Frequently Asked Questions

Data-Driven Torque Wrench Calibration Frequency

How often should we calibrate our torque tools?

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"How often should we calibrate our torque tools?"

This is one of the most frequently-asked questions that comes to us. It is obviously one of the most important questions the owner of torque wrenches - or torque-controlled power tools - needs an answer to. It is also one that has many easily-communicated and rational-sounding wrong answers.

The calibration interval for the torque tools that are in inventory is a large component in the total cost of ownership for each and every torque tool individually and for all of the torque tools collectively. Over the course of years, the cost of ownership for a torque tool is likely to exceed (sometimes by a large amount) the cost of purchase for that tool. This means that each tool affects the company's bottom line not only when it is purchased, but for the life of the tool.

When a tool is calibrated with insufficient frequency, the use of the out-of-tolerance tool can increase warranty costs (external) and it can increase internal repair costs. If a tool is calibrated too frequently, the cost of calibration, certification, any shipping and receiving costs including normal overhead, and cost of downtime are all wasted. Each of these presents the owner with needlessly-inflated costs - money that could otherwise drop to the bottom line.

Worse, many tool suppliers dance around the question when it is asked. Why? Because the best answers are not as simple as most people want them to be.

For decades many people have wanted a simple answer requiring little if any thought. When they ask "how often" they really want to hear "every x months" and be done with it. This is why calendar-based calibration has been so popular, in spite of the methods ineffectiveness.

Fixed, calendar-based calibration intervals:

Ignore differences between the age of differing tools in a facility; the tool that's been in use daily for 5 or 10 years tends to get lumped in with the tool that was purchased last week.

Ignore the difference in tool usage rates; the tool that sees three uses/minute tends to get lumped in with the tool that gets used three times/hour.

The tool that is calibrated too infrequently causes problems, and the cost in time, money and effort to look into the problems may or may not find out that the tool calibration interval is really the root cause of the problem.

Since the money that is wasted on tools calibrated too frequently doesn't show up in red ink labeled "excess cost" it continues to be wasted as long as the methodology is applied.

One-size-fits-all calendar-based calibration simply doesn't work. Fortunately, there are a number of cost-effective solutions that have evolved. And they have been proven to work - efficiently and effectively. Better still, some of these solutions can be blended for extremely high effectiveness.

Product assemblers and scientific laboratories started with the same problem (calibration frequency of their measurement instruments) and took differing tracks towards solving the problem. This is not surprising. What is surprising is how effectively their independently-derived methods can work together.

Assembly Operations

The advent of the inexpensive digital torque tester opened a possible solution for high-volume assembly operations. They had long recognized the adverse effects of inadequate calibration; examination and tracking of their internal and external nonconformance costs disclosed the high price that insufficient calibration frequency imposed. They had also paid the price - quite literally - of excessive calibration. The calibration cost, shipping cost for recalibration of some items, and the cost of tools to use while others were out for calibration became costs that were just too much to be continued.

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The advent of accurate and inexpensive digital torque testers provided a very cost-effective answer. The first digital torque testers were bulky, somewhat complex, and took serious learning to become effective at using. But over the following decade, advances in various technologies led to the development of testers that are amazingly simple, effective and inexpensive.

How inexpensive are they and how simple to use? So inexpensive that an assembler with as few as 12 torque wrenches (or torque-controlled power tools) to check can often have a payback period of 24 months or less. How simple? So simple that virtually any plant floor employee can operate them properly with five minutes of training.

It was not long before assembly operations realized that they could perform frequent interim checks of the torque wrenches between calibrations to make sure that the tools would not cause assembly errors. Shortly after that those that were performing these interim checks discovered that they had been wasting even more money than was evident, and that loss could be stopped.

Some plants have taken this to the logical conclusion; the assembly line personnel each check their own torque wrench on a tester near their work location at the start of each shift. If a torque wrench checks as either out of calibration or near the edge of the allowable variation, the tool is taken out of service for calibration and a replacement tool is used in the meantime. If the tool is within the allowable variation, the assembler can use it that day. Simple, easy, and effective. End of needless calibrations, end of using tools that are out of specification.

Scientific Laboratories

Scientific laboratories use many measurement instruments of many types and designs, and the determination of effective calibration interval determination for laboratories with large quantities of instruments needed a methodology that would address all these variantions. No single technology could be adapted to solve the problem - there was no breakthrough device that could solve it.

The National Conference of Scientific Laboratories (NCSL) took on this problem shared by its members and wound up refining the question. They asked themselves: “Is there a way we can use the calibration data for a piece of equipment to determine an appropriate calibration interval?”

By the time they finished working on the problem they had found many ways to solve it using just the data from the calibrations of each measurement device. And some of them are remarkably simple!

All of the methods they came up with apply a basic idea:

If the device needed no adjustment when it was sent out for calibration, the interval can be extended.

If the device did need adjustment when it was sent out for calibration, the interval should be shortened.

The information on whether or not adjustment was needed is right on the calibration certificate and need only be examined.

When a measurement device is sent for calibration, the laboratory performs a test or tests and records the results before going any further. These results are the “As Found” results, and are the answer to the question “What was the condition of the device when it came in the door?”

If the device is within its allowable limits, nothing is done except for recording the required information, and the device is returned to the user. If the device is out of calibration, the required adjustments are made to the device and it is again tested. The results of the check after adjustment is made, and the results

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are recorded in the "As Left" section of the certificate.

By examining the certificate, the user knows whether or not the device was in calibration at the time it was sent. The data from the certificate can be used to calculate not merely whether to extend or reduce the calibration interval, but by applying one of the methods developed by NCSL one can determine by how much the interval should be changed.

The NCSL made these methods into a Recommended Practice, and publish them as RP-1.

Blended Methods - Practical and Scientific Method Synergy

Belnding the scientific method and the application-specific practice of interim checks provides the closure to the loop by getting rid of the last subjective calibration interval determination - that applicable to the torque tester.

It is obvious that the interim check solves the torque wrench and torque-controlled power tool calibration interval determination problem, and that it solves a host of problems along the way. It is equally obvious that there is a gap - a failure to use data to determine how often to calibrate the torque tester.

Application of any of the methods in NCSL RP-1 closes the gap, effectively and simply.

A rational, inclusive, data-driven calibration program replaces the ineffective and inefficient calendar-based method when this approach is taken. Increased quality and profits replace prior expenses.

We strongly urge all torque tool users to consider this approach.