In this Issue: A Complete Coverage of National Workshop & Exhibition on “Skill Challenges in Implementation of Instrumentation, Automation & Surveillance in Power, Steel, Mining & Cement sector” organized by IASC Sector Skill Council at Vigyan Bhawan, New Delhi on 1st December 2017.
At the very onset, let's understand the meaning of Calibration. It is a set of operations that establishes, under specified conditions, the relationship between the values of quantities indicated by a measuring instrument & the corresponding values realised by standards.

Let me explain why we underlined some set of terms are underlined. First "SPECIFIC CONDITIONS"

In fact, the measurement of fluid flow is dynamic and all measurement devices are affected in some way by the conditions of use. It will be impossible to have a standard which fully reproduces the conditions of practical use. Measurement of the quantity of fluid depends on establishing the basic quantity (volume or Mass) and a number of influence factors

Influence Factors are Temperature, Viscosity, Flow Profile, Pulsations, External Environment & Vibration. The quantity measured by the standard may be different from the quantity passed through the test device due to changes in volume or even mass between the meter and the standard. Changes are usually related to the influence factors.

Next, what is meant by STANDARD?

The standard comprises the system of pumps, pipes, fluids, instrumentation, quantity reference measurement, calculations and operators. This combination of fluid, influence factors, the standard and the device come together to define a set of operations which to provide the calibration.

Now, the moot question: Why Flow Meter Calibration? There are many reasons, such as:

• Flow meters can be affected by corrosion or dirt within the media.
• May also be damaged by impact, variations in the process, or by improper Installation.

• Environment conditions, elapsed time and type of application can all affect the stability of an instrument.
• Even instruments of the same manufacturer, type and range can show varying performance.

• To maintain the credibility of measurements, which directly affects the source of income and productivity.
• To maintain the quality of process instruments.
• ISO900, TQM, TS & other quality systems and regulations.
• Regular calibrations assure you that the flow meter's measurements are as accurate as their specifications.

There can be many causes of inaccuracies and they can happen over a period of time like erosion of vortex shedder bars, pivot tubes become clogged, worn-out turbine rotors, attrition of liner material
of EMFM, improper installation and buildup of deposits etc.

So we need to follow Best Practices of F/M Calibration:
The standard used to calibrate a flow meter must be accurate enough to perform the calibration. As a thumb-rule, the standard should be four times more accurate than the unit under test (UUT); however, this can vary depending on the requirements of the calibration. The standard should be traceable to a recognized standard. Traceability provides an unbroken chain of documentation that shows how the measurements it makes compare to even more accurate standards. The rate of flow between the UUT and the calibration standard must be in a steady state. Since the flow rate of the standard and the UUT are compared in real time during calibration, the system flow rate should not vary with time. All media measured by the calibration standard must also be measured by the flow meter at the same time. In other words, there should not be any leaks or significant temperature changes in intermediary volumes that might affect the measurement. Also, it is important to match the calibration with the flow meter’s application.

Understanding fluid properties is very important. So, remember, prominent Terms related to FLOW Calibration.
All flow meters interact with the flowing fluid. The nature of this interaction is affected by the properties of the fluid or the velocity distribution of the fluid passing through the device. Properties of the fluid such as density, temperature, conductivity, pressure etc. We may also have to be considered when replicating the use of the meter in a calibration. For this reason it is desirable to calibrate using the same fluid and pipework configuration within which the meter will normally operate. This is practically not often possible. So the best practice is to choose the calibration method.

Next is Fluid Profile; fluid interacts with the sensor can be highly dependent on the velocity profile, these effects must be considered in the calibration. Allow adequate straight pipe lengths and the use of flow conditioners to establish predictable and reproducible flow profiles close to an ideal profile.

Other Terms

Traceability is the process by which a measurement can be related through an unbroken chain of comparisons to national/international standards.

Accuracy is the Closeness of the agreement between the result of a measurement and a true value of the Measurand.

Uncertainty is the quantification of Margin of Doubt. It is a non negative parameter and best estimation of the value of the Measurand.

Accreditation is the process that a calibration laboratory or service provider undergoes to give confidence that the result provided to a client meets the expectation stated in the scope of the work

K-factor - Pulsed outputs proportional to quantity passed and expressed as pulses per unit quantity

Meter factor- Qs/Qi (or) Vs / Vi

Methods of Fluid Flow calibration

Comparison Method

It is the most common method of wet calibration by comparing the output of the meter under test with one or more flow meters that have been certified against high-accuracy standards, known as master flow meters. The accuracy of the system depends on the accuracy of the Master meter.
Volumetric Method

Standing Start and Finish
Standing start and stop is the simplest method and can be used for both high and low accuracy calibrations.

Flying Start and Finish
At Flying start, the key to accurate measurement is a clean separation between fluid entering the container and fluid returning to the supply.

Pipe Prover

Pipe provers provide probably the best calibration devices for truly dynamic calibration with high accuracy. If a displacer is introduced to the flow, the time it takes to travel between the switches will give a measure of the flow rate.

Piston Prover

For difficult fluids which may damage a lining material, or leak past the conventional sphere displacer, a piston displacer may be used. Since a piston is unable to pass round bends a piston Prover is straight and hence these devices tend to be quite long. The displacer is a piston with multiple seals. Switches can be conventional plungers or high integrity, non-contacting types. By their nature, they must be bi-directional and the four-way changeover valve is normally located midway along the pipe length to equalize the inlet and outlet pipework. This type of Prover is not so common however finds a particular application with LPG, Liquefied Natural Gas (LNG) and other difficult high value products.

Volume Prover

A piston has been chosen as the displacer operating in a cylinder to minimize leakage and pressure loss. To allow a short length, and retain accuracy, optical detectors are mounted external to the pipe which can resolve to fractions of a millimeter. These detectors give very precise control and start and stop signals across the measured volume.

Clamp on Ultrasonic Flow meter Kit

This time-of-travel (transit-time) meter has a pair of transducers mounted on each side of the pipe. The configuration is such that the sound waves traveling between the devices are at a 45-degree angle to the direction of liquid flow. The speed of the sound signal traveling between the transducers increases or decreases depending upon the direction of transmission and the velocity of the liquid being measured. A time-differential relationship proportional to the flow can be obtained by transmitting the signal alternately in both directions.
Mr. Chetan Swaroop Sharma, Addl. General Manager Bharat Heavy Electricals Ltd. (BHEL) delivered a lecture on Automation in Power Generation- Thermal and Nuclear.

Mr. Sanjay Dehran, Flour Daniel India Pvt. Ltd delivered a lecture on Evolution of Automation in Control Valve.

Dr. Pankaj Kumar Mishra, Principal Scientist, CSIR-CIMFR Dhanbad delivered a lecture on Internet of things in underground Coal Mine Perspective.

Mr. Ranjan Choudhary, Head-World Skills India, World Skills India- NSDC delivered a lecture on Role of Industries in World Skills Competition.

Mr. P. Uppilirajan, Dy. General Manager, Nagman Instruments & Electronics (P) Ltd delivered a lecture on Calibration Techniques-Flowmeter & Skill Challenges.

Dr. Ajay Talwar, Head- Business Verticals BOSCH Limited delivered a lecture on Integrated Optimized Security Solutions and Challenges in Technology Adoption.

Mr. Dhirendra Kumar Yadav, Dy. General Manager, Holtec Consulting Pvt. Ltd delivered a lecture on Skill Needs and Skill Gaps in Indian Cement Industries.

Mr. Pawan Mathur, AVP & HOD-Electrical Ultratech-Aditya Cement Works delivered a lecture on Communication Technology for future.

Mr. Jitendra Kumar Singh, Chief Scientist, CSIR-CIMFR Dhanbad delivered a lecture on Skill challenges and Opportunities in implementing Instrumentation, Automation & Surveillance in Mining Sector.

Mr. Pankaj Pandey, Sr. Manager (Mining) Coal India Limited (CMPDI) delivered a lecture on IOT (Internet of Things) Based technologies in Coal Mining Industry; Opportunities and Challenges.

Mr. S.K. Bardhan, Head CSR, IASC SSC delivered a lecture on Development process of Qualification Pack & National Occupational Standards. He presented 7 Nos QPs for Industry Validation & requested for effective response from Industries.

The program ended with vote of thanks by Dr. D.P.S. Verma COO IASC SSC.

Total 120 Participants attended the workshop from across all over India.

Various media channels covered the session.
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