

## MIT Pressurizer Insurge Test ST4 – Exercise Problem

### OBJECTIVES

- Add the experimental pressure data as a control systems to use for evaluating the response.
- Familiarize yourself with the initial MIT pressurizer model results.



The intent of this set of exercises is to have you learn and apply a specific technique for analyzing and identifying problems in a model. Please wait to explore the model and fix issues until requested to do so in the exercises.

### COPY THE PRESSURE VS TIME DATA INTO THE MODEL

For convenience in evaluating how well our model represents the MIT ST4 pressurizer test data, it is useful to add the experimental data to the model via a control system.

The data pressurizer pressure vs. time data is saved in the file MIT-Przr-Data.xlsm. Do the following:

1. Open the MIT-Przr-Data.xlsm file. This excel file contains macros for calculating water properties. You may be asked whether macros should be enabled. Select the option to enable macros.
2. Select the Pressure Response tab. This has the pressure vs. time response for the ST4 test.
3. Open the MIT-PZR-ST4.med file.

The MIT pressurizer model is simple. It includes Fill 330 to model the liquid influx, Pipe 333 to model the test apparatus, and Heat Structure 10 to model the walls of the test apparatus.

## ADD THE EXPERIMENTAL PRESSURE RESPONSE AS A CONTROL VARIABLE


1. Add a **Function** type control block (Dropdown menu → Control Systems → Control Blocks) to the Default View and give it the control block number **-100**.
2. Add a Problem Time signal variable to the Default View, number it as **10**, and connect it to the Function block.
3. Open the Function Table in the Function block.
4. From the excel Pressure Response tab, copy the time cells.
5. Go back to SNAP and past the time values the Function Table dialog.
6. Copy the pressure values from excel into the second column on the Function Table dialog in SNAP.



If you copy the time and velocity into SNAP together, delete the empty row in the flow table and then right click and select 'paste'. If you try and select the row before pasting, SNAP only pastes in the first row of the data. If you paste the data without deleting the empty row, the empty row is kept at the bottom of the data, and will have to be deleted (it is easy to forget to do this). Thus deleting the row before pasting is recommended.



## RUN THE MODEL

To view results, it is useful to have an animation model. But before we create an animation model, lets generate some data to connect the animation model to. The Job Stream tab has the execute button that runs the simulation.

To run the model you need to lock the view. Click the lock symbol  on the **View Toolbar** and then click the Execute-MIT button. After executing the simulation, we are ready to add an animation model to connect to the simulation.

## CREATE AN ANIMATION MODEL FOR EXAMINING RESULTS

Animations models are a great tool for analyzing TRACE results. They provide a quick way to visualize results. Do the following steps to create an animation model for the ST4 test:

1. In SNAP select 'File→New' and create a new **Animation Model**.
2. The **Navigator Window** should now show the settings for the animation model. The MIT-PRZ-ST4.med file will be collapsed. Select the MIT-PRZ-ST4.med and go to the Default View tab in the **View Window**.
3. Select all the components in the MIT pressurizer model by clicking in the model **View Window** and pressing 'Ctrl-a', or by left clicking and dragging the mouse over the model items. Copy the model by pressing 'Ctrl-c'.
4. In the **Navigator Window**, select the animation model and paste (Ctrl-v) the copied components to the animation model **View Window**.
5. Now connect the animation model to the simulation by expanding Data Sources in the **Navigator Window** and selecting the **Master** data source.
6. In the **Properties Window**, expand the Source Run URL option.
7. Find the Execute-MIT job in the Data Source dialog and select **Base Job** item from the list and click OK.
8. Click the connect icon  in the **Toolbar** to connect to the data. If the animation successful connects, the icon changes to .




In order to add plot variables to the animation, it is necessary to connect to a data source. The next step is to add a plot of the pressure response, so in preparation for adding the plot variables, we connect to the data here.

## ADD A PRESSURE PLOT COMPARISON TO THE ANIMATION

To assess the model we would like to compare the simulated pressure to the experimental pressure. This can be done with a strip plot indicator. To add a strip plot indicator the animation:

1. In the **Toolbar**, select Drowdown menu → Indicators → Strip Plot and click on the animation view to add the strip plot. Move and size the plot control as desired.
2. Select the plot control and in the **Properties Window** expand the Plot Data item.
3. Add a second item to the list. For both items select Master as the Data Source.
4. Set the Data Channel for one of the items to **cb100** (the experimental pressure data) and set the other to **pn-333A20** (pressure at the top of the pressurizer pipe).
5. Choose a different Line Color for each of the plots do differential them.

## REVIEW THE RESULTS

Press the play icon  in the **Toolbar** to run the animation. The plot window should display the pressurizer results. The match between the TRACE simulation and the experimental data is not good. We will examine the model in more detail in the exercises that follow.