

BAB V

NERACA PANAS

Kapasitas Produksi	: 130.000 ton/tahun
Operasi Pabrik	: 300 hari/tahun
Basis Perhitungan	: 1 jam operasi
Temperatur Referensi	: 25°C
Satuan Panas	: kilo Joule (kJ)
Bahan baku	: Metanol
Produk	: Dimetil Eter (DME)

5. 1. Vaporizer (V-01)

Komponen	Input (kJ)	Output (kJ)
Panas masuk VP-01	484.474,1161	-
Steam masuk	67.434.414,7548	-
Panas keluar VP-01	-	47.322.989,6494
Steam keluar	-	20.595.899,2214
Total	67.918.888,8708	67.918.888,8708

5. 2. Kompresor-01 (K-01)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
$Q_{\text{(feed)}}$	2.024.440,1439	-
Q_{kompresi}	-116.354,4679	-
Q_{out}	-	1.908.085,6760
Total	1.908.085,6760	1.908.085,6760

5.3. Heat Exchanger-01 (HE-01)

Panas	Panas Masuk (kJ/jam)	Panas Keluar (kJ/jam)
Q Out Kompresor-01	2262906,7343	-
Q Input H-01	-	6822554,2202
	9304816,1977	
Q Out R-01		-
Q Input CD-01	-	4745168,7005
Total	11567722,9207	11567722,9207

5.4. Heater-01 (H-01)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q Input H-01	6.822.554,2202	-
Q _{win}	2.580.194,81116	-
Q Output H-01	-	8.614.702,8609
Q _{wout}	-	788.046,1704
Total	9.402.749,0313	9.402.749,0313

5.5. Reaktor-01 (R-01)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q Input R-01	7959315,1559	-
Q _{s, in}	376930,6087	-
Q Reaksi	-	-5845212,0205
Q Output R-01	-	11542943,5242
Q _{c, out}	-	2638514,2609
Total	8336245,7646	8336245,7646

5.6. Kondensor-01 (CD-01)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q Input CD-01	8674708,9977	-
Q Laten Kondensasi	-	-35806348,2412
Q Sensibel Distilat	-	3687989,4861
Q _{cw, in}	10198266,9382	-
Q _{cw, out}	-	50991334,6911
Total	18872975,9359	18872975,9359

5.7. Kolom Destilasi-01 (KD-01)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q Input KD-01	1.839.778,1946	-
Q RB-01	43.199.246,7062	-
Q PC-01	-	-56.068,6444
Q _{distilat}	-	56.772,9657
Q _{bottom}	-	45.038.320,5794
Total	45.039.024,9008	45.039.024,9008

5.8. Partial Condensor-01 (PC-01)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q _(feed)	117192,1242	-
Q _(kondensat gas)	-	-8634630,8011
Q _(kondensat liquid)	-	778279,7051
Q _{cw, in}	-11960314,8302	-
Q _{cw, out}	-	-3986771,6101
Total	-11843122,7060	-11843122,7060

5.9. Knock Out Drum-01 (KOD-01)

Aliran	Input (kJ/jam)	Output (kJ/jam)
Q Out PC-01	120194,0624	-
Q Distilat	-	56772,9657
Q Refluks	-	63421,0966
Total	120194,0624	120194,0624

5.10. Reboiler-01 (RB-01)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
$Q_{(feed)}$	6869918,2460	-
Q_v Sensibel	-	43199246,7062
Q_{lv} Laten Penguapan	-	2475692,7534
$Q_{(bottom)}$	-	4394225,4927
$Q_{s, in}$	62194881,4198	-
$Q_{c, out}$	-	18995634,7136
Total	69064799,6658	69064799,6658

5.11. Cooler-01 (C-01)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
$Q_{(Feed)}$	2.072.288,8223	-
Q_{out}	-	1.736.063,1194
$Q_w in$	56.037,6171	-
$Q_w out$	-	392.263,3200
Total	2.128.326,4394	2.128.326,439446

5.12. Kolom Destilasi-02 (KD-02)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
$Q_{\text{(feed)}}$	1.259.279,5679	-
$Q_{\text{(RB-01)}}$	845.902,6278	-
$Q_{\text{(PC-01)}}$	-	70.778,1325
Q_{distilat}	-	949.096,5516
Q_{bottom}	-	1.085.307,5116
Total	2.105.182,1957	2.105.182,1957

5.13. Partial Condensor-02 (PC-02)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
$Q_{\text{(feed)}}$	70.778,1325	-
$Q_{\text{(laten Kondensasi)}}$	-	70.778,1325
$Q_{\text{(sensible distilat)}}$	-	994.032,9465
$Q_{\text{cw, in}}$	-164.781,2736	-
$Q_{\text{cw, out}}$	-	-1.153.468,9152
Total	-94.003,1411	-94.003,1411

5.14. Knock Out Drum-02 (KOD-02)

Aliran	In (kJ/jam)	Out (kJ/jam)
$Q_{\text{(Feed)}}$	1064811,0790	-
$Q_{\text{(Distilat)}}$	-	70778,1325
$Q_{\text{(Refluks)}}$	-	994032,9465
Total	1064811,0790	1064811,0790

5.15. Kondensor-02 (CD-02)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
$Q_{(\text{feed})}$	367811,6746	-
$Q_{(\text{distilat})}$	-	-5510009,7477
Q_c		60502,0644
$Q_{\text{cw, in}}$	1454329,8395	-
$Q_{\text{cw, out}}$	-	7271649,1974
Total	1822141,5141	1822141,5141

5.16. Reboiler-02 (RB-02)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
$Q_{(\text{feed})}$	3968099,4145	-
Q_v (Sensibel)	-	845902,6278
Q_{iv} (Laten Penguapan)	-	1062406,9494
$Q_{(\text{bottom})}$	-	2905692,4651
$Q_{s, \text{ in}}$	1217864,1443	-
$Q_{c, \text{ out}}$	-	371961,5166
Total	5185963,5588	5185963,5588

5.17. Cooler-02 (C-02)

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
$Q_{(\text{Feed})}$	1.190.948,4590	-
$Q_{(\text{Out})}$	-	107.976,1288
$Q_w \text{ in}$	-1.624.458,4954	-
$Q_w \text{ out}$	-	-541.486,1651
Total	-433.510,0364	-433.510,0364