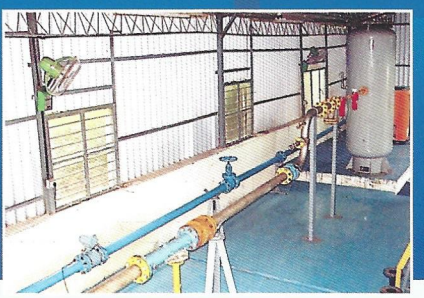
एफ.सी.आर.आई.

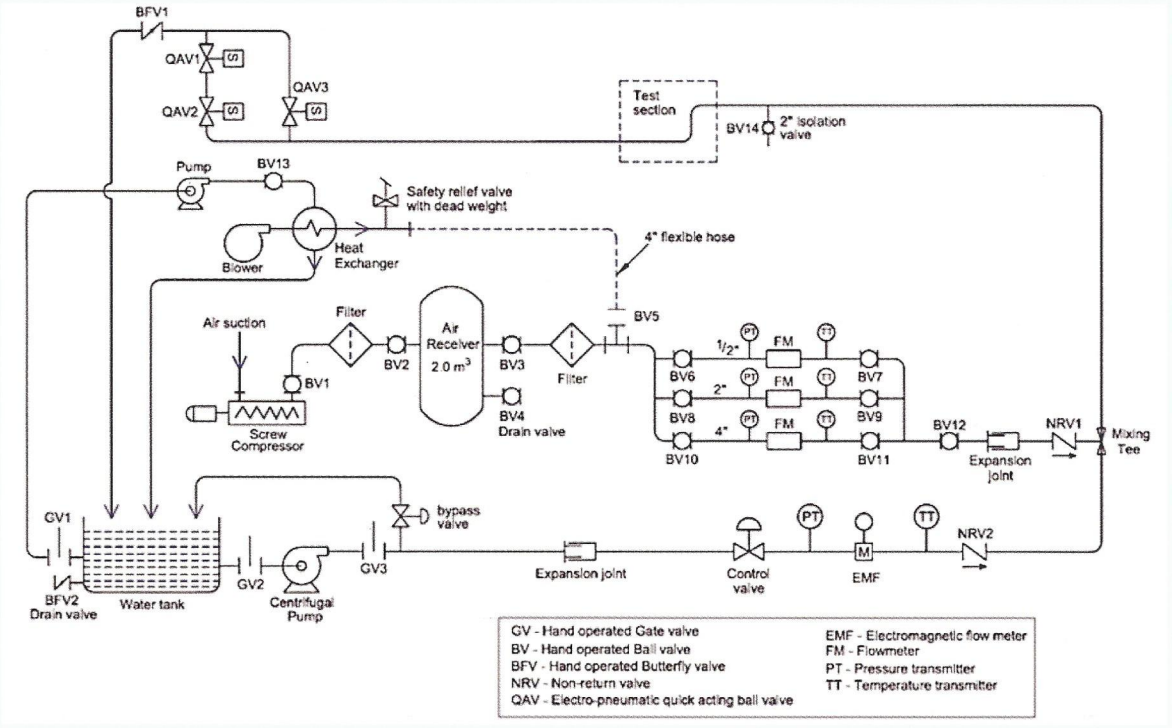
FLUID CONTROL RESEARCH INSTITUTE

MULTIPHASE FLOW FACILITY



It is an established fact that Multi-phase flows have been posing measurement challenges regarding bringing down measurement uncertainties to acceptable orders when conventional single-phase flow meters are used. Multiphase flows, very common to upstream oil and gas sectors and power industry, are characterized by extreme variations in viscosity, density and velocity between phases. The phase distribution in multiphase flow vary both spatially as well as with reference to time besides being affected by conditions such as geometry, orientation, etc. of pipe and piping elements in flow conduit.

During the past more than a decade, FCRI has executed a number of projects in the area of two-phase and multiphase flows for many clients in India and abroad pertaining to applications such as characterization of automotive engine-oil under aeration conditions, Scale down experimental studies on Gas Entrainment in surge-tanks, related assemblies/ auxiliaries of power stations, Computational Fluid Dynamics simulation/ modeling for homogenizer/ mixer assemblies for multiphase flow, Computational Fluid Dynamics simulation/ modeling for Gas entrainment behaviour in power-station sub-assemblies such as surge-tanks, Wet gas flow studies and performance of venturies and differential pressure flowmeters under oscillating flow conditions, Design, development, performance testing of Capacitance-based phase-fraction meter for two-phase measurements.



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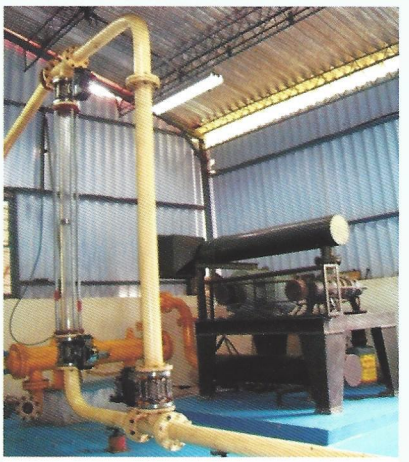
With support from Industry and allied agencies, FCRI has undertaken research studies towards development of custom two-phase flowmeter systems for steady-state and high-response applications such as heat-exchanger safety related monitoring in power plants. Towards research and development activities a Multiphase Flow Facility has been established at FCRI for basic measurements in two-phase air-water mixtures. The outcome of research has been multiphase flowmeters for measurements in steady-state and transient state for high temperature high pressure conditions such as steam-water mixture flows.

The unique feature about the latest flowmeter system developed for transient measurements is its collimated multi-beam gamma-ray scheme that permits inline non-intrusive tomography/visualization. The system also has its high response of the order of 5 to 20 milliseconds permitting usage for transient gas-liquid flows such as steam-water break flows in heat exchanger systems of power plants. The system has been designed for handling high flow velocities at process conditions of up to 340 °C temperature and 170 bar pressure.

With new Multiphase Flow capabilities being added in a phased manner over the past few years, FCRI infrastructure has been providing contractual support for testing and research experimental work for end-users and product developers for their two-phase and three-phase equipment such as phase-homogenisers and static mixers, phase-separators, piping components and custom devices used in multiphase. Besides, the facilities are being used by Industry for pressure drop analysis of components in two-phase gas-liquid flow regimes, experimental evaluation of two-phase flowmeter prototype models, experimental validation exercises for computation components with prototype models, etc.

FCRI welcomes both short-term and long-term research ventures from industry in two-phase and three-phase flow including gas-liquid, liquid-liquid, liquid-solid and gas-solid flows. FCRI has also developed methodologies for undertaking low flow wet-gas experiments in air-water and gas-oil flows.

Vertical Test -section for Air-water loop, with transparent pipe for visualizing air-water regime during experiments



Quick-acting Valve Setup for Phase - fraction measurement, with transparent vertical pipe section .