

APLIKOM

-Azafilmi Hakiim-

RPS

49 Nama Mata Kuliah	: Aplikasi Komputer dalam Teknik Kimia
Kode MK	: TK161649
Jumlah SKS	: 2 SKS

Deskripsi

Mata kuliah ini membahas tentang :

Dasar penyusunan algoritma perhitungan dan konsep logika matematika, da penggunaan berbagai perangkat lunak sering digunakan dalam menyelesaikan permasalahan sistem proses kimia

Perangkat lunak yang digunakan meliputi :

- Perangkat lunak berbasis
- Paket seperti Ms Excel
- Perangkat lunak keteknikkimiaan yang digunakan sebagai proses simulator
 - ChemCAD
 - HYSIS
 - Aspen Plus

Bentuk Pembelajaran

Bentuk pembelajaran dapat berupa : ceramah, diskusi, dan presentasi tugas

Bobot Nilai

Penilaian dosen meliputi	
Tugas terstruktur	20%
Kuis	20%
UTS	30%
UAS	30%

Kriteria Penilaian

Penilaian dilakukan oleh dosen dengan menggunakan kriteria berikut

Kriteria penilaian

Nilai	Poin	Kisaran
A	4,00	≥ 76
B+	3,50	71-75
B	3,00	66-70
C+	2,50	61-65
C	2,00	56-60
D	1,00	46 – 55
E	0,00	≤ 45

Buku Referensi

- Contantinides, A and Mostoufi N. 1999. Numerical Methodes for Chemical Engineers with MATLAB Applications. Prentice-Hall. Englewood Cliffs. Nj
- Finlayson, BA. 2006. Introduction to Chemical Engineering Computing. John Willey and Sons Inc. New Jersey.
- Hanselman, D and Littlefield, B. 1997. MATLAB : Bahasa Komputasi Teknis (terjemahan). ANDI offs. Yogyakarta
- Sediawan, WB dan Prasetya, A. 1997. Pemodelan Matematis dan Penyelesaian Numeris dalam Teknik Kimia. ANDI Ofset. Yogyakarta.
- Hyprotech. HYSIS-GetStart.

ABSEN

 <p>21-13 Riska Listiarini Iskandar</p>	 <p>Bu Azafilmi Hakiim</p>	 <p>21-29,42 Lutfi Pundi; Muhammad ...</p>	 <p>21-17 Aldiana Bayhaqi Ilham</p>	 <p>21-25 Firgi Siswantito</p>
 <p>21-14 Saniatun Wilda</p>	 <p>21-50 Natasya Shafira</p>	 <p>Adifalah Maulana</p>	 <p>21-47 Angelita Sendi Sinaga</p>	 <p>21-44 Amalia Dian Fadilla</p>
 <p>21-05 Fayzah Ahmad</p>	 <p>21-21 24 Christin Eti</p>	 <p>21-34 Putri Nur Hasanah</p>	 <p>21-33 Nanda Aurelia Salsabila S</p>	 <p>21-30 Melisa Nur Halimah</p>
 <p>21-27 Gina Dea Ramadhani</p>	 <p>21-39 Tasya Nur Shakila</p>	 <p>21-06 Gita Sonia</p>	 <p>21-48 Cindy Dwi</p>	 <p>21-26 Ghina Nurul Fadhillah</p>

ASPEN TECH

Aspen berarti Advance system for Process Engineering (didirikan th 1981)

Variasinya ada banyak : Aspen Hysys: Simulator yang digunakan khusus pada FLuid (gas dan liquid) –Perusahaan Migas

Aspen Plus: Simulator yang mensimulasi berbagai macam properties (solid, liquid)

Aspen EDR (Exchanger Design Rating)

ASPEN Energy Analyzer

ASpen Capital Cost Estimator

Bagaimana Memulai menggunakan Aspen Hysys

The screenshot displays the Aspen HYSYS V11 software interface. The title bar reads "Untitled - Aspen HYSYS V11 - aspenONE". The ribbon menu includes tabs for File, Home, View, Customize, and Resources. The Home tab is active, showing various toolbars such as Clipboard, Component Lists, Fluid Packages, Methods Assistant, Reactions, User Properties, Components, Refining, Hypotheticals, Oil Manager, and Oil. A search bar labeled "Search Exchange" is located in the top right corner.

The main workspace is titled "Component Lists" and contains a table with the following columns: List Name, Source, Associated Fluid Packages, and Status. The table is currently empty.

Below the table, there are several buttons: "Add" (with a dropdown arrow), "Copy", "Delete", "Import" (with a dropdown arrow), and "Export...".

On the left side, there is a "Properties" pane with a tree view showing "All Items" and sub-items: Component Lists, Fluid Packages, Petroleum Assays, Reactions, Component Maps, and User Properties. Below this, there are tabs for "Properties", "Simulation", "Safety Analysis", and "Energy Analysis".

At the bottom, there is a "Messages" pane with the following text:

```
Required Info : Fluid Packages -- Select property package  
Required Info : Components -- Empty component list
```

Uji Coba #1

Pada kasus simulasi kali ini, anda saya minta untuk memilih komponen berikut, gunakan persamaan peng robinson pada method properties equationnya.

Ethana	: 95 lbmole/h
Propana	: 50 lbmole/h
n-Butana	: 90 lbmole/h
Iso-butana	: 100 lbmole/h

Pertanyaannya apakah fase komposisi diatas jika berapa pada temperatur 5 C dengan tekanan 10 atm.

COMPONENT LIST

The screenshot displays the Aspen HYSYS V11 software interface. The main window shows the 'Material Stream: S-1' worksheet, which is a table of component flows. The table has columns for 'Molar Flows' and 'Liquid Phase'. The components listed are n-Butane, Propane, Ethane, and i-Butane. The total molar flow is 335.00000 lbmole/hr.

	Molar Flows	Liquid Phase
n-Butane	90.0000	90.0000
Propane	50.0000	50.0000
Ethane	95.0000	95.0000
i-Butane	100.0000	100.0000
Total	335.00000	lbmole/hr

At the bottom of the window, a message box indicates: 'Saving case C:\Users\Aza\AppData\Local\Temp\AutoRecovery save of NoName (0xa30e1e).ahc... Completed.'

MEMASUKKAN 5 C 10 ATM

Untitled - Aspen HYSYS V11 - aspenONE

Simulation Capital: ___USD Utilities: ___USD/Year Energy Savings: ___MW (___%) Exchangers - Unknown: 0 OK: 0 Risk: 0

Flowsheet Case (Main) - Solver Active

Material Stream: S-1

Worksheet	Stream Name	S-1	Liquid Phase
Conditions	Vapour / Phase Fraction	0.0000	1.0000
Properties	Temperature [C]	5.000	5.000
Composition	Pressure [atm]	10.00	10.00
Oil & Gas Feed	Molar Flow [lbmole/hr]	335.0	335.0
Petroleum Assay	Mass Flow [lb/hr]	1.611e+004	1.611e+004
K Value	Std Ideal Liq Vol Flow [m3/h]	14.38	14.38
User Variables	Molar Enthalpy [kJ/kgmole]	-1.332e+005	-1.332e+005
Notes	Molar Entropy [kJ/kgmole-C]	91.92	91.92
Cost Parameters	Heat Flow [kJ/h]	-2.025e+007	-2.025e+007
Normalized Yields	Liq Vol Flow @Std Cond [m3/h]	13.81	13.81
Emissions	Fluid Package	Basis-1	
	Utility Type		

OK

Deleting case C::\Users\aza\AppData\Local\Temp\AutoRecovery save of NoName (0xa30e1e).ahc... Completed.

Uji COba 2

Aliran keluar reaktor pyrolysis dengan laju alir massa total 2664800 lb/hr terdiri 58300 lb/hr HCl, 100000 lb/hr Vinyl chloride dan 106500 lb/hr 1,2 dichloroethane pada 500 C dan 25 atm. Sebelum masuk ke bagian destilasi, aliran ini didinginkan dan dikondensasikan sampai 6 C pada 12 atm. Anggap bahwa ini dilakukan dalam tiga tahap, yang pertama pendinginan dalam alat penukar panas 1 pada 26 atm sampai suhu titik embun (dew point). Selanjutnya, kondensasi dalam alat penukar panas 2 pada 12 atm sampai 6 C. Tentukan beban panas (abaikan pressure drop dalam setiap alat penukar panas

List Component

Untitled - Aspen HYSYS V11 - aspenONE

Material Stream: S-1

Worksheet Attachments Dynamics

Worksheet	Stream Name	S-1	Vapour Phase
Conditions	Vapour / Phase Fraction	1.0000	1.0000
Properties	Temperature [C]	500.0	500.0
Composition	Pressure [atm]	26.00	26.00
Oil & Gas Feed	Molar Flow [lbmole/hr]	4275	4275
Petroleum Assay	Mass Flow [lb/hr]	2.648e+005	2.648e+005
K Value	Std Ideal Liq Vol Flow [m3/h]	118.4	118.4
User Variables	Molar Enthalpy [kJ/kgmole]	-2.304e+004	-2.304e+004
Notes	Molar Entropy [kJ/kgmole-C]	208.9	208.9
Cost Parameters	Heat Flow [kJ/h]	-4.469e+007	-4.469e+007
Normalized Yields	Liq Vol Flow @Std Cond [m3/h]	113.7	113.7
Emissions	Fluid Package	Basis-1	
	Utility Type		

OK

Delete Define from Stream... View Assay

Not Solved

Responsiveness: 5 100%

3:02 AM

Delta P – abaikan – 0

Worksheet Attachments Dynamics

Cooler: C-1

Design Rating Worksheet Performance Dynamics


Design

Connections
Parameters
User Variables
Notes

Delta P

Delta T

Duty



Pressure Relief
BLOWDOWN and D
Flare System

Unknown: 0 OK: 0 Risk: 0

Worksheet

Conditions

Properties

Composition

PF Specs

Name	S-2	S-3
Vapour	1.0000	<empty>
Temperature [C]	158.3	<empty>
Pressure [atm]	26.00	<empty>
Molar Flow [lbmole/hr]	4275	4275
Mass Flow [lb/hr]	2.648e+005	2.648e+005
Std Ideal Liq Vol Flow [m3/h]	118.4	118.4
Molar Enthalpy [kJ/kgmole]	-4.856e+004	-4.856e+004
Molar Entropy [kJ/kgmole-C]	165.6	<empty>
Heat Flow [kJ/h]	-9.417e+007	-9.417e+007

Perhatikan hasil 3 dan 4 (3 dimasukkan P-12), 4 dimasukkan 6 C ,
12 atm

Model Palette

Views: Stream, Flowheet, Solver, Summaries, Analysis

Cooler: E-101

Design Rating Worksheet Performance Dynamics

Worksheet

	3	4	duty-2
Name			
Vapour	1.0000	0.0000	<empty>
Temperature [C]	140.6	6.000	<empty>
Pressure [atm]	12.00	12.00	<empty>
Molar Flow [lbmole/hr]	4275	4275	<empty>
Mass Flow [lb/hr]	2.648e+005	2.648e+005	<empty>
Std Ideal Liq Vol Flow [m3/h]	118.4	118.4	<empty>
Molar Enthalpy [kJ/kgmole]	-4.856e+004	-7.721e+004	<empty>
Molar Entropy [kJ/kgmole-C]	171.2	87.04	<empty>
Heat Flow [kJ/h]	-9.417e+007	-1.497e+008	5.556e+007

Delete OK Ignored

Separator

duty 4

eated on t use either

Energinya terisi dengan melihat di workbook

The screenshot displays the Aspen Plus software interface. The top menu bar includes 'Setup', 'Show Subflowsheet Objects', and 'Order/Hide/Reveal'. Below this, there are sections for 'Workbook' and 'Pages' with 'Export' and 'Import' options. The 'Simulation' section shows 'Capital: ___USD Utilities: ___USD/Year' and 'Energy Savings: ___MW (___%)'. The 'Items' list on the left includes 'Workbook', 'UnitOps', 'Streams', 'Stream Analysis', 'Equipment Design', 'Model Analysis', 'Data Tables', 'Strip Charts', 'Case Studies', 'Data Fits', and 'Plant Data'. The main window shows the 'Flowsheet Case (Main) - Solver Active' and 'Workbook' tabs. The 'Energy Streams' tab is active, displaying a table with the following data:

Name	duty-1	duty-2	** New **
Heat Flow [kJ/h]	4.948e+007	5.556e+007	

Hasil Akhir

Untitled - Aspen HYSYS V11 - aspenONE

File Home Economics Dynamics Plant Data Equation Oriented View Customize Resources Flowsheet/Modify Format

Simulation Capital: ___USD Utilities: ___USD/Year Energy Savings: ___MW (___%) Exchangers - Unknown: 0 OK: 0 Risk: 0

Flowsheet Case (Main) - Solver Active

Material Streams

	1	2	3	4
Vapour Fraction	1.0000	1.0000	1.0000	0.0000
Temperature C	500.0	158.3	140.6	6.000
Pressure atm	26.00	26.00	12.00	12.00
Molar Flow lbmole/hr	4275	4275	4275	4275
Mass Flow lb/hr	2.648e+005	2.648e+005	2.648e+005	2.648e+005
Liquid Volume Flow m3/h	118.4	118.4	118.4	118.4
Heat Flow kJ/h	-4.469e+007	-9.417e+007	-9.417e+007	-1.497e+008

Compositions

	1	2	3	4
Comp Mole Frac (HCl)	0.3740	0.3740	0.3740	0.3740
Comp Mole Frac (VinylCl)	0.3743	0.3743	0.3743	0.3743
Comp Mole Frac (12-CIC2)	0.2517	0.2517	0.2517	0.2517

Energy Streams

	duty-1	duty-2
Heat Flow kJ/h	4.948e+007	5.556e+007

Properties Simulation Safety Analysis Energy Analysis

Messages

Unable to update k values because either of zero flow rate or zero pressure drop. Will k to 1.0e-6.

Saving case C:\Users\Aza\AppData\Local\Temp\AutoRecovery save of NoName ? (0x640150).ahr

Uji#3

Single contact phase separation (flash)

100 kmol h⁻¹ of a mixture containing 10, 20, 30 and 40 mol% of propane, n-butane, n-pentane, and hexane, respectively, is preheated before entering a distillation tower. The liquid mole fraction of the mixture output from heater thus 80%. Calculate the composition of both liquid and vapor phases and the temperature of the vapor-liquid mixture at 700 kPa. Initial temperature of the mixture is 25 °C

Masalah lain

1. Distillation column
2. Absorption -desorption
3. **Reactor (Sudah)**
4. Steam reforming
5. Sweetening Gas Alam

Reactor (With Reaction)

Ethylene glycol is produced by direct hydration of ethylene oxide. The reaction proceeds in the liquid phase without a catalyst at a temperature of 200 C. In addition to the hydration of ethylene to ethylene glycol, also its subsequent hydroxyalkylation for the formation of diethylene glycol or higher glycols can take place. To prevent **the subsequent** reaction, the process is carried out with a large excess of water. In the example, we consider the following main reaction and side reaction with the given conversion:



Conversion of C₂H₄O : 95%



Conversion of C₂H₄O : 5%

The ratio of ethylene oxide to water 1:12

Ethylene oxide and water enter the reactor at **25 C and 3 Mpa. Reactor temperature is 200 C** and its pressure is 3 Mpa

Using Aspen

- a) Composition of the reaction products
- b) Reaction heat duty if 100 kmol /hr of ethylene oxide is processed
- c) Heat of reaction for both reactions if the reference temperature is 25 C, reference is 101.325 kPa, and the reference phase is liquid

Fluid Package: Basis-1

Set Up Binary Coeffs StabTest Phase Order Tabular Notes

Package Type: HYSYS Component List Selection: Component List - 1 [HYSYS Databanks]

Property Package Selection:

- Extended NRTL
- GCEOS
- General NRTL
- Glycol Package
- Grayson Streed
- IAPWS-IF97
- Kabadi-Danner
- Lee-Kesler-Plöcker
- MDMIP

Activity Model Specifications:

Vapour Model	Ideal
Density Method	Costald
UNIFAC Estimation Temp	25.0000 C
Use Poynting Correction	<input checked="" type="checkbox"/>

No Parameters required for the selected Property Package.

Memakai persamaan NRTL (set up)

Cek Binary Coeffs → Unknowns

Fluid Package: Basis-1

Set Up Binary Coeffs StabTest Phase Order Tabular Notes

Activity Model Interaction Parameters

Coeff Matrix To View: Aij Bij Alphaij / Cij

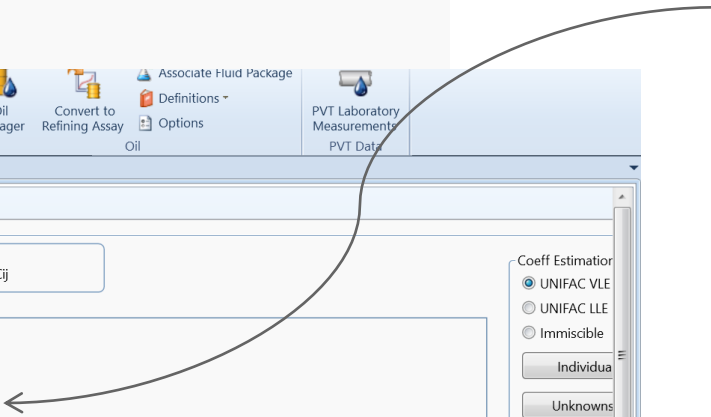
	H2O	C2Oxide	EGlycol	DEGlycol
H2O	---	434.012	771.662	-219.275
C2Oxide	540.004	---	---	---
EGlycol	1715.86	---	---	---
DEGlycol	2556.200	---	---	---

Coeff Estimator:

- UNIFAC VLE
- UNIFAC LLE
- Immiscible

Buttons: Individual, Unknowns, ALL Bina, Reset Par.

R = 1.98721 cal/g



Properties

Fluid Package: Basis-1

Coeff Matrix To View: Aij Bij Alphaj / Cij

	H2O	C2Oxide	EGlycol	DEGlycol
H2O	---	434.012	771.662	-219.275
C2Oxide	540.004	---	-310.819	-768.988
EGlycol	1715.86	898.713	---	-1753.96
DEGlycol	2556.200	1790.66	890.077	---

Property Pkg

Setelah klik unknowns jadi terisi

Clipboard Lists Packages User Properties Assays Remove Duplicates Manager Retaining Assay Options

Clipboard Navigate Components Refining Hypotheticals Oil

Properties Reaction Set: Set-1

All Items

- Component Lists
 - Component List - 1
- Fluid Packages
 - Basis-1
 - Petroleum Assays
- Reactions
 - Set-1
 - Component Maps
 - User Properties

Set Info

Set Type: Unknown

Active Reactions Type

Reactions

Reactant Source

- Hysys
- AspenProperties

Conversion

- Equilibrium
- Heterogeneous Catalytic
- Kinetic
- Simple Rate

Stoichiometry Info

Component	Mole Weight	Stoich Coeff
C2Oxide	44.054	-1.000
H2O	18.015	-1.000
EGlycol	62.069	1.000
Add Comp		

Balance

Balance Error: 0.00000

Reaction Heat (25 C): <empty>

Setelahnya anda lihat REACTION di kiri
 Nah karena di reaktor terdapat reaksi maka masukkan di set-1 Rx-1 dan Rx-2

Conversion Reaction: Rxn-1

Stoichiometry Info

Component	Mole Weight	Stoich Coeff
Add Comp		

Balance

Balance Error: 0.00000

Reaction Heat (25 C): <empty>

Basis

Base Component	<empty>
Rxn Phase	Overall
Co	<empty>
C1	<empty>
C2	<empty>

Conversion (%) = $Co + C1 \cdot T + C2 \cdot T^2$

(T in Kelvin)

Stoichiometry Info

Component	Mole Weight	Stoich Coeff
EGlycol	62.069	-1.000
C2Oxide	44.054	-1.000
DEGlycol	106.122	1.000
Add Comp		

Basis

Base Component	<i>C2Oxide</i>
Rxn Phase	LiquidPhase
Co	95.00
C1	<empty>
C2	<empty>

$$\text{Conversion (\%)} = C_0 + C_1 \cdot T + C_2 \cdot T^2$$

(T in Kelvin)

Basis

Base Component	C2Oxide
Rxn Phase	LiquidPhase
Co	5.000
C1	<empty>
C2	<empty>

$$\text{Conversion (\%)} = C_0 + C_1 \cdot T + C_2 \cdot T^2$$

(T in Kelvin)

Masukkan Conversinya di bagian BASIS
Lihat di soal berapa untuk Rx-1 dan
Rx-2

The screenshot displays a software interface with a sidebar on the left and a main workspace. The sidebar contains a tree view under 'All Items' with the following structure:

- Component Lists
 - Component List - 1
- Fluid Packages
 - Basis-1
 - Petroleum Assays
- Reactions
 - Set-1
 - Rxn-1
 - Rxn-2
- Component Maps
- User Properties

The main workspace shows a 'Reactions' panel with a table:

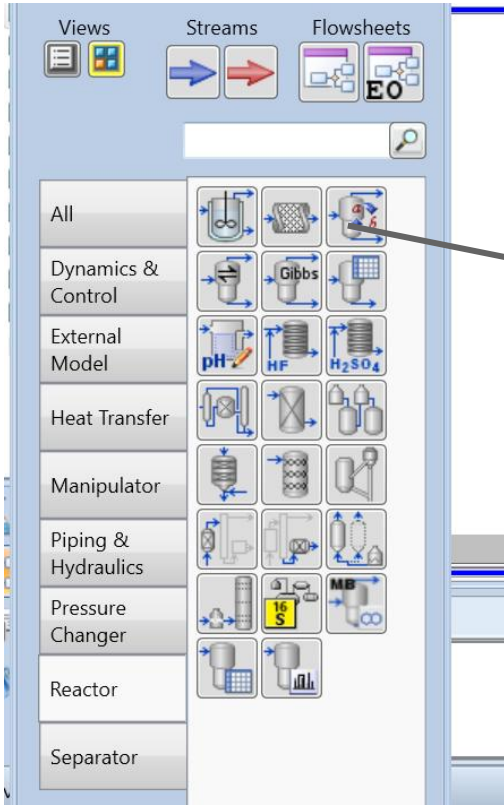
Name	Type	Associated Fluid
Set-1	Conversion	

Below the table are buttons: 'Add', 'Delete', 'Import Set', and 'Export Set'. A dialog box titled 'Add 'Set-1'' is open, showing a table with the following content:

Name	Type	Associated Fluid
Basis-1	NC: 4	PP: NRTL - Ideal

The dialog box has a button 'Add Set to Fluid Package' at the bottom. A tooltip at the bottom right of the dialog reads: 'Add the Reaction Set to the Selected Fluid Package'.

Lalu pilih addFP pada set-1



Design Reactions Rating Worksheet Dynamics

Design

Connections
Parameters
User Variables
Notes

Name

Inlets

- ethyleneoxide
- water
- << Stream >>

Energy (Optional)

Vapour Outlet

Liquid Outlet

Fluid Package

TULIS JELAS APA YANG DI STREAM, dkk

The main design window displays a vertical cylindrical reactor. A blue arrow indicates an inlet stream entering the top of the reactor. A red dashed arrow indicates an energy input (Qreactor) entering the side of the reactor. Two blue arrows indicate outlet streams: one exiting from the top (Vapour Outlet, Vprod) and one exiting from the bottom (Liquid Outlet, Lprod). A dropdown menu at the bottom shows the Fluid Package is set to Basis-1. The interface includes tabs for Design, Reactions, Rating, Worksheet, and Dynamics. A sidebar on the left lists various design parameters and notes.

Design Reactions Rating Worksheet Dynamics

Reactions

Details
Results

Conversion Reaction Details

Reaction Set **Set-1** Reaction **Rxn-1**

Stoichiometry Basis Conversion % View Reaction...

Stoichiometry Info

Component	Mole Wgt.	Stoich Coeff
C2Oxide	44.054	-1.000
H2O	18.015	-1.000
EGlycol	62.069	1.000
Add Comp		

Silakan dibuat
pada detail
reactionnya

-1 (Reaktan)
1 (Produk)

Worksheet Attachments Dynamics

Worksheet

- Conditions
- Properties
- Composition
- Oil & Gas Feed
- Petroleum Assay
- K Value
- User Variables
- Notes
- Cost Parameters
- Normalized Yields
- ▶ Emissions

Mole Fractions

H2O	0.0000
C2Oxide	1.0000
EGlycol	0.0000
DEGlycol	0.0000

The screenshot shows the Aspen Plus interface with the 'Parameters' tab selected for stream 'SET-1'. The 'Multiplier' is set to 12, and the 'Offset [kgmole/h]' is 0.00000 kgmole/h. The equation $Y = (1) * X + (0) \text{ [kgmole/h]}$ is shown, where Y is Material Stream (water) and X is Material Stream (ethyleneoxide).

Parameter	Value
Multiplier	12
Offset [kgmole/h]	0.00000 kgmole/h

$Y = (1) * X + (0) \text{ [kgmole/h]}$

Y = Material Stream (water) : Molar Flow
X = Material Stream (ethyleneoxide) : Molar Flow

Dalam kasus soal nya terdapat rasion $C_2H_4O : H_2O = 1 : 12$

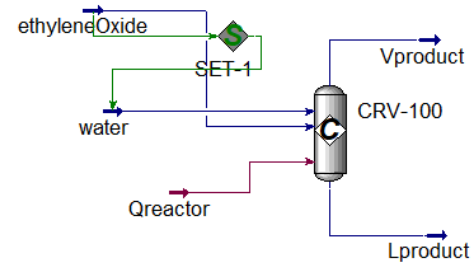
Lprodnya masukkan 200C

Design Reactions Rating Worksheet Dynamics

Worksheet

Conditions
Properties
Composition
PF Specs

	ethyleneoxide	water	Lprod	Vprod
H2O	0.0000	1.0000	0.9172	0.8900
C2Oxide	1.0000	0.0000	0.0039	0.0627
EGlycol	0.0000	0.0000	0.0786	0.0473
DEGlycol	0.0000	0.0000	0.0002	0.0000



Material Streams					
		ethyleneOxide	water	Vproduct	Lproduct
Vapour Fraction		0.0000	0.0000	1.0000	0.0000
Temperature	C	25.00	25.00	200.0	200.0
Pressure	MPa	3.000	3.000	3.000	3.000
Molar Flow	kgmole/h	100.0	1200	0.0000	1205
Mass Flow	kg/h	4405	2.162e+004	0.0000	2.602e+004
Liquid Volume Flow	m3/h	4.994	21.66	0.0000	25.50
Heat Flow	kJ/h	-7.782e+006	-3.418e+008	-0.0000	-3.403e+008