

BAB V

NERACA PANAS

Kapasitas Produksi	: 55.000 Ton/Tahun
Operasi Pabrik	: 300 Hari/Tahun
Basis	: 1 Jam Operasi
Satuan Panas	: Kilojoule/Jam (kJ/Jam)
Produk	: Dimetil Eter

5.1 Vaporizer 01 (VP-01)

Tabel 5. 1 Neraca Panas *Vaporizer* - 01

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q _{2b}	-54055,05132	0
Q _{2b}	0	2451,282457
Q _{steam in}	110.596,4238	0
Q _{steam out}	0	54.090,0900
Total	56541,37244	56541,37244

5.2 Heater (H-01)

Tabel 5. 2 Neraca Panas *Heater* - 01

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q ₃	3623,331337	0
Q ₄	0	23673,58686
Q _{steam in}	39.243,1504	0

$Q_{\text{steam out}}$	0	19.192,8949
Total	42866,48175	42866,48175

5.3 Vaporizer (V-02)

Tabel 5. 3 Neraca Panas *Vaporizer* - 02

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q_{2b}	-833670,295	0
Q_5	0	316,9335431
$Q_{\text{steam in}}$	1632312,677	0
$Q_{\text{steam out}}$	0	798325,4481
Total	798642,3817	798642,3817

5.4 Heater (H-02)

Tabel 5. 4 Neraca Panas *Heater* - 02

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q_6	-857834,6785	0
Q_7	0	4803062,354
$Q_{\text{steam in}}$	11079730,8	0
$Q_{\text{steam out}}$	0	5418833,772
Total	10221896,1261	10221896,1261

5.5 Reaktor (R-01)

Tabel 5. 2 Neraca Panas Reaktor - 01

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q_8	9.675.789,5994	0,0000
Q_9	0,0000	33.361.259,4518

$Q_{\text{Panas Reaksi}}$	0,0000	-50.391.710,8371
Q_{lepas}	0,0000	26.706.240,9848
Total	9.675.789,5994	9.675.789,5994

5.6 *Expander (Ex-01)*

Tabel 5. 6 Neraca Panas *Expander* - 01

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q_{8a}	33.361.259,4518	0
Q_9	0	30.419.291,6426
Q_{Ekspansi}	0	2.941.967,8091
Total	33.361.259,4518	33.361.259,45

5.7 *Partial Condensor (PC-01)*

Tabel 5. 3 Neraca Panas *Partial Condensor* - 01

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q_9	7.999.949,9118	0,0000
Q_{10}	0,0000	-1.807,5667
Q_{18}	0,0000	1.065.944,0294
$Q_{\text{kondensasi}}$	27.905.511,2662	0,0000
$Q_{\text{refrigerant in}}$	-26.855.007,5822	0,0000
Q_{out}	0,0000	7.986.317,1331
Total	9.050.453,5958	9.050.453,5958

5.8 Reaktor (R-02)

Tabel 5. 8 Neraca Panas Reaktor - 02

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q ₂₀	6.943.652,2932	0,0000
Q ₂₁	0,0000	16.424.348,7400
Q _{Panas Reaksi}	0,0000	-72.112.863,4278
Q _{lepas}	0,0000	62.632.166,9811
Total	6.943.652,2932	6.943.652,2932

5.9 Compressor (C-03)

Tabel 5. 9 Neraca Panas *Compressor* - 03

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q ₂₁	16424409,43	0
Q ₂₂	0	4709896,184
Q _{Kompresi}	-11714513,25	0
Total	4709896,184	4709896,184

5.10 Partial Condensor (PC-02)

Tabel 5. 10 Neraca Panas *Partial Condensor* - 02

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q ₂₂	4.848.338,9815	0,0000
Q ₂₆	0,0000	4.169.601,1527
Q ₂₃	0,0000	330.914,2238
Q _{kondensasi}	7.531.305,9793	0,0000
Q _{refrigerant in}	-3.373.043,0570	0,0000
Q _{out}	0,0000	4.506.086,5272

Total	9.006.601,9037	9.006.601,9037
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5.11 Heater (H-04)

Tabel 5. 11 Neraca Panas *Heater* - 04

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q ₁₉	-205.386,5708	0,0000
Q ₂₀	0,0000	6.943.652,2932
Q _{steam in}	13.992.380,6554	0,0000
Q _{steam out}	0,0000	6.843.341,7913
Total	13.786.994,0846	13.786.994,0846

5.12 Compressor (C-04)

Tabel 5. 12 Neraca Panas *Compressor* - 04

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q ₂₆	280307,5622	0
Q ₇	0,0000	1,98E+06
Q _{Kompresi}	1702337,7859	0
Total	1982645,3481	1982645,3481

5.13 Cooler (CO-01)

Tabel 5. 13 Neraca Panas *Chiller* - 01

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q ₂₄	7856,172845	0
Q ₂₅	0	1446,122339
Q _{refrigerant in}	1072,241867	0
Q _{refrigerant out}	0	7.482,2924

Total	8928,414712	8928,414712
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5.14 *Expander* (EX-02)

Tabel 5. 14 Neraca Panas *Expander* - 02

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q ₁₀	82554,0706	0
Q ₁₁	0,0000	-32790,7298
Q _{ekpansi}	-115344,8004	0
Total	-32790,7298	-32790,7298

5.15 *Cooler* (CO-02)

Tabel 5. 15 Neraca Panas *Cooler* - 02

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q ₂₇	48154,56851	0
Q ₂₈	0	1020,297678
Q _{refrigerant in}	-15.916,4074	0
Q _{refrigerant out}	0	31.217,8635
Total	32238,16115	32238,16115

5.16 *Absorber* (ABS-01)

Tabel 5. 14 Neraca Panas *Absorber* - 01

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q ₁₂	48.259,4089	0,0000
Q _{17d}	0,0000	82.863,6987
Q ₂₂	0,0000	116.825,8076

Q_{reaksi}	0,0000	-16.512.558,0924
$Q_{\text{steam in}}$	13.086.572,5053	0,0000
$Q_{\text{steam out}}$	0,0000	29.447.700,5004
Total	13.134.831,9142	13.134.831,9142

5.17 *Heater (H-05)*

Tabel 5. 17 Neraca Panas *Heater* - 05

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q_{15b}	116.825,8076	0,0000
Q_{15c}	0,0000	194.742,7931
$Q_{\text{steam in}}$	101.286,1790	0,0000
$Q_{\text{steam out}}$	0,0000	23.369,1934
Total	218.111,9865	218.111,9865

5.18 *Stripper (STP-01)*

Tabel 5.18 Neraca Panas *Stripper* - 01

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q_{20}	9.587,3100	0,0000
Q_{21}	0,0000	149.840,9289
Q_{22}	0,0000	25.244,9018
Q_{reaksi}	0,0000	33.122.645,6278
$Q_{\text{steam in}}$	43.182.662,9852	0,0000
$Q_{\text{steam out}}$	0,0000	9.894.518,8368
Total	43.192.250,2952	43.192.250,2952

5.19 Compressor (C-03)

Tabel 5. 19 Neraca Panas *Compressor* - 03

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q_{15e}	25245,44672	0
Q_{15f}	0	42862,25101
$Q_{kompresi}$	17616,80429	0
Total	42862,25101	42862,25101

5.20 Heater (H-03)

Tabel 5.20 Neraca Panas *Heater* - 03

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q_{11}	26.718,6176	0,0000
Q_{12}	0,0000	48.259,4089
$Q_{steam\ in}$	28.001,3969	0,0000
$Q_{steam\ out}$	0,0000	6.460,6056
Total	54.720,0145	54.720,0145

5.21 Expander (Ex-03)

Tabel 5. 21 Neraca Panas *Expander* - 03

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q_{13}	66.891,1900	0
Q_{14}	0	55.772,2643
$Q_{Ekspansi}$	0	11.118,9258
Total	66.891,1900	66.891,19001

5.22 Heater (H-06)

Tabel 5.22 Neraca Panas *Heater* - 06

Komponen	Panas Masuk (kJ)	Panas Keluar (kJ)
Q _{17b}	283.498,0286	0,0000
Q _{17c}	0,0000	3.317.194,1263
Q _{steam in}	3.943.575,1233	0,0000
Q _{steam out}	0,0000	909.879,0256
Total	4.227.073,1519	4.227.073,1519