POLITECNICO DI MILANO

MultiphaseLab

Fluid-dynamics and heat transfer of multiphase flows, interface phenomena and refrigerant fluids

Laboratory Managers: **Prof. Ing. Luigi Colombo**
Prof. Ing. Manfredo Guilizzoni

DIPARTIMENTO DI ENERGIA

Description
MultiphaseLab is aimed at supplying basic understanding and technological insight of multiphase flow and interface phenomena for the design of components and systems in energy conversion plants, oil & gas, automotive and aerospace industries, environment protection.

Accredited Staff
Prof. Ing. Alfonso Niro
Prof. Ing. Luigi Colombo
Prof. Ing. Manfredo Guilizzoni
Ing. Andrea Lucchini

Laboratory Manager
Prof. Ing. Luigi Colombo
Prof. Ing. Manfredo Guilizzoni
telephone: +39 02 2399 3887 (L. Colombo)
+39 02 2399 3888 (M. Guilizzoni)
fax: +39 02 2399 3913
e-mail: luigi.colombo@polimi.it
manfredo.guilizzoni@polimi.it

Website
http://www.tfdmultifase.polimi.it
http://www.thermalab.polimi.it/it/laboratori/multiphaselab

Laboratory Address
Dipartimento di Energia
Building BL25A
Via Lambruschini, 4
20156 Milano - Italy

Instrumentation & Facilities

- Multiphase/multicomponent flow test facility for pipelines up to 100 mm diameter and 20 m length.
- Test facility for surface characterization, wettability and drop evaporation analyses.
- Test facility for measurement of heat transfer coefficients and pressure drop in evaporation and condensation of refrigerants.

Measurement devices:

- Quick-closing valves for the measurement of volume-averaged in situ phase fractions.
- Optical and impedance probes for local phase density sampling.
- Capacitance sensors for volume-averaged in situ phase fractions measurement.
- Video cameras and reflex camera with macro lens.
- Roughness and profile analyzer with measuring range from 1 μm to 1 mm.

Activities

Multiphase flow

The activity is focused on the characterization of two-phase and three-phase flows. Typical applications are in the energy conversion and chemistry fields for the gas-liquid case (e.g. boiling and condensation) and in the oil&gas sector (transport of light and heavy hydrocarbons) for the liquid-liquid and three-phase cases.
Flow patterns and pressure drops are mainly investigated, for both conventional and innovative pipes, with uniform diameter and in presence of singularities.

Interface phenomena

Interface phenomena, wettability and thermal drop-surface interactions for conventional and innovative (engineered, coated, …) surfaces are studied, mainly focusing on:

- Wetting states, static/dynamic contact angles, sliding/shedding angles, surface wear by drop impacts on fabrics, structured and highly hydrophobic surfaces.
- Multiple drops interactions, surface coverage.
- Evaporative dropwise cooling and Marangoni convection.

Drop impact onto gas/liquid interfaces is also studied, mainly by CFD.

Boiling and condensation of new refrigerants

Flow patterns, heat transfer and pressure drop during flow boiling and forced convective condensation of new refrigerants inside enhanced tubes and channels are experimentally investigated for HVAC, civil and industrial refrigeration sectors.