

# ***User Problems and Version 4.3.3 Features***

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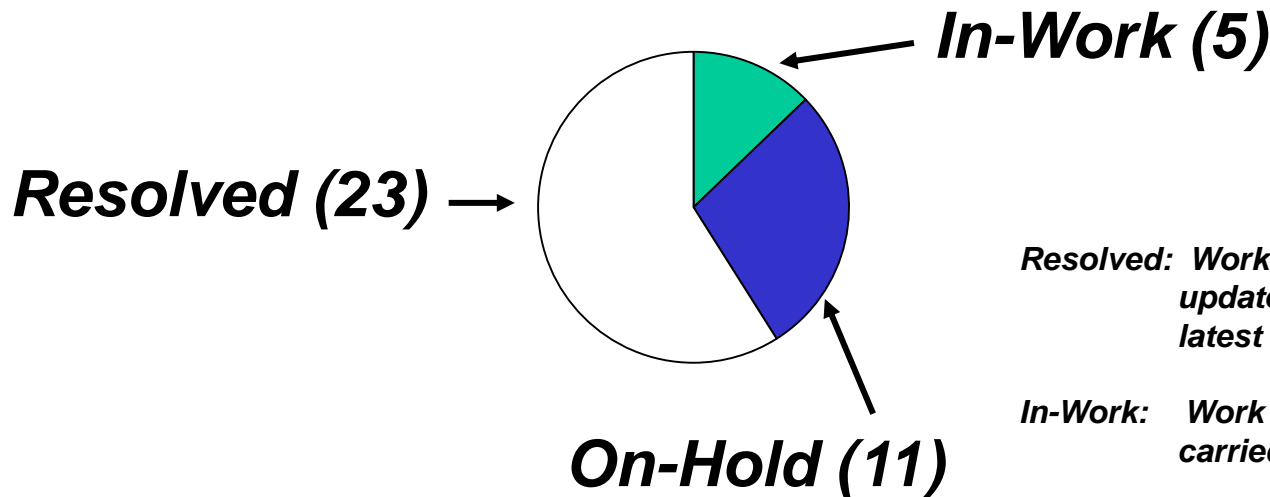
# ***User Problem History***

***September 2014 – Mid July 2015***

***39 reported***

***16 additional problems submitted by end of July***

***4 additional older problems were resolved***



***Resolved:*** Work has been completed on user problem, update has been submitted, and update is in latest developmental version

***In-Work:*** Work on user problem is currently being carried out

***On-Hold:*** Work has not begun on user problem, or work was begun on user problem but work is now stopped on user problem

# *Selected User Problems*

- ***UP# 14038***
- ***UP# 15002***
- ***UP# 15005***
- ***UP# 15009***
- ***UP# 15014***
- ***UP# 15018***

## **Problem 14038**

- ***A diffusion model was added to the code but it is not available because it uses some scdap variables. The diffusion model needs to be modified so that it is independent of scdap and can be run with the default version of RELAP5.***
- ***Root Cause: Inaccessible arrays.***
- ***Resolution: Partially resolved. The diffusion model was made available by adding a relap module to store the diffusion model specific variables. This module was named diffmod.F. The diffusion model is available post version 4.3.1 with the 117 card. The input manual was modified to address the 117 card. The theory manual still needs to be modified.***

## ***Problem 15002***

- ***Symptom: The pitch problem was reported to have failed on backup of an intermediate step. The issue was not observed previously because the problem self-corrects and the verification file is only different for a few intermediate steps.***
- ***Root Cause: Variable 'athrot' needed to be backed up.***
- ***Status: Resolved. Variable 'athrot' is not backed up for inertial valves (the pitch problem has an inertial valve). This variable is now backed up and the problem now runs without any back up issues.***

# Problem 15005

- **Symptom:** *It was reported that with the latest intermediate version of the code some of the DA problems that use the restart capability failed. The issue was tracked to a general table that was deleted on restart. When the table is not deleted the problem runs. The table delete functionality is not working. An additional failure was found when a material table was deleted on restart.*
- **Root Cause:** *Bad nullification and incomplete coding.*
- **Status:** *Resolved. A recently added pointer nullification caused the general table delete error. This nullification was removed. The material data delete error was the result of some missing coding to exit a loop properly. The coding was corrected and tested. A test problem was generated to test the delete functionality of heat structures, general tables, material properties, and control variables. This problem was added to the test set so the delete functionality is exercised more frequently.*

## Problem 15009

- **Symptom:** *In running a series of calculations, the code hangs up in input processing on a restart. A steady state calculation is run, then a transient is run from the steady state. A second restart is then attempted, in which several components are renodalized. This second restart hangs up. The problem was encountered on 4.1.3, but also occurs in internal version 4.3.1.*
- **Root Cause:** *The deletion of a heat structure causes an incorrect count in the number of heat structures by the radiation enclosure model.*
- **Status:** *Resolved. Found that the error was caused by an issue in subroutine rradht.F (relates to radiation enclosure model). The number of heat structures changed on restart but the radiation enclosure model was counting the number of heat structures incorrectly. Modified the coding so that the number of heat structures would be calculated correctly, and now the problem runs successfully.*

## **Problem 15014**

- ***Symptom: The code currently allows only one conductance to be entered for a conduction enclosure. The user must select some expected average temperature to use. Design basis transients in the gas reactors, where the response is driven by conduction and radiation, have very large changes in structure temperatures. Allowing the conductance to change during the transient would more accurately model the response of these reactors.***
- ***Root Cause: New capability requested.***
- ***Status: Resolved. The ability to specify and use a temperature-dependent conductance table was added. The manuals were also updated to indicate how this capability can be accessed and used.***



# Problem 15018

- **Symptom:** *The code currently uses the boundary volume length as the structure length whenever axial conduction (including reflood) is specified. For problems in which it is more appropriate or more convenient to have multiple axial structures connected to the same control volume, the reflood model (or axial conduction) is adversely affected. The capability to specify the length of the heat structures through input is desired.*
- **Root Cause:** *New capability requested.*
- **Status:** *Resolved. This capability was added by using the newly added 1CCCG500 & 1CCCG600 Cards. These cards allow the user to use the 7 word format for the 1CCCG501-599 and 1CCCG601-699 cards, where the heat structure length can be specified with Word 6.*

## ***Version 4.3.3 Features***

- **Molecular diffusion model is made available.**
  - A molecular diffusion model was implemented in the code a few years ago, but it was not fully converted to Fortran 90. This option is controlled with Card 117.  
See Vol. 2, Appendix A, Section 2.
- **Capability to specify heat structure lengths on input for reflood/2D conduction.**
  - This capability was added using the new 1CCCG500 and 1CCCG600 cards. These cards allow the user to use a 7 word format for the 1CCCG501-599 and 1CCCG601-699 cards, where the heat structure length can be specified with Word 6.  
See Vol. 2, Appendix A, Section 8.

## ***Version 4.3.3 Features, cont.***

- **Capability to use temperature-dependent conductances for conduction enclosures.**
  - The user can now specify a temperature-dependent conductance table for conduction enclosures. The table must be of type htc-temp for this capability.  
See Vol. 2, Appendix A, Sections 9 and 11.
- **Property file generator for use with other codes.**
- **Ph-Interpolator Auxiliary Program**
  - This program calculates state properties from pressure and specific enthalpy.
  - It can run as a subroutine that can be called from RELAP5-3D.
  - In the polate directory at same level as relap & run directories.
- **Card 1 Option 78 was made accessible.**

## ***Version 4.3.3 Features, cont.***

### **Nodal Kinetics Updates**

- **Energy-dependent albedos can be specified for external radial and axial boundaries.**
- **Composition-dependent neutron velocities can be specified to account for variations across compositions.**
- **Kinetics time step advancement can be controlled independent of the thermal-hydraulics.**
- **OpenMP parallel processing was enabled for nodal kinetics.**

## ***Version 4.3.3 Features, cont.***

- **Fixes for machine-dependent plot files.**
- **PVMEXEC has been rebranded as R5EXEC.**
- **Initialization and nullification.**
  - Additional arrays are now initialized and pointers are nullified upon creation.
- **The number of verification testing cases increased and differences were resolved.**
  - Some verification test cases were added to test additional features. Some problems that did not previously pass verification testing for restart or backup have been corrected.
  - Many of the additional verification cases test the PVM functionality.

## ***Version 4.3.3 Features, cont.***

- **Multi-deck feature improved**
  - The ability to include several input decks in a single input file.
  - Fixed the ability to restart the first deck with a second.
- **PYGMALION Auxiliary Program improved**
  - Many user issues were resolved.
- **Fixes to h2on file and interpolators.**
  - User problems found and corrected in the h2on tpf file and in the interpolators.
- **User problem corrections.**
  - Various user problems have been found and fixed in this version.

***Questions?***