An Intensive 3 Day Training Course

Water Flow Measurement & Control Techniques

14 - 16 Aug 2017, Tbilisi
21 - 23 Aug 2017, Kampala
13 - 15 Nov 2017, Aberdeen

www.petroknowledge.com
Why Choose This Training Course?

Effective water transmission and distribution systems requires an understanding and appropriate application of Instrumentation and Process Control concepts. This PetroKnowledge course was designed to provide such understanding tailored to Water Flow Measurement & Control and cover their practical applications.

Sensors, Mechanical and Electrical Instrumentation are a key resource in industrial plants with multiple uses ranging from flow measurement, monitoring, and control. The use of smart sensors, microprocessors, PLCs, SCADA systems and automatic measurement systems (AMS) are the latest and most important trends in water transmission and distributions systems.

This Water Flow Measurement & Control Techniques training course includes the fundamentals and practical applications of Water Measurement and Control Devices. In addition, the course covers control valves and electronic instrumentation and networking. The training course ends with coverage of automatic measurement systems emphasizing wired and wireless communication technologies.

What Are The Goals?

- To provide fundamentals and practical applications of sensors, instrumentation, and control valves for water transmission and distribution systems
- To provide the theoretical and practical knowledge to be able to match the desired instruments for specific applications
- To provide the theoretical and practical knowledge to be able to resolve problems involving accuracy and reliability of measurements
- To provide the processes for calibration, installation, and troubleshooting of water measurement instruments
- To provide the fundamentals and practical applications of electronic instrumentation, industrial networks, SCADA, and automatic metering systems (AMS)

At the conclusion of this training course, the attendees should have an in-depth knowledge on the principle of operation and configuration of all types of water flow meters covered in the course: invasive and non-invasive type, positive displacement, turbine, electromagnetic, and ultrasonic meters. They should be able to choose the correct flow meter for a particular application and to resolve any ensuing problems in relation to unreliability or inaccuracy of flow meter readings and understand the various processes involved in the calibration of liquid flow meters. They should also have a practical understanding of control valves, smart flow meters, and automatic meter systems.
DAILY AGENDA

Day One: Introduction and Mechanical Flow Meters

- Introduction to course, expectations from participants, review of programme
- Introduction to Sensors, Transducers and Instrumentation Systems
- Examples
- Flow Terms and definitions: Mass flow, Volumetric flow rate, Pressure, Viscosity, Turbidity, Units, Laminar and Turbulent flows, Reynolds number, Bernoulli’s equation, Pipe Velocity Distributions, Pipe Fitting Losses
- Examples
- Instrumentation Terms: Accuracy, Range, Span, Maximum error, Hysteresis, Reproducibility and Reproducibility, Sensitivity, Resolution, Response time, Calibration Graphs
- Examples
- Principles of Water Flow Measurement & Control

Mechanical Flow meters:

- Devices; principle of operation, application and installation considerations of invasive types:
  - Coriolis Flow meter
  - Differential Pressure type flow meters
    - Orifice plate
    - Venturi tube
    - Flow nozzle
    - Dall flow tube
- Positive displacement flow meters (Volumetric Rotary Piston Type): principle of operation, characteristics, sizing, Installation.
- Turbine flow meters: Single jet, Multi jet, Woltman, characteristics, Calibration Curve, Sizing & Selection, Installatio & Accessories.
- Testing and calibration of water meters.
- Installation considerations, Maintenance, and troubleshooting of water meters.

Workshop #1: Case Study, Practical Exercises, Videos.

Day Two: Electronic Flow meters and Control Device

- Ultrasonic Flow Meter (Transit Time Measurement): Prerequisites for measurement, Operating Principles, transducers, design variations, size ranges and limitation, applications & performance, installation, troubleshooting.
- Insertion Magnetic Flow Meter: Operating principles, Advantages, Disadvantages, installation.
- Maintenance and calibration

Control Devices

- General Categories of Control Valves
- Rangeability, End Connections, Shutoff Capability
- Valve Sizing
- Choked Flow
- Control Valve Sizing and selection
- Control Valve Cavitation and Noise
- Piston, Electric and Hydraulic Actuators
- Positioners
- Live Loading
- Diagnostic Testing of Control Loops
- Air-Operated Valves Diagnostics
- Motors-Operated Valves Diagnostics

Workshop #2: Case Study, Practical Exercises, Videos.

Day Three: Smart Sensors, Transmitters and AMR Systems

NOTE: This outline uses the HART industrial network but it could be replaced with any other network such as Profibus or Foundation Fieldbus

- Microprocessors and Microcomputer Systems
- Smart Sensor Systems
- Intelligent (Smart) Transmitters
- Microprocessor-Based Transmitters (Smart Transmitters)
- Transmitter Options: 20 mA Current Loop, Fieldbus, Wireless
- Smart (Intelligent) Pressure Transmitters
- Advantages of Intelligent Instrumentation
- Comparison Between Intelligent and Non-Intelligent Instrumentation
- Stand-Alone Controllers
- Self-Tuning, Sequencing, and Networking
- HART Protocol
- Fieldbus Protocols: Profibus, Foundation Fieldbus
- WirelessHART Protocol
- Supervisory Control and Data Acquisition (SCADA) System
- Other Wireless sensors and transmitters
- Wireless measurement readers
- Automatic meter reading
- Automatic meter systems

Workshop #3: Case Study, Practical Exercises, Videos.
**Course Dates, Venues and Fees**

<table>
<thead>
<tr>
<th>Date Range</th>
<th>Venue</th>
<th>Fee</th>
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</thead>
<tbody>
<tr>
<td>14 - 16 Aug 2017</td>
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<td>$3,500</td>
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</tbody>
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This fee is inclusive of documentation, lunch and refreshments.

Please use BLOCK CAPITALS to fill in this form. It is important that you read carefully through all information before starting to complete the form.

**Registration Details**

Family Name: ___________________________________________
First Name (Mr./Ms.): ____________________________________
Position: ________________________________________________
Company: _______________________________________________
Mailing Address: ________________________________________

Telephone:____________________ Mobile: __________________
Fax: _______________________ Email: _____________________

**Authorisation**

Authorised By: _________________________________________
Position: ______________________________________________
Company: ______________________________________________
Mailing Address: ________________________________________

Telephone:____________________ Mobile: __________________
Fax: _______________________ Email: _____________________

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**Booking Terms & Conditions**

**Booking**
- Bookings for courses can be made via our website (petroknowledge.com) or by contacting our Registration Desk on +971 2 5577389 or at reg@petroknowledge.com
- For on-line bookings, please select the course that you require and click on the “Register Now” button, following the instructions step by step
- Upon receipt of booking in order, enrolment on the respective training course will be confirmed by Registration Team with all necessary documentation

**Invoicing and Payment**
- Our fees include course presentation, relevant materials, physical & digital documentation, lunch and refreshments served during entire training. Accommodation charges are not included in the course fees
- Course fees are payable upon booking unless a valid, authorized Purchase Order is provided and accepted
- Invoices will be sent via email/courier to the ID/name and address provided
- We prefer to have the fees payment in our account before the start of training course. However, if your company has a different payment policy, the same should inform us in advance
- The currency of fees is in US Dollars (USD). Payments can be made in USD or UAE local currency AED (Arab Emirates Dirhams) either by Bank Transfer or by Credit Card. Our Bank Account details will be provided on the Invoice
- Please note that we do accept payment by cash, in USD or AED, only for the last minute bookings

**Cancellation of Courses**
- It may be necessary for PetroKnowledge to amend or cancel any course, course times, instructors, dates or published fees due to unforeseen circumstances and we reserve the right for such changes
- Any amendments will be advised before the course start date and any bookings already paid in full will not be subject to increased fees

**Cancellation by Client**
- Once you have completed your booking, received your confirmation of enrolment and a dated payment Invoice, you are deemed to have a contract with PetroKnowledge. You reserve the right to cancel this contract given the below terms
- All cancellations must be received in writing at reg@petroknowledge.com and info@petroknowledge.com at least 14 days prior to the training
- After the cancellation period has expired, consideration may be given, on a case to case basis, if a registered delegate nominates a substitute on the same course, shifts to next session of the course or moves to a new course
- For a cancellation request made on or before the statutory 14 day cancellation period, a refund may be given or a credit note issued which can be used against future course fees
- A 25% administration fee (of the total course fee at the time of booking) will be charged for any cancellations made outside of the statutory cancellation period

**Attendance Certificate**
- The daily course schedule should be accurately followed to ensure undeterred implementation of our training
- All delegates, who participated in their course throughout, will receive the Certificate of Completion on the last day
- Please report any foreseeable absences to a PetroKnowledge representative or to your sponsors directly
- An absence of three (3) or more sessions of the course will invalidate your eligibility for the Certificate of Completion