White Paper
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AMS™ Suite: Intelligent Device Manager: An Automated Instrument Calibration System

This paper describes advanced asset optimization software interfaces with self-documenting calibrators, making it easy to define and implement calibration procedures and saving time for technicians and after field calibration.

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An Automated Instrument Calibration System

AMS™ Suite: Intelligent Device Manager

Calibration is a time-consuming maintenance activity that must be performed periodically on every field instrument in order to assure efficient operation of the process and to satisfy the requirements of regulatory agencies. Instrument calibration can take one to four hours per device using generally accepted procedures. Since many plants have thousands of field instruments, a significant portion of maintenance time must be spent on calibration alone.

Annual calibration of all instruments is common, and in plant areas where instrument accuracy is critical to product quality, calibration every six months or even more frequently is not unusual. However, maintenance supervisors often admit that, because of time constraints, calibration may slip to an every-other year event in their plants. Sometimes an instrument is found to be totally inoperative by the time a technician arrives to do calibration testing. Many process plants now use computer software to shorten the time required for instrument calibration.

Established Procedure

Most maintenance departments follow the same calibration procedure they have used since hand-held, self-documenting calibrators became available. The procedure goes something like this:

1. A calibration route is established for each group of instruments – generally, those in one area of the plant, but it could be by instrument type or by the date on which those particular instruments need calibration.

2. A calibration scheme, including all test parameters, is defined for each instrument. Frequently, technicians must dig into file cabinets and pull out the test requirements on each instrument in the group. This is a very time-consuming job, especially if the filing system is disorganized.

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3. Test data is transferred to a self-documenting calibrator by manually entering it in a predetermined sequence or code into the keypad of the calibrator – another time-consuming, error-prone activity.

4. The technician goes into the plant and attaches the calibrator to each instrument in a prearranged sequence. Readings from each instrument are compared with the source information to determine accuracy.

5. If a device fails the calibration test, the instrument is adjusted and retested to be sure the calibration is correct. If calibration cannot be achieved, the instrument is replaced and the new instrument calibrated.

6. This procedure continues until all instruments on that route have been tested.

7. When the technician returns to the maintenance shop, a report is written on each instrument tested, utilizing data stored in the self-documenting calibrator—another tedious, time-consuming process.

8. The written reports are filed for future reference or to prove to an inspector that calibrations were done in compliance with regulations.

Automated Calibration

An automated calibration system using advanced asset management software is a promising approach to the problem of runaway maintenance costs. Used in conjunction with self-documenting calibrators, this software saves substantial time for technicians before and after the in-field phase of the normal calibration procedure.

Emerson's AMS™ Suite: Intelligent Device Manager, loaded into a desktop PC or laptop computer, contains an instrument database. Calibration parameters for every instrument in this database, a key element of Emerson's PlantWeb® digital plant architecture, can cover all the instruments in a plant or a select group of smart instruments to provide the basis for the automated calibration system described below.

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Calibration routes are predefined by a Calibration Assistant SNAP-ON™ application, providing technicians with groups of instruments that can be calibrated most efficiently. A route can consist of the instruments in one general area, one particular type of instrument, or those devices due to be tested. In any case, all of the necessary information is readily accessible.

Figure 1 depicts the calibration scheme for instruments in the database. The technician simply locates an instrument to be tested by tag number and “drags” the calibration settings for that instrument to the calibrator. There is no digging into poorly organized files to find the test parameters. The direct download of information for any route from computer to handheld self-documenting calibrator is fast and accurate with minimal chance for human error.

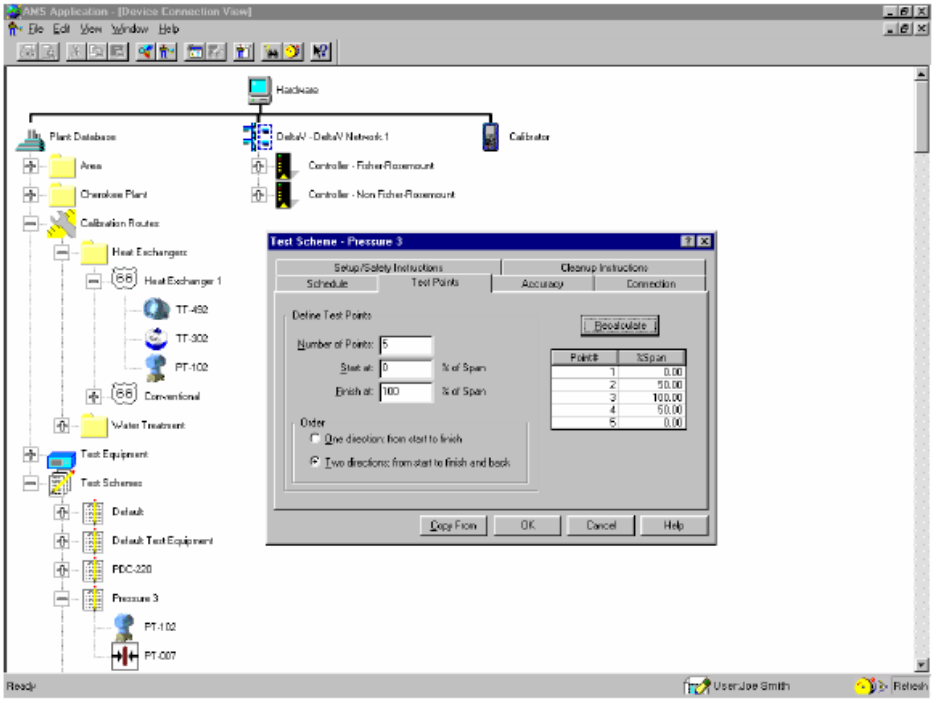

Figure 1. *All the information required for instrument calibration is contained in the AMS Device Manager database. Technicians can download calibration parameters using the Calibration Assistant SNAP-ON application.*

When the fieldwork is completed, the technician returns to the maintenance shop, attaches the calibrator to the PC once more, and instantly uploads the test results. This data transfer is fast, error-free, and easy to accomplish for a tired technician who has spent the day climbing around towers, columns, and reactors. No handwritten reports are necessary.

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The calibration results are archived with all the other maintenance data for each instrument, automatically providing the documentation required to comply with the regulatory agencies. If the calibration history of any field device is needed later, that device's records are immediately available for on-screen review or print out. See Figure 2.
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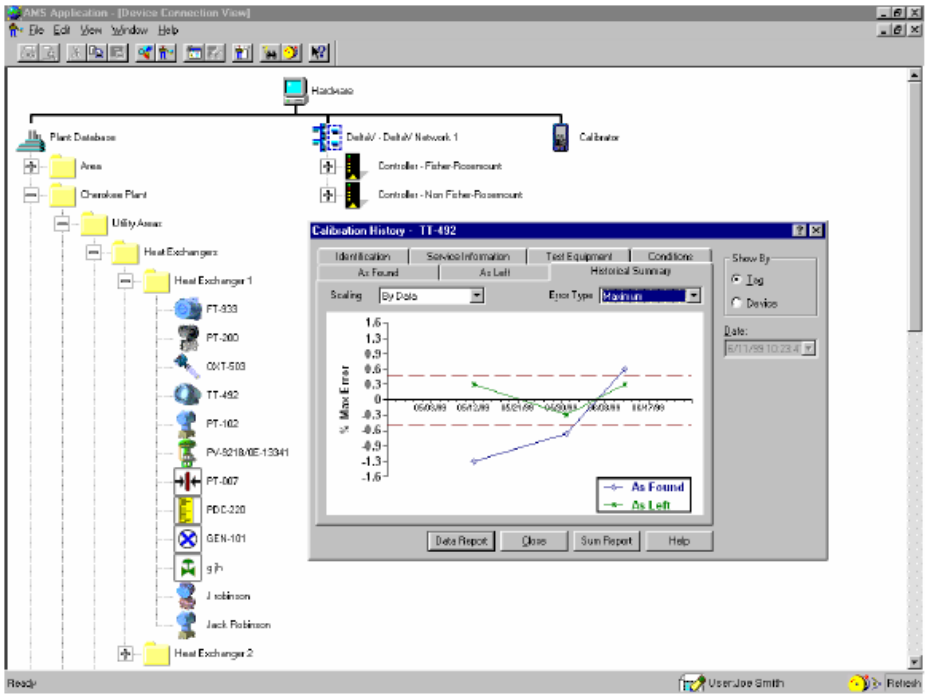

***Figure 2**. The calibration history of field devices can be accessed for on-screen review by inspectors or for printout.*

While conventional (not smart) instruments are not automatically part of an online asset management network, their calibration specifications can be entered into the database if desired. Thus, the calibration settings for any instrument in a plant can be transferred to the calibrator with the results returned to the database following calibration. The availability of documented calibration information on those devices is important, because they are as subject to regulation as the newer instruments.

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Online Calibration of Control Valves

Calibration of control valves equipped with FIELDVUE® brand digital valve controllers (DVC) can be done directly from the maintenance shop. The embedded microprocessors in these devices acquire, store, and transmit data about the operation and condition of the valves on which they are mounted.

Technicians use the AMS ValveLink® SNAP-ON application to communicate directly with these smart positioners, obtaining accurate feedback on valve position, travel deviation, and other functional information. The valves can also be configured and calibrated without sending instrument technicians into the field at all.

According to one engineer at the Gainesville Regional Utility in Florida, “Twenty-three control valves equipped with DVC positioners are easily calibrated from the engineering workroom without a technician ever setting foot in the plant, saving additional time with those devices. If a positioner will not ‘calibrate’, we know immediately that the valve has a mechanical problem, which we check out immediately.”

Documented Savings

Savings of $25 to $100 per device calibration are typical, depending on local labor costs. With most plants doing hundreds or thousands of calibrations annually, the savings in a single year easily exceed the cost of the automated calibration system.

According to Bruce L. Johnson, engineering and technical manager at Noltex L.L.C. in LaPorte, Texas, the new calibration procedure reduces calibration time by “30 minutes per instrument because technicians don’t have to pull out a calibration record sheet and file it. This means more than $6,000 per year in savings to us.”

David Wright, senior instrument and control specialist with Alabama Power Company, believes faster configuration and calibration of field devices saves “a substantial amount each year” in his plant. “We estimate that improved valve operation, better troubleshooting, and faster calibration of field devices will save this plant as much as $40,000 annually,” Wright said.

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Process Engineer David Montgomery of Solutia, Inc., Decatur, Alabama, reported, “The time saved in configuration, calibration, commissioning, and documentation using Emerson’s asset optimization software ranges from 1.92 to 5.95 hours on each newly installed smart device. This covers various kinds of transmitters as well as control valve positioners, although the time saved with valves is on the higher end of the range. Using a hypothetical $50 per hour labor rate, the savings can range from $96 to $297.50 per device.”

Conclusion

By automating key parts of the calibration process, AMS Device Manager contributes significantly to reduced maintenance costs. Automated calibration eliminates manual, error-prone data entry of calibration schemes into self-documenting calibrators prior to testing, as well as handwritten or typed documentation of the results.

In plants with hundreds or thousands of field devices, these savings represent a significant economic benefit that is simply too great to ignore.

POWERS PlantWeb®

AMS Suite: Intelligent Device Manager powers PlantWeb through predictive and proactive maintenance of intelligent field devices to improve availability and performance.

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