which has more accurate test equipment.

So which instruments should be calibrated, how should they be calibrated, and how often? One way to answer these questions is this: If the instrument is in the system, it is important to the process and should be calibrated to verify and maintain its function. As to the frequency and type of calibration, manufacturer's recommendations are a good place to start, but the instrument's impact on quality and its tendency to drift over time must also be considered. Other times or events that may trigger a need for calibration include:

- The instrument is new.
- Before and after critical processing tests.
- After repairs.
- If the instrument accuracy is suspect.
- An electrical surge.
- The instrument being bumped or dropped.
- When a safety check should be performed.

Who should perform calibrations? Some plants have the staffing and equipment to perform calibrations internally. If not, many reputable companies offer this important service. In either case, calibrations are all about the detail, and therefore should only be performed by a skilled craftsperson who is familiar with instrumentation and understands process control loops and systems. Keeping neat, thorough records of each instrument's calibration is important too. (In fact, the paperwork is 90% of the work: If it wasn't documented, it wasn't done.) These records help track instrument stability, and can help understand instrument health over time (using "As-Found" and "As-Left" data). Data history can also aid in making changes to calibration frequencies. If a particular instrument drifts too much and often fails to meet the tolerance when recalibrated, more frequent calibrations are required. And if no adjustments are required with every recalibration cycle, consideration can be made to increase the calibration period. However, as mentioned at the start of this article, the decision to extend calibration frequency needs to be made based on the cost of a failed calibration.

experience in brief

For more information, visit the [ISA](#) website, which houses multiple articles on calibration, including the ISA [guidelines for managing a calibration program](#).

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