Chemical Engineering 512

Nuclear Reactor Transient Modeling

Lecture 16

Debugging I

Spiritual Thought

"Each of us needs to plead for personal revelation and then act on it. And once we have received that revelation, then we will know what to do. The revelation we receive will always be framed and supported by scriptures, by the words of living prophets, and by the direction we receive from our local leaders. But within that context, there is so much variation that God will inspire us as to how we should live our lives."

Elder Dale G. Renlund

Question 2 – 1 Issue

```
*****************************************************************************************
*                                                                                       *
*                          Miscellaneous Control Cards                                  *
*                                                                                       *
*****************************************************************************************
*
*       Type      Option
100     new       transnt
*       Inp-Chk/Run
101     run
*       Input-Units      Output-Units
102     english          english
*       CPUrem1    CPUrem2    CPUalloted
105     5.0        6.0        5000.0
*       Ref-Vol         Elev     Fluid    Name
120     500010000       0.0      h2o      Primary
*
```

- Answer: English is not a valid unit format

Question 3 – 1 Issue

```
*******************************************************************************
*                                                                             *
*                           Time Step Control Cards                           *
*                                                                             *
*******************************************************************************
*
*      TimeEnd  MinStep  MaxStep  Ssdtt  MinorEditFreq  MajEditFreq  ResrtFreq
201    500      1.0e-6   1.0      00000  1              500          500
```

- Answer: TimeEnd must be in floating point format

Question 4 – 1 Issue

```
**********************************
*          Pipe - 520            *
**********************************
*          Name      Type
5200000    bigcor    pipe
*          NumOfVolumes
5200001    6
*          Area                        VolNum
5200101    1.4                         7
*          Length                      VolNum
5200301    0.6                         7
*          InclAng                     VolNum
5200601    90.0                        7
*          Roughness  HydraulicDiam    VolNum
5200801    0.00005    0.0132           7
*          Af         Ar               JunNum
5200901    1.0        1.0              6
*          tlpvbfe                     VolNum
5201001    0000100                     7
*          Jefvcahs                    JunNum
5201101    00000000                    6
*          Ebt   Initial-Conditions          VolNum
5201201    003   15.0e6  550.  0.  0.  0.    7
*          Vel/Mfr
5201300    0
*          Liquid  Vapor  Interface  JunNum
5201301    3.0     3.0    0.0        6
*
```

- Answer: Number of volumes and volume numbers do not match up

Question 5 - 3 Issues

- Answer: 1401301 should be in floating point format, 120 ref volume does not exist, and 201 W1 should be in floating point format

```
= Debugging
*
*       Type      Option
100     new       transnt
*       Input-Units      Output-Units
102     si               si
*       CPUrem1    CPUrem2    CPUalloted
105     5.0        6.0        5000.0
*       Ref-Vol        Elev     Fluid    Name
120     500010000      0.0      h2o      Primary
*
*       TimeEnd  MinStep  MaxStep  Ssdtt  MinorEditFreq  MajEditFreq  Resrt
201     500      1.0e-6   1.0      00000  1              500          500
*
*********************************
*           Pipe - 140          *
*********************************
*           Name      Type
1400000     test      pipe
*           NumOfVolumes
1400001     10
*           Area                        VolNum
1400101     1.0                         10
*           Length                      VolNum
1400301     10.0                        10
*           Volume                      VolNum
1400401     0.0                         10
*           InclAng                     VolNum
1400601     0.0                         10
*           Roughness  HydraulicDiam    VolNum
1400801     0.0        0.0              10
*           tlpvbfe                     VolNum
1401001     0000000                     10
*           Jefvcahs                    JunNum
1401101     00000000                    9
*           Ebt   Initial-Conditions      VolNum
1401201     003   2000.  500.  0.  0.  0.  10
*           Vel/Mfr
1401300     1
*           Liquid  Vapor  Interface  JunNum
1401301     9000    0.0    0.0        9
.
```

Question 6 – 1 Issue

- Answer: temperature is too low

```
= Debugging
*
*       Type      Option
100     new       transnt
*       Input-Units      Output-Units
102     si               si
*       CPUrem1    CPUrem2    CPUalloted
105     5.0        6.0        5000.0
*       Ref-Vol        Elev     Fluid    Name
120     140010000      0.0      h2o      Primary
*
*       TimeEnd  MinStep  MaxStep  Ssdtt  MinorEditFreq  MajEditFreq  Resrt
201     500.     1.0e-6   1.0      00000  1              500          500
*
**********************************
*           Pipe - 140           *
**********************************
*          Name      Type
1400000    test     pipe
*          NumOfVolumes
1400001    10
*          Area                        VolNum
1400101    1.0                         10
*          Length                      VolNum
1400301    10.0                        10
*          Volume                      VolNum
1400401    0.0                         10
*          InclAng                     VolNum
1400601    0.0                         10
*          Roughness  HydraulicDiam    VolNum
1400801    0.0        0.0              10
*          tlpvbfe                     VolNum
1401001    0000000                     10
*          Jefvcahs                    JunNum
1401101    00000000                    9
*          Ebt    Initial-Conditions          VolNum
1401201    003    101325.  270.  0.  0.  0.   10
*          Vel/Mfr
1401300    1
*          Liquid  Vapor  Interface  JunNum
1401301    9000.     0.0      0.0        9
.
```

Question 7 – 1 Issue

This is modeling 2 square pipes each with side length of 1m

```
**********************************
*           Pipe - 140           *
**********************************
*          Name      Type
1400000    test     pipe
*          NumOfVolumes
1400001    10
*          Area                          VolNum
1400101    1.0                           10
*          Length                        VolNum
1400301    10.0                          10
*          Volume                        VolNum
1400401    0.0                           10
*          InclAng                       VolNum
1400601    0.0                           10
*          Roughness  HydraulicDiam      VolNum
1400801    0.0        1.0                10
*          tlpvbfe                       VolNum
1401001    0000000                       10
*          Jefvcahs                      JunNum
1401101    00000000                      9
*          Ebt   Initial-Conditions                VolNum
1401201    003   101325.  370.  0.  0.  0.  10
*          Vel/Mfr
1401300    1
*          Liquid  Vapor  Interface  JunNum
1401301    9000.    0.0    0.0        9
```

- Answer: Area should be 2.0

Question 8 – 1 Issue

```
**********************************
*           Pipe - 140           *
**********************************
*          Name      Type
1400000    test     pipe
*          NumOfVolumes
1400001    10
*          Area                          VolNum
1400101    1.0                           10
*          Length                        VolNum
1400301    10.0                          10
*          Volume                        VolNum
1400401    9.0                           10
*          InclAng                       VolNum
1400601    88.                           10
*          Roughness  HydraulicDiam      VolNum
1400801    0.00052    0.0                10
*          tlpvbfe                       VolNum
1401001    0000010                       10
*          Jefvcahs                      JunNum
1401101    00000000                      9
*          Ebt   Initial-Conditions                VolNum
1401201    003   101325.  370.  0.  0.  0.  10
*          Vel/Mfr
1401300    1
*          Liquid  Vapor  Interface  JunNum
1401301    9000.   8000.  0.0        9
```

- Answer: Area, Length, and Volume do not match

Question 9 – 2 Issues

- Answer: Inclination Angle is over 90 and type is incorrect

```
**********************************
*           Pipe - 140           *
**********************************
*          Name      Type
1400000    test      sngvol
*          NumOfVolumes
1400001    10
*          Area                        VolNum
1400101    1.0                         10
*          Length                      VolNum
1400301    10.0                        10
*          Volume                      VolNum
1400401    10.0                        10
*          InclAng                     VolNum
1400601    92.                         10
*          Roughness  HydraulicDiam    VolNum
1400801    0.00052    0.0              10
*          tlpvbfe                     VolNum
1401001    0000010                     10
*          Jefvcahs                    JunNum
1401101    00000000                    9
*          Ebt   Initial-Conditions              VolNum
1401201    003   101325.  370.  0.  0.  0.      10
*          Vel/Mfr
1401300    1
*          Liquid  Vapor  Interface  JunNum
1401301    9000.   8000.  0.0        9
```

Question 10-1 Issue

- Answer: h20 instead

```
= Debugging
*
*       Type      Option
100     new       transnt
*       Input-Units      Output-Units
102     si               si
*       CPUrem1    CPUrem2    CPUalloted
105     5.0        6.0        5000.0
*       Ref-Vol         Elev     Fluid    Name
120     140010000       0.0      h20      Primary
*
*       TimeEnd  MinStep  MaxStep  Ssdtt  MinorEditFreq  MajEditFreq  Resrt
201     500.     1.0e-6   1.0      00000  1              500          500
*
*********************************
*           Pipe - 140          *
*********************************
*           Name      Type
1400000     test      pipe
*           NumOfVolumes
1400001     10
*           Area                        VolNum
1400101     1.0                         10
*           Length                      VolNum
1400301     10.0                        10
*           Volume                      VolNum
1400401     10.0                        10
*           InclAng                     VolNum
1400601     90.                         10
*           Roughness  HydraulicDiam    VolNum
1400801     0.00052    0.0              10
*           tlpvbfe                     VolNum
1401001     0000010                     10
*           Jefvcahs                    JunNum
1401101     00000000                    9
*           Ebt   Initial-Conditions          VolNum
1401201     003   101325.  370.  0.  0.  0.   10
*           Vel/Mfr
1401300     1
*           Liquid  Vapor  Interface  JunNum
1401301     9000.   8000.  0.0        9
.
```

AND THE WINNER IS????

What To Take Away

- Sometimes we can be better debuggers than RELAP
- Small mistakes can cause big problems
- Practice makes better
- Debugging takes TIME
- You are all winners when it comes to RELAP debugging

HW Introduction

- HW8.i has 20 errors in the deck that are causing it not to run
- Find all 20 errors
- Explain each error
- Fix each error
- Run the deck
- Provide a plot of your results
- 1 point for each error found
- 5 points for plots

Assignment

- HW 8 due Thurs 10/30 at midnight
- Keep working on your final project