

Model a Flowsheet

Talk to a Teacher

<http://spoken-tutorial.org>

National Mission on Education through ICT

<http://sakshat.ac.in>

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Learning Objectives

We will learn how to

- ▶ **Model a mixer**



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- ▶ **Model a reactor**



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We will learn how to

- ▶ Model a mixer
- ▶ Model a reactor
- ▶ **Connect different components**



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We will learn how to

- ▶ **Model a mixer**
- ▶ **Model a reactor**
- ▶ **Connect different components**
- ▶ **Run the flowsheet**



System Requirements



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- ▶ **Ubuntu Linux OS v.12.04**



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- ▶ **Ubuntu Linux OS v.12.04**
- ▶ **ASCEND v.0.9.8**



Pre-requisites



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User must have basic knowledge of

- ▶ **Linux**
- ▶ **ASCEND**



Pre-requisites



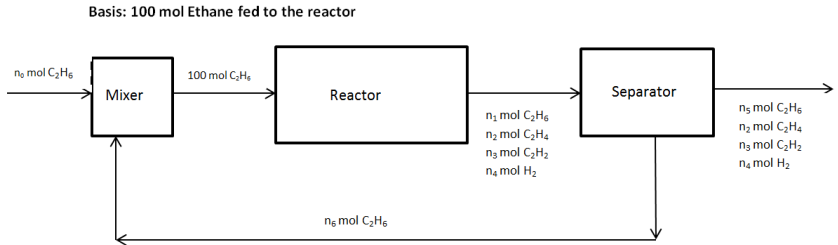
Pre-requisites

To know more about ASCEND,

- ▶ **Please visit ascend4.org**
- ▶ **For relevant tutorials please visit <http://spoken-tutorial.org>**

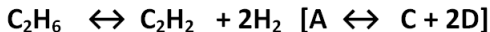


Flowsheet



Reactions

Ethane is dehydrogenated to ethylene and acetylene.



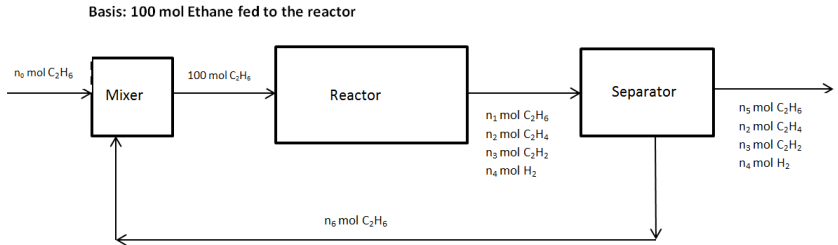
Equilibrium Conditions:

$$y_{\text{B}}y_{\text{D}} / y_{\text{A}} = 3.75 \quad y_{\text{C}}y_{\text{D}}^2 / y_{\text{A}} = 0.135$$

The separation process separates 95% unreacted ethane and recycles it to the mixer.



Flowsheet



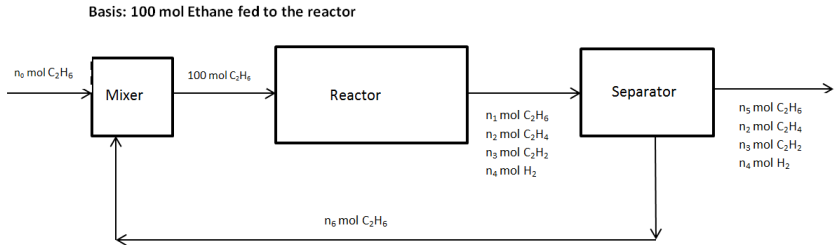
Equations for Mixer

Mixing Point:

$$\text{Eq 1: } n_0 + n_6 = 100$$



Flowsheet



Equations for Reactor

Reactor:

$$\text{Eq 2: } n_1 = 100 - \xi_1 - \xi_2$$

$$\text{Eq 3: } n_2 = \xi_1$$

$$\text{Eq 4: } n_3 = \xi_2$$

$$\text{Eq 5: } n_4 = \xi_1 + 2\xi_2$$

$$\text{Eq 6: } n_{\text{tot}} = n_1 + n_2 + n_3 + n_4 = 100 + \xi_1 + 2\xi_2$$

$$\text{Eq 7: } \xi_1(\xi_1 + 2\xi_2) = 3.75 * (100 - \xi_1 - \xi_2)(100 + \xi_1 + 2\xi_2)$$

$$\text{Eq 8: } \xi_2(\xi_1 + 2\xi_2)^2 = 0.135 * (100 - \xi_1 - \xi_2)(100 + \xi_1 + 2\xi_2)^2$$



Assignment: Equations for Separator

Separation Process:

Eq 9: Ethane split: $n_5 = 0.05n_1$

Eq 10: Ethane balance: $n_1 = n_5 + n_6$



Summary

We have learnt how to

- ▶ **Model a mixer**
- ▶ **Model a reactor**
- ▶ **Connect different components**
- ▶ **Run the flowsheet**



About the Spoken Tutorial Project

- ▶ Watch the video available at http://spoken-tutorial.org/What_is_a_Spoken_Tutorial
- ▶ It summarizes the Spoken Tutorial project



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- ▶ If you do not have good bandwidth, you can download and watch it



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



Acknowledgments

- ▶ Spoken Tutorial Project is a part of the Talk to a Teacher project
- ▶ It is supported by the National Mission on Education through ICT, MHRD, Government of India
- ▶ More information on this Mission is available at

<http://spoken-tutorial.org/NMEICT-Intro>

