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INTERIM REPORT

Monthly Highlights

for

February 1980*

Light Water Reactor Thermal Hydraulic Development Division

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* Work carried out under the auspices of the United States Nuclear Regulatory Commission.

2. Nonequilibrium Phase Change Studies

2.1 Development of Analytical Modeling (N. Abuaf, B.J.C. Wu)

The flashing onset correlation developed by Alamgir and Lienhard for static depressurization was compared with the depressurization data available from the Marviken critical flow tests. The results for the 26 tests examined are presented in Fig. 1. The pressure difference between the initial pressure for each test and the turning point in the pressure history, $p_o - p_N$, are plotted vs. the depressurization rate. The depressurization rates recorded in the Marviken tests are below the limit of applicability of the Alamgir-Lienhard correlation and this is the region where the data available in the literature showed a wide unexplainable scatter. Although the extrapolated Alamgir-Lienhard correlation predicts a constant pressure undershoot for T_o = 264 C, for the depresurization range considered, the Marviken data depicts an increase in the undershoot with the depressurization rate which is the normally expected trend. The dissolved oxygen content of the Marviken data for the measured cases ranges from 0.005 -1.3 mg O_2/kg H_2O and the data does not show a trend with the dissolved O_2 content. The 1.3 mg O_2/kg H_2O would correspond to approximately 1 cc of O_2 at standard conditions per kg of water, which could be very low in order to cause a considerable effect on the inception point. The typical reactor water in PWR and BWR's contain 0.25 - 0.43 ppm, of O_2, and thus the dissolved oxygen in reactor water would probably not to change the inception. The H_2 concentration on the other hand were quoted to be 15 - 35 cc/kg of H_2O in PWR's and such quantities of dissolved H_2 may have an effect on the inception points.

The variation of the observed pressure undershoot with the depressurization rates and the absence of any observed effect of the O_2 concentrations seem to reinforce the necessity of conducting shock tube experiments as proposed earlier

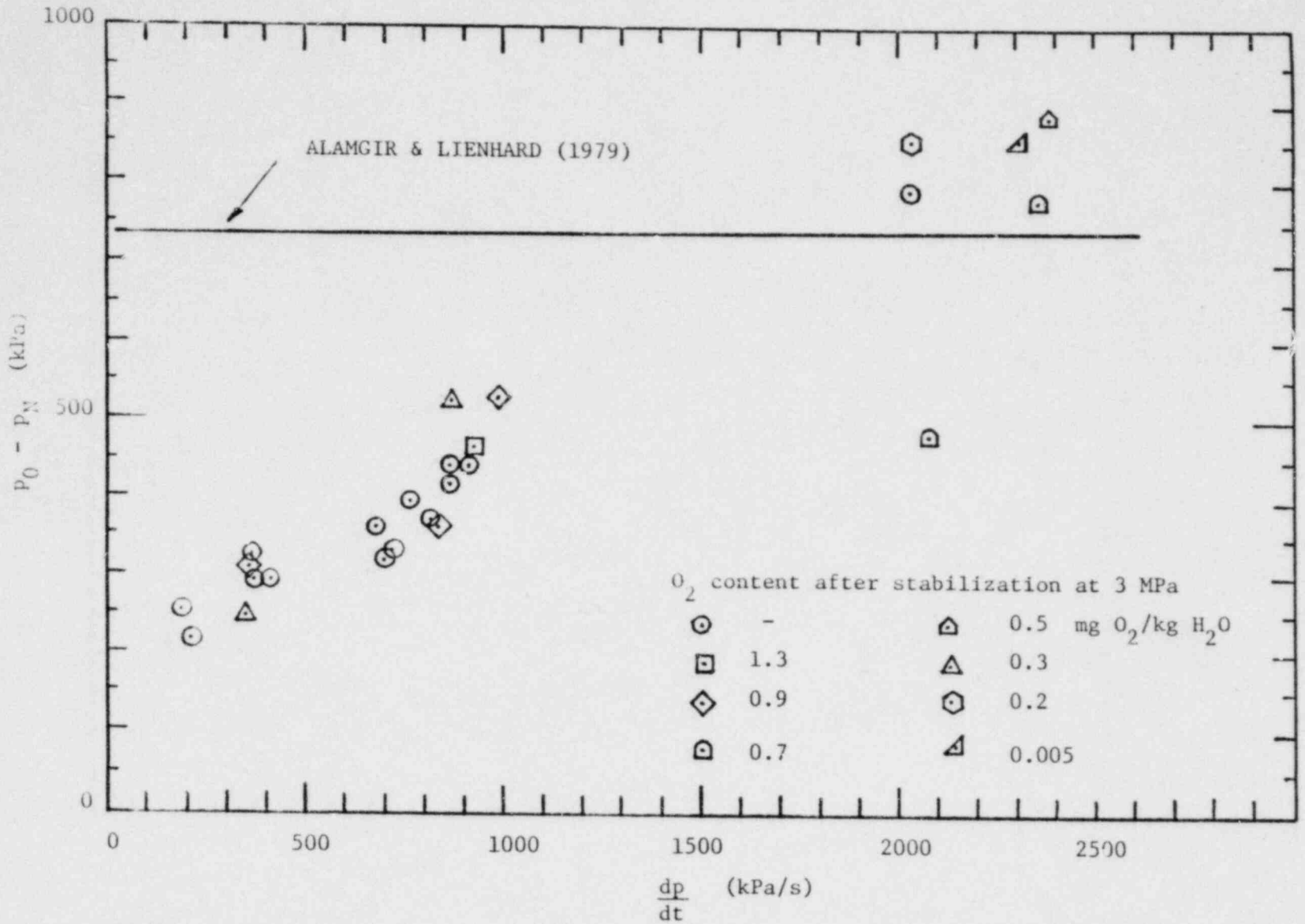

Figure 1 Comparison of Experimental $p_o - p_N$ with Alamgir-Lienhard Correlation. (Marviken Tests 1-27)

to determine the onset points at low depressurization rates and systemmatically study the effect of various dissolved gases and particulates.

The methodology developed to calculate the critical mass flow rates through converging nozzles from nozzle geometry and inlet conditions (p_o, T_o) was successfuly applied in predicting Powell's data.

2.2 Flashing Experiments (G.A. Zimmer, J.H. Klein, B.J.C. Wu, and N. Abuaf)

The multichannel scanner which is the basis of the automatic data acquisition system broke down during the calibration of the thermocouples, pressure transducers and the five beam gamma densitometer. The scanner was replaced. The wiring of the new scanner is being accomplished in order to finish the calibration and start the flashing experiments.

The void fraction data obtained in the last series of runs is being analyzed and the necessary corrections and uncertainty calculations are being incorporated in the data analysis programs.

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