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SSC Project Highlights

for

September 1979

PROGRAM: SSC Code Development and Validation

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Code Development and Verification Group
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This is the monthly highlights letter for (1) the SSC Code Development and (2) SSC Code Validation Programs, Fast Reactor Safety Assessment, for the month of September 1979. These programs are covered under the budget activity number 60-10-20-01. Only major accomplishments are noted in this letter.

A. CODE DEVELOPMENT (J. G. Guppy)

I. SSC-L Code (J. G. Guppy)

1. Transient Hydraulics (I. K. Madni, E. G. Cazzoli)

Oscillations in predicted vessel-to-pump flow coastdown had been a continuing problem with LOEP calculations using SSC-L. The problem was traced to the orifice tank pressure loss coefficient (K) being too small. Appropriately converting the value in DEMO to MKS units yielded a much higher K. Subsequent calculations with the new value for K in SSC-L showed the pump-to-vessel flow coastdown to be oscillation free.

2. Steady-State Pump Speed (I. K. Madni, E. G. Cazzoli, L. G. Epel)

In running a steady-state (null) transient for FFTF at 75% power, the computed primary pump head during transient was seen to be significantly different from the initialized value. This caused the solution to drift. Also, the impeller speed at 75% power was higher than the speed at 100% power. The steady-state pump formulation was examined, and two problems were uncovered and corrected. First, the impeller can be in either of two curves (HAN, HVN) during steady-state operation, and the code occasionally selected the wrong curve to calculate pump speed. This problem was eliminated. Second, the polynomial representation for each curve has multiple roots. With steady-state operation significantly different from 100%, the polynomial converged to the root closest to 1.0, the initial guess. This problem was eliminated. Similar changes have also been made to the intermediate pump routine.

3. CRBRP Heterogeneous Core Data (M. Khatib-Rahbar)

The recently published Alternative Fuel Management Scheme (AFMS-M) for CRBRP is being used to prepare an input deck for study of in-vessel natural convection capability and comparison to the original Reference Fuel Management Scheme (RFMS).

4. Steam Generator Control Systems (M. Khatib-Rahbar, E.S. Srinivasan)

A general subroutine for feedwater, throttle, and steam dump valve controllers was written and coded. Work is underway to interface the steam generator controllers into the SSC-L code.

5. Steam Generator Modeling (W. L. Weaver III, G. J. Van Tuyle, R. J. Kennett, S. F. Carter)

The changes to the steam generator modules described in the last monthly progress report have been coded, debugged, and tested and are ready to be incorporated into the next version of SSC-L. These changes are reflected in additional data items which are required for the specification of the volumes contained in the steam generating system. A new benchmark data set for the CRBRP has been prepared to conform to the new data requirements.

The simulation models of the turbine, turbine bypass system, pressure relief system and the feedwater system have been coded and are now being debugged. These new models require data which will be input to the code as part of the transient data deck. An input processor for this new data is being prepared. These new models require control signals in order to function so that the simulation models must be interfaced with models of the controllers for the various new systems.

6. LMFBR Accident Progression Analysis (K. M. Jamali, M. Khatib-Rahbar)

A draft report describing the state of the art and the need for further studies of protected accidents in LMFBRs is nearing completion. The report describes a proposed methodology combining probabilistic and deterministic approaches for accident progression analysis in loop-type LMFBRs.

II. SSC-P Code (I. K. Madni)

1. Steady-State Transient (E. G. Cazzoli, I. K. Madni)

All calls to tank energy balance routines were removed and the problems created by advancing the code to the new SSC-L cycle were isolated and corrected. A steady-state transient run was successfully executed. SSC-P cycle 4 is now satisfactorily interfaced with SSC-L cycle 31.

Tank energy balance transient modules have been debugged up to the first integration step. Note that in SSC-P, tank energy balance equations are integrated together with pool hydraulics.

2. Input Data (I. K. Madni, E. G. Cazzoli)

The new input data file for in-vessel and core is being analyzed in order to produce, from the available information, an input deck for the PHENIX-type reactor that would be compatible with SSC-L cycle 31 input requirements.

III. SSC-W Code (J. G. Guppy)

1. Steam Generator Modeling (G. J. Van Tuyle)

Work on steam generator modeling for this reporting period focused on those areas where the SSC-L and SSC-W versions overlap. Please refer to the appropriate section of SSC-L in this report.

2. Transient Calculations (T. C. Nepsee)

Testing of the transient initialization segment of SSC-W is completed. The changes to modify the transient loop hydraulics calculations and to include the pressurizer have been interfaced.

B. CODE VALIDATION (J. G. Guppy)

1. FFTF Simulation (L. G. Epel and R. Pyare)

All four of the FFTF acceptance tests series 5A008 have been simulated using "cycle 31" of the FFTF version of SSC-L. The runs model Loss of Electric Power transients leading ultimately to natural convection cooling in the primary and secondary sodium loops and in the air side of the DHX. The four acceptance tests will have the following initial conditions:

5% power, 75% flow in primary and secondary,
35% power, 75% flow in primary and secondary,
75% power, 75% flow in primary and secondary,
100% power, 100% flow in primary and secondary.

Analysis of results of the runs and comparison with HEDL results uncovered a number of coding errors and also suggested areas for model improvement. These changes include representation of pump friction losses, characterization of pump head and flow, and modification of DHX fan behavior. Fine tuning of the input data is also continuing as available design information is further scrutinized.

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