BAB V
NERACA MASSA

1.1 Neraca Massa Keseluruhan

Basis perhitumgan neraca massa:

Kapasitas produk : 7000 ton per tahun

Diambil dalam satu tahun kerja : 330 harian kerja

1 hari kerja : 24 jam

Kapasitas produksi : 350.000 ton per tahun

$\frac{ton}{tahun} \; x \frac{1000\ kg}{1\ tahun} \; x \; \frac{1\ tahun}{330\ hari} \; x \frac{1\ hari}{24\ jam}$: 44.191,9191 kg/jam

Proses yang terjadi :kontinyu

Neraca massa tanpa reaksi:

Akumulasi = input – output + generasi – konsumsi

Diasumsikan bahwa proses dalam keadaan steady state sehingga akumulasi = 0. Karena tidak ada reaksi sehingga generasi dan konsumsi = 0, maka persamaan neraca massa menjadi:

0 = input – output + 0 – 0 **Input = output**

Neraca massa dengan reaksi:

Akumulasi = input – output + gnenerasi – konsumsi

Asumsi dalam keadaan stady state, sehingga akumulasi = 0 maka persamaan neraca massa menjadi:

0 = input – output + generasi – konsumsi **Input = output – generasi + konsumsi**

Data berat Molekul

$C_3H_5(COOR)_3$	**:** 847,28 g/gmol
CH_3OH	**:** 32,04 g/gmol
H_2O	**:** 18 g/gmol
NaOH	**:** 28,56 g/gmol
H_3PO_4	**:** 98 g/gmol
Bleaching Earth	: 60 g/gmol
CH_3COOR	: 284 kg/kmol
$C_3H_8O_3$	: 92 kg/kgmol
NaCO	: 292 kg/kgmol

1.2 Neraca Massa Pada Reaktor

Tabel 5.1 Komposisi Bahan Masuk Reakto-01

Komponen	**Bahan Masuk**	
	kg/jam	**kgmol/jam**
$C_3H_5(COOR)_3$	44.269,7170	52,2049
RCOOH	110,9517	0.4109
CH_3OH	10.023,3321	313,2291
NaOH	442,6972	11,0674
H_2O	599,0379	33,2799
Total	**55.445,7359**	**410,1922**

Jika konversi = 0,6626

Bahan Yang Bereaksi dan Terbentuk

Reaksi 1

$C_3H_5(COOR)_3$ bereaksi = $XA_1 \times C_3H_5(COOR)_3$ masuk
= 0,6626 × 52,2049 kgmol/jam
= 34,5945 kgmol/jam

CH_3OH bereaksi = $3 \times C_3H_5(COOR)_3$ bereaksi
= 3 × 34,5945 kgmol/jam
= 103,7835 kgmol/jam

H_3COOR terbentuk = $3 \times C_3H_5(COOR)_3$ bereaksi
= 3 × 34,5945 kgmol/jam
= 103,7835 kgmol/jam

$C_3H_8O_3$ terbentuk = $C_3H_5(COOR)_3$ bereaksi
= 34,5945 kgmol/jam

Reaksi 2

RCOOH bereaksi = RCOOH bereaksi
= 0.4109 kgmol/jam

NaOH = RCOOH bereaksi
= 0.4109 kgmol/jam

NaCOOH terbentuk = RCOOH bereaksi
= 0.4109 kgmol/jam

H_2O terbentuk = RCOOH bereaksi
= 0.4109 kgmol/jam

Bahan Keluar Reaktor

$C_3H_5(COOR)_3$ = $C_3H_5(COOR)_3$ masuk - $C_3H_5(COOR)_3$ bereaksi
= 52,2049 kgmol/jam - 34,5945 kgmol/jam
= 17,6103 kgmol/jam

CH_3OH = CH_3OH masuk - CH_3OH bereaksi
= 313,2291 kgmol/jam – 103,7835 kgmol/jam
= 209,4456 kgmol/jam

RCOOH = RCOOH masuk – RCOOH bereaksi
= 0.4109 kgmol/jam - 0.4109 kgmol/jam
= 0 kgmol/jam

NaOH = NaOH masuk – NaOH bereaksi
= 11.0674 kgmol/jam - 0.4109 kgmol/jam
= 10,6565 kgmol/jam

CH_3COOR = CH_3COOR terbentuk
= 103,78351 kgmol/jam

$C_3H_8O_3$ = $C_3H_8O_3$ terbentuk
= 34,5945 kgmol/jam

NaCOOH = NaCOOH terbentuk
= 0.4109 kgmol/jam

H_2O = H_2O masuk + H_2O terbentuk
= 33,2799 kgmol/jam + 0.4109 kgmol/jam
= 33,6908 kgmol/jam

Tabel 5.2 Neraca Massa Reaktor-01

Komponen	Masuk (kg/jam)	Keluar (kg/jam)
C3H5(COOR)3	44.269,7170	14.933,5709
CH3OH	10.023,3321	6.702,2590
RCOOH	110,9517	-
NaOH	442,6972	426,2599
CH3COOR		29.474,5241
C3H8O3		3.182,6951
NaCOOH		119,9922
H2O	599,0379	606,4347
Total	**55.445,7359**	**55.445,7359**

1.3 Neraca Massa Tipe Alat

1) Mixer-01

Tabel 5.3 Neraca Massa Mixer-01

Komponen	Masuk (kg/jam)		Keluar (kg/jam)
	Fresh Feed	Recycle	
CH3OH	5.422,6227	4.600,7095	10.023,3321
NaOH	442,6972		442,6972
H2O	487,8954	110,6779	598,5733
Total	**11.064,6026**		**11.064,6026**

2) Mixer-02

Tabel 5.4 Neraca Massa Mixer-012

Komponen	Masuk (kg/jam)	Keluar (kg/jam)
C3H5(COOR)3	44.269,7170	44.269,7170
RCOOH	222,4609	222,4609
H3PO4	1.770,7887	1.770,7887
H2O dalam H3PO4	312,4921	312,4921

BE	442,6972	442,6972
Total	**47.018,1558**	**47.018,1558**

3) Filter-01

Tabel 5.5 Neraca Massa Filter

Komponen	Masuk (kg/jam)		Keluar (kg/jam)	
	Umpan	Air Pencuci	Hasil Atas	Hasil Bawah
$C_3H_5(COOR)_3$	44.269,7170		44.269,7170	
RCOOH	222,4609		110,9517	111,5092
H_3PO_4	1.770,7887			1.770,7887
H_2O dalam H_3PO_4	312,4921	2.955,3329		442,6972
BE	442,6972			3.267,8251
Total	**49.973,4888**		**49.973,4888**	

4) Tangki Pencuci-01

Tabel 5.6 Neraca Massa Tangki Pencuci-01

Komponen	Masuk (kg/jam)		Keluar (kg/jam)
	Reaktor	Utilitas	
$C_3H_5(COOR)_3$	885,3943		885,3943
CH_3OH	5.111,8994		5.111,8994
NaOH	426,2599		426,2599
CH_3COOR	43.588,9656		43.588,9656
$C_3H_8O_3$	4.706,7897		4.706,7897
NaCOOH	119,9922		119,9922
H_2O	606,4347	10.461,3518	11.067,7865
Total		**65.907,0876**	**65.907,0876**

5) Dekanter-01

Tabel 5.7 Neraca Massa Dekanter-01

Komponen	Masuk (kg/jam)	Keluar (kg/jam)	
		Evaporator	Prodak samping
$C_3H_5(COOR)_3$	885,3943	602,9535	282,4408
CH_3OH	5.111,8994	4.600,7095	511,1899
NaOH	426,2599		426,2599
CH_3COOR	43.588,9656	43.588,9656	
$C_3H_8O_3$	4.706,7897		4.706,7897
NaCOOH	119,9922		119,9922
H_2O	11.067,7865	110,6779	10.957,1086
Total	**65.907,0876**	**65.907,0876**	

6) Evaporator-01

Tabel 5.8 Neraca Massa Evaporator-01

Komponen	Masuk (kg/jam)	Keluar (kg/jam)	
		Recycle	Produk
$C_3H_5(COOR)_3$	602,9535		602,9535
CH_3OH	4.600,7095	4.600,7095	
CH_3COOR	43.588,9656		43.588,9656
H_2O	110,6779	110,6779	
Total	**48.903,3065**		**48.903,3065**