

Calibration

AUTUMN 2014

WORLD

**New methods for
calibrating loops**

Calibrating switches

**Intelligent
commissioning**

**Customer
success stories**

British Sugar, UK

L-Tech Engineering, India

Monsanto, US



CEO's Letter

Today's modern process plants, production processes and quality systems place new and tough demands on the accuracy of process instruments and control. Quality systems, such as the ISO9000 and ISO14000, call for systematic and well-documented calibrations with regard to accuracy, repeatability, uncertainty and confidence levels. At the same time, many of the dedicated and experienced calibration specialists are retiring, and the new specialists replacing them are also typically given other duties and responsibilities, leaving less time to become deeply familiar with calibration.

Fortunately, modern calibration techniques and calibration systems have made it easier to overcome the challenges mentioned and fulfil the demands on instrumentation calibration and maintenance in a more productive way without sacrificing the quality of the calibrations. Sophisticated, highly accurate, multifunctional, easy-to-use calibration equipment, such as the Beamex MC6 advanced field calibrator and communicator, are available. An excellent example of a perfect solution for documentation requirements is calibration software like Beamex CMX calibration management software.

Approaching the task of calibration with a fresh perspective and utilizing the most advanced equipment and software, there are plenty of opportunities to "do more with less". One of the articles in this magazine deals with new methods for calibrating loops. Good planning of loop testing strategies will result in improved control performance without compromising the quality, reliability or safety of plant operations. The other informative articles in this magazine cover intelligent commissioning and calibration of switches.

At the time I am writing this, the general market outlook in Europe is not very positive. Furthermore, we also have some political challenges in our neighbourhood which may have a negative impact on our customers' business in the near future. Fortunately, Beamex business is very global in nature and the rest of the world can, if needed, balance European sales.

Enjoy your reading and remember that we greatly appreciate your feedback – not only concerning this magazine!



Raimo Ahola
CEO, Beamex Group



CEO's Letter 2

New methods for calibrating loops 4

Calibrating switches 12

Intelligent commissioning 14

Customer success stories

British Sugar introduces the Beamex Integrated Calibration Solution 16

L-Tech Engineering number one in fieldbus calibration in India 18

Calibration with the right tools simplifies procedures at Monsanto 20

News 22

Calibration Insights – Beamex newsletter series

Beamex makes significant equipment and software donation to ISA

Beamex CMX version 2.8

Beamex in brief 27

Beamex products and services 27



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New methods for calibrating loops

Instrument technicians are following practices that were set up many years ago and it is not uncommon to hear, “this is the way we have always done it.” Measurement technology continues to improve and is becoming more accurate.

ps



New methods for calibrating loops



The typical approach to calibration has been to regularly test instrumentation that influences effective control, safe operation, quality or other relevant criteria. In most cases, scheduling is conservative and methods at a particular site have slowly evolved over time. Instrument technicians are following practices that were set up many years ago and it is not uncommon to hear, “this is the way we have always done it.” Measurement technology continues to improve and is becoming more accurate. It is also becoming more complex – why test a fieldbus transmitter with the same approach as a pneumatic transmitter? Performing the standard five-point, up-down test with an error of less than 1 % or 2 % of span does not always apply to today’s more sophisticated applications.

In general, calibration tasks require special skills and an investment in test equipment. Sophisticated, highly accurate and multifunctional calibration equipment, such as the Beamex MC6 advanced field communicator and calibrator, are required to effectively calibrate advanced instrumentation, like multivariable and smart/digital instruments. With the complexity of instrumentation, there is more pressure than ever on the calibration technician. Technicians with 30+ years’ experience at a single plant are retiring and cannot easily be replaced by a younger technician or be properly outsourced. Documentation requirements are becoming much more common for improved quality, environmental monitoring, and for adhering to government regulations. Calibration software, like Beamex CMX calibration management software, is often required to store and analyze detailed data as well as to create calibration certificates and reports. All of these factors should cause scrutiny and evaluation of current practices. Simpler and more efficient test methods need to be considered to ensure proper plant operation.

While not a new concept, there are advanced calibration techniques based on loop testing. In some cases, it is best practice to perform individual instrument calibration to achieve maximum accuracy (e.g. custody transfer metering). However, there are viable methods where a loop can be tested end-to-end and if readings are within acceptable tolerances, there is no need to break into the loop for individual instrument testing. To be effective, a common sense approach is required with the goal to minimize downtime, maximize technician efficiency while ensuring reliable control and maintaining a safe work environment.

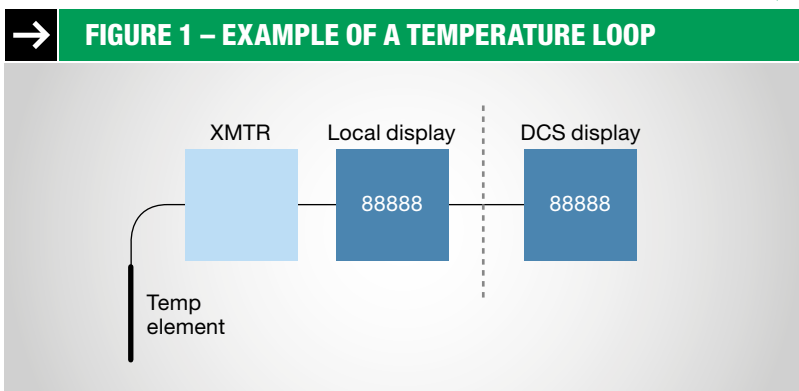
What is a loop?

The idea of a loop can mean different things to different people due to their work background and/or industry. In practice, a loop is simply a group of instruments that in combination make a single measurement or effect a control action in a process plant. A typical temperature example would be a temperature element (RTD or T/C) that in turn is connected to a transmitter, which is connected in a series to a local indicator and finally a control system input card (DCS or PLC). The signal is then displayed on one or more control panels and the measurement is ultimately used to control the process.

The idea of a loop can mean different things to different people due to their work background and/or industry.

When evaluating a loop for testing, an important distinction to make is whether a closed loop test should be performed or an open loop test?

A closed loop is an end-to-end test; in the temperature loop example (figure 1), the temperature element would need to be removed from the process and placed in a temperature block, such as the Beamex temperature blocks, or temperature bath in order to simulate the process temperature. The final displayed measurement would be compared to the simulated temperature and the error interpreted. A closed loop test is the best practice; if an accurate temperature is made for the control process, it does not matter how the individual instruments are performing. The DCS/PLC value is what is used to make any control changes, alarms, notifications, etc. However, if the loop measurement has a significant error, then the error of each instrument in the







One good way to look at error is to think in terms of the loop's input engineering units.

loop should be checked and corrected one by one in order to bring the final measurement back into good operation.

In some cases, it is not possible to make a closed loop test. In the example loop, it may be extremely difficult or expensive to remove the probe from the process or the probe cannot be inserted into a temperature block/bath. If this is the situation, then an open loop test can be performed where the temperature element is disconnected from the transmitter and a temperature calibrator is used to simulate a signal into the transmitter. As in the closed loop test, the final displayed measurement would be compared to the simulated temperature and the error interpreted, etc. While the loop is open, it would be good to check the installed temperature element; perhaps a single-point test could be done by temporarily inserting a certified probe/thermometer into the process and comparing that measurement against the element's output when connected to a calibrator.

Analysis of loop error

Error limits can be somewhat difficult to determine and many mistakes are made when it comes to setting error limits. One common judgment is to base process measurement tolerance on a manufacturer's specification. Some manufacturers are better than others, but the marketing department may have as much to say about an accuracy specification as an R&D engineer. Furthermore, accuracy statements are generally an "off-the-shelf" value that

does not include such things as long-term stability (typically a significant error component), repeatability, temperature effects and more. Sensor and transmitter accuracy should be a consideration of what the process measurement tolerance should be, not the final value.

The best method is to have a collaborative discussion between the control engineer, quality engineer and/or the safety engineer with the instrument engineer in setting a realistic and practical tolerance. It is extremely important to keep in mind that the tighter the tolerance, potentially, the more expensive it will be to not only make the measurement, but to maintain the measurement. The balance falls somewhere between the required tolerances to create efficient control, the best quality and maintain the highest safety versus minimizing downtime, maximizing technician efficiency and/or utilizing optimum test equipment. In practice, it is common to see $\pm 1\%$ of span (or $\pm 2\%$ or even $\pm 5\%$). However, this does not easily apply to flow measurements (typically a percent of reading or rate) or analytical instruments (pH or ppm, for example).

One good way to look at error is to think in terms of the loop's input engineering units. As regards the temperature loop example (figure 1), the discussion should focus on what minimum temperature error creates the highest operating efficiency without compromising quality or safety and can be realistically measured by the calibration/test equipment. One other complication for loop error is that a given loop is no more accurate than the least accurate component contributing to the measurement. Today's transmitters are extremely accurate and provide excellent performance. However, temperature sensors are typically not nearly as accurate and, depending on the process, can exhibit significant drift. If a typical RTD is rated to ± 0.5 °F, a control engineer cannot

expect better than ± 0.5 °F to control the process. In reality, even though the transmitter and DCS analog-to-digital conversion can be significantly more accurate, it must be recognized that these components add additional error to the loop measurement. A common practice to compute loop error is to utilize a statistical average or a root-mean-square (RMS) calculation. With regard to the temperature loop example, assume the RTD sensor is rated $\pm 0.5^\circ$, the transmitter is $\pm 0.10\%$ span (span = 50 to 250 °F) and the DCS input card is $\pm 0.25\%$ span (span = 50 to 250 °F). The loop error could be evaluated as follows:

$$\sqrt{0.52 + (0.001 \times 200)^2 + (0.0025 \times 200)^2} \approx \pm 0.75^\circ\text{F}$$

The most conservative approach would be to simply sum up the errors ($0.5 + 0.2 + 0.5$ or ± 1.2 °F). The final decision should also consider the criticality of the measurement along with evaluation of the impact the error will have on the process and/or the risks involved.

The discussion should not end here. The control engineer will strive for the lowest number possible (± 0.75 °F), but there are other factors. An evaluation of the test equipment is required. The typical temperature block has an accuracy anywhere from 0.3 °F to 1.0 °F, and it is good practice to have a 4:1 ratio of test equipment versus process measurement. To make a proper temperature simulation, a reference probe (RPRT or SPRT, reference or secondary primary resistance thermometers) along with an accurate PRT meter, such as a Beamex MC6 with the optional RPRT probe, would both need to be utilized to achieve an improved measurement error of 0.1 °F to 0.2 °F. This could impose a significant investment in test equipment, depending on the industry, and it should be noted this will require a higher cost of maintenance for the more accurate test equipment. For example, what if the quality engineer reports that

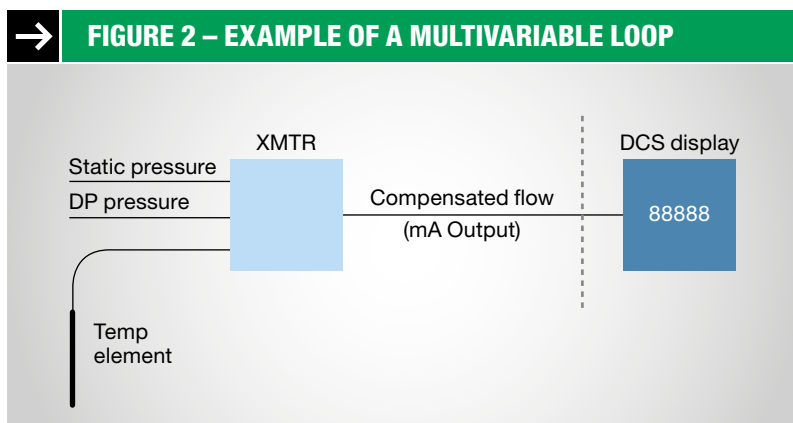
an error of ± 5 °F is all that is needed to make a good product? Why impose an unnecessary burden on the instrumentation department? If the control engineer has no objection (along with input from reliability, safety, etc.), a practical approach would be to set a loop tolerance of ± 2.0 °F, assuming the temperature block has an accuracy of ± 0.5 °F over the range of 50 to 250 °F. While not as accurate as the instrumentation in the loop, it is better than 2:1 for what is required to make a quality product and allows the calibration technician to utilize a simple combination of equipment.

While this is just one scenario, it is good practice to determine the “weakest link” in the loop and not set an unrealistic performance tolerance. When looking at fuel costs or process efficiencies, this type of analysis could easily justify a larger investment in test equipment along with frequent testing if the cost/risk of error is high. With good judgment, striking a balance and avoiding unreasonable testing requests, manufacturing objectives can be met.

LOOP TESTING EXAMPLES

Temperature loop test example

Should a process plant have hundreds of temperature loops like the example (figure 1), there are good benefits with loop testing. While it takes time to make a test with a temperature block, the calibration technician can effectively check 2, 3 or more instruments that make up the loop. With this type of approach, it may make sense to invest in more rugged and/or more accurate probes in order to minimize failures. Depending on the process, more frequent testing may be required, but in any case, management will have a high level of confidence that accurate measurements are being made. With repeatable work methods, technicians will recognize common issues and there



should be efficiency gains. If calibrations are being documented, analysis of test cycles can be analyzed and most likely intervals can be extended or at least optimized. The need for troubleshooting and emergency repairs will always be required, but the loop cycle should be reset whenever such an event occurs. This methodical approach effectively provides contact to every instrument in the plant while minimizing disturbances to the loop integrity and delivering the very best measurements to the control system.

Multivariable loop example

Flow measurements can be very demanding and often require very tight performance tolerances. In the case of natural gas or steam measurements, a small error can amount to significant errors in billing, thus creating extra scrutiny by management. A common example of orifice measurement is to compensate the differential pressure

measurement by factoring in the process temperature and static pressure. These three measurements can be processed by the DCS to make an accurate flow calculation. However, there are now dp flow meters (aka, “multivariable”) with an integrated process RTD and static pressure measurement that provide a compensated flow measurement output; the flow calculation is built into the smart transmitter.

If the three measurements are independently processed by the control system, typical test procedures apply, but a loop test should be done to verify the accuracy of the compensated flow reading. While multivariable meters appear to be complex, a loop test can be set up to quickly verify that the meter is correctly measuring the flow to a desired per cent of reading accuracy by identifying the measurement components. As an example, consider a steam application:

Input pressure range:	0 to 250 inH ₂ O
RTD input range:	-200 °F to +800 °F
Normal process temperature:	450 °F
Static pressure input range:	0 to 800 psi
Ambient barometric pressure:	14.735 psia (average local barometric pressure in 2012)
Output:	4–20 mA (typical range of 0–1,500 lbs/hr, ± 1 % of reading)



New methods for calibrating loops



For this example, a non-linear test should be set up where the expected lbs/hr output is calculated for specific pressure input test points assuming a constant, typical 450 °F temperature and a static pressure of 14.735 psi since the low side of the transmitter is vented to atmosphere for testing. Consulting with the control engineer, expected measurements may look like this:

inH ₂ O	mA	Lbs/Hr
0.00	4.0000	0.0
30.00	7.6250	339.8
60.00	9.2202	489.4
90.00	10.4787	607.4
120.00	11.5717	709.8
150.00	12.5634	802.8
180.00	13.4872	889.4
200.00	14.0738	944.4
225.00	14.7845	1,011.0
250.00	15.4743	1,075.7

The Beamex MC6 offers very unique features for testing multivariable transmitters. The preceding non-linear table can be entered into the Beamex CMX software for a specific tag and downloaded into the MC6 for testing. Additionally, the three tests can be performed with the process variables versus each HART value that is used in the compensated output calculation. The only additional test tool required would be a Beamex temperature block.

The loop test should simply be a 5-point check of inH₂O vs. lbs/hr at 0 %, 50 %, 100 %, 50 % and 0 %. If all of the measurements fall within a 1 % reading, the technician can pack up his tools and move on to the next instrument. If the loop test result is marginal or a failure, then 3 tests of the dp pressure versus HART, RTD temperature versus HART and static pressure versus HART will need to be performed and adjusted as needed. Upon completion of the three variables that plug into the flow calculation, a quick check of the 4–20 mA output should be done as well. Assuming one or more of the inputs require adjustment, a final As Left loop

test of the improved flow output will document indicate that the meter is in good operating condition and make documentation of it. It is a real time saver to focus on the non-linear input vs. flow output for a multivariable loop and this will result in a much simpler maintenance task for the instrument technician.

Other loop examples

A pressure loop can be easily checked by applying a pressure to the input transmitter and comparing it to the DCS or final control reading. This can be done very quickly and can be much more effective than merely testing the transmitter. Any batch control loop should be evaluated for loop testing with the goal to make work more efficient for the technician while verifying that control measurements are as accurate as possible.

This same technique should be considered for control valve testing where an mA input into the I/P is compared to an mA output (feedback). This would also apply to smart control valve positioners using a communicator to step the valve and monitor the digital feedback. By making 10 % test points, a quick test on a valve will verify that it is operating correctly. In most cases, the test should pass and the technician can make a quick round of testing of critical control valves.

An overlooked component of a flow loop is the primary element (orifice plates, annubars or averaging pitot tubes). These are critical for a proper flow measurement and while they cannot be calibrated, they should be inspected for damage or wear.

Another critical area where loop testing should be considered is safety instrumented systems (SIS). When the process is down, it is common to follow a script of testing procedures that can include calibration of single instruments. However, whenever possible, consider checking an entire

loop where the integrity of a critical measurement can be verified, especially for temperature (utilizing a block/bath) or pressure measurements. Also, it may be possible to perform quick and simple tests on a SIS while the process is up and running to ensure systems are operating properly.

Conclusion

In many, many process plants, calibration is performed by simply checking the transmitter. It takes time to use a temperature block/bath, but consider how important it is to test all the devices that make up a given measurement. Transmitters are not the only devices that drift. Temperature probes drift due to thermal stress/shock and vibration or physical damage. DCS/PLC input cards drift as much or more than transmitters. If loops are not being tested, how can a good measurement be made? Without good measurements, how can optimum control, safety, reliability and quality be ensured?

As instrumentation and automation evolve, so should the methods for calibrating instrumentation. Loop testing is not a new concept, but it is underutilized as an effective strategy for instrumentation testing. With the Beamex Integrated Calibration Solution, flexible tests can be designed to meet a variety of applications. The Beamex solution delivers the highest level of automation while providing detailed documentation and electronic reporting.

By approaching the task of calibration with a fresh look, there are plenty of opportunities to “do more with less” and effectively make contact with every instrument in the plant more efficiently using loop calibration strategies. Logical and careful planning of loop testing strategies will result in improved control performance without compromising quality, reliability or safety of plant operations.



Calibrating switches

For most technicians, calibrating switches becomes somewhat of an afterthought

For most technicians, calibrating switches becomes somewhat of an afterthought. This may be due to the fact that switches are commonly viewed as an overly simplistic device. A technician may see a switch and think, "What is there to calibrate?" The fact of the matter is that there are significant reasons to calibrate switches and multiple ways of doing so.

The three main reasons to calibrate switches:

- 1. DUE TO REGULATIONS** from the FDA, EPA or EMEA, all regulated instruments, including safety instrumented systems (SIS) require calibration and documentation
- 2. A FAULTY SWITCH** can be a safety hazard for both employees and customers. If too much pressure builds up in a vessel and the switch does not release it properly, it could explode and seriously injure nearby employees and cause damage to the surrounding factory. For industries producing consumable items, a faulty switch leads to product quality issues. This type of inconsistency in ingredients can prove fatal when dealing with medication or food products.
- 3. A SWITCH THAT IS NOT** functioning properly, opens and releases at an incorrect time, wastes material. Ultimately this causes a factory to lose time and money, whether it is due to the cost of raw materials, failing an audit or recalling a product.

With all of these reasons to calibrate, why is it still an afterthought? Maybe it is not an issue of why one calibrates a switch, but how and what is involved?

There is what we like to call the shade tree mechanic way. Here, a technician applies pressure and hooks up a meter to the switch and waits until the meter changes. At this point, the technician sees the meter change and maybe hears it click, looks at the dial and tries to guess at what pressure the switch tripped (not so scientific).

A more accurate way allows one to automatically capture the pressure at which the switch actuated with precise resolution instead of guessing when the analog meter changed and what value was indicated on the pressure gauge. Before you calibrate, you need to know your switches' defined set and reset values have a process tolerance defined. For example, a normally open (NO) rising switch may have a set point of 10 psi and a reset of 8 psi. If our tolerance is ± 1 psi, then our set point can be anywhere from 9 to 11 psi and our reset from 7 to 9 psi. Using those two aspects and functions, one can then perform a test and determine whether the switch passes or fails.



Like us on Facebook and watch our webinar, "Calibrating switches", where we walk you through the

process step by step. It is our aim to demystify switch testing and take the backyard mechanic out of the equation.





Intelligent commissioning

A closer look at process instrument commissioning and the difference an automated procedure can make

Process instrument commissioning is an essential part of a plant's overall commissioning program and is necessary for ideal plant performance. It requires an allocated budget, time, and trained personnel, and must be considered within the scope of the overall program. Typically, the most common activities that affect time and costs in a conventional process instrument commissioning program are:

1. learning to use the field device,
2. physically installing the field device,
3. connecting to and identifying the field device, and
4. configuring the required parameters and testing the configuration and interface with other systems.

With all of these activities, it is obvious that detailed planning is necessary to complete the process. A schedule must be established with benchmarks and monitoring activities in order to keep track of progress. This discussion will focus on tracking the rate of process instrument commissioning, which is possible to measure (e.g. number of loops or sequence of steps tested per day).

For example, a new chemical facility may have a project with 150 loops to check out for a total of 375 instruments (2.5 instruments per loop, on average). Using a conventional calibration procedure, testing/checking takes 30 minutes per instrument and there is an additional 30 minutes per loop of

checking required, the total estimated man-hours would be 263. This equates to one person working 10-hour days, non-stop for nearly a month. Let's assume that this process was appropriately planned, and the correct amount of time, money and man hours were allocated to the project. That is a hefty budget.

Now imagine they were using highly automated and paperless procedures. For example, during commissioning, the design engineer has the instrument details readily available. Typically, smart instrumentation is used, and smart calibrators can obtain set-up details via HART/FF/PA. By combining this data with system features, instrumentation can be easily checked prior to start-up and all testing documented in electronic format. Having the field commissioning team organized with test tools that lead them through detailed testing is a tremendous benefit. When power is finally provided to the loops, there will be far less problems and troubleshooting. If there is a problem, test history is readily available for a much quicker analysis and solution resolution. Recently, an experienced I&C Engineer told me he estimated the savings in troubleshooting and gain in loop check efficiency saved him "on the order of several man-weeks."

Eliminating as many of the "moving parts" involved in this critical activity as possible directly correlates to lower cycle time for loop checks. Using a procedure that replaces paper-based

records with electronic records reduces the man-hour requirements inherent with handling paper, both in planning and particularly when a contracted technician is in the field, who also has to manage the equipment required to accomplish the task. Ideally, the equipment required for loop checks and instrument configuration also provides the technician electronic data when needed and documents the results. Elimination of hardcopy records also mitigates the risk associated with human error. This risk, if realized, has potential to become extremely costly indeed. All in all, automating the calibration process during commissioning can save time, reduce risks and costs.

ning



British Sugar, UK

British Sugar introduces the Beamex Integrated Calibration Solution

British Sugar at Wissington, built in 1925, is the largest beet sugar factory in the world and the most efficient in Europe – operational 355 days per year. The operation runs with 267 permanent employees peaking at 500 including non-permanent staff during campaign periods when the sugar beet is being brought into the factory. During this campaign period over 3 million tons of beets are processed with 1,000 trucks visiting the site every day. That's a truck every 45 seconds. In total 420,000 tons of sugar are produced per year, some of which is stored in 7 silos with total capacity of 97,000 tons.

No waste, everything is transformed into sustainable products

The Combined Heat and Power (CHP) plant produces annually 500,000 MWh of electricity. It consists of an LM6000 gas turbine, a waste heat recovery boiler, a 34 MVA steam turbine, a water treatment plant, two small shell boilers and a back-up plant consisting of three water tube boilers and a 20 MVA steam turbine. The plant supplies heat and power to the sugar factory and bio-ethanol plant, as well as waste heat and carbon dioxide to the 46 acres of greenhouses on site producing 140,000,000 tomatoes a year! The CHP plant also normally exports 45MW of power back to the National Grid, enough to supply a population of 120,000 people.

British Sugar therefore produces a wide range of products, for example 140,000 tons of animal feed, 6,000 tons of betaine, 55,000 tons of bio-ethanol, 120,000 tons of limex, 15,000 tons of tomatoes, 150,000 tons of topsoil, 5,000 tons of stone cleaned and sold as aggregate each year. A carbon dioxide recovery and liquefaction plant recovering up to 70,000 tons of carbon dioxide per year from the bio-ethanol fermentation processes.

Work smarter not longer

Wissington's CHP plant is shut down for a maintenance period of 10 days a year. During this period all maintenance tasks have to be completed including statutory and mandatory testing, repairs and inspections.

There are six shift operators and a day support team comprising the CHP Manager, a CHP Mechanical Engineer and the EC&I Engineer. They are responsible for running and maintaining the whole plant, safely and efficiently within environmental limits. "It is essential that we all work together so that there is no interruption of steam supply to our clients. Any interruption to the steam supply would shut the sugar factory down, causing much inconvenience and expensive downtime, potentially destroying a multi-million pound tomato crop and causing us financial penalties through loss of export revenue", the EC&I Engineer Trevor Wolfe, describes.

The first step was to use a Beamex MC5 and then develop a Beamex CMX calibration database.

The introduction of a new boiler house standard required all instruments to be calibrated every year. The standard was to ensure that all safety and operationally critical instrumentation would be in good working order if ever called upon in earnest. This meant that over 400 instruments would have to be calibrated in a short period of time. The instrumentation in use at the plant is a mixture of temperature, pressure, flow, pH and conductivity transmitters together with pressure gauges and switches. This created its own challenges



and one solution was to employ more contract labour and work longer hours in the outages. However, there is only one CHP EC&I Engineer on site and the



corporate agenda was to work smarter not longer. A system was trialled by the factory electrical technicians by using the CMMS system to schedule the

calibration work to the shift technicians. However, the system took several days to turn around work orders with corrective actions, which was unacceptable for such a short outage period.

Cutting time for outage calibrations by half with the Beamex MC5 and CMX

Beamex calibration equipment and software was introduced as a solution to minimize the time required for each calibration. The first step was to use a Beamex MC5 and then develop a Beamex CMX calibration database, which was used to help manage the calibrations during an annual outage.

“Utilizing the Beamex set up successfully helped to halve the amount of time taken to complete outage calibrations”, Trevor comments.

Subsequently, the site purchased one MC5 multifunction calibrator and CMX calibration software and Trevor Wolfe successfully introduced the Beamex Integrated Calibration Solution cutting the amount of time taken to complete outage calibrations by half, while complying with the company standards and without increasing labour costs. “Utilizing the Beamex set up successfully helped to halve the amount of time taken to complete outage calibrations, therefore enabling us to comply with the company standards without increasing labor costs”, Trevor comments.

The MC5 multifunction calibrator allowed Trevor to optimize the calibration process, and perform field-

→ SOLUTION

Description

- Beamex CMX calibration software
- Beamex MC5 multifunction calibrator

Main benefits

- Major time savings
- Optimized calibration process
- Ease of use
- Less instruments to carry

based calibration whereas, previously pressure instruments were generally taken to a workshop for calibration. Calibration time was minimized and the risk of introducing leaking impulse lines was reduced. “Less time is wasted with technicians returning to the workshop to swap equipment, thanks to the Beamex MC5 calibrator having all-in-one capabilities meaning that most calibrations can be carried out with one single calibrator”, Trevor continues. The instrument technicians also adopted the concept of combining a loop test with each calibration by working in pairs via radio contact. “Being able to download multiple jobs to the MC5 calibrator means a day’s worth of calibrations can be given out at the start of a shift; therefore instrument technicians can plan their day better”, Trevor Wolfe adds.

The Beamex Integrated Calibration Solution has now also been rolled out into the bio-ethanol plant and the Beamex CMX software is used in the automatic transfer of work orders and data to British Sugars CMMS system. This system is now in the process of being implemented at the other sites within the British Sugar Group.

L-Tech Engineering, India

Number one in fieldbus calibration in India

L-Tech Engineering services started its business in India in 1998 with the objective of providing specialized services in the field of process instrumentation calibration, pre-commissioning, commissioning, maintenances and safety valve testing services for all process instrumentation industries (oil and gas, refinery, petrochemicals and power plants).

L-Tech Engineering services is one of the revolutionary companies in India. They are specialized in the field of process instrumentation calibration; commissioning jobs for oil and gas, refineries and power plant projects.



An Engineer at L-Tech Engineering does a field calibration / loop checking.

L-Tech Engineering services is one of the revolutionary companies in India. They are specialized in the field of process instrumentation calibration; commissioning jobs for oil and gas, refineries and power plant projects. They have gathered a prestigious client database with many leading Indian companies. Since its establishment, the company has successfully executed more than 100 projects covering a wide range of process instrumentation services.

High-level performance

To attain higher levels of excellence by providing professionalized treatment and specialized technical services, L-tech Engineering is equipped with the

most modern test instruments/equipment available in instrumentation. They also have a well-educated and extremely experienced technical staff for calibration, testing, commissioning and maintenance in scheduled time.

“We consider ourselves the best-equipped contractor in India. We were also the first company to introduce fieldbus calibrators in India. Being the best and staying the best, we constantly keep up to date with all of the developments in process instrumentation, providing training programs for our staff. At L-Tech, we assist customers by providing resources/tools designed to perform multiple function calibration services for process

variables and to maintain quality”, describes Mr. Binish Nair.

Unexpected challenges when introducing the fieldbus calibrator

In 2007, L-Tech received a substantial contract from a leading Indian Oil & Gas company. As a result, L-Tech mobilized itself with a lot of new equipment and significant investments and learned that over 80 % of the transmitters in the contract were fieldbus-based. According to Mr. Nair, finding the right solution was a huge challenge; learning about Beamex created new hope for L-Tech as a calibration company. “We are the first



company to inquire about and adapt fieldbus calibration in India. We introduced the Beamex MC5 in the world's most expansively installed base of fieldbus instruments, at that time, the flagship of refinery expansion projects", he says proudly.

At first, the request was denied internally with the claim that fieldbus transmitters do not need to be calibrated. After several discussions and meetings, L-Tech was allowed to test the transmitters. After testing more than two thousand transmitters, several issues related to configuration and accuracy, which did not match the datasheet were found. According to the datasheet, the accuracy specified for transmitters was a 0.025 % span. The same was reported to the client, and the As Left accuracy level was from a 0.1 %

to 0.4 % span. The client conducted an inspection of the transmitter and more than 100 transmitters were tested. The client was extremely active and conducted close inspections. Several transmitters of different ranges were tested in different conditions; with a/c, without a/c, different room temperatures and different times in our lab. All of the aspects related to the calibration procedure, master equipment, room temperature, data sheets and recorded video, photos, etc. were also checked. All required documents were submitted to the principal manufacturer.

"We claimed that with the Beamex calibrator we understand that the transmitter accuracy does not meet the specifications given by the transmitter manufacturer. Some sample transmitters from the US were tested in front of the customer and these performed perfectly within Beamex's error limit. The customer finally admitted that we were right. Thanks to the Beamex MC5 multifunction calibrator, we could achieve this prestigious moment because of the consistent repeatability attained through each transmitter which has been tested in various temperature and humidity conditions", Mr. Nair remembers.

Bonded to Beamex

In early 2008, a senior person from one of the instrument manufacturers from the US came to the L-Tech site and all of the calibration performances were repeated for 5 days, 12 hours a day. After hundreds of trials, the vendor finally accepted, advised to recalibrate and appreciated L-Tech as well as the performance of the Beamex MC5.

"One of the important challenges for any calibration technician/engineer after calibration of instruments is to test and show the same reading in front of a witnessing inspector at the time of



SOLUTION

Description

- Beamex MC6 advanced field calibrator and communicator
- Beamex MC5 multifunction calibrator
- MC2 multifunction calibrator

Main benefits

- High-quality calibrations with improved accuracy and reliable results
- Cost-saving
- Time-saving, efficient

random checking, as the random checking may take place either the same day or even after 2 to 3 weeks. For this the calibration technician needs both good skills and calibration equipment and with Beamex it is very easy to prove it", Mr. Nair notifies.

From this moment L-Tech started using Beamex calibrators for all of the major projects. L-tech is obtaining more and more practical experience which is shared with all of the sites and customers. This experience has also changed the common attitude regarding the importance for calibration of fieldbus transmitters.

Since November 2007, L-tech has used Beamex calibrators for more than 1 million instrument calibrations and loop checking jobs. During this time, we have not come across any maintenance requirements for the calibrator and we have been able to use Beamex calibrators without any interruption in our work. We have also reduced costs and been able to complete the jobs within the scheduled time and with hardly any complaints from our staff or customers.

Customer success story

Monsanto, US

Calibration with the right tools simplifies procedures and saves time

Monsanto produces sustainable agriculture products and solutions for farmers throughout the globe. Seeds, crop protection, and biotechnology solutions encompass Monsanto's portfolio of products. By 2030, Monsanto aims to make agriculture more productive; develop beneficial partnerships and collaborations while reducing the amount of resources needed in agriculture by one-third.

Monsanto's dedication to conservation and sustainability are just two reasons why they are extremely environmentally responsible and conscious of the impact their operations have on the environment. It is because of this continued effort to increase productivity and exceed regulations that CR Magazine choose to recognize Monsanto as one of the "100 Best Corporate Citizens" in 2013.

Monsanto: Soda Springs, Idaho

In Soda Springs, Idaho, Monsanto's phosphate mining and processing facilities produce elemental phosphorus by removing phosphate ore from the ground and refining this material. Since the plant's establishment in 1953, it has operated continuously.

The primary purpose for extracting and refining phosphate ore is to make elemental phosphorus which is the fundamental ingredient in Roundup® herbicide. Elemental phosphorus is also used in other industries to make fire retardants, leavening agents, aviation fluids, carbonated beverages and a host of other products. This location continues to develop and add new instrumentation to accommodate the production. About 2 years ago, the plant made significant capital improvements and today, approximately one million tons per year of phosphate ore are mined.



Today it is a much different scene at Monsanto's Soda Springs plant after the incorporation of Beamex's integrated calibration solution (ICS). Calibrations that took days before are now being done in a matter of hours.

Electrical and instrumentation department

Today, at the Soda Springs plant, a core electrical department maintains the plant's 1,000+ instruments. There are many types of devices found inside the plant, including those that measure pressure, temperature, flow, level and electronic readings. These instruments run on Foundation Fieldbus, DeviceNet and HART protocols, with HART comprising up the majority of the instruments.

Instruments are classified into three different categories. First, "freedom to operate instruments" are defined as the most critical instruments and ensure that Monsanto is operating in an environmentally conscious fashion. An environmental department supervises the documentation for this category. Second, "quality critical instruments" or QCI relate back to the ISO9001 standards. Finally, the remaining devices are classified as "process control, general instrumentation."

There are nine staff members in the

department, including several electrical and instrumentation (E&I) technicians. Tom Bassett, previously an E&I technician, is currently an Electrical Reliability Engineer. Tom now oversees the QCI program and assists when instruments require troubleshooting. Ed Shea, Laran Burdick, and Keven Nield, E&I technicians, have the primary responsibility for testing and calibrating the instrumentation.

Overcoming the conditions through automation

Outdoor conditions in Idaho can be intense, with winter temperatures averaging well below freezing. This weather has a profound effect on working conditions and instrument performance. Regular calibration is crucial to make sure the integrity of each instrument is not compromised.

Prior to implementing the current system, the technicians were using individual, separate and bulky calibrators. Each instrument measurement required the technician to

bring the correlated calibrator out into the field. For example, to calibrate pressure, temperature and electrical instruments, three pieces of equipment were required; one to perform tests, one to calibrate the pressure instrument, and one for the temperature. Even more, if a HART instrument needed to be configured, a HART communicator would be required as well. Consequently, the technician may have had to haul out up to four pieces of equipment at one time or be forced to make multiple trips to the shop between calibrations. It was a big hassle to carry multiple instruments out into the field, especially in extreme weather conditions.

Not only was it challenging for the technicians to lug around all the equipment, but the post-calibration work was extremely time consuming. After the calibrations took place, the results had to be documented. This was done manually, by writing down the results using pen and paper, which took many man hours.

Selecting the right solution

First, the department decided to go on the hunt for multifunction calibrators, and contacted several vendors. Each vendor loaned demo equipment for the department to test, with the agreement to use it for a few months. After a few days, Tom discovered that the department was only using Beamex because of the user friendliness, or ease of use. This situation prompted Monsanto to purchase equipment from Beamex.

Nowadays, it is a much different scene at Soda Springs. Since the team decided to invest in the multifunction Beamex MC5 multifunction calibrator and MC6 advanced field calibrator and communicator, they are able to carry one piece of equipment into the field to calibrate all of their devices. The MC6 with the HART communicator option allows the technicians to configure the

HART instruments as well. Overall, they have decreased their need for equipment from up to four or five pieces, down to one.

The versatility of the MC6 has met all the requirements for the E&I department. Not only has it made the calibration work itself easier, but efficiency has increased tremendously. Prior to purchasing Beamex products, only 1-2 technicians were able to perform calibrations due to the difficulty of using the equipment. Now, the department can divide up the work between everyone because the equipment is so easy to use and operate. The intuitive nature of the Beamex calibrator allows even new hires to pick up and quickly begin calibrating devices.

The smarter equipment also offers much needed functionality. One of the most valuable aspects of the system is that if there is an instrument in the field that has not been set up yet, the technicians can take the calibrator out and plug right into the instrument, download the data and create a test.

A big impact

After experiencing the major benefits of multifunction, documenting calibrators and an improved calibration process, the department chose to streamline their entire calibration program by utilizing Beamex CMX professional calibration management software to document and manage their instrument database. The software, combined with the multifunction calibrators form an integrated calibration solution (Beamex ICS). The change was immediate. Calibrations that would take all day are now performed and documented in a couple of hours.

The calibration software works in unison with the plant's enterprise resource planning system which generates work orders on pre-set intervals and routes them using the auto-generated order feature. The work-



SOLUTION

Description

- Beamex MC5 multifunction documenting calibrators
- Beamex MC6 advanced field calibrator and communicator
- Beamex CMX professional calibration management software

Main benefits

- User-friendly interfaces
- Time savings through increased efficiency
- Improved documentation
- Compliance with regulatory and audit requirements
- Extended calibration intervals

order is sent to the E&I technicians. The technicians then use their MC6 and MC5's in the field to perform the calibrations. All calibration data is stored separately in the CMX database. CMX is able to store calibration data, generate reports and organize detailed information required to produce calibration certificates to meet regulatory and internal audit requirements. Since the records are now stored electronically instead of being hand-written and filed, they are now able to easily access the instrument's information, view history and generate reports in the database. Furthermore, the crew was able to extend calibration intervals for some instrumentation based on a historical trend analysis.

The Beamex equipment is recalibrated on an annual basis by the Beamex laboratory to ensure the highest performance. The department also submits calibration certificates on the Beamex equipment from Beamex, which proves their calibrators are up to date and re-certified.

Calibration Insights – Beamex newsletter series

■ Calibration Insights is a new newsletter series for calibration professionals, technical engineers, potential and existing Beamex users. The purpose is to provide insightful information on technical details and applications.

The newsletter is divided into three different main topics: Managing calibrations, Performing calibrations and Regulatory calibrations. The newsletters consist of white papers, case stories, best practices, product news, quick polls and videos. One to two newsletters on every topic will be published yearly. Readers can subscribe to any of the three newsletter topics. Please visit www.beamex.com for more information.

Beamex Marketing Director Villy Lindfelt says, "Beamex has always sent out news and campaigns, but this is the first newsletter series that we have made. We know that our customers and end users are very well educated, so we decided to create a newsletter that gives the reader detailed and technical information on calibration applications."

Remember that we appreciate your feedback immensely. If you have any comments or questions, please send us email to calibrationinsights@beamex.com.



Beamex makes significant equipment and software donation to ISA

■ Research Triangle Park, North Carolina, USA (18 June 2014) – The International Society of Automation (ISA) reports that Beamex, ISA's Premier Strategic Partner for calibration, has donated to ISA a significant amount of calibration equipment, including multifunctional documenting calibrators and communicators, pressure pumps, and field temperature blocks, along with calibration management software.

The donated assets will be used in a range of ISA's hands-on technical training courses for automation and control professionals, enabling them to become familiar with and utilize some of the most advanced, accurate and reliable calibration equipment in the marketplace.

"ISA depends on companies like Beamex to provide the latest tools and software so that our training students around the globe can learn using real-world equipment," says ISA Executive Director & CEO Patrick Gouhin. "Receiving donations like this one from the vendor community facilitates the best possible experience for the automation professionals engaged in our training, and we thank Beamex for their donation."

ISA, says Raimo Ahola, CEO of Beamex Group, "offers outstanding curriculum for automation professionals and we are proud to partner with them. Beamex appreciates the opportunity to provide educational tools for ISA students and give them the ability to learn accurate processes to collect, analyze and store calibration data through our integrated calibration solution."

Ahola emphasizes that Beamex is "the only company in the marketplace to offer this type of streamlined solution. We are at the forefront of an automation

revolution. We're developing the most robust equipment, combined with advanced calibration software, to perform calibrations, document and house data, as well as examine results.

"We will continue to be a pioneer of process improvement and education," he continues. "One day, in the not so distant future, integrated calibration solutions will be the standard for all calibration processes. Every technician, experienced or new to the field, will need to understand these concepts to effectively and efficiently calibrate their instrumentation."

About Beamex

Beamex is a leading, worldwide provider of calibration solutions that meet even the most demanding requirements of process instrumentation. Beamex offers a comprehensive range of products and services--from portable calibrators to workstations, calibration accessories, calibration software, industry-specific solutions and professional services. Through Beamex's subsidiaries, branch offices and an extensive network of independent distributors, the company's products and services are available in more than 60 countries. Beamex has more than 10,000 customers worldwide.

To gain further information on Beamex, contact Katie Turner, Beamex Marketing Manager, at katie.turner@beamex.com or by calling 1+ 770-951-1927.

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About ISA

■ Founded in 1945, the International Society of Automation (www.isa.org) is a leading, global, nonprofit organization that is setting the standard for automation by helping over 30,000 worldwide members and other professionals solve difficult technical problems, while enhancing their leadership and personal career capabilities. Based in Research Triangle Park, North Carolina, ISA develops standards; certifies industry professionals; provides education and training; publishes books and technical articles; and hosts conferences and exhibitions for automation professionals. ISA is the founding sponsor of The Automation Federation (www.automationfederation.org).

Beamex CMX version 2.8

■ Beamex has released a new version 2.8 of the CMX calibration management software. The new CMX version has many beneficial features and updates:

Support for Windows 8

CMX now supports the Windows 8 operating system. This allows you, for example, to use CMX with a tablet computer operating on Windows 8. You can install CMX onto a tablet computer and also communicate with calibrators via the tablet. Alternatively, you can install the CMX client onto a Windows 8 tablet assuming the tablet has an online connection to the CMX server. Please note that the Windows 8 RT is not supported.

“Group Calibration” for CMX Pocket PC

The CMX for Pocket PC now has the same type of “Group Calibration” functionality that was recently introduced for Beamex MC6. The Group Calibration functionality allows simultaneous calibration of several instruments/functions.

Updated technology support:

- Windows Server 2012 support
- SQL Server 2012 support

Warn/deny of overdue references

If you are trying to use references/calibrators that are overdue for calibration, CMX will now warn you about it or deny access to the reference, depending on the settings selected in the CMX.

FCINTF support

The CMX now supports the FCINTF (Field Calibrator Interface) protocol, enabling support for Fluke 750 series and Honeywell 2020 calibrators. Please note that communication for third party calibrators is optional.

Other developments

The 2.8 version includes various other developments, such as:

- 23 minor improvements
- 4 major fixes
- 37 minor fixes

Please read the release note for detailed information.



Ready for the field?



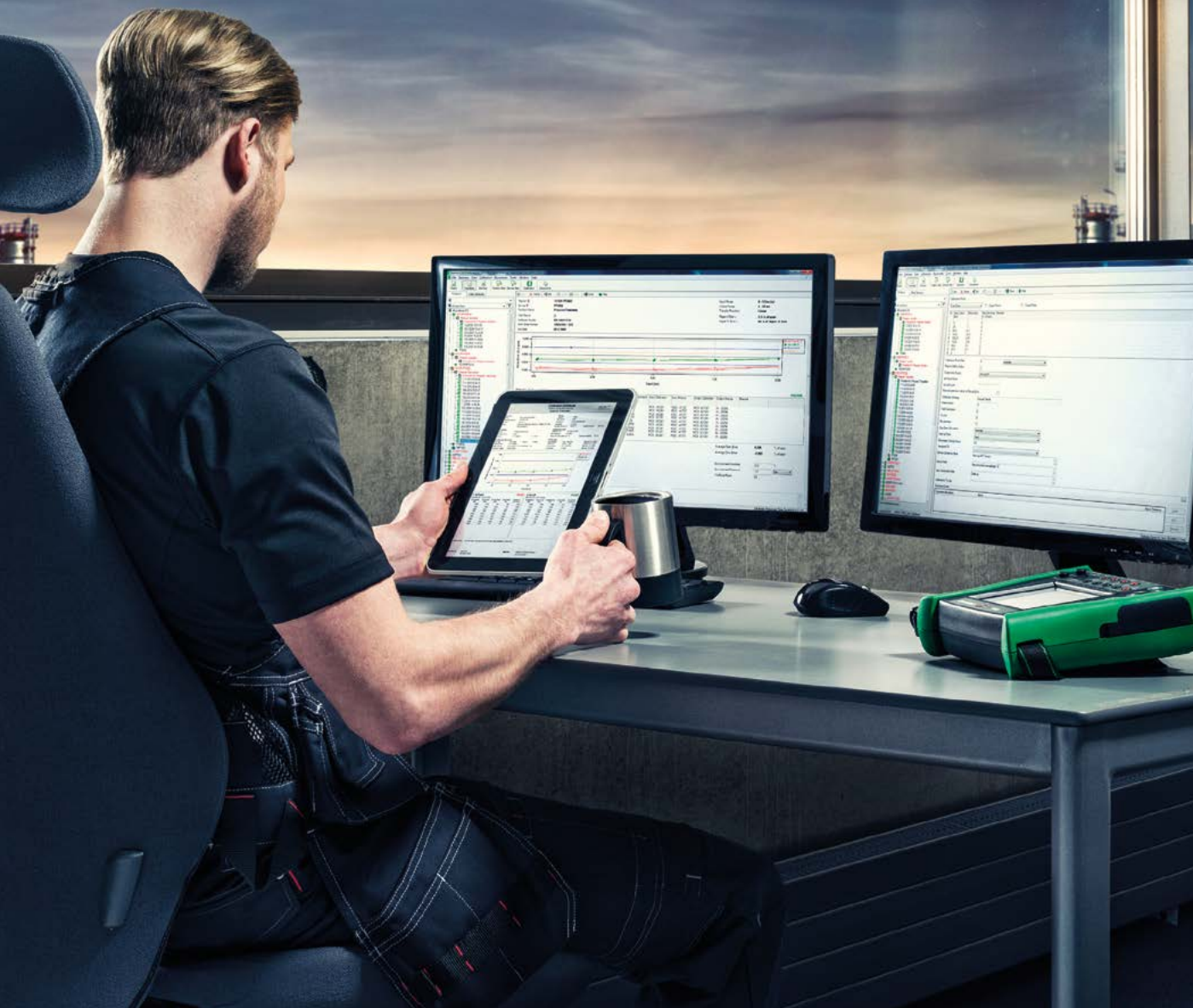
Being a field calibration technician is a tough job: you need to have many skills and carry multiple devices, environmental conditions can be challenging and constantly changing, documentation of data takes time and is difficult in the field and work efficiency requirements are demanding. However, having the right gear makes the work much easier and also more efficient.

Learn more at beamex.com/readyforthefield

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www.beamex.com
info@beamex.com

Calibrations under control



Beamex provides the equipment, software and services needed for an efficient calibration process. The calibration process starts from the planning and scheduling of the calibration work and includes performing of calibrations as well as documentation of results. An efficient calibration process saves time, automates procedures, is cost-efficient and assures that the results are reliable. The best-in-class calibration processes are integrated, automated and paperless. Learn more and test how advanced and efficient your existing calibration process is at: beamex.com/calibrationsundercontrol

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Beamex in brief

Beamex is a leading worldwide provider of calibration solutions that meet even the most demanding requirements of process instrumentation. Beamex offers a comprehensive range of products and services — from portable calibrators to workstations, calibration accessories, calibration software, industry-specific solutions and professional services. Through Beamex's partner network, our products and services are available in more than 80 countries.

Learn more about Beamex products and services

www.beamex.com

Brochures, product demonstrations and quotations

info@beamex.com

www.beamex.com/request (online request form)

Software support

support@beamex.com

Re-calibration and service

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Please visit www.beamex.com

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Beamex products and services

Portable calibrators

Beamex's range of portable MC calibrators for field calibration is known for accuracy, versatility and meeting both high and uncompromised quality standards.

- MC6 advanced field calibrator and communicator
- MC5-IS intrinsically safe multifunction calibrator
- MC2 series
- MC4 documenting process calibrator
- MC2-IS intrinsically safe multifunction calibrator
- FB/MB temperature dry blocks
- POC6 automatic pressure controller

Workstations

A workstation can be considered ideal when most of the maintenance and calibration tasks are performed in the workshop.

- MCS200 workstation
- MCS100 workstation
- MC5P calibration host module

Accessories

Beamex's calibration accessories complete your investment in calibration equipment.

- External pressure modules
- Calibration hand-pumps
- Spare parts

Calibration software

Plan, manage and document all your calibrations efficiently and safely using Beamex's calibration software.

- CMX Light
- CMX Professional
- CMX Enterprise

Professional services

An essential part of a complete calibration solution is professional services — service and re-calibration, installation and training, software support, validation services and integration services.

- Re-calibration and service
- Installation and training
- Software service agreement (SSA)
- Validation services (pharmaceutical industry)
- Integration services



The impossible made possible: combining advanced functionality with ease-of-use

Beamex MC6 advanced field calibrator and communicator

Touch-screen, 5.7" color-display with a user-friendly interface. Light-weight, robust (IP65) and long operating time. One device, five different operational modes: meter, calibrator, documenting calibrator, data logger and full multi-bus field communicator. Pressure, electrical, temperature and frequency signals. HART, Profibus PA, Foundation Fieldbus H1. Seamless communication with calibration software for paperless calibration management.



PROFIBUS



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