Course on
On The Job Training For Field Engineers On
Flowmeters & Calibration Techniques
10 - 14 July 2017
177th in series

Course Organised by:
FLUID CONTROL RESEARCH INSTITUTE
(Under Ministry of Heavy Industries & Public Enterprises, Govt. of India)
Kanjikode West, Palakkad-678623, Kerala, India
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Email: training@fcriindia.com,
Website: www.fcriindia.com
About the Programme
The course envisages to cater to the requirements of Technical Personnel from Petroleum, Natural Gas, Petrochemical, Process, Manufacturing Industries etc., for on the Job Training of Flow metering and Auxiliary measurement system for both Liquid and Gas flow measurement. Awareness of accurate flow measurement and calibration methods & practices results in enhanced revenue generation, improvements in recoveries, accurate process control, improved quality of the end products, less disputes in custody transfer applications and overall improvement of the efficiency of the plant metering systems.

The course is designed to provide training in flow measurement and calibration. The participants will be given demonstration in the Liquid and Air Flow Calibration facilities at FCRI. In addition, they will also be given demonstration in calibration of secondary instruments for pressure, temperature, Density measurements and geometrical parameters in the respective labs.

Topics Covered
- Calibration of Flow Meters in Air/ Gas / Water and Oil Medium
- Calibration of flow meters using primary & secondary standards
- Pressure measurement ad calibration / calibration of Dimensional parameters
- Calibration of voltage, current, resistance and time
- Temperature measurement and Calibration
- Uncertainty analysis and preparation of Uncertainty budget

Registration Fee:
For Indians working in India :
Rs. 25,358/- + Service Tax @ 15% Rs. 3804/- =
Total Rs. 29,162/-* per participant
For those working abroad
US $ 1,492 + Service Tax @ 15% US $ 224 + Charge US $ 20 = Total US $ 1,736 per participant.
*10%Discounts for nominating 5 or more participants from same organization. we accept e-payment only
(Bank Details : State Bank of India(SME Branch) Kanjikode west, Palakkad - 678 623 Account No.10258760349 IFSE Code : SBIN0006640

The Fees includes registration fee, course materials, participation certificate, group photo, and lunch & refreshments during the course days). FCRI is exempted from payment of income tax.
## About FCRI
FCRI, a state of the art Flow and Fluid Engineering facility, first of its kind in South East Asia is dedicated to Research & Development in Fluid Flow Measurement & Control Techniques. About 100 sponsored projects for various reputed organisations have been successfully completed by the institute. The Institute provides facilities towards technological developments to the flow product industries and serves as a National Certifying Authority and Quality / Reliability evaluation facility. The Institute also provides facility for calibration of mechanical, thermal, electrical parameters, noise, vibration etc. Apart from testing and calibration, the Institute conducts National and International training programmes in the field of flow control, Measurement & Instrumentation, Calibration and related areas.

## Major Calibration & Test Facilities at FCRI

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Range</th>
<th>Calibration &amp; Measurement Capabilities</th>
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<th>Calibration &amp; Measurement Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASS-Standards Weights</td>
<td>1 mg and up to 500 kg</td>
<td>0.0025 mg</td>
<td>PRESSURE</td>
<td>Pressure transducers</td>
<td>up to 60 kg/cm²</td>
</tr>
<tr>
<td>MASS-Weighing Balance &amp; Mass Comparator</td>
<td>Various ranges from 0.2 g to 600 kg</td>
<td>0.01 g to 0.2 kg</td>
<td>pressure</td>
<td>Pressure gauge</td>
<td>100 to 2000 mbar, 5000 mbar</td>
</tr>
<tr>
<td>VOLUME - Specific Gravity bottle, Pipettes, Burettes Measuring Flasks</td>
<td>1 ml to 5000 ml</td>
<td>±0.05% to ±0.7%</td>
<td>Pressure-Low pressure gauge &amp; differential</td>
<td>0.2 mbar to 1.2 mbar</td>
<td>±0.5% rdg</td>
</tr>
<tr>
<td>DENSITY - Hydrometers</td>
<td>0.64 g/cc to 1.98 g/cc</td>
<td>±0.0005 g/cc</td>
<td>Pressure-gauge pressure transducer (pneumatic)</td>
<td>0.2 mbar to 1.2 mbar</td>
<td>±0.1% of rdg</td>
</tr>
<tr>
<td>VISCOSITY</td>
<td>Dynamic</td>
<td>10 to 8500 mPas/ct</td>
<td>Pressure-vacuum (gauge)</td>
<td>0.25 bar to 20 bar abs</td>
<td>±0.015% of rdg</td>
</tr>
<tr>
<td>Kinetic</td>
<td>0.002 to 100000 µSt</td>
<td>±0.5% rdg</td>
<td>LENGTH - slip Gauges (steel)</td>
<td>0.5 – 100 mm</td>
<td>±0.05 µm to 0.16 µm</td>
</tr>
<tr>
<td>Acoustic Pressure – Free Field</td>
<td>125 Hz to 20 Hz</td>
<td>±0.5 dB</td>
<td>Vibration Test Facility</td>
<td>600 Kgf / 2000 Kg shaker</td>
<td>±0.05% rdg</td>
</tr>
<tr>
<td>Acoustic Pressure – Pressure Field</td>
<td>94 &amp; 114 dB @ 1 kHz</td>
<td>±0.25%</td>
<td>Acoustic Test Facility</td>
<td>Ferri Anchoic Chamber ISO3745</td>
<td>±0.05% rdg</td>
</tr>
<tr>
<td>Acoustic Power</td>
<td>125Hz to 16 kHz</td>
<td>±0.025</td>
<td>Temperature &amp; RH Test Facility</td>
<td>70 to 180 deg C</td>
<td>±0.04% rdg</td>
</tr>
<tr>
<td>Vibration Amplitude - Analyzer</td>
<td>0.1 to 15g (acceleration)</td>
<td>±2%</td>
<td>IP Tests</td>
<td>Dust – IP 5X, 6X</td>
<td></td>
</tr>
<tr>
<td>Speed (Contact)</td>
<td>120 to 10000 rpm</td>
<td>±0.1%</td>
<td>Speed</td>
<td>20000 rpm to X8</td>
<td></td>
</tr>
<tr>
<td>Speed (Non-contact)</td>
<td>60 to 100000 rpm</td>
<td>±2.4 %</td>
<td>Temperature</td>
<td>Fixed Point Cells</td>
<td>±0.01% to ±0.03%</td>
</tr>
<tr>
<td>Resistance Source Measure</td>
<td>±0.05%</td>
<td>±0.1%</td>
<td>DC Current</td>
<td>±0.01%</td>
<td>±0.01% to ±0.03%</td>
</tr>
<tr>
<td>Temperature</td>
<td>38.834°C to 961.78°C</td>
<td>±0.04% to ±0.05%</td>
<td>Frequency</td>
<td>±0.01% to ±0.03%</td>
<td></td>
</tr>
</tbody>
</table>

### Laboratory Full Flow

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Range</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Water Flow</td>
<td>Maximum Flow Rate (m³/h)</td>
<td>Maximum Line Size (mm)</td>
<td>Uncertainty in Flow Rate (% reading)</td>
<td>Uncertainty in Volume (% reading)</td>
<td></td>
</tr>
<tr>
<td>6000</td>
<td>1500</td>
<td>1000mm</td>
<td>2000mm</td>
<td>±0.05%</td>
<td>±0.02%</td>
</tr>
<tr>
<td>Air Flow</td>
<td>10000</td>
<td>400mm</td>
<td>±0.01%</td>
<td>±0.01%</td>
<td></td>
</tr>
<tr>
<td>Closed loop Air Test Facility</td>
<td>10^2 to 10^3 m³/h</td>
<td>150mm</td>
<td>±0.3%</td>
<td>±0.1%</td>
<td></td>
</tr>
<tr>
<td>Compressed Natural Gas</td>
<td>600</td>
<td>250mm</td>
<td>±0.1%</td>
<td>±0.01%</td>
<td></td>
</tr>
<tr>
<td>Oil Flow</td>
<td>600</td>
<td>1500mm</td>
<td>±0.05%</td>
<td>±0.01%</td>
<td></td>
</tr>
</tbody>
</table>

### Calibration & Test Facilities at FCRI

- **Water Flow**
  - Maximum Flow Rate (m³/h)
  - Maximum Line Size (mm)
  - Uncertainty in Flow Rate (% reading)
  - Uncertainty in Volume (% reading)
- **Air Flow**
  - At Ambient conditions
- **Closed loop Air Test Facility**
  - Calibration Loop
  - Gravimetric Loop Velocity
- **Oil Flow**
  - Maximum Flow Rate (m³/h)
  - Maximum Line Size (mm)
  - Uncertainty in Flow Rate (% reading)
  - Uncertainty in Volume (% reading)
- **Compressed Natural Gas**
  - Maximum Flow Rate (m³/h)
  - Maximum Line Size (mm)
  - Uncertainty in Flow Rate (% reading)
  - Uncertainty in Volume (% reading)

### Calibration & Measurement Capabilities

- **Pressures**
  - Up to 6000 mbar
  - ±0.02% to ±0.05% of reading
- **Temperature & RH Test Facility**
  - ±0.05% rdg
- **Acoustic Test Facility**
  - ±0.05 % rdg
- **Vibration Test Facility**
  - ±0.05 % rdg
- **Temperature & Humidity Chamber**
  - ±0.07% to ±1.3% of reading
  - ±0.01% to ±0.03%
RECOGNITION OF FCRI

<table>
<thead>
<tr>
<th>Agency</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands Measurement Institute (NMI)</td>
<td>CLATF (20 Bar, 400 m/s/h) of FCRI complies with the criteria for Calibration Laboratories as per ISO/IEC 17025</td>
</tr>
<tr>
<td>Department of Science &amp; Technology</td>
<td>Recognized R&amp;D Institute</td>
</tr>
<tr>
<td>Department ofWeights &amp; Measures (Ministry of Civil Supplies)</td>
<td>Model Approval tests on flowmeter for custody transfer of oil/gas as per OIML Standard</td>
</tr>
<tr>
<td>Chief Controller of Explosives, Nagpur</td>
<td>Testing of Safety Relief Valves</td>
</tr>
<tr>
<td>Bureau of Indian Standards</td>
<td>Testing of Water Meters, Anemometers etc.</td>
</tr>
<tr>
<td>Institution of Fire Engineers, New Delhi</td>
<td>Hydraulic Qualification tests on fire fighting equipments</td>
</tr>
<tr>
<td>Central Pollution Control Board</td>
<td>Certification of Petrol, Kerosene &amp; Diesel Generators for type approval</td>
</tr>
<tr>
<td>Nuclear Power Corporation</td>
<td>Seismic Studies for Power plant Equipments</td>
</tr>
<tr>
<td>Ministry of External Affairs (ITEC) &amp; Ministry of Finance, Dept. of Economic Affairs (Colombo Plan)</td>
<td>Training programmes for Foreign Nationals on Flow Measurement and Instrumentation for Oil Gas &amp; Water utilities/industries</td>
</tr>
</tbody>
</table>

NABL Approved Test Facilities

- **Control Valves/Actuators**: Cv, FL, Seat leakage test, Fugitive emission, cryogenic testing, torque
- **Water Meters**: All test as per IS6784, IS779, IS2373, IS04064
- **Butterfly Valves & Actuators**: POD tests as per AWWA C504 & C540
- **Venting devices/air valves**: API 2000
- **Safety Relief Valves**: ASME PTC 25
- **Gas Turbine Meters**: OIMLR137-1 Model Approval
- **Gas Regulators**: BS EN 334
- **Diaphragm Gas meters**: BS EN 1359 Model Approval
- **Liquid Flow Meters**: As per relevant standards

Other Tests

- Life cycle tests & cavitations tests for valves

For further information & Registration, please contact:
Head Training,  
Fluid Control Research Institute  
Kanjikode West, Palakkad-678623, Kerala, India  
Telephone: 0491-2566206, 2566120,  
Fax: 0491-2566326  
Email: training@fcriindia.com  
Website: www.fcriindia.com

Registration

Registration for the training program can be confirmed by sending the details: Name, Designation, Organisation, Postal Address Email/Phone/Fax/Post to the address given below. The course fee is to be remitted in advance through E-payment only. The registration must be completed on or before 9th July 2017.