Equilibrium Reactor

Spoken Tutorial Project
http://spoken-tutorial.org

National Mission on Education through ICT
http://sakshat.ac.in

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Learning Objectives

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- **Define an Equilibrium Reaction**
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- **Calculate Conversion percentage and Reaction extent**

System Requirement

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- **DWSIM v 5.2 (Classic UI) Update 22**

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- **Windows 10**

System Requirement

- DWSIM v 5.2 (Classic UI) Update 22
- Windows 10
- Any OS: Linux, Mac OS X or FOSSEE OS on ARM

Prerequisites

To practice this tutorial, you should know

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- **Add components to a flowsheet**

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- **Add components to a flowsheet**
- **Select thermodynamic packages**

Prerequisites

To practice this tutorial, you should know

- **Add components to a flowsheet**
- **Select thermodynamic packages**
- **Add material and energy streams and specify their properties**

Prerequisite Tutorials and Files

- **http://spoken-tutorial.org**
- **You can access these tutorials and all the associated files from this site**

Reaction and Inlet Condition

Reaction	$CO(g) + H_2O(g) \rightleftharpoons H_2(g) + CO_2(g)$	
Inlet Stream	Mass Flow	3600 kg/h
	Temperature	25 °C
	Pressure	1.01325 bar
	Mole Fraction	$x_{CO} = 0.5$
		$x_{H_2O} = 0.5$
		$x_{H_2} = 0$
		$x_{CO_2} = 0$

Property Package and Reaction Temperature

- **Property Package:**
  Raoult's Law
- **Reaction Temperature:**
  225 °C

Summary

In this tutorial, we have learnt to:

- **Define an Equilibrium Reaction**
- **Simulate an Equilibrium Reactor**
- **Calculate Conversion percentage and Reaction extent**

Assignment

Reaction	$N_2 + 3H_2 \rightleftharpoons 2NH_3$	
Package	**Peng-Robinson**	
Inlet Stream	**Mass Flow**	**1000 kg/h**
	Temperature	**425 °C**
	Pressure	**200 bar**
	Mole fraction	$x_{N_2} = 0.5$
		$x_{H_2} = 0.5$
		$x_{NH_3} = 0$
Reaction Temp	**400 °C**	

About the Spoken Tutorial Project

- **Watch the video available at http://spoken-tutorial.org /What_is_a_Spoken_Tutorial**
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Spoken Tutorial Workshops

The Spoken Tutorial Project Team,

- **Conducts workshops using spoken tutorials**
- **Gives certificates to those who pass an online test**
- **For more details, please write to contact@spoken-tutorial.org**

Forum for specific questions

- Do you have questions in this Spoken Tutorial?
- Please visit http://forums.spoken-tutorial.org
- Choose the minute and second where you have the question
- Explain your question briefly
- Someone from the FOSSEE team will answer them

DWSIM Flowsheeting Project

- **The FOSSEE team coordinates conversion of existing flow sheets**
- **We give honorarium and certificates for those who do this**
- **For more details, please visit this site http://dwsim.fossee.in/flowsheeting-project**

Textbook Companion Project

- The FOSSEE team coordinates coding of solved examples of popular books
- We give honorarium and certificates for those who do this
- For more details, please visit this site http://dwsim.fossee.in/textbook-companion-project

Lab Migration Project

- **The FOSSEE team helps migrate commercial simulator labs to DWSIM**
- **We give honorarium and certificates for those who do this**
- **For more details, please visit this site http://dwsim.fossee.in/lab-migration-project**

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Thanks

- **Thanks for joining**