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Effects of a flow obstacle on liquid film thickness in relation with *CHF* enhancement

Abstract

There is evidence in literature that the insertion of flow obstacles in the coolant flow of a boiler flowing in an annular regime postpones the film dryout emergence on the heated surfaces. Specifically, the obstacle is believed to force the deposition of droplets to the wall, hence to increase the film flow rate, and therefore to delay dryout.
The two objectives of the present research are (i) to confirm the increase in the film flow rate due to the obstacle, by (ii) building an appropriate flow-loop equipped with suited techniques for film thickness and film velocity measurements.
A solid cylinder is inserted in the center of a vertical water-air annular tube flow. Variations in liquid film characteristics, e.g. film thickness and interfacial parameters (disturbance waves velocity and frequency), are measured through a local conductance probes technique.
This work shows that the presence of an obstacle in an annular flow leads to an increase in the film thickness, specifically the substrate thickness, and does not affect the interfacial behavior of the film. An increase in the droplet deposition constant is observed and agrees reasonably well with predictions from the Windecker *et al.* (1999) correlation. The flow-loop and the measurements techniques are suited for extensive droplet deposition measurements.

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