Course on
ADVANCED FLOW MEASUREMENT
AND INSTRUMENTATION –
PRINCIPLES & PRACTICE
3rd – 5th February 2016
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. More than 88 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 facilities for calibration of metrological, pressure, temperature, electrical parameters, noise, vibration etc., for ISO certification. Apart from testing and calibration, the Institute conducts National and International training programmes in the field of flow control, Measurement & Instrumentation, Metrology, Pressure and Temperature measurement / Calibration and related areas.

Major Calibration & Test Facilities at FCRI

<table>
<thead>
<tr>
<th>Laboratory Fluid Flow NABL C026/1027</th>
<th>Maximum Flow Rate (m³/h)</th>
<th>Maximum Line Size</th>
<th>Uncertainty in Flow Rate (% reading)</th>
<th>Uncertainty in Volume (% reading)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Flow</td>
<td>4500</td>
<td>900mm</td>
<td>Upto 400m³/h : ±0.05%</td>
<td>20m³ : ± 0.05%</td>
</tr>
<tr>
<td></td>
<td>15000</td>
<td>2000mm</td>
<td>600 to 2500m³/h : ±0.10%</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>2500 to 4500 m³/h : ±0.15%</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>5000 - 15000m³/h : ±0.5%</td>
<td></td>
</tr>
<tr>
<td>Air Flow At Ambient conditions</td>
<td>10000</td>
<td>400mm</td>
<td>0-40m³/hr : ±0.1%</td>
<td>0.5 m³ : ±0.1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt;40m³/hr : ± 0.25%</td>
<td></td>
</tr>
<tr>
<td>Closed loop Air Test Facility (20 bar)</td>
<td>400</td>
<td>100mm</td>
<td>± 0.3%</td>
<td></td>
</tr>
<tr>
<td>*Calibration Loop</td>
<td>50</td>
<td>50mm</td>
<td>± 0.1%</td>
<td></td>
</tr>
<tr>
<td>*Gravimetric Loop Velocity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Flow</td>
<td>650</td>
<td>250mm</td>
<td>0-1000 m³/h : ± 0.05%</td>
<td>1.8 m³ to 9 m³ : ± 0.04%</td>
</tr>
<tr>
<td>Compressed Natural Gas</td>
<td>4500 Kg/hr</td>
<td>1.5”</td>
<td>± 0.1%</td>
<td></td>
</tr>
</tbody>
</table>

### About NABL C 0255

**NABL C 0255**

- **Source Measure**
  - DC Voltage
  - AC Voltage
  - Source Measure
  - ±100µV to ±1000 V
  - ±0.1mV to ±1000V
  - 1mV to 1000V
  - 100mV to 1000V
  - 0.04% to 0.03%
  - 0.06% to 0.03%
  - ±0.04% of RDG
  - ±0.03% of RDG
  - 1% of RDG
  - ±0.01% of RDG
  - 2% of RDG

- **Comparison**
  - Source Measure
  - 10µΩ 1Ω 10G Ω 100µΩ 1G Ω
  - 0.5% to 0.05%
  - 0.4% to 0.05%
  - 0.6% to 0.02%
  - 0.4% to 0.02%

- **AC Voltage**
  - ±100µA to ±1000A
  - ±0.04% to 1%
  - ±0.03% to 0.05%
  - 0.10% to 0.05%
  - ±0.02% to 0.05%
  - ±0.01% to 0.05%
  - ±0.005% to 0.05%

- **Frequency**
  - 1 Hz to 15 MHz
  - 10 Hz to 600 MHz
  - 1.0 Hz to 1 GHz
  - 1.0 Hz to 1.2 Hz

- **Thermal Calibration**
  - Temperature
  - -70°C to +1200°C
  - ±0.1°C to 1.3°C
  - ±0.2°C to 1.5°C
  - ±0.5°C to 3°C

- **IP Tests**
  - Dust
  - IP 5X & IP6X
  - Water
  - IP X3 to IP X8

### About Mechanical Calibration NABL 05.6

- **Line Size**
  - Upto 1.8m³ : ± 0.03%
  - 1.8m³ to 9 m³ : ± 0.04%
  - Vacuum (gauge)
  - 0.5 % reading
  - 1% reading

- **Frequency**
  - 2 Hz to 15 Khz
  - 2.5 Hz to 20 Khz

- **Vibration sensor sensitivity check**
  - 2 Hz to 15 Khz
  - 2.5%
About the Programme
Fluid flow measurements play a very vital role in petrochemical industries, process plants and water distribution net work etc... Flow measurement and control is an essential requirement for assuring the quality as per the relevant standards and the safety operation of the piping network and personnel involved. The course is designed to deal with all the relevant aspects of gas/liquid flow measurement and control and will also cover the new technological developments in the field.

Topics:
- Principles of Flow Meters.
- Linear, Non Linear, Non Intrusive Types.
- Calibration Methods of Flowmeters viz. Gravimetric, Volumetric, Meter Proving.
- Uncertainty Estimation as per ISO/NABL norms.
- Selection and Sizing of Flowmeters for Specific Applications.
- Flow Measurement Techniques in Large Ducts.
- Flare Gas Measurement.
- Auxiliary Measurement Systems - Pressure, Temperature & Density Measurement.
- Domestic Gas Metering.
- Introduction to Multiphase or Polyphase Flow.
- LPG Metering.
- Model Approval Testing of Flow Metering System as per OIML Standard.

Lab Experiments / Demonstration
Calibration of industrial flow meters as per relevant standards in
(1) Gas
(2) Liquid

Target Group:
Technical personnel from Mechanical, Instrumentation, Chemical, Petroleum or Electrical Engineering with a background of industrial instrumentation and control in fluid flow measurement and related field. Participants may be from industries dealing with gas/liquid flow measurement, flow meter manufacturers, other related industries like Refineries, Power Plants, Fertilizers, R&D Organisation or Academic Institutions.

General Information
Venue: FCRI Conference Hall
Date: 3rd to 5th February 2016
Course Timings: 9.30 AM to 5.30 PM

Fees (Non Residential)
For Participants working in India:
Rs. 15,435/- + 14.5% Service Tax Rs.2,238/- Total Rs. 17,673/- per participant

For Participants from abroad: US $ 908 + S.T. 14.5 % + Charge Us $ 20 = Total US $ 1,060/- per foreign participant.

(This includes registration fee, course materials, participation certificate, initial & final objective type tests (as per ISO requirement), group photo, lunch & refreshments and local transportation from Hotels to FCRI & back during the course days). FCRI is exempted from payment of income tax. This course is purely Non-residential. Assistance can be provided for booking of accommodation in hotels in and around Palakkad, Kerala.)
### 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 m³/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 of Weights &amp; Measures (Ministry of Civil Supplies)</td>
<td>Model Approval tests on flowmeter for custody transfer of oil/gas as per OIML Standard</td>
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<tr>
<td>Chief Controller of Explosives, Nagpur</td>
<td>Testing of Safety Relief Valves</td>
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<tr>
<td>Bureau of Indian Standards</td>
<td>Testing of Water Meters, Anemometers etc.</td>
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<tr>
<td>Institution of Fire Engineers, New Delhi</td>
<td>Hydraulic Qualification tests on fire fighting equipments</td>
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<tr>
<td>Central Pollution Control Board</td>
<td>Certification of Petrol, Kerosene and Diesel Generators for type approval</td>
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<tr>
<td>Nuclear Power Corporation</td>
<td>Seismic Studies for Power plant Equipments</td>
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<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>

### Registration

Registration for the training program can be confirmed by sending the details viz. NAME, DESIGNATION, ORGANISATION, POSTAL ADDRESS / EMAIL / PHONE / FAX / POST (to the address given below). The Course fee is to be remitted in advance through crossed Demand Draft favouring “Fluid Control Research Institute”, payable at Palakkad. The registration must be completed **preferably before 2nd February 2016**.

For further information and registration, please contact:

Director, **FLUID CONTROL RESEARCH INSTITUTE**, Kanjikode West, Palakkad - 678 623, Kerala.
Tel: 0491-2566120/206/119, Fax: 0491-2566326, E-mail: training@fcriindia.com, website: www.fcriindia.com