

Vertical and inclined test section for two-phases air-water flows experiments

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Introduction

This work presents the project development of a vertical and inclinable test section that is underway in the Thermo-Hydraulic Laboratory of the Nuclear Engineering Institute (LTE/IEN), aiming studies and experiments on two-phase air-water flows.[1]
This new facility will allow to the increasing of the working capacity of the laboratory since it only possesses a structure for horizontal and slightly inclined flows studies which have been developing so far. Furthermore, a new air compressor will be installed in the laboratory that will enable a wider range of flow patterns studies, including annular flow that requires a higher void fraction.

The Facility

The Figure 1 presents the schematic of the new test section. It consists of two sets of four circular acrylic tubes with 1 and 2 inches in internal diameter and 2m long, joined by flanges, totaling 8m high. A centrifugal pump takes water from a separation tank to a air-water mixer located at the inlet of the sets of acrylic tubes. In this way, the water passes through a heat exchanger in order to maintain constant the temperature. Air is supplied to the system by a compressor. The two-phases air-water mixture flows along the test section and returns to the air-water separation tank, completing the loop. The flow rates of water and air can be separately controlled and an instrumentation is properly positioned before the tube inlet in order to monitor the parameters of each component of the air-water mixture (flow rate, temperature and pressure).

The test section will be supported on trestles with pulleys and connected to a metallic structure by cables, allowing it to be inclined with respect to the vertical position, extending the range of inclined flows for other values besides the range of $\pm 10^\circ$ currently available in the LTE.

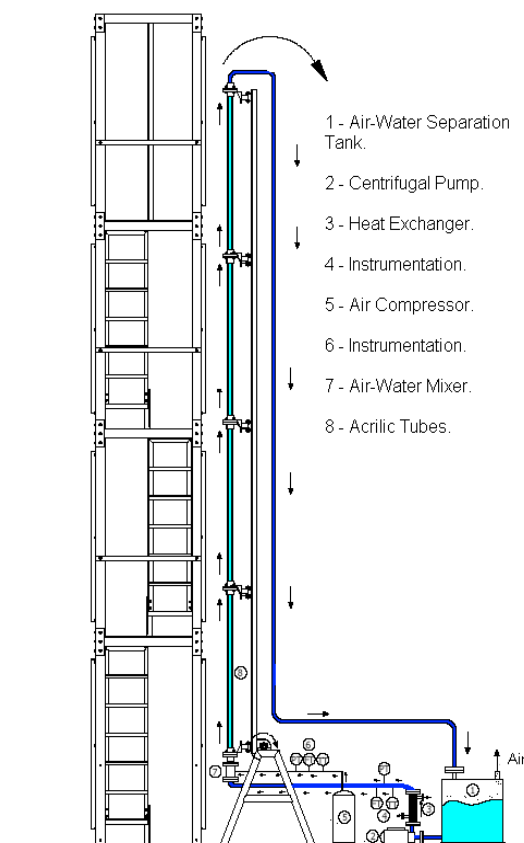


Figure 1 – Schematic of the Vertical Two-Phase Air – Water Test Section

Conclusion

A vertical and inclined test section is being designed and will soon be mounted in the Thermo-Hydraulic Laboratory of IEN. Together with a new compressor that will be installed, this new facility will expand the working capacity of the laboratory enabling a wider range of studies and experiments in two-phase air-water flow.

References

- [1] Estudos de Escoamentos Bifásicos Gás-Líquido em Tubos Verticais e Inclinados. Projeto APQ1 2011/02, No. E-26/110.282/2012 - FAPERJ 2012