**Training program on Flow Measurement & Control Techniques/Software in Industrial Process & Water Distribution System**

General orientation program on India and its culture.

Theory session 40%, on the job Lab/Hands on training 40%, Evaluation of projects and standards presentations 20%.

**COURSE CONTENT**

**Flowmeters:**

Differential pressure flowmeters - Orifice plate, flow nozzle, venturi meters, Pilot static tubes etc., Mass flowmeters - Coriolis, Thermal, Oscillating type flowmeters, Vortex shedding, Fluidic, Positive Displacement meters, Turbine flowmeters, Ultrasonic flowmeters, Variable area meters, Electromagnetic flowmeters, Latest developments in flow metering, flowmeter selection & Sizing, Software for flowmeter selection, Installation effects and maintenance aspects of flowmeters, Two phase flow measurement techniques.

**Valves:**

Control valves - Butterfly, Ball, Globe, Angle valve etc., intelligent control valve, safety relief valves, non return valves / gas filling heads etc. Performance evaluation, noise and vibration measurements of control valves, Aero dynamic noise Studies on control valves, Selection & Sizing of Valves. Automated calibration of vibration sensor and vibration analyzer, as per ISO 16063 part 21, DG set emission certification for seismic qualification of valves, software for sizing of control Valves.

**Water Transmission & Distribution Systems**

Design aspect of water distribution systems, testing of water meters, Automated meter reading systems, pumping systems, Sumps and intakes, performance evaluation of pumps, water level controllers. Use of Software for design and optimization of water networks, selection of pumps, hydraulic transient analysis. Performance evaluation of pumps.

**Flow network / System parameters:**

Inspection and auditing of flowmetering stations to check conformance to API/AGA, Flow measurement and control in industrial process control, natural gas properties and computations for flow correction, Oil and gas network distribution analysis techniques, Use of Computational Fluid Dynamic (CFD) analysis software for flow measurement and control applications. Non-Revenue Water, Leak detection methods and instruments, pipeline locators, Use of open source Software in design of water distribution systems.

**Performance /QR evaluation /Calibration of flowmeters:**

Calibration Techniques, Primary and Secondary Calibration, Gravimetric Method, Volumetric Method, Master Meter Method, Meter provers, Pipe provers and Tank provers, Calibration at Site and case studies. Performance evaluation of water meters, calibration of all types of flowmeters, testing of valves, meter provers, Model approval of flowmeters as per Organization Internationale De Metrologie Legale (OIML) standards, Calibration of flowmeters in multi viscous media.

**Calibration of Auxiliary/secondary instruments for flow measurement:**

(Pressure, Temperature, density, Viscosity, Mass etc.), Pressure calibration, Calibration of pressure transducers, Calibration of Mass and Weighing balances, Density and Volume Calibration, Temperature Measurement and calibration of electrical parameters. Calibration of Industrial and Laboratory grade sourcing and measuring instruments for Electrical & Thermal parameters, Performance tests for electronic measuring systems based on OIML Standards

**Quality aspects in flowmetering systems:**

Assessment of uncertainty and statistical analysis of accuracy in fluid flow measurement, Quality audit and measurement audit, Traceability of measurements, Inter-comparison of International labs.

**Electronics / Instrumentation Data Acquisition Systems:**

Flow measurement and control in distribution network. Supervisory control and data acquisition system (SCADA), Electronic design of control loops, Different types of controllers, Flow computers for custody transfer, Instrumentation related to flow measurement, Automatic level gauging of storage tanks. Design of specialized instrumentation and control set up. Software for control and Data acquisition

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