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February 11, 1980

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Subject: FLECHT-SEASET Program
Informal Monthly Progress Report for December, 1979
Contract: NRC-04-77-127, EPRI No. RP959-1

Gentlemen:

Attached is an informal progress letter for the month of December, 1979 for FLECHT-SEASET.

Sincerely,

H. William Massie
FLECHT-SEASET Project Engineer
Strategic Projects

HWM/dlc
attachments
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NRC Research and Technical Assistance Report

FLECHT-SEASET PROGRAM
CONTRACT NRC-04-77-127
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FLECHT-SEASET PROGRAM
INFORMAL MONTHLY PROGRESS REPORT
DECEMBER, 1979

PROJECT MANAGEMENT--H. William Massie

Input was provided to NRC and EPRI for Contract Modification No. 4 which will reflect the agreement to include natural circulation tests along with reflood tests for the Systems Effects Task.

The 161 Rod Blocked Bundle draft task plan was transmitted to NRC and EPRI for comments.

TEST PLANNING AND ANALYSIS--L. E. Hochreiter/R. P. Vijuk

Unblocked Bundle Task (Task 3.2.1)

Effort is continuing in validating data and writing the data report which will be issued to EPRI and NRC in February, 1980.

Preliminary plots (Nu Vs Z and Nu Vs Re) of the steam cooling heat transfer results have been gneerated. Effort was continued in correlating the heat transfer results and generating heat transfer correlations. Due to some unexpected difficulties in obtaining the actual axial power factors and power step lengths of the heater rods, effort to use the COBRA computer code has been delayed; the problem is expected to be solved shortly.

Effort is being continued to understand the wide variation of heat flux among heater rods above the forth level in the boil-off tests. It was suggested that rod to rod radiation may be a possible explanation, but no firm conclusion could be drawn at this moment.

The quench time portion of the skewed power correlation (h vs z-zq) has been completed in reformulation in dimensionless form. The heat transfer coefficient portion of the skewed power correlation has also been reformulated in dimensionless groups, however, some coefficients have yet to be determined from data.

ORNL performed recovery low temperature annealing and infrared scanning tests on 30 heater rods to be used in the first 21-Rod Bundle Test Series. The infrared scanning tests showed that one rod had Boron Nitride insulation anomalies and was recommended not to be used in the bundle.

RAMA is still working on the Westinghouse modified design heater rod prototypes. A four foot long heater sample was made of the single ended design. This sample resulted in elongation of about 2.8% and a Boron Nitride density of about 1.8 grams per liter.

21-Rod Bundle Task (Task 3.2.2)

The single rod/sleeve instrumentation and deformation test was planned. This test will be conducted to evaluate the method by which KFK of Germany attaches

thermocouples to blockage sleeves and routes the thermocouple lead downstream of the blockage sleeve in the flow sub-channel. The test will also be conducted to determine the amount of sleeve deformation as a function of thermal cycling. A total of four sleeves will be placed in the high power region in order to determine the deformation characteristics of various sleeve designs. These sleeves include a short, thick, instrumented sleeve; a short thin, non-instrumented sleeve; a short, thick, non-instrumented sleeve; and a long, thick, instrumented sleeve. A drawing of the test set-up and appropriate description was sent to EPRI and NRC for their review.

Work is continuing on the data reduction programs for the 21-Rod Bundle Task. Work was initiated on a data tape which would possess all pertinent thermocouple information for the DATAR code.

The computer program for comparing heat transfer coefficients between test runs is operational.

COBRA code analysis of the FEBA 25 rod bundle data had resulted in problems. It was found that the problem was due to an error in the code itself. This will be corrected through consultation with PNL personnel. The FEBA calculation was reformulated and is under progress.

161-Rod Blocked Bundle Task (Task 3.2.3)

The draft task plan was completed.

Natural Circulation and Reflood Systems Effect Task (Task 3.2.7)

Work continued for finalization of the design of piping, equipment, and instrumentation for the system effects, natural circulation, and reflux tests.

The twin bundle design has been eliminated and substituted with a bundle design similar to the 161-Rod Unblocked Bundle. This design change in conjunction with the deletion of housing windows will simplify, and consequently, reduce the cost of the design and fabrication of the bundle housing.

The primary loop scaling used in the FLECHT-SET phase B tests was reviewed as a preliminary task in designing the loop piping for the FLECHT-SEASET Systems Effects Tests. The objective of the scaling is to preserve the total primary loop hydraulic resistance of the FLECHT-SEASET model compared to a PWR plant.

Scaling methodology similar to the FLECHT-SET Phase B Scaling will be applied to the hydraulic resistance of the FLECHT-SEASET loop.

Steam Generator Separate Effects Task (Task 3.2.6)

Work continues to finalize the data report.

The steam generator evaluation model computer program (SGEVAL) was improved by adding a system subroutine to perform all time integrations. The routine, called ICE (i.e. integration with controlled error) automatically adjusts the integration time step to ensure stable and accurate results. Prior to this improvement, results from SGEVAL were somewhat sensitive to the time step selected for the calculation.

To improve the calculational detail in the elevations where the tube wall quenches the axial mesh structure was recast to a dual mesh, allowing small axial mesh steps where rapid changes occur and a larger mesh above the quench front where changes were more gradual.

FACILITIES ENGINEERING/TEST OPERATIONS--L. R. Katz/C. E. Fuchs

21 Rod Bundle (Task 3.2.2)

Electrical inspection of annealed heater rods were performed for bundle No. 1. The operator's panel was essentially completed and loop operating procedures were initiated.

161 Rod Blocked Bundle (Task 3.2.3)

Procurement of housing windows and loop structural steel was initiated. Design of stainless steel upper and lower test section plena was also initiated.

System Effects (Task 3.2.7)

Effort continued on the loop layout design.