

INTERIM REPORT

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NRC Research and Technical
Assistance Report

Enclosure 3

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MONTHLY PROGRESS REPORT

November 1979

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Contract No.: NRC-04-74-180

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Project Title: Investigation of Post-CHF Heat Transfer
for Water-Cooled Reactor Application and
Development of Two-Phase Flow Instrumentation

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NRC Research and Technical
Assistance Report

INVESTIGATION OF POST-CHF HEAT TRANSFER FOR WATER-COOLED
REACTOR APPLICATION AND DEVELOPMENT OF
TWO-PHASE FLOW INSTRUMENTATION

1. POST-CHF HEAT TRANSFER

The major effort in this month was on operation of the two-phase boiling loop, in the continued acquisition of data on nonequilibrium post-CHF boiling heat transfer. As stated in the previous progress report, some sixty experimental runs had been completed by November 1. In this past month these data were more than doubled with the acquisition of an additional 115 runs, bringing the total of post-CHF runs to 175. The range of test parameters covered in these experiments are updated in the attached Figure 1.

Data collection is continuing in the month of December. Our intention is to fill in some of the gaps in the parametric parameters as indicated in Figure 1.

2. CORRELATION DEVELOPMENT

In the continuing effort to improve correlations for prediction of post-CHF heat transfer, we have centered our attention in the range of low mass fluxes and low to moderate vapor qualities. As had been discussed in previous progress reports, existing correlations have all been developed from available data base which are primarily for flow mass fluxes in the order of 10^5 lb/mass/hr/ft² or greater. Consequently, there is a high degree of uncertainty in the applicability of such correlations to lower mass flux conditions. Recent experience with rewetting in the LOFT tests have shown that the rewetting process is in fact highly sensitive to post-CHF heat transfer at mass fluxes below 10^5 lb/hr/ft².

Several months ago, the Babcock & Wilcox Company generously provided us with proprietary data obtained in their laboratory, as a cooperative effort to help improve the state of art in this subject. From these data, we have culled some 600 data points which are in the range of 10^4 to 10^5 lb/hr/ft² mass flux. We are currently comparing these new data with existing correlations, concentrating on possible shortcomings in the existing correlations at these low mass flow rates.

3. TWO-PHASE FLOW INSTRUMENTATION

The probe used to obtain the film thickness measurements shown in the last progress report is being recalibrated to insure accuracy of the measurements. A flat tray rig with imbedded electrodes of the same geometry as the film thickness probe is being fabricated for this recalibration. In the meanwhile, the formulation of theoretical analysis for comparison with the experimental measurements of film thickness in countercurrent two-phase flow is continuing.

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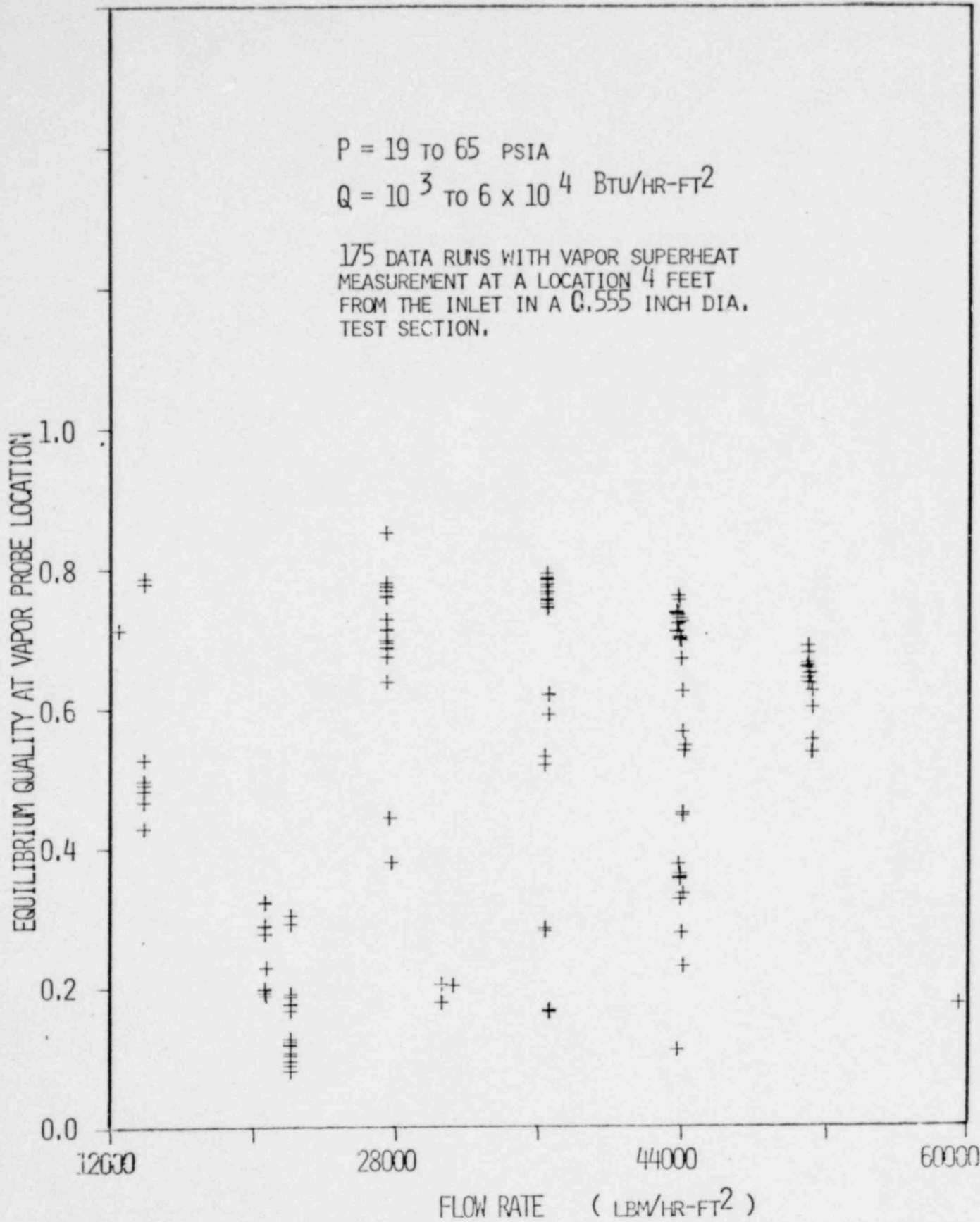


FIG. 1 RANGE OF TEST PARAMETERS IN POST CHF EXPERIMENTS (AS OF DEC.1,1979)