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COMPUTATIONAL FLUID DYNAMICS APPLIED TO THE STUDY OF FALLING LIQUID FILMS IN A WAVE FILM GENERATION FACILITY

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Two phase gas-liquid flow appears in several engineering applications, such as boiling nuclear reactors, oil and gas industry, chemical plants, among others. For this phenomenon's study the experimental facility Wave Film Generator (GEPELON, *Generador de Película Ondulatoria*) was constructed. It uses conductivity sensors for the multi-phase flow analysis in vertical pipes. In this work, we propose the use of Computational Fluid Dynamics for modelling the falling liquid films regime in this facility. Specifically, this air-water flow regime consists of a water film that falls down the pipe wall and a central region with stagnant air.

We build up a simplified installation's geometrical model, considering a mass flow boundary condition in the inlet and constant pressure in the outlet. To capture the water-air interface a non-uniform structured mesh with fine elements close to the wall was constructed. Using a Volume of Fluid (VOF) model and the FLUENT solver, we simulate different flow rates and from the water volumetric fraction we estimate the film thickness in all the domain. The simulations are stationary and due to the hydrodynamic complexity, a pseudo-transient approach was used to stabilize the iterative process. The simulation values were compared with the experimental results obtained in the GEPELON facility. A mesh independence analysis was performed and several mass flows were simulated, showed good agreement with the experimental values for lower flows and reasonable for higher flows.

This is a work in progress, whose next stages move in two complementary directions: the first, that involves the simulation, comprises the more detail geometry, the inclusion of turbulence models and the realization of time-dependent simulations. The second line, associated with the experimental work considers, the measures' improvement, including, error estimation techniques and the validation of the conductivity sensor's measurement, comparing their results with PLIF (Planar Laser-Induced Fluorescence) image measurements.

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