



PRA RANCANGAN PABRIK

“PABRIK ETILEN GLIKOL DARI ETILEN OKSIDA DAN AIR DENGAN PROSES HIDRASI NON KATALITIK KAPASITAS 100.000 TON/TAHUN”

BAB IV NERACA PANAS

Kapasitas Produksi = 100,000 ton/tahun
= 12,626.2626 kg/jam
Waktu Operasi = 1 tahun = 330 hari
= 1 hari = 24 jam
Basis Perhitungan = 11,170.7483 kg/jam

1. HEATER - 1 (E-112)

Neraca Panas Heater-1 (E-112)	
Aliran Masuk (kkal/jam)	Aliran Keluar (kkal/jam)
$C_2H_4O = \frac{27101.7149}{27101.7149}$	$C_2H_4O = \frac{1102148.2023}{1102148.2023}$
Q Supply = 1131627.8814	Q Loss = 56581.3941
Total = 1158729.5964	Total = 1158729.5964

2. HEATER - 2 (E-122)

Neraca Panas Heater-2 (E-122)	
Aliran Masuk (kkal/jam)	Aliran Keluar (kkal/jam)
$H_2O = \frac{228529.1781}{228529.1781}$	$H_2O = \frac{7658072.0516}{7658072.0516}$
Q Supply = 7820571.4457	Q Loss = 391028.5723
Total = 8049100.6239	Total = 8049100.6239

3. REAKTOR (R-210)

Neraca Panas Reaktor (R-210)	
Aliran Masuk (kkal/jam)	Aliran Keluar (kkal/jam)
$C_2H_4O = 1102148.2023$	$C_2H_4O = 0.0000$
$H_2O = 7658072.0516$	$H_2O = 6968845.5670$
Total = 8760220.2539	$C_2H_6O_2 = 1407652.5322$
	$C_4H_{10}O_3 = 251836.1219$
	$C_6H_{14}O_4 = 14817.9382$
	Total = 8643152.1592
$\Delta H \text{ Reaksi} = 6064060.906$	Q Serap = 6181129.0006
Total = 14824281.1598	Total = 14824281.1598



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4. COOLER - 1 (E-211)

Neraca Panas Cooler-1 (E-211)			
Aliran Masuk (kkal/jam)		Aliran Keluar (kkal/jam)	
C_2H_4O	= 0.0000	C_2H_4O	= 0.0000
H_2O	= 6968845.5670	H_2O	= 4600957.9486
$C_2H_6O_2$	= 1407652.5322	$C_2H_6O_2$	= 923537.1884
$C_4H_{10}O_3$	= 251836.1219	$C_4H_{10}O_3$	= 165416.4395
$C_6H_{14}O_4$	= 14817.9382	$C_6H_{14}O_4$	= 9731.4748
	8643152.1592		5699643.0513
		Q Serap	= 2943509.1079
Total	= 8643152.1592	Total	= 8643152.1592



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5. MULTIPLE EFFECT EVAPORATOR

Neraca Panas Multiple Evaporator			
Aliran Masuk (kkal/jam)		Aliran Keluar (kkal/jam)	
Effect 1 (V-310)			
H ₂ O	= 4601842.2386	H ₂ O	= 2538787.8442
C ₂ H ₆ O ₂	= 923714.6894	C ₂ H ₆ O ₂	= 947072.0335
C ₄ H ₁₀ O ₃	= 165448.2320	C ₄ H ₁₀ O ₃	= 169630.3870
C ₆ H ₁₄ O ₄	= 9733.3451	C ₆ H ₁₄ O ₄	= 9979.3014
	5700738.5052		3665469.5662
Q steam	= 11032904.8440	Uap air	= 12516528.5408
		Q loss	= 551645.2422
Effect 2 (V-320)			
H ₂ O	= 2538787.8442	H ₂ O	= 1047213.6131
C ₂ H ₆ O ₂	= 947072.0335	C ₂ H ₆ O ₂	= 802064.0923
C ₄ H ₁₀ O ₃	= 169630.3870	C ₄ H ₁₀ O ₃	= 143654.9906
C ₆ H ₁₄ O ₄	= 9979.3014	C ₆ H ₁₄ O ₄	= 8451.7955
	3665469.5662		2001384.4915
Q steam	= 10188101.2666	Uap air	= 7446383.3081
		Q loss	= 4405803.0331
Effect 3 (V-330)			
H ₂ O	= 1047213.6131	H ₂ O	= 236776.2184
C ₂ H ₆ O ₂	= 802064.0923	C ₂ H ₆ O ₂	= 614737.6742
C ₄ H ₁₀ O ₃	= 143654.9906	C ₄ H ₁₀ O ₃	= 110073.7348
C ₆ H ₁₄ O ₄	= 8451.7955	C ₆ H ₁₄ O ₄	= 6477.1733
	2001384.4915		968064.8008
Q steam	= 6305524.9953	Uap air	= 4903747.1422
		Q loss	= 2435097.5438
Total	= 38894123.6688	Total	= 38894123.6688



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6. BAROMETRIC CONDENSER (E-334)

Neraca Panas Barometric Condenser (E-334)	
Aliran Masuk (kkal/jam)	Aliran Keluar (kkal/jam)
Uap air = 4903747.1422 dari evaporator	Uap air = 5281.2067 ke steam jet ejector
	Air condensate = 4450359.0251
	Q serap = 202919.5532
	Q loss = 245187.3571
Total = 4903747.1422	Total = 4903747.1422

7. STRIPPER (H-400)

Neraca Panas Stripper (H-400)	
Aliran Masuk (kkal/jam)	Aliran Keluar (kkal/jam)
C ₂ H ₄ O = 0.0000	Menuju Akumulator
H ₂ O = 286256.4077	C ₂ H ₄ O = 0.0000
C ₂ H ₆ O ₂ = 746133.5723	H ₂ O = 529.3577
C ₄ H ₁₀ O ₃ = 133630.3883	C ₂ H ₆ O ₂ = 1392920.9449
C ₆ H ₁₄ O ₄ = 7862.3396	C ₄ H ₁₀ O ₃ = 249215.5960
1173882.7079	C ₆ H ₁₄ O ₄ = 14663.5387
	1657329.4372
	Menuju Reboiler
	C ₂ H ₄ O = 0.0000
	H ₂ O = 79467.7405
	C ₂ H ₆ O ₂ = 203.0526
	C ₄ H ₁₀ O ₃ = 36.3066
	C ₆ H ₁₄ O ₄ = 2.1377
	79709.2375
Q reboiling = 2445031.7285	Q condensation = 1759624.1752
	Q loss = 122251.5864
Total = 3618914.4364	Total = 3618914.4364



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8. MENARA DISTILASI I (D-410)

Neraca Panas Menara Distilasi I (D-410)			
Aliran Masuk (kkal/jam)		Aliran Keluar (kkal/jam)	
C ₂ H ₄ O	= 0.0000	Menuju Tangki Penyimpanan EG	
H ₂ O	= 529.3577	C ₂ H ₄ O	= 0.0000
C ₂ H ₆ O ₂	= 1392920.9130	H ₂ O	= 0.6690
C ₄ H ₁₀ O ₃	= 249215.5904	C ₂ H ₆ O ₂	= 1761.2728
C ₆ H ₁₄ O ₄	= 14663.5383	C ₄ H ₁₀ O ₃	= 314090.1676
	<u>1657329.3994</u>	C ₆ H ₁₄ O ₄	= 18491.9932
			<u>334344.1026</u>
		Menuju Reboiler	
		C ₂ H ₄ O	= 0.0000
		H ₂ O	= 79.4677
		C ₂ H ₆ O ₂	= 202646.7340
		C ₄ H ₁₀ O ₃	= 36.2703
		C ₆ H ₁₄ O ₄	= 2.1356
			<u>202764.6076</u>
Q reboiling	= 796282.8104	Q condensation	= 1876689.3590
		Q loss	= 39814.1405
Total	= 2453612.2098	Total	= 2453612.2098



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9. MENARA DISTILASI II (D-420)

Neraca Panas Menara Distilasi II (D-420)			
Aliran Masuk (kkal/jam)		Aliran Keluar (kkal/jam)	
C ₂ H ₄ O	= 0.0000	Menuju Tangki Penyimpanan DEG	
H ₂ O	= 0.6690	C ₂ H ₄ O	= 0.0000
C ₂ H ₆ O ₂	= 1761.2728	H ₂ O	= 0.0078
C ₄ H ₁₀ O ₃	= 314090.1676	C ₂ H ₆ O ₂	= 20.6068
C ₆ H ₁₄ O ₄	= 18491.9932	C ₄ H ₁₀ O ₃	= 3664.7630
	334344.1026	C ₆ H ₁₄ O ₄	= 21378.2355
			25063.6131
		Menuju Reboiler	
		C ₂ H ₄ O	= 0.0000
		H ₂ O	= 0.0788
		C ₂ H ₆ O ₂	= 200.8211
		C ₄ H ₁₀ O ₃	= 35871.6959
		C ₆ H ₁₄ O ₄	= 21.3342
			36093.9300
Q reboiling	= 688947.4801	Q condensation	= 927686.6656
		Q loss	= 34447.374
Total	= 1023291.5827	Total	= 1023291.5827

10. COOLER - 2 (E-426)

Neraca Panas Cooler-2 (E-426)			
Aliran Masuk (kkal/jam)		Aliran Keluar (kkal/jam)	
C ₂ H ₄ O	= 0.0000	C ₂ H ₄ O	= 0.0000
H ₂ O	= 0.0078	H ₂ O	= 0.0008
C ₂ H ₆ O ₂	= 20.6068	C ₂ H ₆ O ₂	= 2.0285
C ₄ H ₁₀ O ₃	= 3664.7630	C ₄ H ₁₀ O ₃	= 362.3404
C ₆ H ₁₄ O ₄	= 21378.2355	C ₆ H ₁₄ O ₄	= 2112.0891
	25063.6131		2476.4587
		Q Serap	= 22587.1544
Total	= 25063.6131	Total	= 25063.6131