



SPECIAL ASSIGNMENTS & PROJECTS FACILITY



Apart from Hydraulic Performance tests and calibrations, FCRI is involved in evaluating and certifying Flow Products in Special Purpose Test Facilities. Here the performances of the flow products are checked for severe operating conditions as per design to evaluate its life in line with international and national standards. This facility also provide special tests for specific industries like Nuclear and Hydro Power industry, Water distribution systems, Automobile and aerospace industries.

The industry specific test facilities include

- ◆ High Pressure & High Temperature Testing,
- ◆ Fugitive Emission Testing
- ◆ LOCA/MSLB Test
- ◆ Product validation of swing check valve and air release valve
- ◆ Flow visualization schemes (PIV / High speed videography)
- ◆ Endurance / Life cycle Test facility
- ◆ Environmental Qualification Testing
- ◆ Cavitation Testing
- ◆ Cyclic Testing
- ◆ Cryogenic Testing
- ◆ Fire Testing
- ◆ Thermal Cyclic Testing

High Pressure and High Temperature Facility:

The high pressure high temperature loop has an operating pressure of 200 bar and temperature of 325°C with super cooled water as test medium. Pressure and temperature is attained with the help of a high pressure pump, heat exchangers and electrical heaters. Valves and flow elements with severe operating conditions can be tested in the high pressure high temperature endurance test loop for evaluating the life and performance. During test the required working pressure and temperature will be maintained on the upstream side when the valve is fully closed. Valve can be operated manually or with actuator against the set pressure. At the end of required mechanical cycles, the valve will be subjected to seat leakage test by applying the requisite pressure and temperature at the upstream side with downstream side open to atmosphere. Valve operation with rated differential pressure across the valve can also be performed in this loop. This facility is ideal for Endurance, Life cycle and Thermal cycling on valves and other flow devices.

Brief specification of the loop is

- ◆ Standards Followed : ANSI B 16.104
- ◆ Temperature : 0-350°C
- ◆ Ramp rate : 150°C/hr. (max)
- ◆ Pressure rating: 0-200 bar
- ◆ Test Fluid : Water

Fugitive Emission Test / Type Approval Test / Elevated Temperature Test:

Here fugitive emission from control valves, isolation valves and other flow elements can be tested as per ISO 15848 or ISA 93.1 standard. Helium is used as the test fluid and Helium mass spectrometer is employed to measure the leak. Both vacuum and sniffing method can be employed for leakage measurement. During the test, valve will be subjected to the required mechanical and thermal cycles. The valve will be pressurised to a pressure corresponding to its pressure rating at the temperature set during the test. Number of mechanical and thermal cycles to be applied on the valve depends on the standard being followed. Valves upto 1500 class pressure rating and sizes upto 16" can be tested in this facility. The test temperature can vary from -196°C to +400°C.



Type approval test as per SHELL specification (77-300) can also be performed in this facility. Two Helium mass spectrometer (ASM 142 & ASM 320) forms the heart of this facility.

Standards Followed : ISO 15848 Part I & II, ASME SEC V, ISA/ANSI 93.01, MESC SPE 77-300;77-312

Temperature : -196 to +400° C

Pressure rating : Up to ANSI 1500 Class

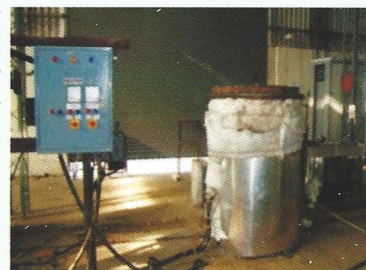
Minimum detectable leak rate for He : Sniffing: 1×10^{-7} mbar l/s Vacuum : 1×10^{-11} mbar l/s

LOCA/MSLB Testing for Nuclear valves:

Test facility for Steam Event Simulation for Loss of Coolant Accident and Main Stream Line Break (LOCA/MSLB) testing services meets the requirements of IEEE 323. This will enable testing of various components for the new, advanced reactor designs. MSLB/LOCA chamber simulates the harsh environment resulting due to LOCA/MSLB failure modes of Nuclear Reactors. The ability of the equipment to perform its required safety function while being subjected to the pressure, temperature, and humidity effects associated with the environment of a design basis accident. The required temperature, pressure and humidity profile will be generated in the chamber during testing. Provisions are made in the chamber to conduct actual operation of the device under test during LOCA / MSLB test environments.

Brief Specification of the LOCA/MSLB test facility is as under

- ◆ Overall Dimension of chamber : 1000 mm dia and 1 meter depth
- ◆ Inside dimension of Chamber : 950mm dia and 1 meter depth
- ◆ Chamber environment : To suite LOCA / MSLB conditions



Test facility for Water Transmission & supply systems (Sluice, Butterfly, Non-return, Air release valve)

Product validation of Sluice, Butterfly, Non-return, 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 test facility is the validation test requirements of the prototype products developed by the valve manufacturer. Swing Check Valve (SCV), Non-return Valve (NRV), Sluice Valve, Butterfly Valve and Air Release Valve (ARV) for use in pipe work can be tested in this facility. If any deviation outside normal design parameters is found the details shall be recorded in the test report. The test 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 the required mechanical 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 cyclic test.



Standards Followed : BS EN 1074, BS EN 12266 - Part 1 & 2, ANSI/ISA-S75.02

Temperature : Ambient

Fire Testing Of Valves :

In this test facility Testing of valves -specification for fire type testing as per BS6755 Part-2 & Fire testing of valves as per API 607 is carried out and Test fluid is water. Test valve is mounted in the test setup in normal operating direction. Upstream side of the valve is mounted with water pump as per the schematic. Downstream side of the valve is connected to collecting tank to measure the valve seat leakage. Calorimeter and thermocouples are located at proper location of the test bench. Initial valve seat



leakage will be conducted at Room temperature and recorded. The valve temperature can be elevated upto 960°C by using fuel gas. During the test the valve seat leakage will be measured and the calorimeter temperature also will be recorded. After completion of the test the leakage rate is compared with allowable value.

- ◆ Standards Followed : API 607, API 6FA, ISO 10497:2010,
- ◆ Temperature : Upto 960°C
- ◆ Pressure rating : Upto ANSI 150 Class

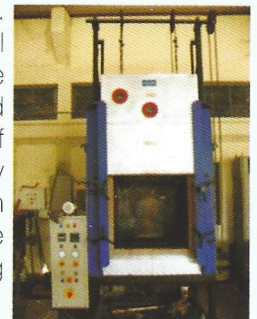
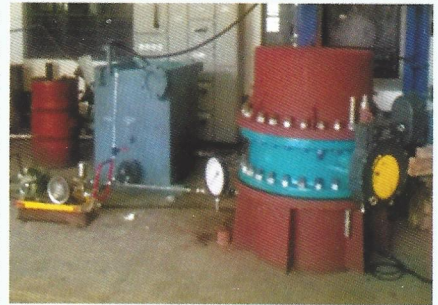
Endurance Test Facility:

In this facility the test was conducted as a part of proof of design test for the valve. The valve will be tested for required numbers of mechanical cycles under the test pressure as per national and international standards. The test valve is mounted on the test fixture arrangement and both sides of the valve body will be covered by cylindrical flanged test head. Upstream side of the valve was connected to pump outlet arrangement with bypass connection. Downstream side was connected to the reservoir tank. Pressure gauge and pressure switch were provided in the upstream side and downstream side of the valve. The actuator was connected to control center with pre on/off setting time. The number of ON/OFF operation of the valve was counted by an electro-mechanical counter. Before the commencement of the cyclic test the valve was subjected to the following tests Performance test, Shell Test, Disc Strength Test, Seat leakage Test, Cyclic Test. The valve was subjected to a cyclic Opening/Closing test with required time interval. Each cycle consists of applying the rated differential Pressure to the disc in the closed position, then opening the valve to the wide open position and then closing the disc. After completion of the required cycles of operation the valve was subjected to seat leakage test as per the design proof testing. After completion of the cycle test, the valve was subjected to seat leakage test and strip test.

- ◆ Standards Followed : AWWA C 504, POD Test
- ◆ Temperature : Ambient. Pressure: PN 10
- ◆ Size upto : 48 inch

Environmental Test Facility:

FCRI has environmental test facility to perform Long term thermal aging testing to monitor degradation of the Test component using qualified test facilities which enable testing for the new, advanced designs. Thermal degradation refers to the change in chemical and physical properties of a material that occur at elevated temperatures. Increased temperature accelerates most of the degradation processes. It involves aging the proposed component at three or more elevated temperatures. After each heat cycle, samples are also subjected to a repeated series of environmental exposures, such as cold shock, mechanical stress and humidity. Thermocouples and electronic temperature controllers are used to the test facility to maintain the specified thermal aging temperature. Temperatures are maintained within $\pm 1^\circ\text{C}$ of the specified thermal aging temperature. Redundant Controllers are used to prevent overheating of the test samples in the event of a malfunction of the main controller.



Brief Specification of the Thermal Ageing Test Facility

Thermal Ageing Test Facility-I	Thermal Ageing Test Facility-II
Chamber Size: 32" x 32" x 32"	Chamber Size: 33" x 29" x 35"
Temperature range: Ambient to 700°C	Temperature range: -75 to 180°C

Cryogenic Test:

FCRI is equipped with all infrastructure required for Cryogenic Testing of valves as per national/international standards.

The test valve is mounted on the test fixture arrangement and the line is to be flooded and entrapped air to be cleared using circuit air bleeds. Both side of the valve body was covered by blind flange. The test valve was pressurized in one direction in closed position and seat performance is checked for required time duration. During the test, one side of the valve is subjected to rated pressure. Liquid nitrogen was filled in the container and the temperature of the valve body and bonnet are measured and recorded. Once the rated temperature reached, valve seat leakage is measured and recorded. After completion of the test, the valve opening torque can be measured and recorded. Condition of the valve was visually observed for any damages. Other hydraulic components such as wire mesh hoses and braided hoses etc are also tested for their performance in this facility.

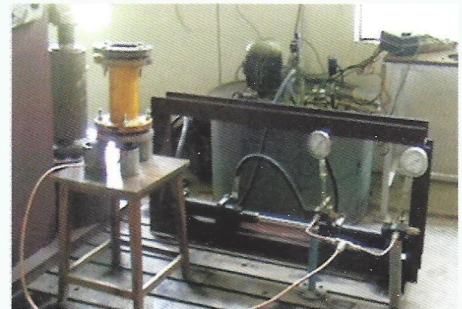


Standards Followed : BS 6364
Temperature : Upto -196° C
Pressure rating : Upto ANSI 150 Class

Hydraulic Impulse Testing:

To ensure the long life and trouble free performance of hydraulic components Hydraulic impulse testing is being used for qualification and performance evaluation of hydraulic system components.

The hydraulic power unit (HPU) is the mechanical source of high-pressure hydraulic fluid required to operate the test components. A motor drives a hydraulic pump which Test fluid shall be water/oil. Test valve is mounted in the test setup in normal operating direction. Upstream side of the valve draws hydraulic fluid from a reservoir and pressurizes it upto 140 bar. The pressurized fluid is made available to the hydraulic test components. The HPU can produce low and high pressure output and low and high flow output. When proof pressure tests are used to determine leakage of hoses or hose assemblies, the specified proof pressure in accordance with the product standard is applied and the test components are examined during this period for evidence of leakage, cracking, abrupt changes in the dimensions of the component. The online data was logged to the Data Acquisition system continuously.



Operating pressure : 0 to 140 bar
Size : 3/8 Inch
Flow : 0-40 LPM
Standards followed : DS/EN ISO 1402
Temperature : Ambient