

FCRI Bulletin

A RESOURCE FOR INDUSTRY

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FLUID CONTROL RESEARCH INSTITUTE

NABL Accredited ISO 9001 Certified Establishment
(Under Ministry of Heavy Industries and Public Enterprises, Govt. of India)
Kanjikode West, Palakkad – 678623, Kerala, India

Tel: +91-491-2566120/206/2569009/2569135; Fax: +91-491-2566326

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MESSAGE FROM DIRECTOR



FCRI has Celebrated Its Silver Jubilee on 18 Apr 2014. We are proud to state that over the past 25 years FCRI has contributed substantially for the growth of flow product industry in India by providing services in related areas and has contributed substantially for import substitution efforts. Organising training programmes in the area of flow measurement and control for both the Indian and International participants has been an important activity of FCRI.

The silver jubilee celebrations were inaugurated by **Shri. R.K. Parmar, Chairman, Governing Council, FCRI and Economic Advisor, Ministry of Heavy Industry, Govt. of India**. An invited lecture was delivered by **Prof. R.V.G Menon** on this occasion. Today, the institute provides infrastructural facilities for applied research projects in the area of fluid flow. It also acts as a national certifying authority for testing and calibration of all types of flow products and related measuring instruments. Through in house R&D efforts, FCRI has successfully developed and transferred technical Knowledge for a variety of products, viz, cone flowmeter, multiphase flow meter, thermal mass flow meter etc. More than 3000 organisations, spread all over India has benefited from FCRI'S services so far and this includes design evaluation, quality improvement, establishment of appropriate flow measurement and control technology, etc

In the silver jubilee year of its inception FCRI is poised for its growth in multiple directions, rededicating itself to its major objective of greater accuracy and precision in flow measurement and control. This issue of the bulletin focuses on the existing test resources and also on the test facility recently added in the special assignments test facility. Product and performance validation of air relief valve and swing check valve facility also has been included. FCRI has extended its accreditation by NABL in fluid Flow testing and calibration for another term of two years by NABL.

Dr. JACOB CHANDAPILLAI
Director



Fluid Control Research Institute (FCRI) is stepping into its twenty fifth year of service to the nation especially in the field of flow measurement and control arena. FCRI has travelled great lengths starting from a flow-metering and control research and development establishment with focus on valves and flow-meters to celebrate its silver jubilee. On the occasion of the silver jubilee celebration we thank the gratification and support given to FCRI by various industries and institutions spread across the globe for their immense support by utilizing the high-tech and utilitarian technical services of our institute.

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Foundation day Speech by Chairman, FCRI



Shri. R. K. Parmar, Economic Advisor, Ministry of Heavy Industries and Public Enterprises, Govt. of India

1. GENERAL HIGHLIGHTS

- Large water flow facility was accredited by NABL for fluid Flow calibration and testing with a maximum flow rate of 15000 m³/hr for pipe sizes upto 2.0 meter diameter.
- NABL extended accredited status of fluid Flow TESTING & CALIBRATION for another term of two years
- Started commercial calibration and testing in Large Water Flow facility .Cavitation testing on a centrifugal pump was conducted recently.
- Endurance test facility for Air release valve & Non return valves was commissioned.
- Fugitive Emission test capability extended to 400° C and ANSI 1500 class valves
- Accredited status as per ISO 9001: 2008 extended up to 2015 March.
- Received an order from CPCL, Chennai for fire hydrant network analysis
- FCRI has conducted auditing of gas measurement skids for GAIL Noida.
- Online calibration of large size flow meter is a major concern in the water distribution mains. FCRI has now decided to venture into the area for calibrating the flow meters at site using various methods.
- FCRI has been invited by a major gas distribution company for the study of loss of unaccounted gas due to Metering errors, Pressure and Temperature compensation, Billing cycle, Line damage etc.



FOUNDATION DAYS SPECIAL LECTURE

As a part of FCRI silver jubilee celebration, an invited talk was given by **Prof R. V. G. Menon** renowned scientist and former Director of Agency for Non-conventional Energy and Rural Technology (ANERT) on the Foundation day. He expressed that adopting best practices and developing new technologies will improve the overall quality of the work and will help to meet the goals and objectives of the organization. The speaker highlighted the need of necessary infrastructure and skills required for the development of indigenous systems and the interaction with reputed academic institutions will help the continuous growth of research and development in the institution. His speech was highly motivating and inspiring. The talk was followed by a very lively and interesting interactive session with the audience which included the past and present employees of the Institute.



Special Lecture by Prof. R. V. G. Menon, Renowned Scientist, & Former Director – Agency for non-conventional Energy and Rural Technology (ANERT)

The silver jubilee celebration and the foundation day programme concluded with cultural programme which comprises orchestra, Mohiniyattam and folk dance. This was performed by Ganaavishkar a Palakkad based cultural troop. Apart from music and dance, sports and games competitions for FCRI staff and their family members were also conducted as a part of annual day celebration. All FCRI staff and their family members have actively participated in the sports activities.



2. SPECIAL ASSIGNMENTS AND PROJECT FACILITY



Fig 1: HPHT Test Setup

High Pressure And High Temperature Test for control valves

Fluid control research institute (FCRI) specialists have conducted qualification tests on thousands of safety-related electrical and mechanical components, including valves, cables, actuators, switches, relays, breakers, transmitters and transducers. Changes in temperature and pressure in valves and process control elements causes thermal effects, specially thermal deformation. Process elements subjected to such extreme operating temperature and pressure normally undergo an accelerated life test or endurance test before being introduced to service in order to validate the design. This is being used to prove the design and analyse the reliability of the components constituting the entire system. These tests are normally performed in specially designed test rigs as per the International standards which are designed for the required operating pressure and temperature.

FCRI has recently tested a 4 "NB class 600 control valve with pneumatic actuator. The valve was tested for 250 mechanical cycles at 67 bar and 200 deg C in compliance with the nuclear power standards. The test was carried out in the High Pressure and High Temperature test loop. The test loop can go upto an operating pressure of 200 bar and temperature of 325 deg c. The photograph of the valve under testing is shown in the Fig 1. The pneumatic actuator was operated by supplying the required air with regulator. The valve was made to open and close pneumatically against the set pressure and at the end of each 50 mechanical cycles the valve was subjected to leak test by applying the required pressure and temperature at the upstream side with the downstream side open to atmospheric pressure.

Test facility for swing check valves in water supply systems

Product validation of Swing Check Valve and air release valve has been carried out as Per BS EN 1074, BS EN 12266 – Part 1 & 2, ANSI/ISA-S75.02 suitable for water applications. The purpose of this procedure is the validation of the prototype products developed by the manufacturer. A Swing Check Valve (SCV) and air release valve for use in pipe line systems have been tested. If any deviation outside the normal design parameters is observed, the details of the deviations shall be recorded in the test report.

SCV testing is accomplished by cycling the pump on and off and allowing the pressure to dissipate prior to the start of the next cycle and completing 2500 cycles. The following test such as Shell Test, Hi-pressure Seat / Closure Low-pressure Seat /Closure Test, Obturator (Disc / Wedge)Strength Test, Resistance of Valves to Bending Resistance of Valves to Operating Load (Max Torque – Min Strength),Valve Kv (Coefficient of Flow) was measured on the valve before the start of cyclic test and after the completion of 2500 cyclic test. The test setup is shown in figure 2.



Fig 2: SCV Test Setup

3. VISITORS TO LABS / ESTTS:

Shri. Laurence Stratton – Design Director, Nihon KOSO and Shri. Giri Kumar – Design Director KOSO Engineering Services has visited FCRI on 18 March 2014. Scientists from FCRI briefed the visitors about the technologies developed and facilities available at FCRI .The delegates interacted with the Director and senior scientists of the laboratory to get acquainted with the technical activities of FCRI.

Shri.Abdul Gomez , Director from Schuf Speciality Valve , Shri.Sandeep Chittora from Siemens, Shri Hirokazu Takaahashi from Toshiba ,Japan , Shri .Vladimar Kuranov from Russia , Shri.K.R.Sanjeev of NPCIL , etc. were some of the other dignitaries who visited FCRI during the period for technical discussion and facility visit.

4. NABL ACCREDITATION

FCRI has been assessed for the implementation of Quality System as per ISO/IEC 17025-2005 guidelines by NABL team for fluid Flow calibration and testing category during 9th to 11th May 2014. Tests and calibrations in Flow laboratories were witnessed by the accreditation team. Assessment team have recommended for extension of the accredited status of the water flow laboratory, air flow laboratory, oil flow laboratory, Centre for water management, Special assignments test laboratory and Closed loop air test facility. The test and calibration facility of Large water flow lab was recommended for accredited status. The detailed list of scope for calibration and testing are given in the institute website www.fcriindia.com

5. WATER FLOW LABORATORY

Valves for Water supply – Fitness for purpose requirements and appropriate verification tests

Exclusive test facilities for the testing of the valves against "BS EN 1074 – Valves for water supply –Fitness for purpose requirements and appropriate verifications tests" are available at Water flow laboratory These standards define the minimum fitness for purpose requirements for valves to be used in, or connected to, water pipe systems, above or below ground carrying water intended for human consumption. The following performance tests are conducted as per the standard. Mechanical strength, High Pressure Seat/Closure Test, Low Pressure Seat/Closure Test, Obturator Strength Test, Maximum operating torque for operation and leak tightness, Resistance of valves to bending, Resistance of valve to operating load. The above tests were conducted on 100mm and 300mm Gate valves from a valve manufacturer.

Safety valve (Pressure Relief valve)

These valves are tested as recommended in ASME PTC 25-2001-Pressure Relief Devices performance test codes. The test was conducted to determine the venting capacity, lift etc. at a rated pressure of 130psig. The Fig.3 shows the tests setup .The performance was brought to its required levels by trying out various combinations of springs and spring coefficient



Fig.3 Safety valve (Pressure Relief valve)

Calibration of Bypass flow meter

Two bypass flow meters of main line size 250mm and 25mm bypass line were calibrated for M/s. IGCAR. The aim of the experiment was to establish a relationship between the flow rate in the main line in relation to the bypass line. The initial tests were not comparable with the simulated values and some minor modification in the bypass line helped to achieve the expected values.



Calibration of Bypass flow meter



Filter testing

Filter testing

Determination of pressure loss coefficient for strainers of sizes up to 500 mm were carried out in the water flow laboratory.

The tests with 50% clogging in strainer basket was also performed.

The design of the filter was finalized after a CFD analysis at FCRI and this helped the manufacturer to optimize their design and successfully conclude the testing.



Resistance to Valve Bending

Resistance to Valve Bending

The Bending Test has been conducted on the VALVE as per standard EN 1074. This is a four point bending test. The bending test for valves is a leak test. The bending was simulated by applying standard weights on the valve assembly at required points of loading The valve shall be closed by applying the maximum permissible torque to the valve.

The test has been carried out by applying pressure on one side of the valve for 10 minutes As per the standard; there shall be no leakage from the Seat of the valve.

6. CENTRE FOR WATER MANAGEMENT (CWM)

Centre for water management (CWM), offer different kinds of services like flow product assessment, in-situ measurement/calibrations, analysis/design and consultancy service related to flow problems especially in water distribution networks, surge etc. CWM has tested around 525 water meter samples received from Bangalore Water Supply and Sewerage Board (BWSSB) and 700 samples from Delhi Jal Board (DJB) as a part of their domestic water meter procurement. Routine testing of bulk water meters of sizes from 15 mm to 150 mm has also been conducted for DJB. Life cycle testing of water meters of various sizes (15 mm to 50 mm) has been conducted for Municipal Corporation of Greater Mumbai (MCGM), Vadodara Mahanagar Seva Sadan and also for DJB for their tender for purchase of water meters. Various manufacturers also have conducted life cycle testing of their water meters.

Centre for Water Management has started a water metering scheme for delivering good quality water meters to the customers. Many water boards have made it mandatory to install water meters, which passed the routine tests, for getting water supply connection. We often see the meters purchased from the local markets failing the tests and the customer lose their money. In order to ensure that the customer gets good quality meters, FCRI has introduces a water metering scheme. Under this scheme FCRI supply water meters, which pass the testing as per IS/ISO standards, to the user for installing at their location for a period of 5 years. The risk of losing money in buying and testing meters directly from the market is eliminated here.

Officials from Legal Metrology, Ernakulam has visited FCRI for a discussion on setting up of a water meter test facility at Central Laboratory of Legal Metrology (CLLM), Kakkannad, Ernakulam. They have visited CWM and has showed interest in having a similar facility for CLLM. Official from MCGM has visited CWM for witnessing the testing of water meters conducted for MCGM. MCGM has also sought offer from FCRI for supply of test bench. CWM has received order from CPCL, Chennai for fire hydrant network analysis.



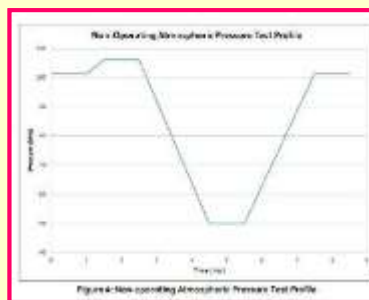
Testing of bulk water meter for Nuclear Fuel Complex Hyderabad

7. PHYSICAL STANDARDS LABORATORY

Altitude testing of medical equipment:

Non operating Atmospheric Pressure test (shipping or storage test)

In Altitude Test, the Unit under Test (UUT) is subjected to different simulated atmospheric conditions (under varying altitude). Typically this can be (i) Non operating Atmospheric Pressure test (shipping or storage test) and (ii) Operating Atmospheric Pressure Test. The non-operating atmospheric pressure test is intended to verify whether the item is adequately protected under these pressure conditions while kept inside its packing and container. The operating atmospheric pressure test is done to verify the uninterrupted functionality and operation of the device under varying atmospheric pressure conditions.



Pressure Vs Time Plot

A non-operating Altitude test was conducted on medical equipment under packed condition for one of the manufacturers.

The size of UUT was (600x600x600) mm weighing about 50 kg. This total test duration is 8 1/2 hours. Environmental conditions maintained at 25 ± 2 °C.

The required test profile is graphically represented in the Pressure vs. Time plot shown

8. LARGE WATER FLOW LABORATORY

Cavitation Testing of Pump At Large Water Flow Laboratory

Apart from calibration of flowmeters and testing of valves, Large Water Flow laboratory is also taking up testing of pumps. One such test is carried out presently at Large Water Flow laboratory on a centrifugal pump with operating pressure of 10 bar and maximum flowrate of 256m³/hr from GRUNDFOS pumps India private limited, Chennai for cavitation performance. The pump is designed to deliver a flow rate of 170m³/hr with a head of 85mWC. The coupling power required for this is 65KW. The cavitation test was conducted by suction valve throttling method. The Net Positive Suction Head available (NPSHa) was varied by throttling the suction valve and the head developed by the pump was measured keeping the flowrate constant. This test was repeated at various constant flow rates and the cavitation performance was obtained. Typical Cavitation test results are shown in the figure 1 The photograph of test set up is also shown in figure 2.

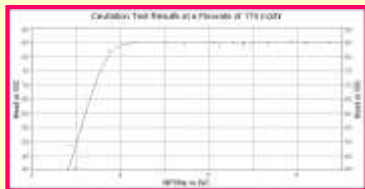


Fig: Cavitation Performance of Pump

NABL ACCREDITATION

Large Water Flow Laboratory has got NABL Accreditation for calibration of flowmeters and testing of valves as under.

Calibration: Using Magnetic flow meters as reference meters in the flow range 3500 – 15000 m³/h with an uncertainty of ± 0.5 %

Testing: Valve capacity test and inherent flow characteristics upto 1200 mm As per ANSI / ISA 75.01, 75.02 & IS 10189



Fig Cavitation Test Setup

9. TRAINING

FCRI conducted two bimonthly courses, one on 'Water transmission & Distribution Engineering' of 2 day duration in which Engineers from Greater Mumbai Municipal corporation actively participated & another 3 day course on 'Liquid Hydrocarbon Flow Measurement and Custody Transfer'. FCRI has also conducted two customised training programmes namely 4 day course on 'Flow metering in Gas Business' for engineers from M/s. Gas Authority of India Ltd and another 5 day course on 'Liquid & Gas Flow Measurement' for participants from M/s. AFP Operations AS, Norway. **Certificate Programme for fresh Graduate Engineers** is another important event in the coming quarter. Under this programme a 3 months course titled 'Liquid & Gas / Air Flow Measurement & Control Techniques and Standards' is commencing from August 2014. Nominations are being received for the above programme. Participants from Post Graduate Diploma Programme organized by Karunya University and M-Tech programme by Veltech university Chennai will be joining for the above course. **Inplant training** of durations 1 week, 2 weeks and 3 weeks for students from different Institutions like IIT Chennai, Veltech Chennai, Govt. Engg. College Trivandrum etc is being conducted at FCRI. Training for foreign nationals from various countries is also an important event in FCRI. One such training course on 'Oil, water and Gas Flow Measurement and Control Techniques & standards' for 3 months will be commencing from August 2014.

Series	Name of the Program	Duration	Date
150	Principles of Data Acquisition & SCADA	4 Days	17-20 Sep '14
153	On the Job Training for Field Engineers on Flowmeters & Calibration Techniques	5 Days	07 -11 Jul '14
154	Basics of Computational Fluid Dynamics	2 Days	17 -18 Jul '14
155	Metrology, Pressure, Thermal & Electro Technical Measurements and Calibration	2 Days	07- 8 Aug '14
Forthcoming International Training Programs for the year 2014			
1	Oil, Water and Gas Flow Measurement and Control Techniques & Standards	12 weeks	01 Aug – 31 Oct, '14



10. ENVIRONMENTAL QUALIFICATION LABORATORY

Environmental Qualification Laboratory Of FCRI is involved as service providers in the area of Noise & Vibration testing and calibration. It caters across the sectors from Transportation, Power engineering to medical instrumentation.

Some of the major assignments conducted during this period are:



Acoustic Test

Vibration testing of an Automobile component: Fuel filter manufactured by M/s Mann & Hummel Filter Pvt. Ltd., Bangalore was tested As per customer's specification for automobile component qualification. the following tests were carried out on the component Resonance search test - Initial, Endurance testing - Random vibration, Resonance search test - final



Vibration Test Facility



Environmental Qualification Test

Vibration & environmental qualification testing: Vibration & environmental qualification testing of a brake cylinder used in railways manufactured by M/s Faively transport, Hosur, Tamilnadu was tested and the test was conducted as per RDSO specification for bogie mounted brake system. The following test Endurance testing at discrete frequency & Environmental temperature test at discrete temperatures was carried out



Ingress Protection Test

Ingress protection test Ingress protection test was carried out for a junction box manufactured by M/S Giant reinforced plastic industries Ltd., Sharjah , UAE. The test was carried out as per IEC 60529 "Degrees of protection provided by enclosures". The following tests were carried out IP6X, IPX7

FOR FURTHER DETAILS PLEASE CONTACT

customercare@fcriindia.com

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