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Responsible NRC Individual and NRC Office of Division:

Pedro Albrecht, RES Headquarters

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Prepared for
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Under Contract No. NRC-04-76-293-06

INTERIM REPORT

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December 5, 1978

Mr. Pedro Albrecht
U. S. Nuclear Regulatory Commission
Mail Station 1130 SS
Washington, D. C. 20555

Dear Mr. Albrecht:

Task Agreement Number 6, to
Contract No. NRC-04-76-293-06

This is the monthly letter report for November, 1978 on the subject contract.

Work on the first phase of a dynamic-viscoelastic analysis of crack propagation and arrest in the DCB test specimen is now complete. The work is motivated by the fact that a considerable portion of the research aimed at achieving a basic understanding of crack arrest in nuclear steels is being conducted with optical polymers -- materials that exhibit substantial viscoelasticity. Computations for Araldite B and Homolite 100 show that the amount of energy dissipated viscously in the specimen away from the crack tip is quite small. As typical results, for $K_Q/K_D = 2$, the fractions of the initial strain energy dissipated were 1.6×10^{-7} and 4.6×10^{-8} for Araldite B and Homolite 100, respectively.

These results indicate that the computational procedure employed in previous work at Battelle -- using the long time (static) modulus to set the initial conditions and the short time (dynamic) modulus for the crack propagation computations -- is quite appropriate.

A summary of the analysis of axial crack propagation and arrest in thick-walled cylindrical vessels with temperature gradients is being submitted to the SMIRT-5 Conference in Berlin, August, 1979. The computations on the Oak Ridge National Laboratory experiment (0.24 m I.D. and 0.53 m O.D., initial temperature 291 C, -25 C fluid in interior of cylinder), in which reasonable agreement with the experimental results were obtained, are described. Emphasis is also put on computational results for long crack jumps in which significant differences between the dynamic and static approaches exist.

Experimental progress includes retrieval of the irradiated capsule. On November 1, shipping cask BMI-1 and hot lab personnel were sent to the University of Michigan to pick up the irradiated capsule. The capsule was loaded into the cask, and received back at BCL on November 2. The capsule was removed from the cask, and moved into a high level cell. Both the opening and specimen inventory were completed by the end of November.

Results continue to be received from the Cooperative Test Program. Fifteen labs have now reported partial results such that about 1/3 of the specimens have been tested. The additional data received in November do not alter the conclusions reported at the ASTM seminar at the beginning of the month.

Sincerely,

A. R. Rosenfield
Metal Science Section

ARR:lw

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