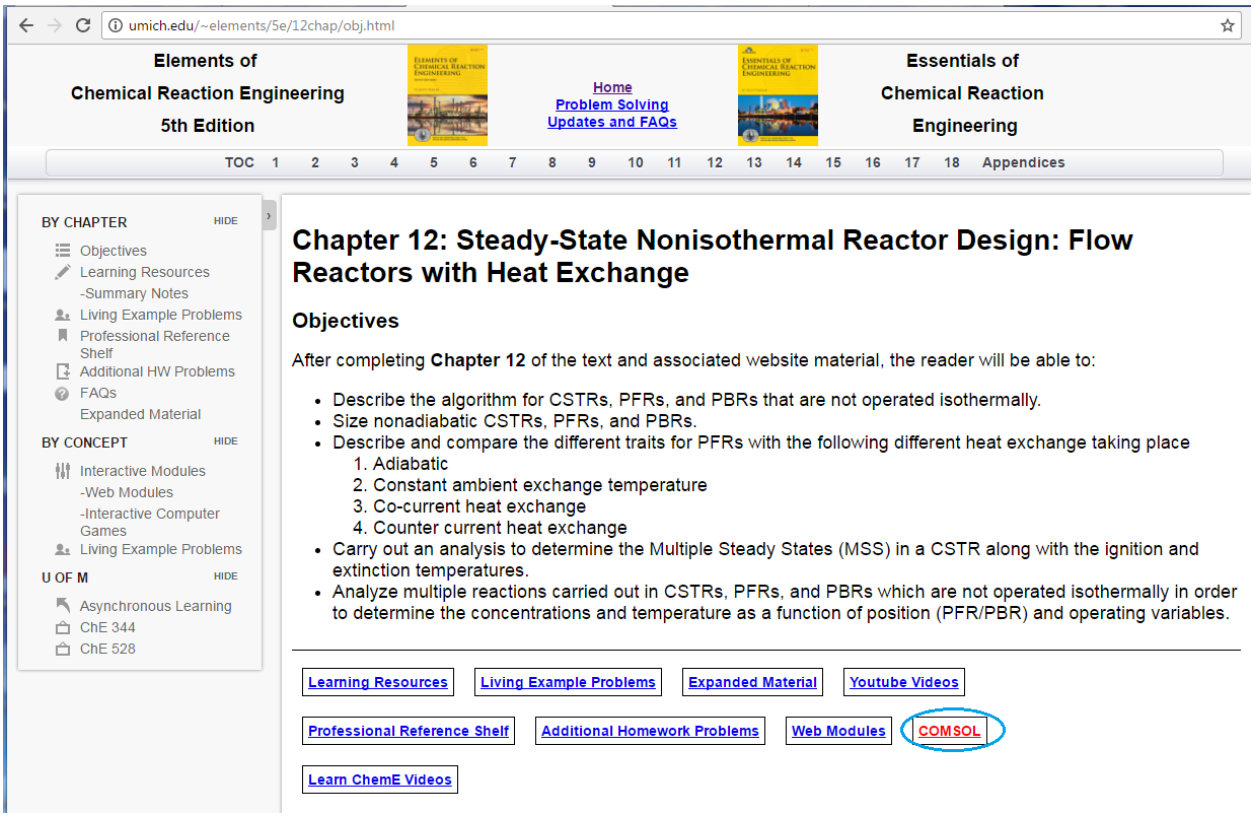
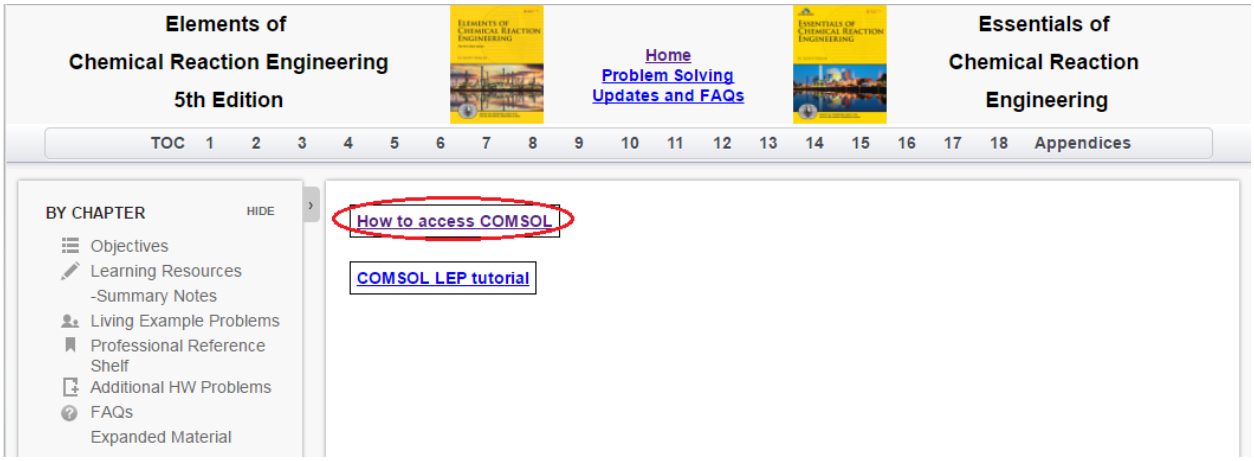
COMSOL LEP tutorial for Nonisothermal plug flow reactor with Heat exchange

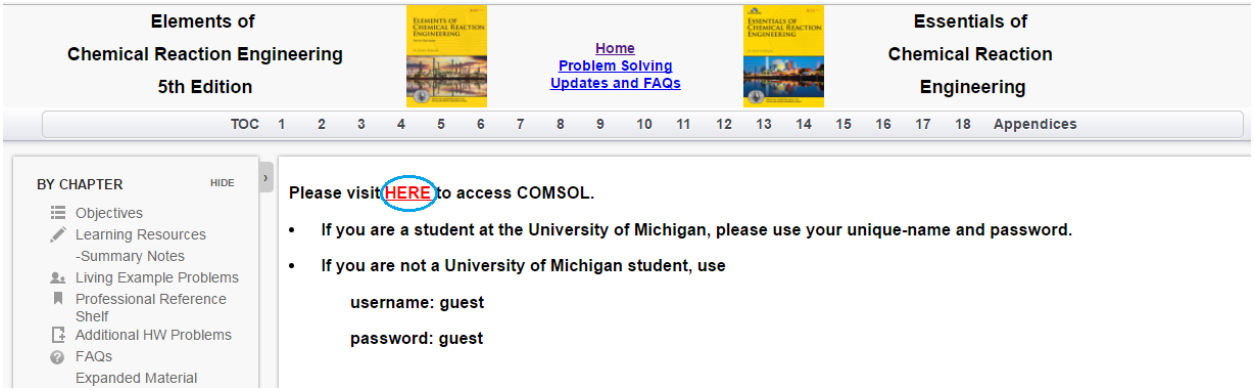
Step 1: Open chapter 12 and click on COMSOL tab present in the bottom of the page



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



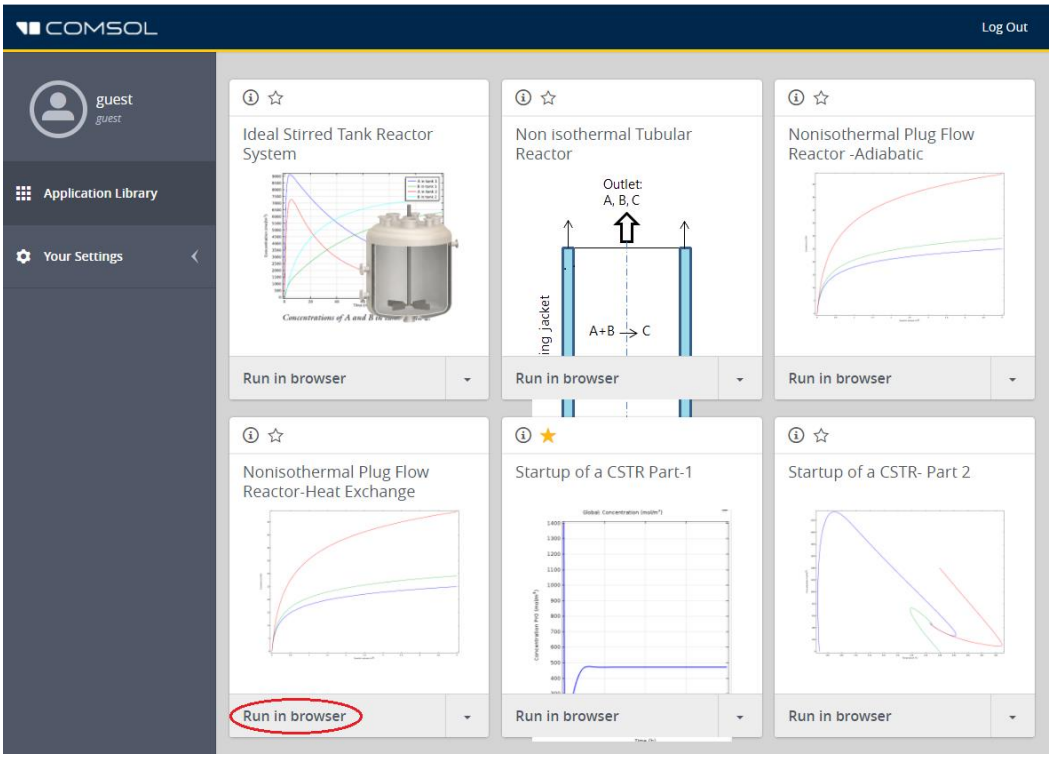
Step 3: The following page will open. Click "Here"



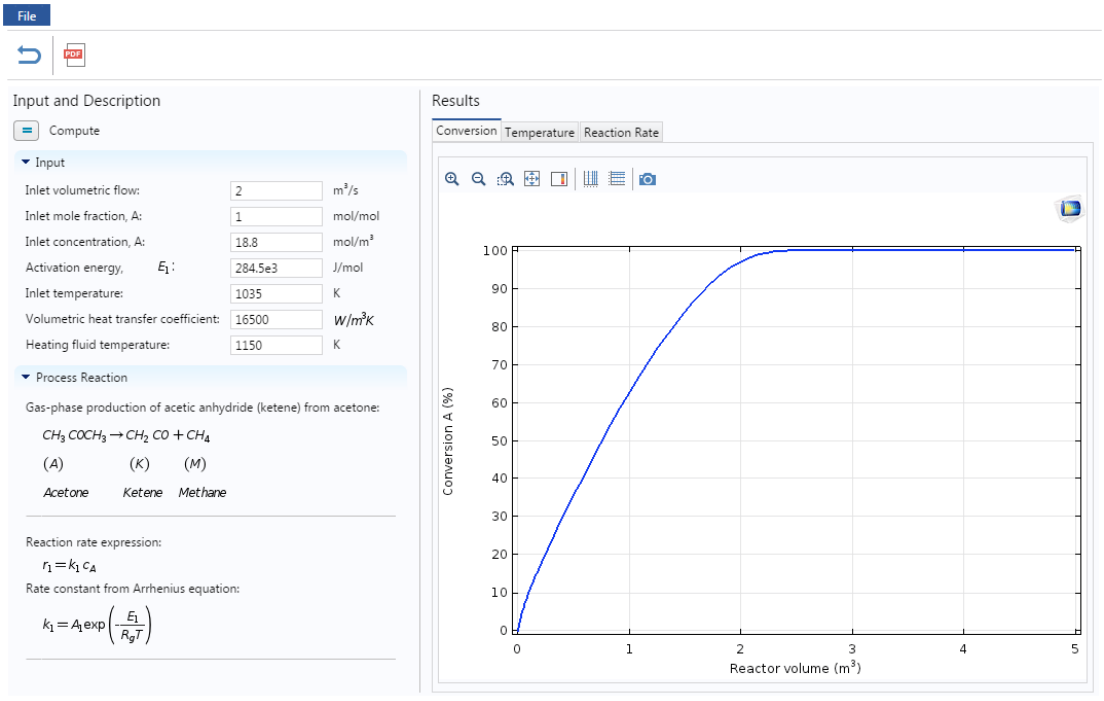
Step 4: This will take you to COMSOL Server. If you are a student at the University of Michigan, please use your Uniqname and password. If you are not a University of Michigan student, use

username: guest
password : guest

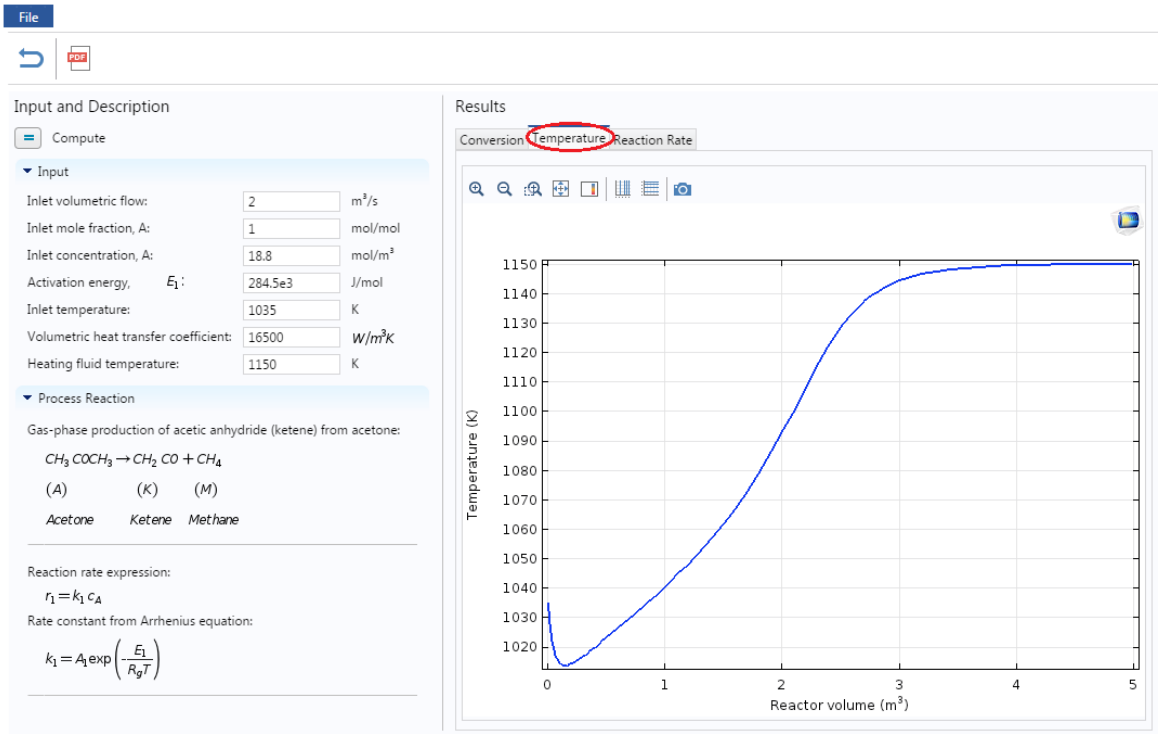
Step 5: This will open up COMSOL library where you see many COMSOL files to solve chemical reaction engineering problems. Find "***Nonisothermal Plug Flow Reactor-Heat exchange***". Click on "Run in browser" to start the application



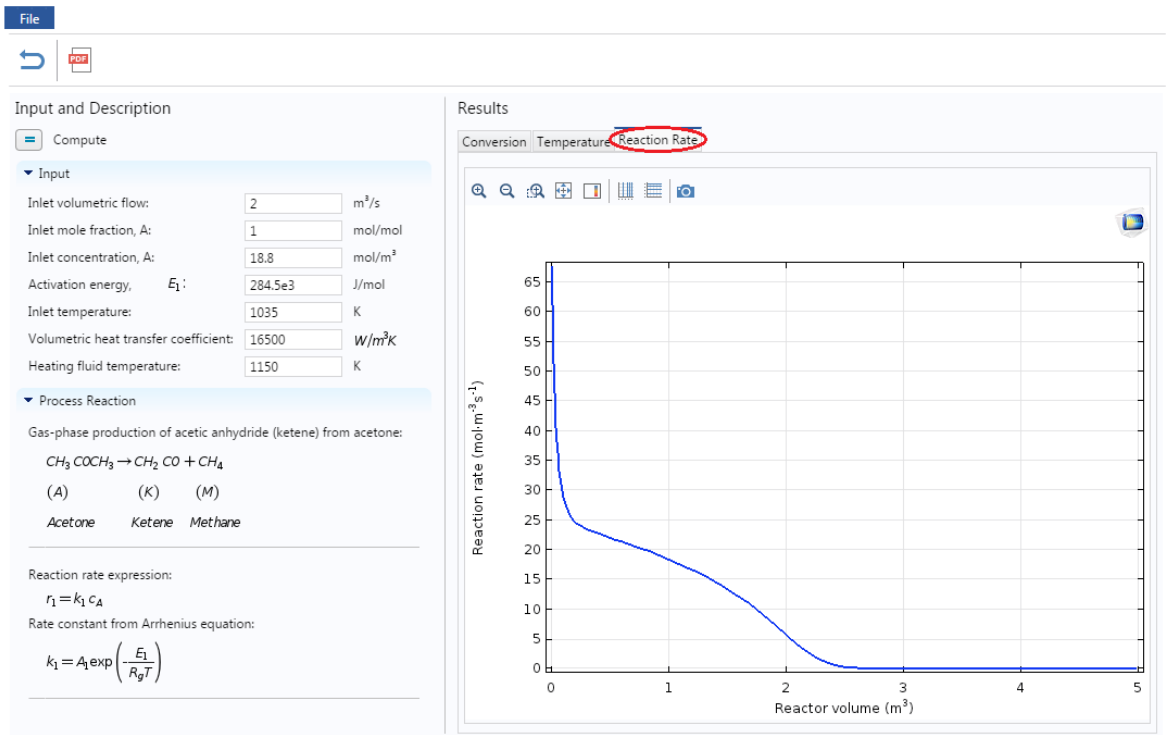
You will see that following window opens which has input parameters, description, graphical features and a few buttons. You can see the conversion profile on the right side of the page



Step 6: Click on Temperature tab to view Temperature graph

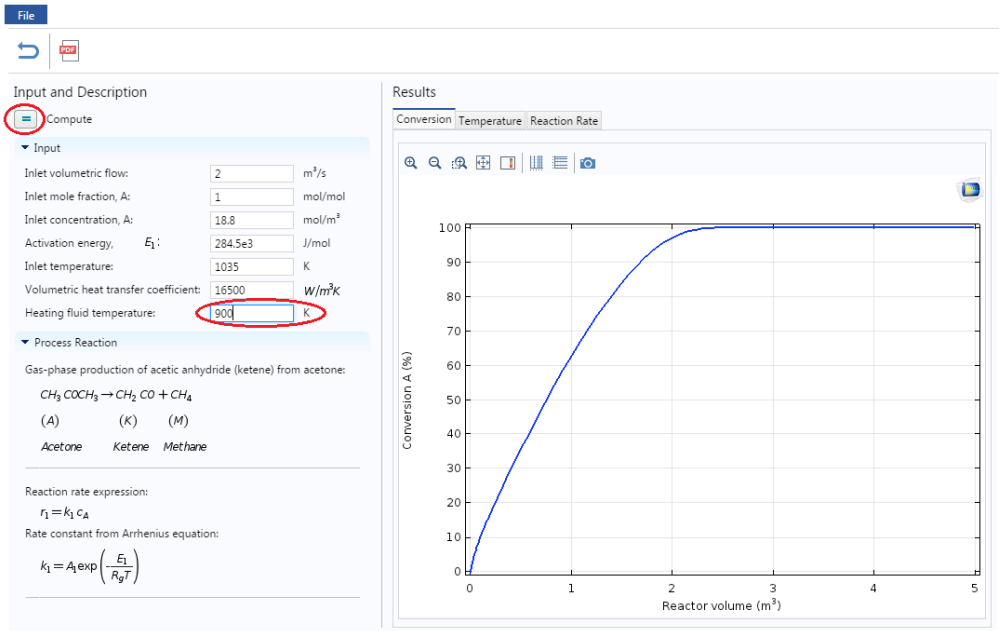


Click on Reaction Rate tab to view graph of reaction rate

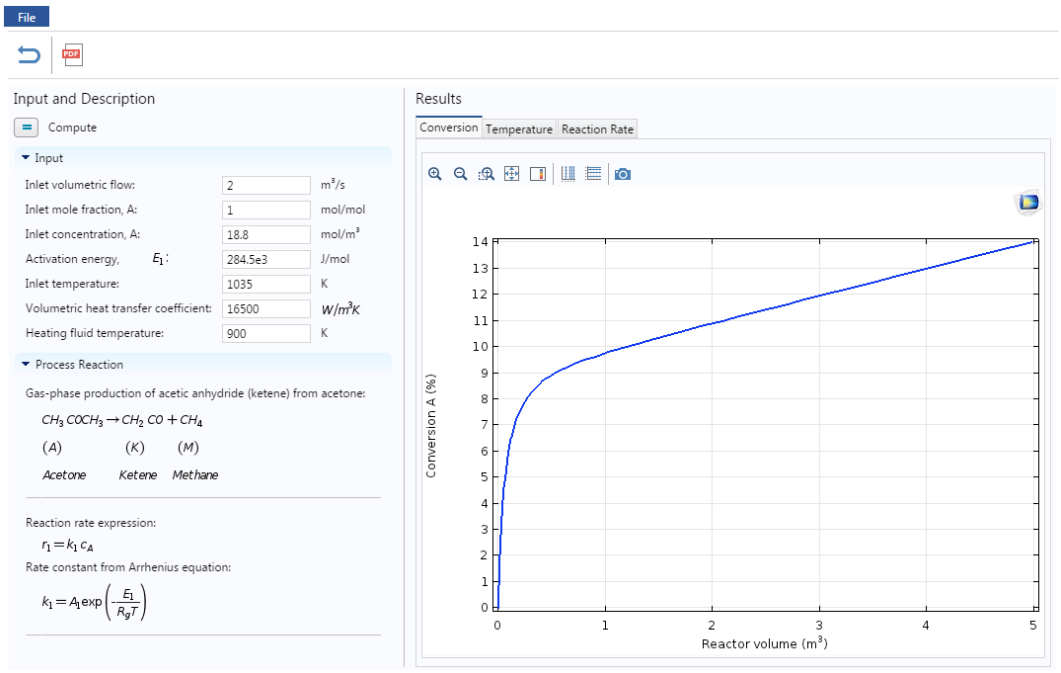


Step 7: Under Input section on the left hand side, you can view and change any parameter values. Let's change a parameter and see the effect on the profile. Change the Temperature of heat exchanger medium from 1150 K to 900 K. After you are done, click on Compute button (=) present above the Input parameters

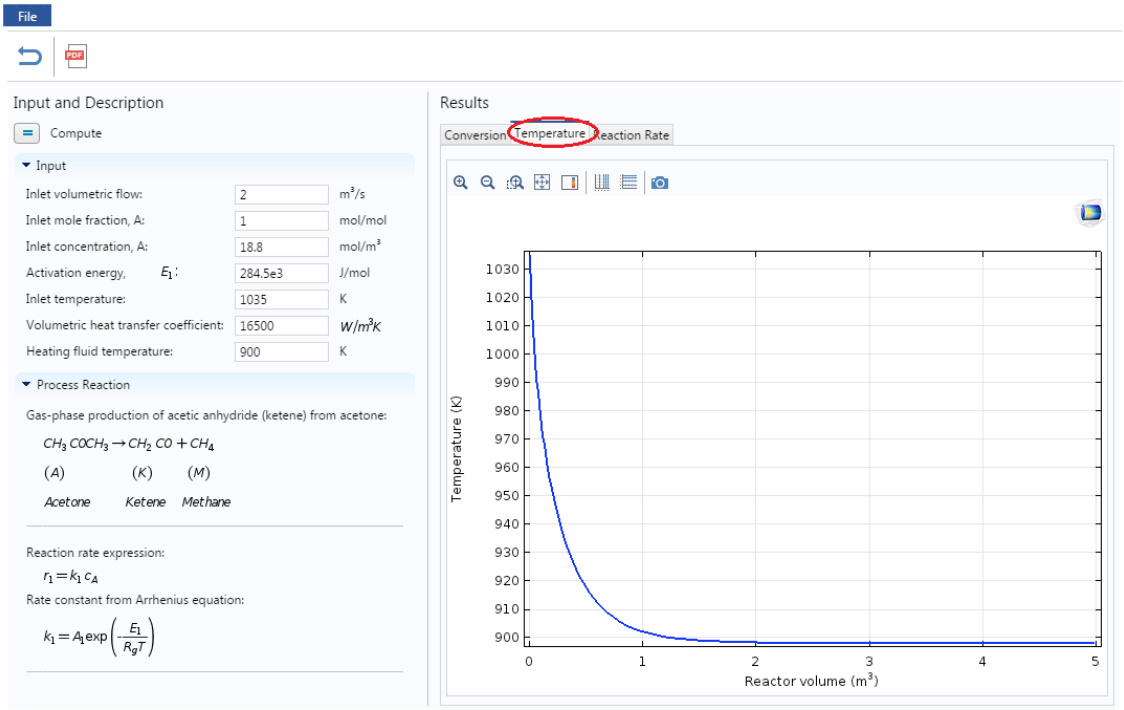
Caution: The y axis is dynamic and scale changes with respect to the values. Make sure to look at both scale and graph



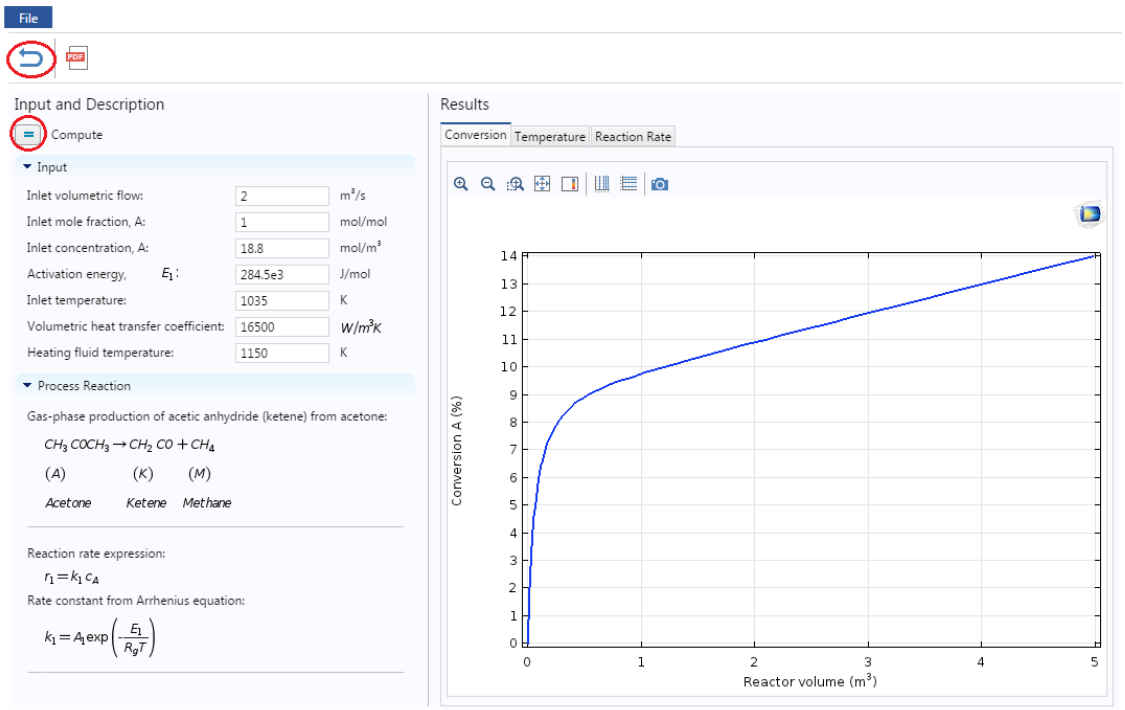
Step 8: Now check the Conversion and Temperature profiles. The following graph is obtained for Conversion. You can see that conversion has decreased at lower heating fluid temperature



The following graph is obtained for Temperature profile which shows that temperature has also decreased

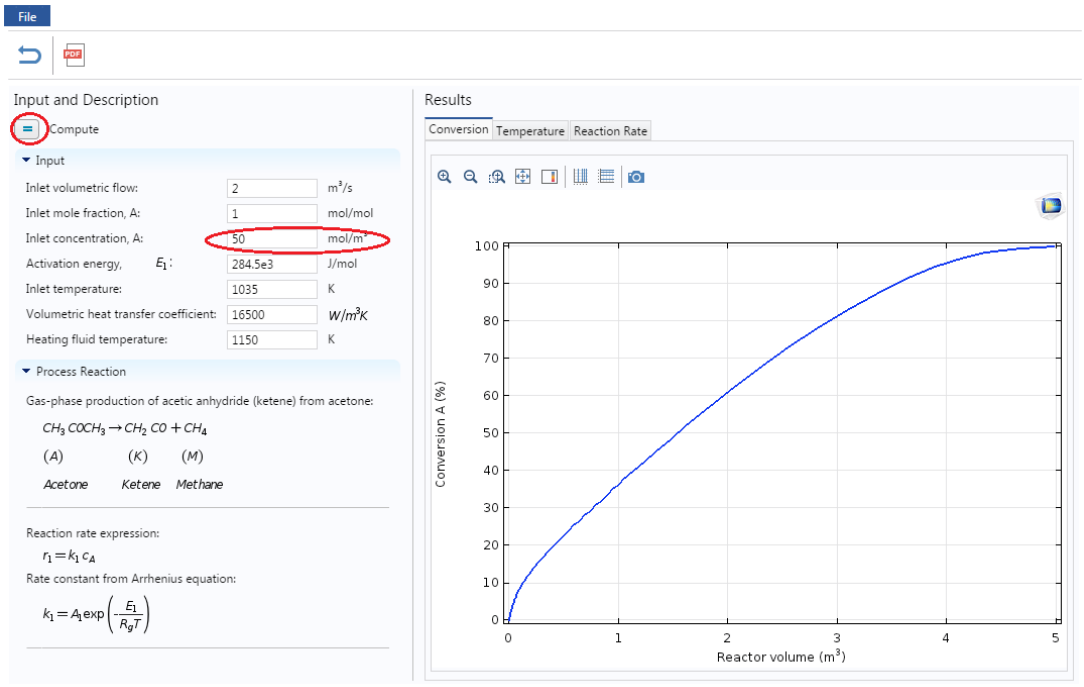


Step 9: Now if you want to re-set all the parameter values to its initial values, click on "reset to default button( ). Click on this button and you will find that it resets the value of Temperature. To update the graph, click on Compute button. Each time you change a variable, click Compute

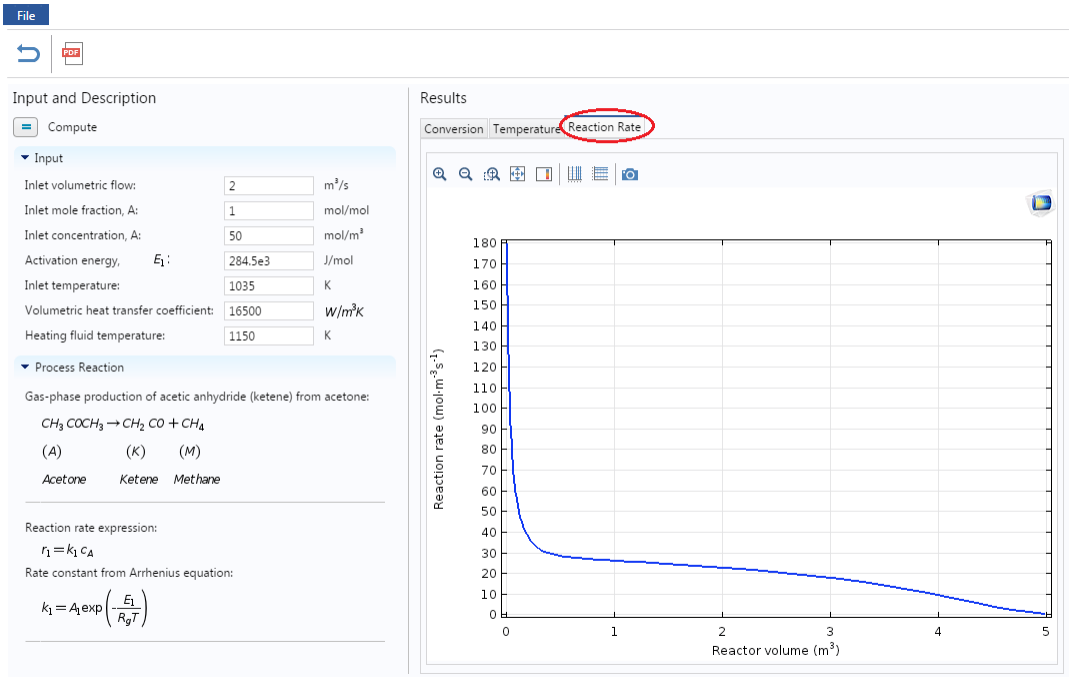


Step 10: Now let's consider a case where you want to maintain the Inlet concentration such that 100 % conversion is achieved at the end of the reactor. Enter the inlet concentration of A as 50 mol/m^3 and click compute to see its effect on profile.

The following graph will be obtained for conversion. You can see that as inlet concentration is increased, 100% conversion is shifted towards the end of the reactor



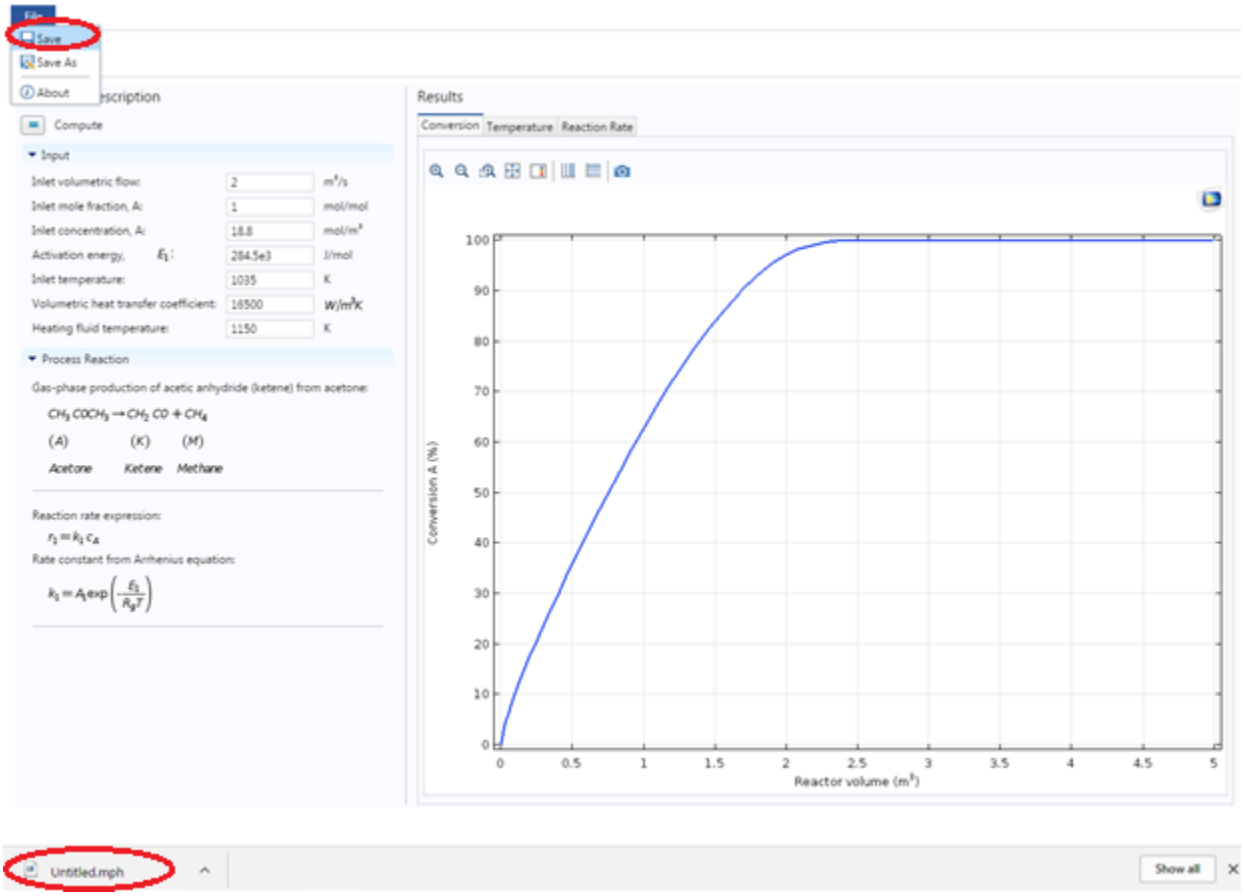
The following graph will be obtained for reaction rate which shows reaction rate now decreases slowly



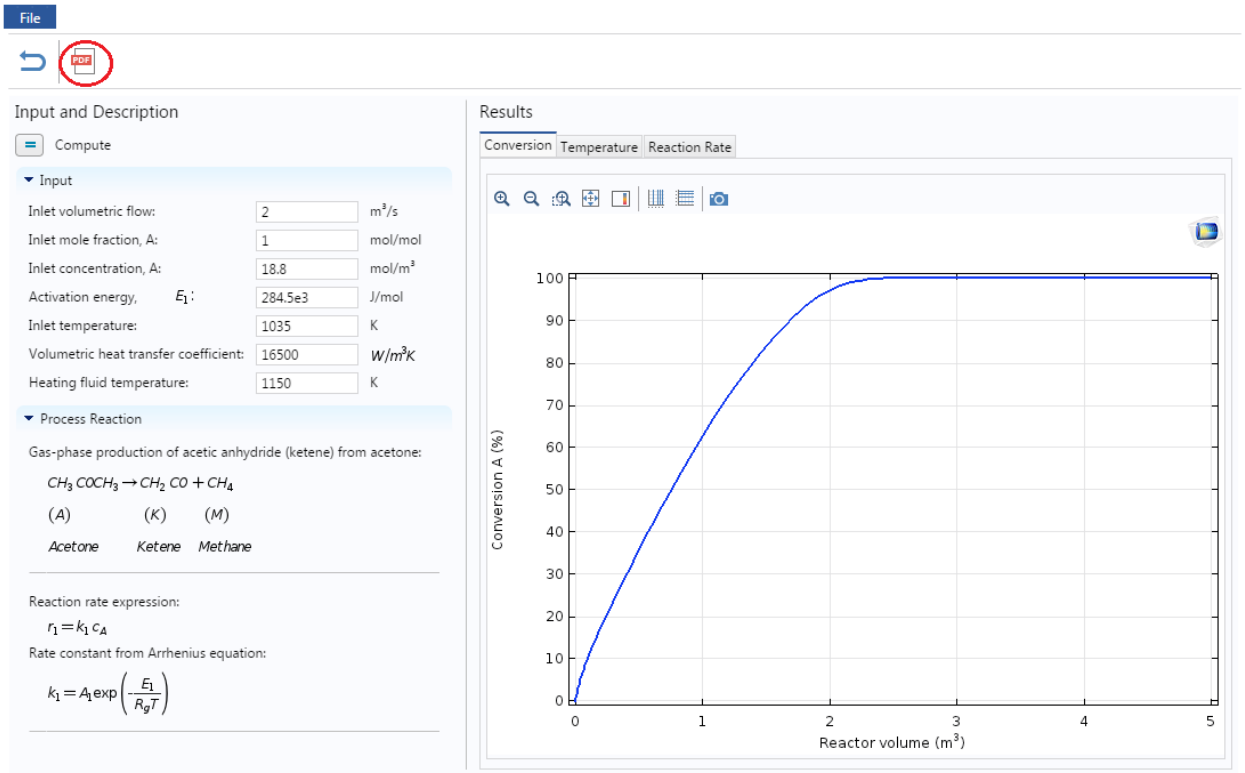
Step 11: Now, you can change any listed parameter value and check its effect on profiles. Make sure to click Compute button after you change a variable.

Step 12: 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 13: You can also open a pdf documentation which details the reactor model and a step-by-step-procedure to create this COMSOL module from scratch. Click on PDF button present on the menu bar



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