Beamex

Calibration White Paper

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Why Use Software for Calibration Management?

INCLUDES CUSTOMER CASE STORY: Heineken España A.S.

beamex
WORLD-CLASS CALIBRATION SOLUTIONS™

Calibration management software can benefit all sizes of process plants

Every plant has some sort of system in place for managing calibration operations and data, but the different methods for doing it varies greatly in terms of cost, quality, efficiency and accuracy of data.

Introduction

Every manufacturing plant has some sort of system in place for managing instrument calibration operations and data. Plant instrumentation devices such as temperature sensors, pressure transducers and weighing instruments – require regular calibration to ensure they are performing and measuring to specified tolerances.

However, different companies from a diverse range of industry sectors use very different methods of managing these calibrations. These methods differ greatly in terms of cost, quality, efficiency, and accuracy of data and their level of automation.

Calibration software is one such tool that can be used to support and guide calibration management activities, with documentation being a critical part of this.

All plant instruments and measurement devices need to be listed, then classified into 'critical' and 'non-critical' devices.

But in order to understand how software can help process plants better manage their instrument calibrations, it is important to consider the typical calibration management tasks that companies have to undertake. There are five main areas here, comprising of planning and decision-making, organization, execution, documentation, and analysis.

Careful **planning and decision-making** is important. All plant instruments and measurement devices need to be listed, then classified into 'critical' and 'non-critical' devices. Once this has been agreed, the calibration range and required tolerances need to be identified. Decisions then need to be made regarding the calibration interval for each instrument. The creation and approval of standard operating procedures (SOPs) for each device is then required, followed by the selection of suitable calibration methods and tools for execution of these methods. Finally, the company must identify current calibration status for every instrument across the plant.

The next stage, **organization,** involves training the company's calibration staff – typically maintenance technicians, service engineers, process and quality engineers and managers – in using the chosen tools and how to follow the approved SOPs. Resources then have to be organized and assigned to actually carry out the scheduled calibration tasks.

The **execution** stage involves supervising the assigned calibration tasks. Staff carrying out these activities must follow the appropriate instructions before calibrating the device, including any associated safety procedures. The calibration is then executed according to the plan, although further instructions may need to be followed after calibration.

The **documentation** and storage of calibration results typically involves signing and approving all calibration records that are generated. The next calibration tasks then have to be scheduled, calibration labels need to be created and pasted, then created documents copied and archived.

Based on the calibration results, companies then have to **analyze** the data to see if any corrective action needs to be taken. The effectiveness of calibration needs to be reviewed and calibration intervals checked. These intervals may need to be adjusted based on archived calibration history. If, for example, a sensor drifts out of its specification range, the consequences could be disastrous for the plant, resulting in costly production downtime, a safety problem or leading to batches of inferior quality goods being produced, which may then have to be scrapped.

Documentation

Documentation is a very important part of a calibration management process. ISO 9001:2000 and the FDA both

state that calibration records must be maintained and that calibration must be carried out according to written, approved procedures.

This means an instrument engineer can spend as much as 50 percent of his or her time on documentation and paperwork – time that could be better spent on other value-added activities. This paperwork typically involves preparing calibration instructions to help field engineers; making notes of calibration results in the field; and documenting and archiving calibration data.

Imagine how long and difficult a task this is if the plant has thousands of instruments that require calibrating on at least a six-monthly basis? The amount of manual documentation increases almost exponentially!

When it comes to the volume of documentation required, different industry sectors have different requirements and regulations. In the Power & Energy sector, for example, just under a third of companies (with 500+ employees) typically have more than 5,000 instruments that require calibrating. 42 percent of companies perform more than 2,000 calibrations each year.

In the highly regulated pharmaceuticals sector, a massive 75 percent of companies carry out more than 2,000 calibrations per year. Oil, Gas & Petrochemicals sector is similarly high, with 55 percent of companies performing more than 2,000 calibrations each year. The percentage is still quite high in the food & beverage sector, where 21 percent of firms said they calibrated their instruments more than 2,000 times every year. This equates to a huge amount of paperwork for any process plant.

The figures outlined appear to suggest that companies really do require some sort of software tool to help them manage their instrument calibration processes and all associated documentation. However, the picture in reality can be very different.

Only a quarter of companies use calibration software

In Beamex's own Calibration Study carried out a mere 25 percent of companies with 500+ employees (across the industry sectors mentioned above) said that they did use specialist calibration management software. Many other companies said that they relied on generic spreadsheets and/or databases for this, whilst others used a calibration module within an existing Computerised Maintenance Management System (CMMS). A significant proportion (almost 20 percent) of those surveyed said they used a manual, paper-based system.

Any type of paper-based calibration system will be prone to human error. Noting down calibration results by hand in the field and then transferring these results into a spreadsheet back at the office may seem archaic, but many firms still do this. Furthermore, analysis of paper-based systems and spreadsheets can be almost impossible, let alone time consuming.

Using software for calibration management enables faster, easier and more accurate analysis of calibration records and identifying historical trends.

In a recent survey conducted by *Control Magazine,* 40 percent of companies surveyed said that they calculated calibration intervals by using historical trend analysis – which is encouraging. However, many of these firms said they were doing it without any sort of calibration software to assist them. The other 60 percent of companies determined instrument calibration intervals based on either the manufacturer's own recommendation, or they used a uniform interval across the plant for all instruments. Neither method is ideal in practice. Companies could save so much time and reduce costs by using calibration management software to analyse historical trends and calibration results.

Using software for calibration management enables faster, easier and more accurate analysis of calibration records and identifying historical trends. Plants can therefore reduce costs and optimize calibration intervals by reducing calibration frequency when this is possible, or by increasing the frequency where necessary.

For example, for improved safety, a process plant may find

CHECKLIST

Choosing the right calibration software

- Is it easy to use?
- What are the specific requirements in terms of functionality?
- Are there any IT requirements or restrictions for choosing the software?
- Does the calibration software need to be integrated with the plant's existing systems?
- Is communication with smart calibrators a requirement?
- Does the supplier offer training, implementation, support and upgrades?
- Does the calibration software need to be scalable?
- Can data be imported to the software from the plant's current systems?
- Does the software offer regulatory compliance?
- Supplier's references and experience as a software developer?

it necessary to increase the frequency of some sensors that are located in a hazardous, potentially explosive area of the manufacturing plant.

Just as important, by analyzing the calibration history of a flow meter that is located in a 'non-critical' area of the plant, the company may be able to decrease the frequency of calibration, saving time and resources. Rather than rely on the manufacturer's recommendation for calibration intervals, the plant may be able to extend these intervals by looking closely at historical trends provided by calibration management software. Instrument 'drift' can be monitored closely over a period of time and then decisions can be made confidently with respect to amending the calibration interval.

Regardless of industry sector, there seems to be some general challenges that companies face when it comes to calibration management.

The number of instruments and the total number of periodic calibrations that these devices require can be several thousand per year. How to plan and keep track of each instrument's calibration procedures means that planning and scheduling is important. Furthermore, every instrument calibration has to be documented and these documents need to be easily accessible for audit purposes.

Paper-based systems

These systems typically involve hand-written documents. Typically, this might include engineers using pen and paper to record calibration results while out in the field. On returning to the office, these notes are then tidied up or transferred to another paper document, after which they are archived as paper documents.

While using a manual, paper-based system requires little or no investment, it is very labor-intensive and means that historical trend analysis becomes very difficult to carry out. In addition, the calibration data is not easily accessible. The system is time consuming, soaks up a lot of resources and typing errors are commonplace. Dual effort and re-keying of calibration data are also significant costs here.

In-house legacy systems (spreadsheets, databases, etc.)

Although certainly a step in the right direction, using an in-house legacy system to manage calibrations has its drawbacks. In these systems, calibration data is typically entered manually into a spreadsheet or database. The data is stored in electronic format, but the recording of calibration information is still time-consuming and typing errors are common. Also, the calibration process itself cannot be automated. For example, automatic alarms cannot be set up on instruments that are due for calibration.

Calibration module of a CMMS

Many plants have already invested in a Computerized Maintenance Management System (CMMS) and so continue to use this for calibration management. Plant hierarchy and works orders can be stored in the CMMS, but the calibration cannot be automated because the system is not able to communicate with 'smart' calibrators.

Furthermore, CMMS are not designed to manage calibrations and so often only provide the minimum calibration functionality, such as the scheduling of tasks and

entry of calibration results. Although instrument data can be stored and managed efficiently in the plant's database, the level of automation is still low. In addition, the CMMS may not meet the regulatory requirements (e.g. FDA) for managing calibration records.

Calibration Software

With speciality calibration management software, users are provided with an easy-to-use Windows Explorer-like interface. The software manages and stores all instrument and calibration data. This includes the planning and scheduling of calibration work; analysis and optimization of calibration frequency; production of reports, certificates and labels; communication with smart calibrators; and easy integration with CMMS such as SAP and Maximo. The result is a streamlined, automated calibration process, which improves quality, plant productivity and efficiency.

Benefits of Using Calibration Software

With software-based calibration management, planning and decision-making are improved. Procedures and calibration strategies can be planned and all calibration assets managed by the software. Position, device and calibrator databases are maintained, while automatic alerts for scheduled calibrations can be set up.

Organization also improves. The system no longer requires pens and paper. Calibration instructions are created using the software to guide engineers through the calibration process. These instructions can also be downloaded to a technician's handheld documenting calibrator while he is in the field.

Execution is more efficient and errors are eliminated. Using software-based calibration management systems in conjunction with documenting calibrators means that calibration results can be stored in the calibrator's memory, then automatically uploaded back to the calibration software. There is no re-keying of calibration results from a notebook to a database or spreadsheet. Human error is minimized and engineers are freed up to perform more strategic analysis or other important activities.

Documentation is also improved. The software generates reports automatically and all calibration data is stored in one database rather than multiple disparate systems. Calibration certificates, reports and labels can all be printed out on paper or sent in electronic format.

Analysis becomes easier too, enabling engineers to optimize calibration intervals using the software's History Trend function.

Also, when a plant is being audited, calibration software can facilitate both the preparation and the audit itself. Locating records and verifying that the system works is effortless when compared to traditional calibration record keeping.

Regulatory organizations and standards such as FDA and ISO place demanding requirements on the recording of calibration data. Calibration software has many functions that help in meeting these requirements, such as Change Management, Audit Trail and Electronic Signature functions. The Change Management feature in Beamex's CMX software, for example, complies with FDA requirements.

Business Benefits

For the business, implementing software-based calibration management means overall costs will be reduced. These savings come from the now-paperless calibration process, with no manual documentation procedures. Engineers can analyze calibration results to see whether the calibration intervals on plant instruments can be altered. For example, those instruments that perform better than expected may well justify a reduction in their calibration frequency.

Plant efficiencies should also improve, as the entire calibration process is now streamlined and automated. Manual procedures are replaced with automated, validated processes, which is particularly beneficial if the company is replacing a lot of labor-intensive calibration activities. Costly production downtime will also be reduced.

Even if a plant has already implemented a CMMS, calibration management software can be easily integrated to this system. If the plant instruments are already defined on a database, the calibration management software can utilize the records available in the CMMS database.

The integration will save time, reduce costs and increase productivity by preventing unnecessary double effort and re-

keying of works orders in multiple systems. Integration also enables the plant to automate its calibration management with smart calibrators, which simply is not possible with a standalone CMMS.

Benefits for all process plants

Beamex's suite of calibration management software can benefit all sizes of process plant. For relatively small plants, where calibration data is needed for only one location, only a few instruments require calibrating and where regulatory compliance is minimal, Beamex **CMX Light** is the most appropriate software.

For medium-to-large sized companies that have multiple users who have to deal with a large amount of instruments and calibration work, as well as strict regulatory compliance, Beamex **CMX Professional** is ideal.

Beamex's high-end solution, **CMX Enterprise,** is suitable for process manufacturers with multiple global sites, multilingual users and a very large amount of instruments that require calibration. Here, a central calibration management database is often implemented, which is used by multiple plants across the world.

Beamex Users

Beamex conducted a survey of its customers, across all industry sectors. The results showed that 82% of CMX Calibration software customers said that using Beamex products had resulted in cost savings in some part of their operations.

94% of CMX users stated that using Beamex products had improved the efficiency of their calibration processes, whilst 92% said that using CMX had improved the quality of their calibration system.

Summary

Every type of process plant, regardless of industry sector, can benefit from implementing specialist calibration management software. Compared to traditional, paper-based systems, in-house built legacy calibration systems or calibration modules with CMMS, using dedicated calibration management software results in improved quality, increased productivity and reduced costs of the entire calibration process.

Despite these benefits, only one quarter of companies who need to manage instrument calibrations actually use software designed for that purpose.

SUMMARY

Calibration Software improves calibration management tasks in all these areas

- Planning & Decision-Making
- Organization
- Execution
- Documentation
- Analysis

The Business Benefits of using software for Calibration Management

- Cost reduction
- Quality improvements
- Increase in efficiency

CUSTOMER CASE STORY

Heineken España,

S.A. (Fábrica Sevilla) Spain

From an environmental perspective, the new Heineken Brewery has been designed to make an optimum use of natural resources.

In Sevilla, 2 years after its start and with an investment of over 300 million Euros, the new brewery of Heineken España S.A., is nearly completed. It is called "Jumbo" because of the magnitude of the project, which has been built at record speed in such a short time.

In keeping with their beer tradition and traditional fabrication recipes, the installations have been designed with the highest levels of safety and automation. The new Heineken brewery will be the most modern and productive plant in Europe, allowing the company to remain the beer market leader in Spain.

From an environmental perspective, the new Heineken brewery has been designed to make an optimum use of natural resources. For instance, the use of heating systems based on overheated water or the cleaning systems, which reuse water, will ensure that the use of water and energy is reduced by 20%. From the point of view of automation, it should be underlined that everything communicates via fieldbuses: Ethernet, Profibus DP, Profibus PA (for process instrumentation) and AS-I for valves and actuators.

Armando Rivero Rubalcaba has been Head of Instrumentation for the Sevilla factory since 1996, in its former location, in calle Greco, and now in the new factory.

The situation

For Heineken, the quality of the beer is a number one priority. All their plants in Spain have received ISO 9001 and ISO 14001 certifications, in addition to the BRC certificate of food safety. They must therefore ensure that all processes correspond to the planned characteristics, and the role of calibration is very important to ensure the quality and safety of the processes. The Instrumentation Department includes the Head of Instrumentation and 5 instrumentation technicians, who are responsible for all the calibrations/adjustments of the instruments. In the new factory, the Instrumentation Department calibrates, checks, adjusts the following equipment: temperature, flow, CO_2 in beer, dissolved O_2, level, pH, conductivity, pressure, weight, yeast consistency, density, turbidity and color.

In the old Heineken factory, the management and documentation of calibrations were carried out via a database in Access. It was designed for printing the calibration certificates of the control loops collected among the critical equipment, in keeping with the ISO 9001 and 14001 norms and to establish the annual calibration plans of these loops. This database contained the specifications of the equipment, but did not store the calibration data, and thus they had to be kept on paper in view of the audits.

For the calibrations, Heineken used printed reports from the database to note the calibration results. These results were then entered into the database to obtain the corresponding calibration reports. Consequently, the instrumentation technician did not know if the calibration was accepted before introducing the data and establishing the report.

The solution and main benefits

For the new plant, there was a need for a tool, which for instance would make the calibration work easier, stores all calibration results, show the calibration history trend and provide a quick access to calibration data.

These factors led Heineken to choose the Beamex® CMX Calibration Software with the Beamex® MC5 Multifunction Calibrator in the new factory (JUMBO). The whole instrumentation of the factory (instruments with analog variables) are entered into the CMX, following a codification and plant structure (TAG) according to the ISA 88 standard. Each instrument that is calibrated regularly has its calibration procedure including the initial calibration date, due date and all calibration related information. Then the various preventive maintenance plans (calibrations), which automatically generate work orders for each calibration plan, are entered into the SAP® PM (Plant Maintenance) management system. Once the work order is created in SAP® PM, the instrumentation technician sends the equipment to calibrate from the CMX to the MC5, or the PDA if they are manual calibrations.

Once the calibrations are completed, the data are stored in the CMX and electronically approved by the Head of Instrumentation. All the calibration labels are then printed and positioned on the calibrated equipment. The combined solution of the CMX, MC5 and PDA allows for a seamless electronic flow between the calibration software and the calibrators, with the following benefits: it reduces possible errors of manual data entry, gives an automatic documentation of all data, electronic approval of calibrations, paperless management of calibration, quick access to the equipment which requires calibration, trend analysis capacity and history of calibrations as well as very precise and robust calibrator. The main benefits obtained with this combined solution CMX, MC5 and PDA are centered around a more efficient, practical and accurate working method, with a better optimization and quality of calibrations, saving costs which results in a rapid ROI. “I think it was an excellent decision to choose for the most modern brewery in the world the best calibration management system, the Beamex® CMX with the Pocket PC and the MC5”, Armando Rivero Rubalcaba summarizes.

CASE STORY IN BRIEF

CUSTOMER PROFILE

Heineken España, S.A.
(Fábrica Sevilla) Spain

THE SITUATION

The new brewery (JUMBO) of Heineken España S.A. in Sevilla, is nearly completed. The new Heineken factory will be the most modern and productive plant in Europe, allowing the company to remain the beer market leader in Spain. For the new plant, there was a need for a tool, which for instance would make the calibration work easier, store all calibration results, show the calibration history trend and provide a quick access to calibration data.

SOLUTION DESCRIPTION

- Beamex® CMX Calibration Software (with Pocket PC Option)
- Beamex® MC5 Multifunction Calibrator

MAIN BENEFITS

- Streamlined and automated calibration procedures (e.g. documentation, calibration work procedures)
- Efficient, practical and accurate working methods, which minimizes the possibilities for human errors
- Calibration system provides safety by adhering to regulations (ISO 9001, ISO 14001)
- Improved quality, cost savings and fast ROI for the new calibration system efficiency, and reduces risk of problems