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Author(s): Pradip Saha
Department of Nuclear Energy, Brookhaven National Laboratory
Upton, NY 11973

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Responsible NRC Individual and NRC Office or Division: Dr. Novak Zuber
Sr. Research Analyst
Analysis Development Branch
Division of Reactor Safety Research
Nuclear Regulatory Commission
Mail Stop G-158
Washington, DC 20555

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Brookhaven National Laboratory
Upton, New York 11973
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Monthly Highlights

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TRAC Assessment and Model Development

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Pradip Saha
Department of Nuclear Energy
Brookhaven National Laboratory
Upton, New York 11973

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TRAC Assessment and Model Development

1. TRAC-P1A Assessment

1.1 University of Houston Flooding Tests (U. S. Rohatgi)

It was stated in the last monthly highlight letter that the interfacial shear coefficient needed to predict the countercurrent flow situations of this test is four to five times that of the Wallis correlation used in the TRAC-P1A code. With this in mind, a literature search was undertaken to find a better correlation for the coefficient of interfacial shear; one such expression by Bharathan [1979] was found and is being investigated. The expression is as follows

$$f_i = 0.005 + A\,\delta^{*B}$$

where

$$\log_{10} A = -0.56 + 9.07/D^*$$

$$B = 1.63 + 4.74/D^*$$

$$\delta^* = \delta \Big/ \sqrt{\sigma/\left(g\left(\rho_f - \rho_g\right)\right)}$$

and

$$D^* = D \Big/ \sqrt{\sigma/\left(g\left(\rho_f - \rho_g\right)\right)}$$

Furthermore, f_i, δ, σ, ρ_f, and ρ_g are the interfacial shear coefficient, film thickness, surface tension, and liquid and vapor density, respectively.

1.2 Battelle Institute (Frankfurt-Main) Vessel Top Blowdown Test (L. Neymotin)

A topical report on the TRAC-P1A assessment using this test is being prepared. Also a paper based on this activity will be presented at the 1980 ANS/ENS International Conference.

1.3 FRIGG-Loop Force and Natural Circulation Tests (L. Neymotin)

The one-dimensional steady-state calculations for the FRIGG Test N313020 have been made using the drift-flux and the BNL-modified two-fluid model of TRAC-P1A. Comparisons between the predictions and the experimental data show that neither the drift-flux nor the two-fluid model of TRAC-P1A can adequately calculate the two-phase nonequilibrium flows. The causes are, in particular, due to some *ad hoc* restrictions placed during the course of the interfacial heat transfer calculations. Comments on this subject are contained in a BNL memo.

Currently a topical report on the TRAC-P1A assessment based on the results obtained from these tests is being prepared.

2. Assessment of Pump Model in TRAC-P1A (U. S. Rohatgi)

In the case of a small break LOCA or plant transients, the performance of the reactor coolant pumps can significantly affect the reactor core behavior. Therefore, any code which may be used to analyze these types of transients should have a good pump model; therefore, the TRAC-P1A pump model was examined. This model is the same as the one found in most of the codes such as RELAP4 and RELAP5. All of these models depend upon a degradation function which is assumed to be a function of void fraction only. However, it has been found from many experimental studies (e.g., CREARE/EPRI and INEL pump tests) that the degradation is also a strong function of flow coefficient and specific speed. Furthermore, the TRAC-P1A pump model does not include the shaft work in the energy equations and the motor torque contribution in the angular momentum equation. All of these effects should be further investigated for the development of a better pump model.

3. TRAC-PD2 Implementation (G. Slovik)

The TRAC-PD2 code has been implemented at the BNL machine, and two of the LASL sample problems have been run successfully. The calculations done at BNL match exactly those performed at LASL. However, for the same problem, the computing time at BNL is greater.

4. The International Standard Problem 8 Report (P. Saha, U. S. Rohatgi, L. Neymotin, and G. Slovik)

The final documentation and analysis of all the ISP8 (Semiscale S-06-3 test) calculations are in progress. Emphasis will be placed on uncovering the possible reasons for the discrepancies between the various calculations and the experimental data. Also, the effects of user input will be examined by comparing the calculations obtained by using the same code, e.g., RELAP4/MOD6.

Reference

Bharathan, D., "Air-Water Countercurrent Annular Flow," Sept. 1979, EPRI NP-1165

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