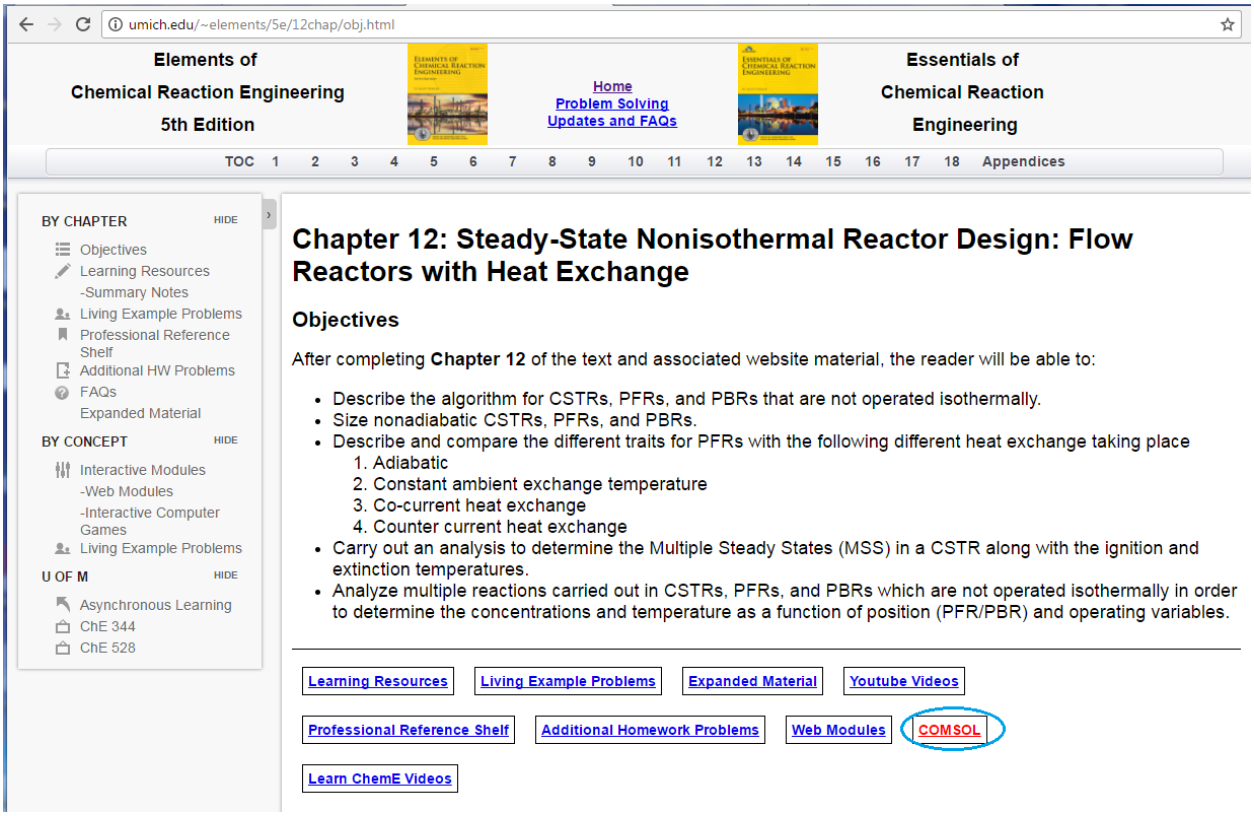
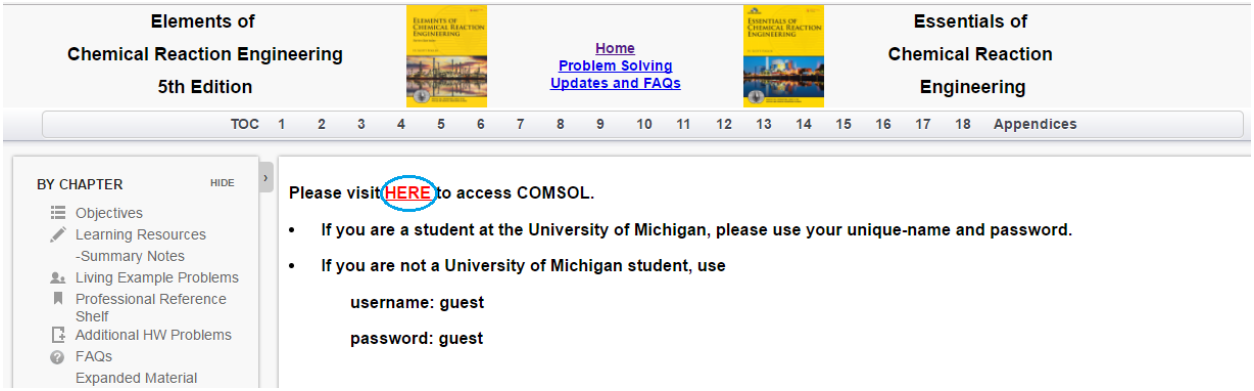
COMSOL LEP tutorial for Nonisothermal Tubular reactor with radial and axial variation (*Chapter 12, Example W12-8*)

Step 1: Open chapter 12 and click on COMSOL tab present in the bottom of the page



Step 2: The following page will open. Click on "How to access COMSOL"

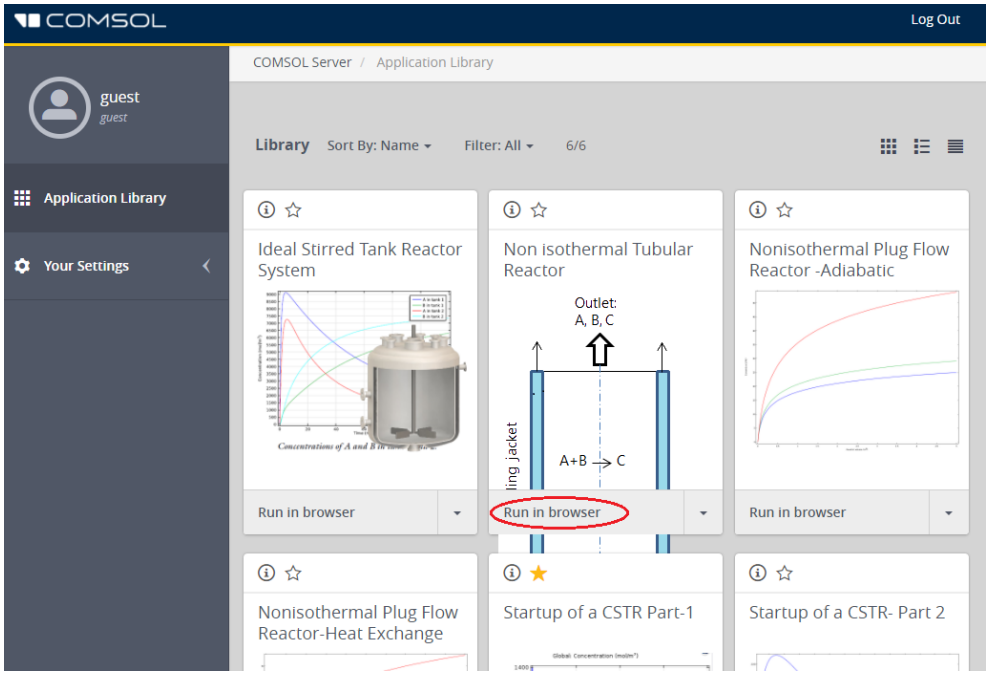
Step 3: The following page will open. Click "Here"



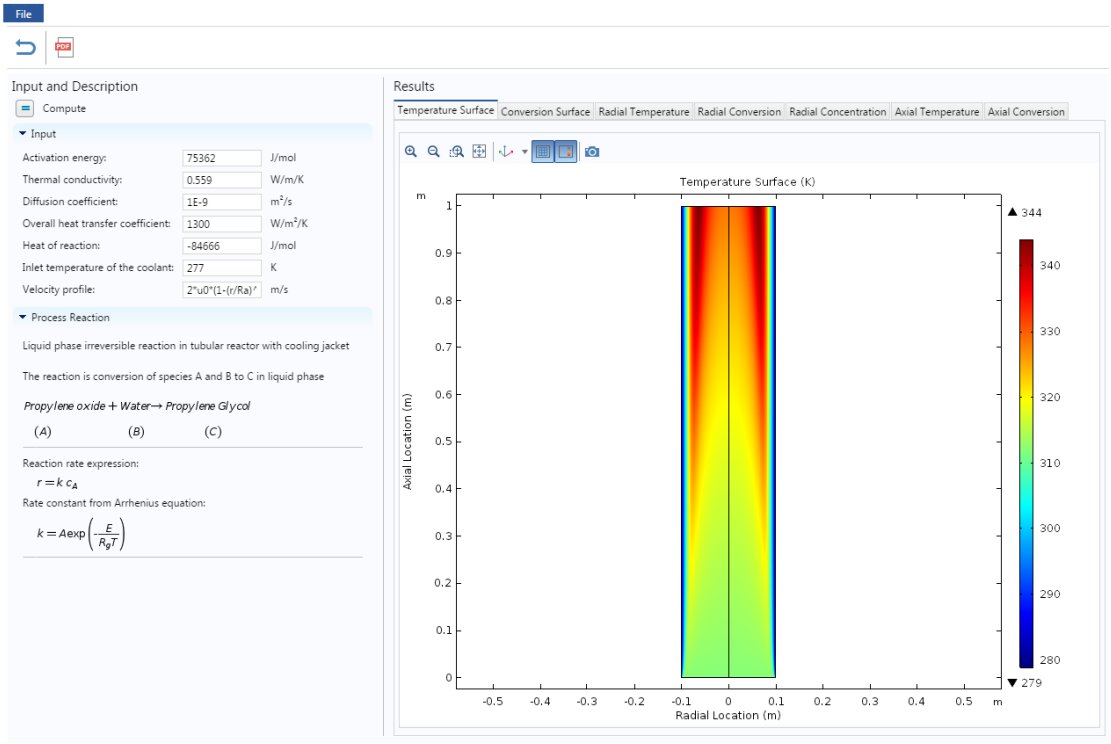
Step 4: This will take you to COMSOL Server. If you are a student at the University of Michigan, please use your Uniqname and password. If you are not a University of Michigan student, use

username: guest
password : guest

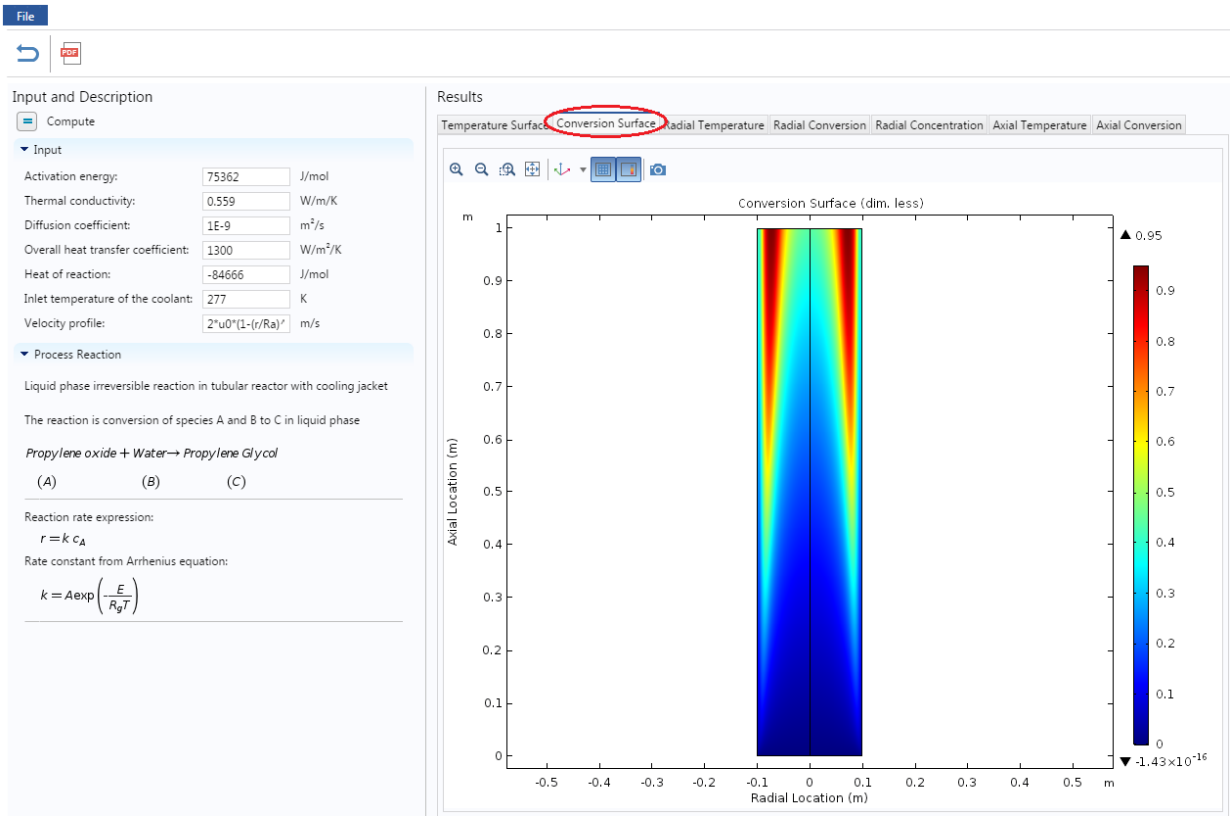
Step 5: This will open up COMSOL library where you see many COMSOL files to solve chemical reaction engineering problems. Find "***Non isothermal Tubular Reactor***". Click on "Run in browser" to start the application



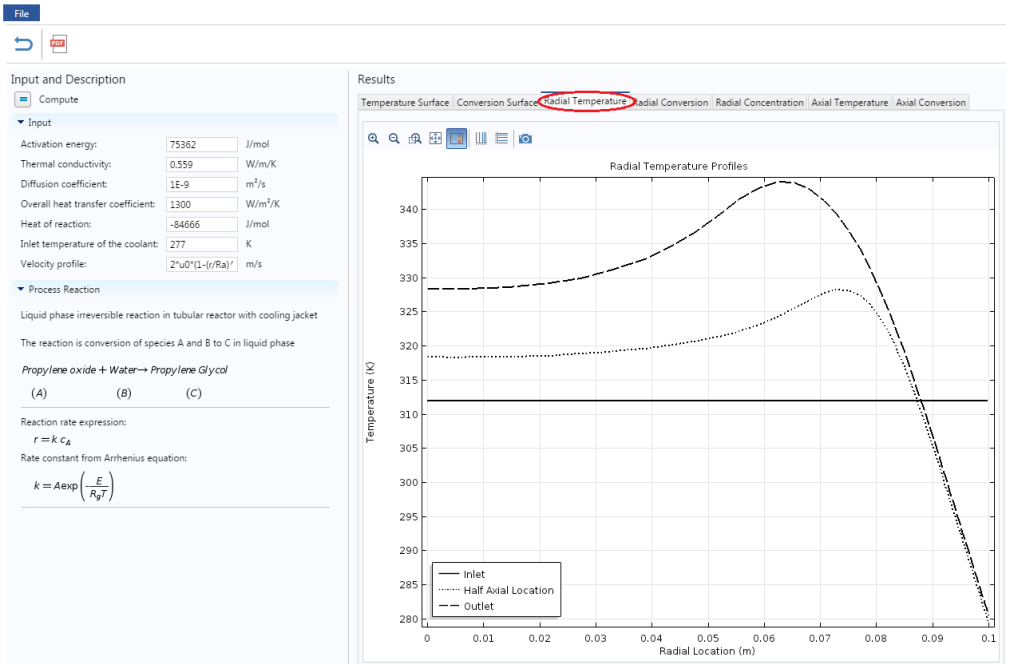
You will see that the following window opens which has input parameters, description, graphical features and a few buttons. You can see the Temperature distribution (Surface graph) on the right side of the page



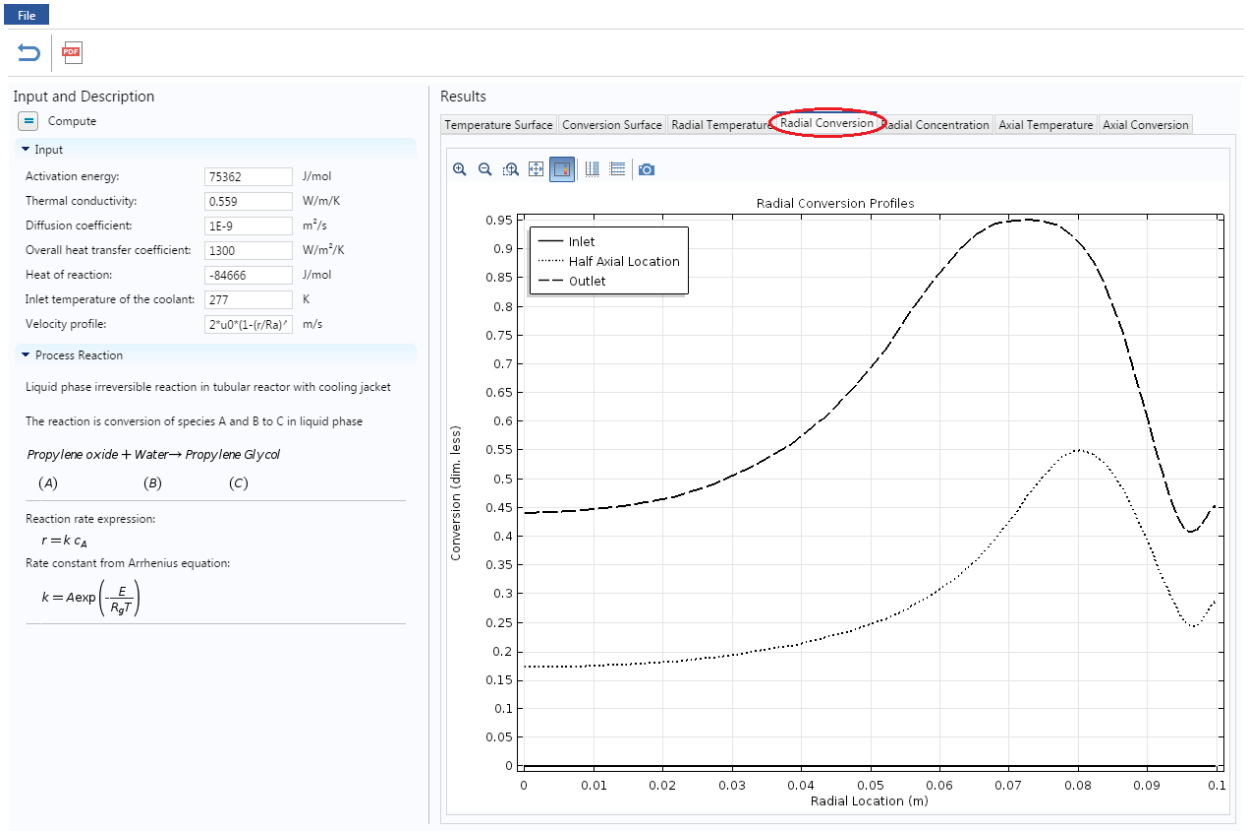
Step 6: Click on Conversion surface to view Conversion surface (2 D graph) plot



Click on Radial Temperature to view Radial Temperature profiles



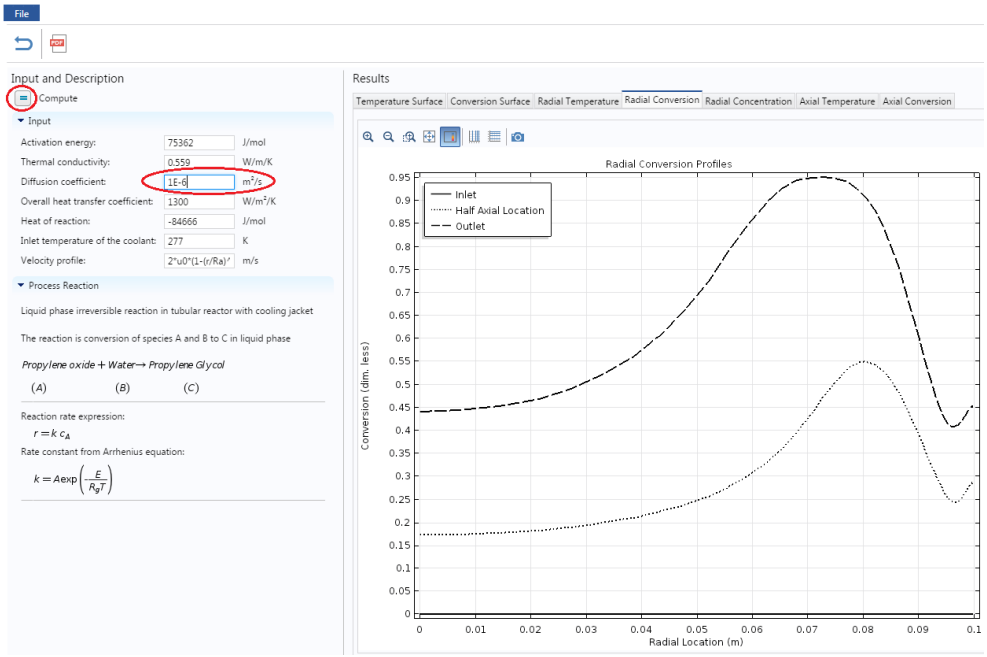
Click on Conversion profiles tab to view Conversion 1D graph



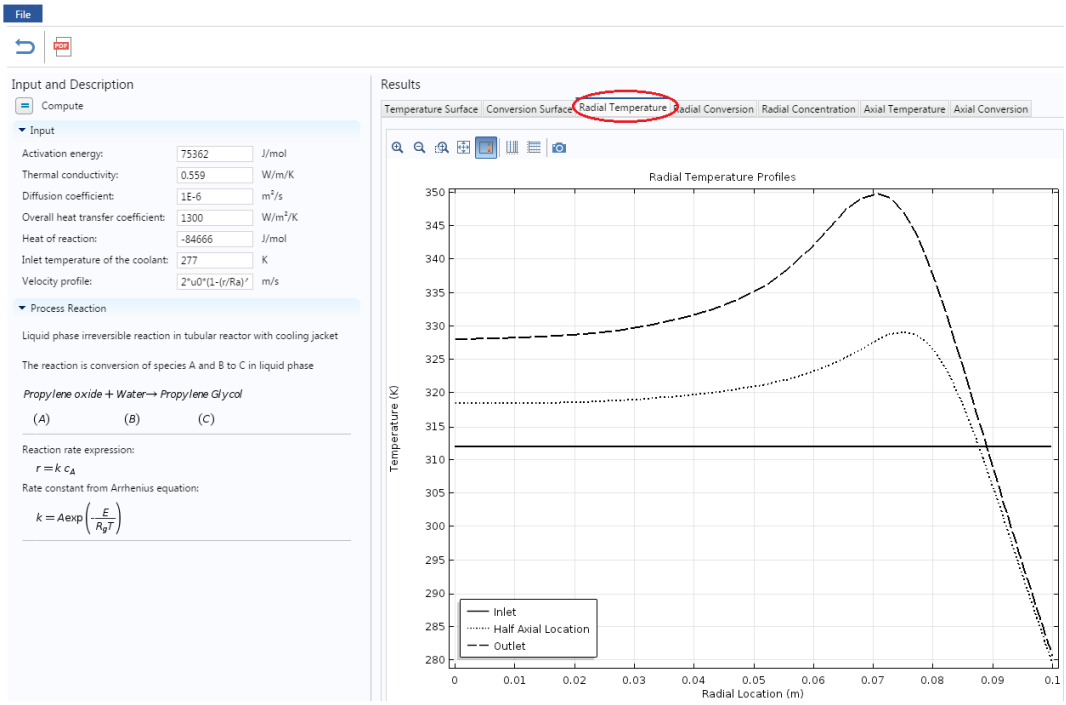
Similarly click on other tabs to view Radial Conversion, Axial Temperature and Axial Conversion profiles

Step 7: Under Input section on the left hand side, you can view and change any parameter values. Let's change a parameter and see the effect on the profile. Increase the Diffusivity value from its initial value of 1e-9 to 1e-6. After you are done, click on Compute button (=) present above the Input parameters

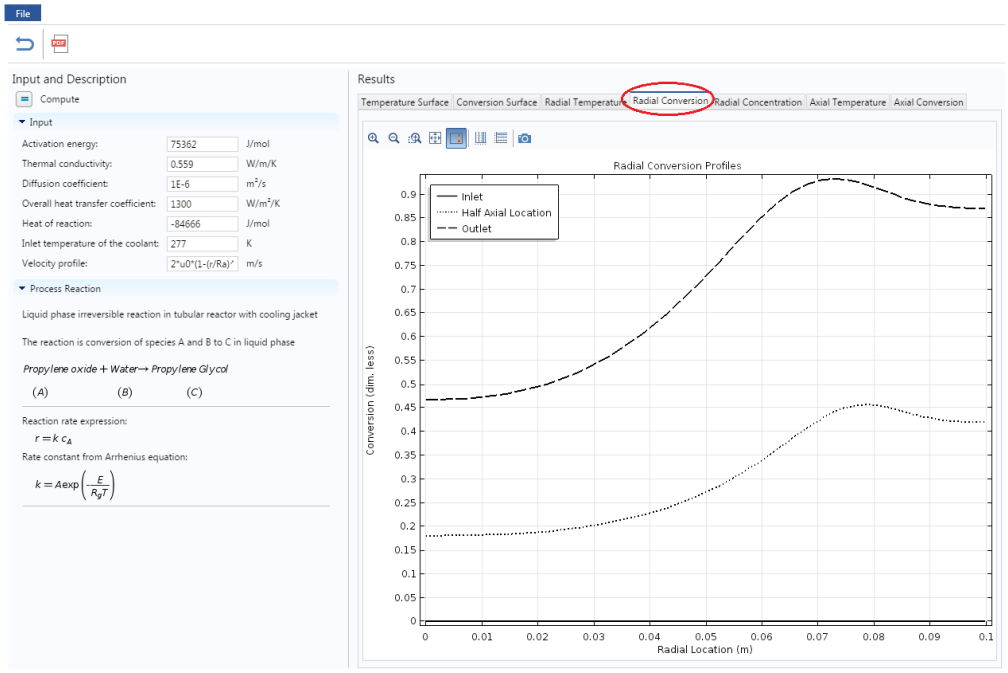
Caution: The y axis is dynamic and scale changes with respect to the values. Make sure to look at both scale and graph



Step 8: Now check the Temperature and Conversion profiles. The following graph will be obtained for Temperature profile. You can see that temperature has increased in the radial direction

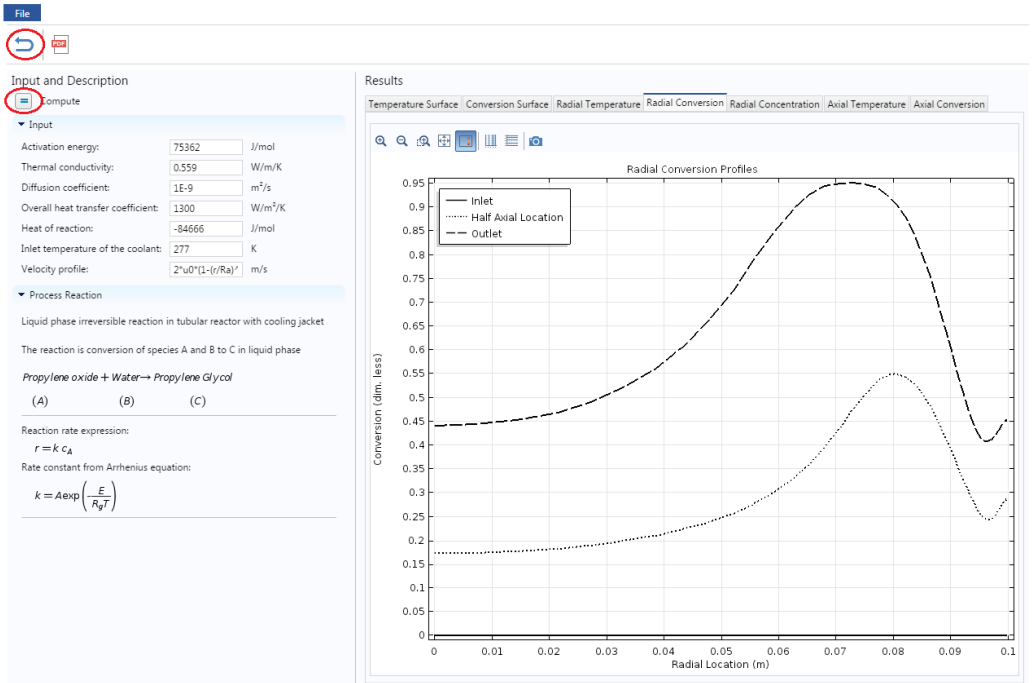


The following graph is obtained for conversion profile. With the increase in diffusivity, higher conversion will be achieved near to the wall of the reactor

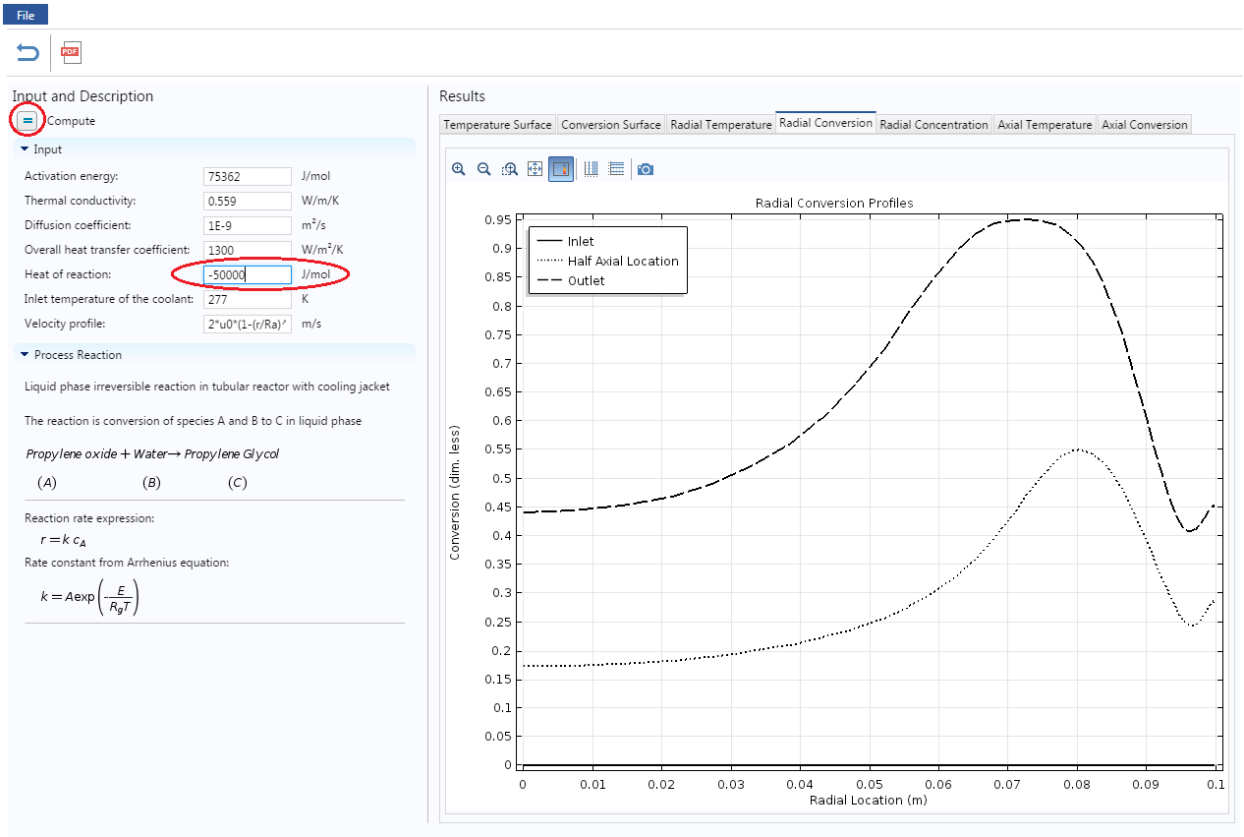


Step 9: Now if you want to re-set all the parameter values to its initial values, click on "reset to default button( ) . Click on this button to reset the value of diffusivity. To update the graph, you will have to click on Compute button each time you change a variable.

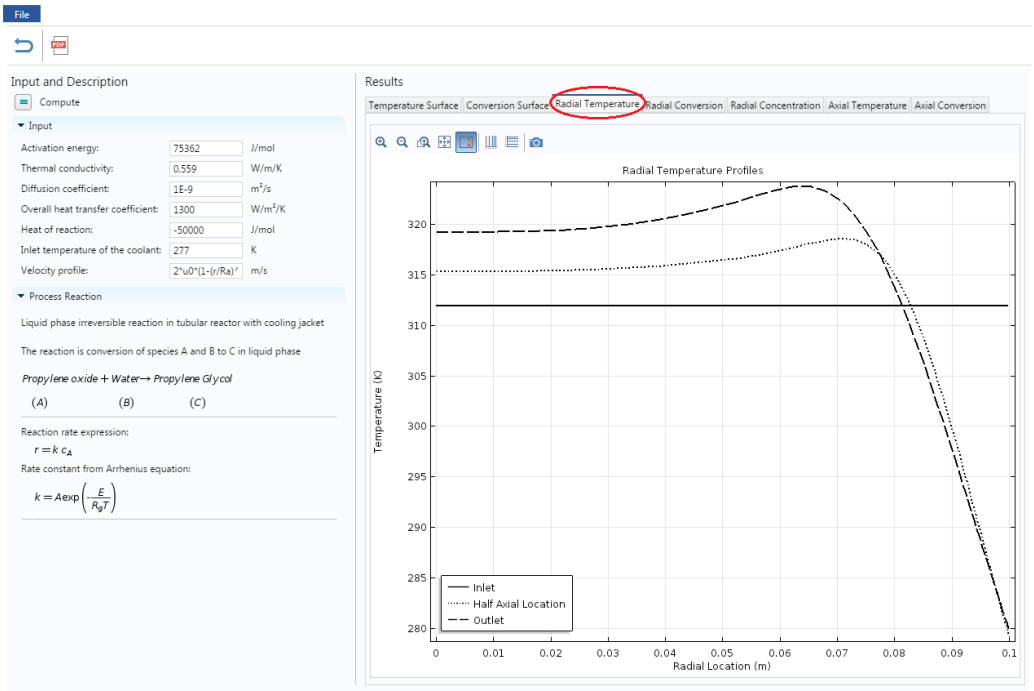
Please note that reset to default button doesn't reset the expression for Velocity profile. If you change the velocity profile, then you need to reset it manually

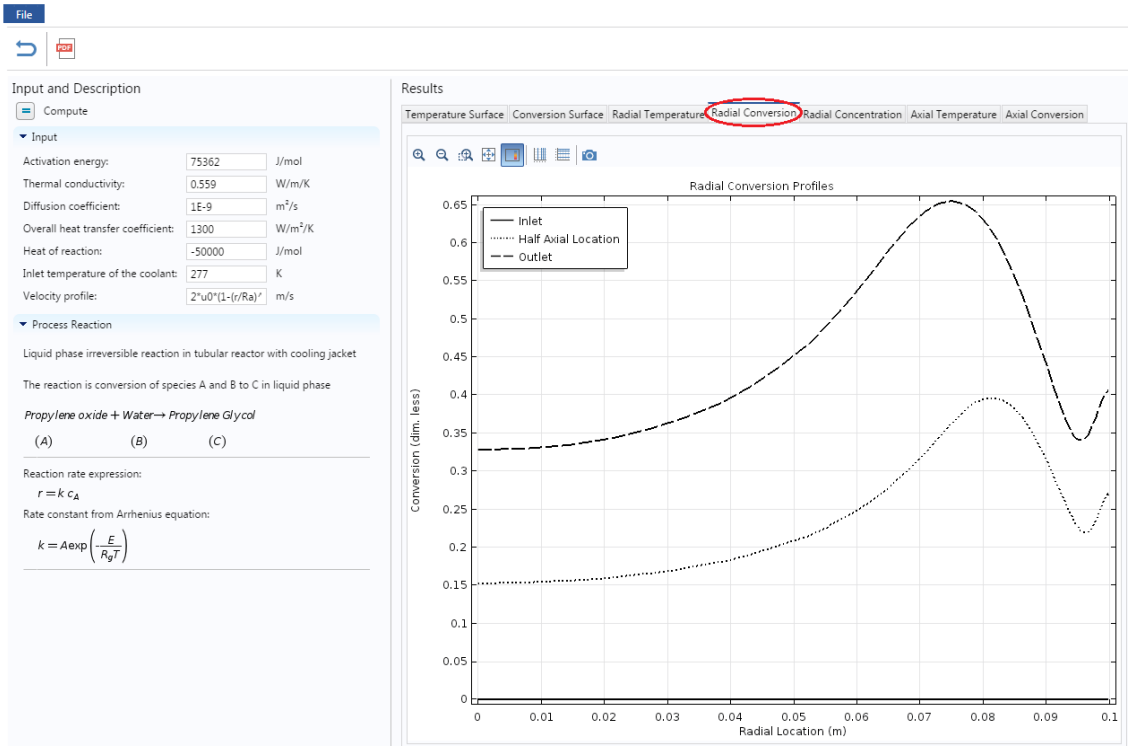


Step 10: Now let's change the heat of reaction and see its effect on profile. Enter the Heat of reaction to be -50000 and click compute to update the results

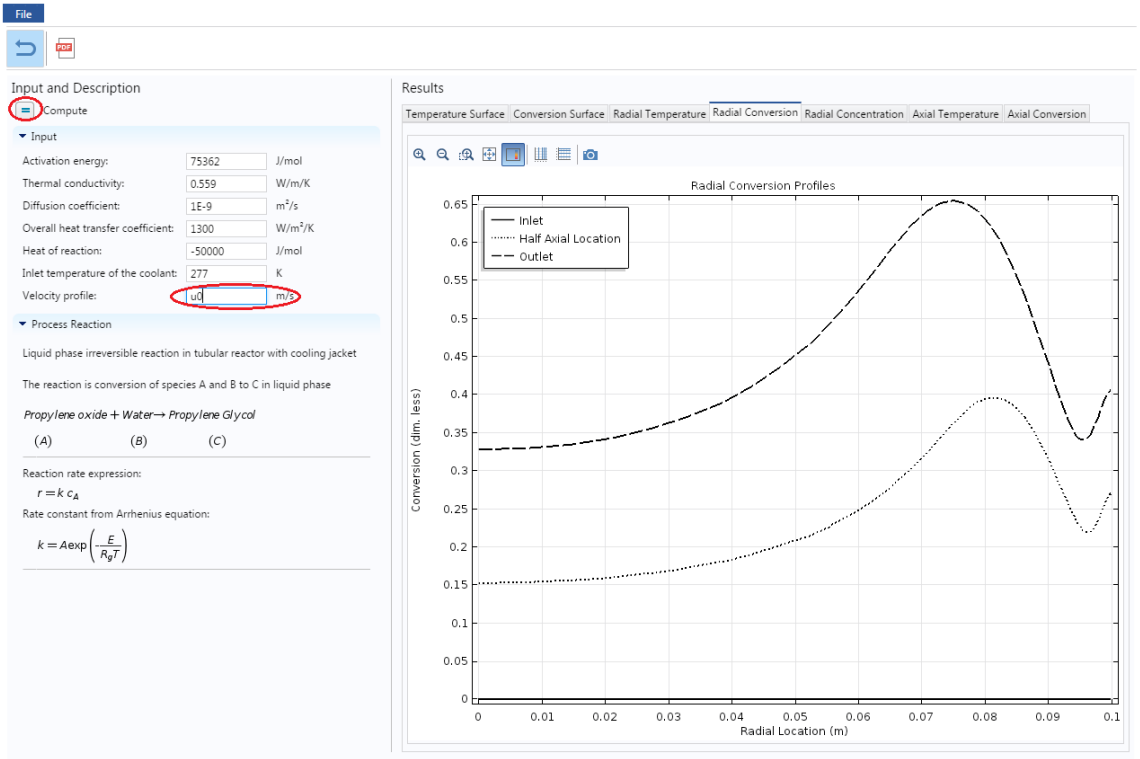


The following graph will be obtained for Temperature and Conversion profiles

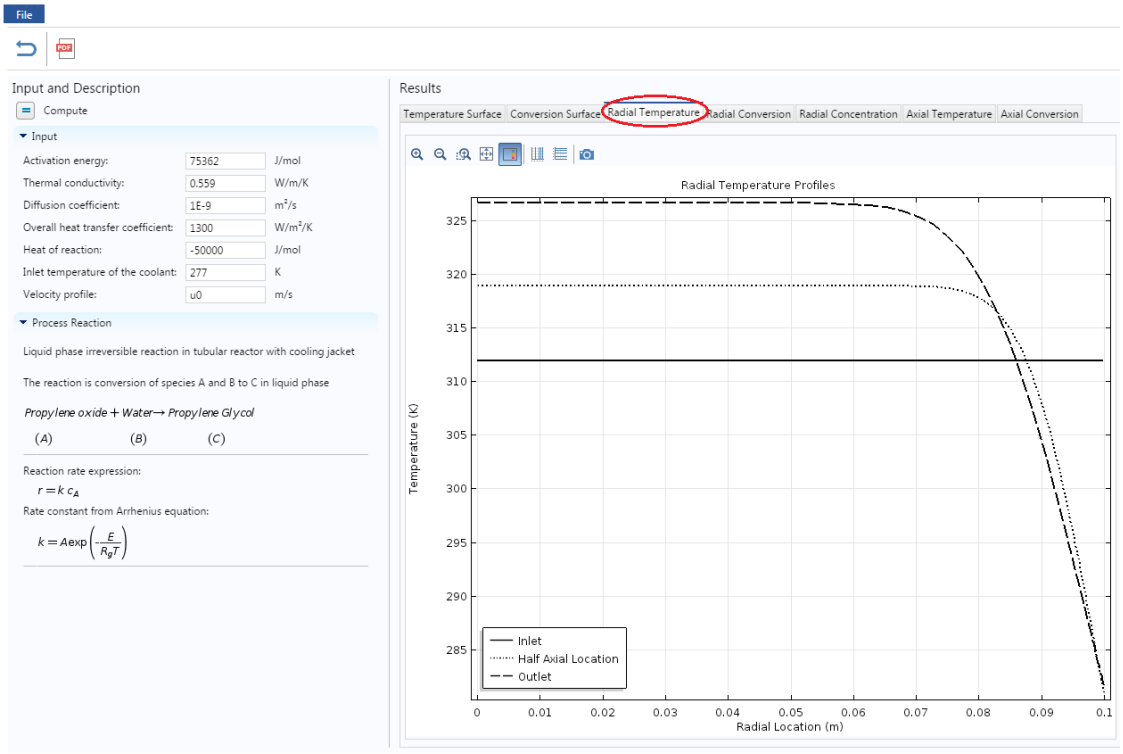




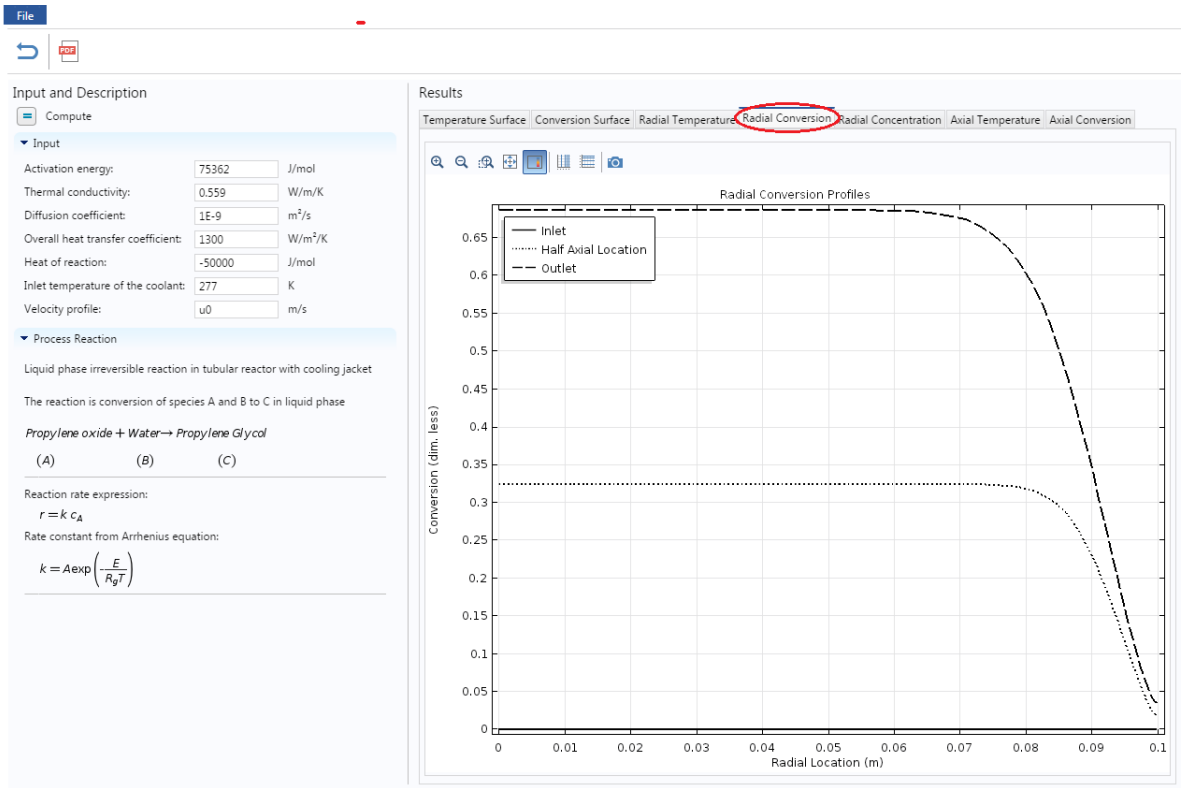
Step 11: To change the flow conditions from laminar to plug flow or turbulent flow, enter the corresponding equation for Velocity profile in the text field. For plug flow, enter the velocity profile as u0 Click compute



The following graph is obtained for radial temperature under plug flow conditions



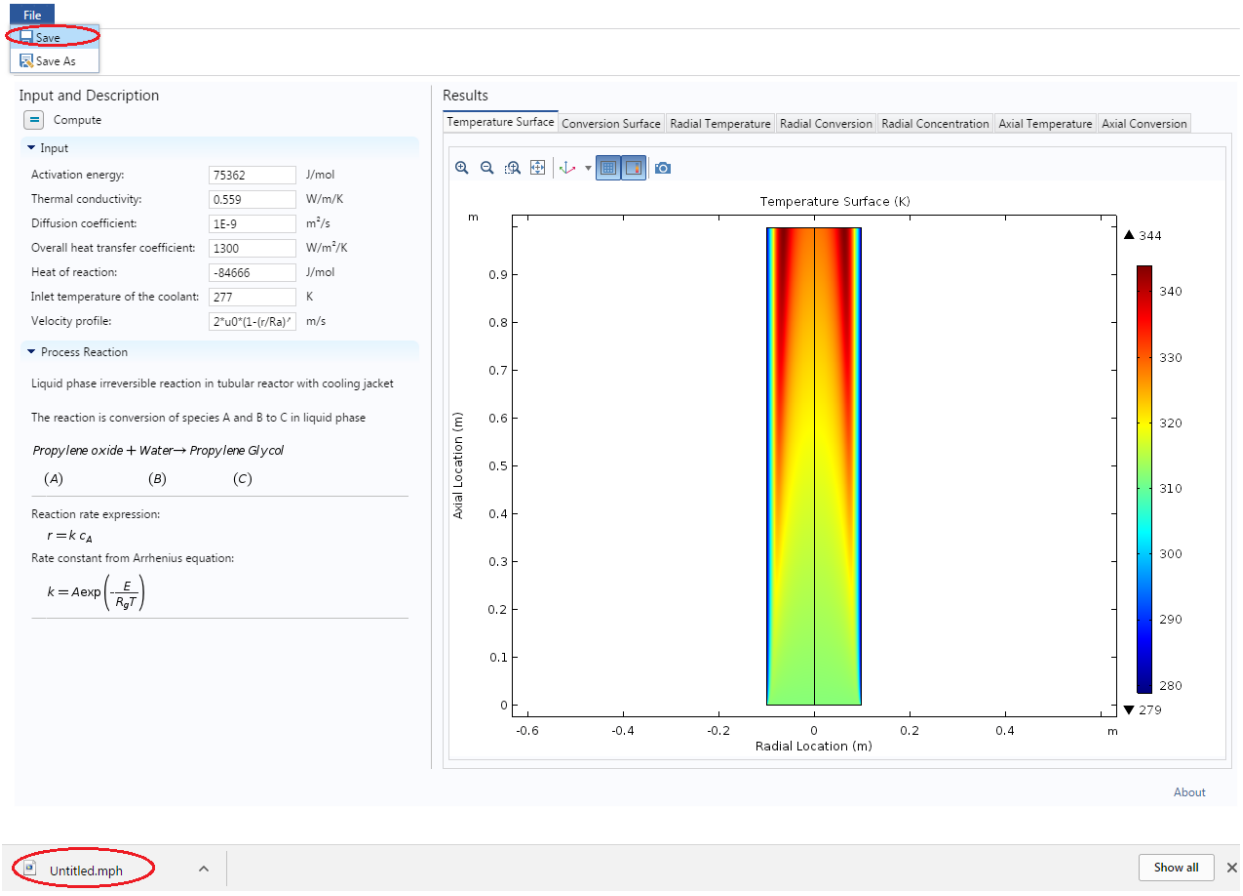
The following graph is obtained for radial conversion under plug flow conditions



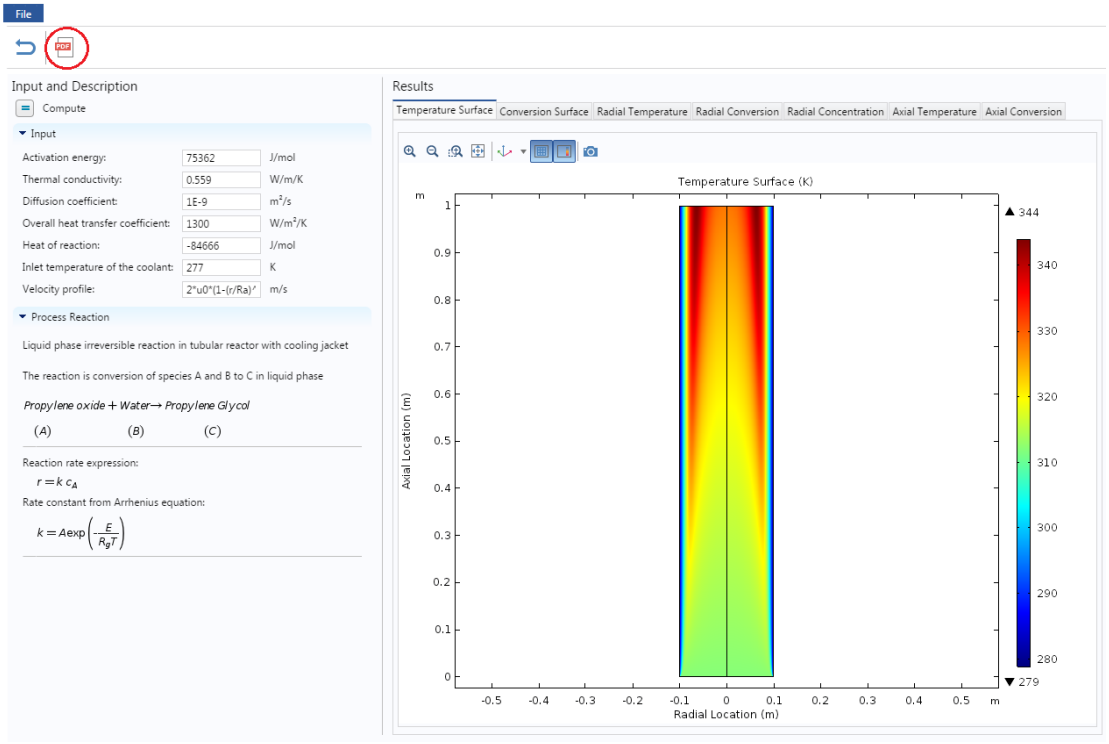
Step 12: Now, you can change any listed parameter value and check its effect on profiles. Make sure to click Compute button after you change a variable.

Step 13: If you have COMSOL installed on your computer, then you can also download the complete COMSOL file (with user interface)

a) Go to file on toolbar and click on Save button. This will download the file at the bottom of the browser (if you are using Chrome)
b) Click on the downloaded file to open the application



Step 14: You can also open a pdf documentation which details the reactor model by clicking on PDF button



This will open up a new tab with PDF file which you can also download