Idaho National Engineering and Environmental Laboratory

RELAP5-3D Reported Problems and Requested Improvements

Rich Riemke, INEEL, Idaho Falls, Idaho, USA

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Outline

- *Introduction*
- *Reflood on Left Side, Convection on Opposite Side*
- *Henry-Fauske Choking using Nearly-Implicit Scheme*
- *Restrictive Noncondensable Specification*
- *Heat Transfer Data Output*
- *Inconvenient Kinetics Output Specification*
- *Restart Problem Time*
- *Input Data Limitation*
- *Summary*

Introduction

- *User problems usually fall into the categories of installation problem, input processing failure, code execution failure, restart/renodalization failure, unphysical result, and requested improvement.*
- *This presentation will discuss some of the more recent generic code problems/improvements for RELAP5-3D.*

INEEL Contact for User Problems

- *Constance Nielson*
- *Address:* *INEEL, P. O. Box 1625, Idaho Falls, Idaho, USA, 83415-3890*
- *Telephone:* *(208)-526-2589*
- *Fax:* *(208)-526-0528*
- *Email:* *ece@inel.gov*
- *Web:* *http://www.inel.gov/relap5*

Reflood on Left Side, Convection on Opposite Side

- *Reflood capability was implemented in RELAP5/MOD1.5 (fine-mesh rezoning, two-dimensional heat conduction, reflood heat transfer).*
- *Originally functioned on either side of heat slab, and with a convective or symmetry boundary condition on the opposite side.*
- *Left side reflood and convective boundary condition on the opposite side became disabled following adaptation of the code to UNIX workstations.*

Reflood on Left Side, Convection on Opposite Side (continued)

- *After fixing divide by zero in subroutine IHTCMP and replacing incorrect scratch variable in subroutine HT2TDP, test problem (modified Flecht-Seaset using rectangular geometry) ran with reflood on the left and produced identical answers to reflood on the right.*
- *After fixing an incomplete equation in subroutine HTRC2, test problem ran with convective boundary condition on opposite side.*
- *Test problem runs in both explicitly and implicitly coupled modes.*

Henry-Fauske Choking using Nearly-Implicit Scheme

- *The Henry-Fauske choking model was operational in the semi-implicit scheme but not in the nearly-implicit scheme.*
- *Subroutine JCHOKE was modified to store the proper terms in the variables COEFV, SOURCV, SUMDPK, SUMDPL, DIFDPK, and DIFDPL.*
- *Subroutine RTSC was modified to remove the input failure if the Henry-Fauske model was used with the nearly-implicit scheme.*
- *Modifications were tested using the Edwards pipe, a critical flow thought problem, and the Marviken CFT21 test problem.*

Restrictive Noncondensable Specification

- *Selecting noncondensable input consists of specifying type (Card 110) and mass fraction (Card 115) of species and by selecting options 4, 5, 6, or 8 on the volume initial condition cards. The mass fractions on Card 115 are the default values.*
- *Previously, the time dependent volume was the only hydrodynamic volume that allowed optional input of the noncondensable mass fractions that is different from Card 115.*
- *Now, for all hydrodynamic volumes except accumulator volumes (nitrogen only), the noncondensable species mass fractions can also be entered in the hydrodynamic data.*

Restrictive Noncondensable Specification (continued)

- *Previously, it was not possible to minor edit/plot the volume and junction noncondensable mass fractions for the 5 species identified on Card 110.*
- *Now, the minor edit/plot variables for the volume noncondensable mass fractions are QUALAN1, QUALAN2, QUALAN3, QUALAN4, and QUALAN5.*
- *Now, the minor edit/plot variables for the junction noncondensable mass fractions are QUALNJ1, QUALNJ2, QUALNJ3, QUALNJ4, and QUALNJ5.*

Heat Transfer Data Output

- *Previously, all the terms that make up the net heat transfer rate out of a heat structure (convection, radiation/conduction enclosure heat flux, generation) were only available from major edits.*
- *The minor edits/plots only showed the convection term.*
- *Now, the radiation/conduction enclosure heat flux and generation (internal heat source) terms are both available in the minor edits/plots.*
- *The radiation/conduction enclosure heat flux minor edit/plot variable is QRAD. The generation (internal heat source) minor edit/plot variable is HTPOWG.*

Inconvenient Kinetics Output Specification

- *Previously, for nodal kinetics, the user must enter a significant number of 2080XXXX cards for many groups and nodes.*
- *Now, for nodal kinetics, the user can enter -1 for the parameter on the 2080XXXX cards for some of the alphanumeric variable codes.*
- *This will cause the data for all groups and nodes to be written to the restart-plot file.*
- *The alphanumeric variable codes that allow -1 are RKOBK, RKOD, RKOPHI, RKONDIFP, RKONDFPD, RKONDRFP, RKONRFP, RKOSIGA, RKOSIGF, and RKOSIGSj.*

Restart Problem Time

- *Finding and entering the correct restart number on Word 1 of the 103 Card can be awkward.*
- *Now, there is an option to enter the restart time on Word 1 of the 103 Card.*
- *This word must be the time that can be calculated from Word 3 and Word 7 on Cards 201-299 and whose associated restart information is stored in the restart-plot file.*
- *The time for each restart is also printed in one of the restart print messages.*
- *If -1.0 is specified for this word, the last restart dump from the restart-plot file is used.*

Input Data Limitation

- *With the addition of the 3D features (nodal kinetics and multi-dimensional hydrodynamics) in RELAP5-3D, input processing failures have sometimes occurred because there were too many words in the input deck.*
- *The code has been changed to increase the limit.*
- *Now, the total number of input words on all cards in the input deck was increased from 524,287 to 2,097,151.*
- *The largest card number allowed is still 536870911.*
- *The total number of words on a card and its continuation cards may still not exceed 2,047.*

Summary

- *Reflood model is now operational on the left side of heat slabs and convection is now operational on the opposite side.*
- *Henry-Fauske choking model now works with the nearly-implicit scheme.*
- *User-friendly changes have been implemented:*

-Noncondensable input - Restart

-Heat transfer output - Large input decks

-Kinetics output