

BAB VI
SPESIFIKASI PERALATAN

6.1.TANKI-01 (T-01)

| IDENTIFIKASI | |
|-----------------------------|---|
| Nama Alat | Tanki Liquid |
| Kode Alat | T – 01 |
| Jumlah | 10 unit |
| Fungsi | Tempat penyimpanan bahan baku Asam Asetat |
| DATA DESIGN | |
| Tipe | Silinder vertikal dengan tutup elipsoidal |
| Kapasitas (m ³) | 517,29 |
| Temperatur (°C) | 30 °C |
| Tekanan (atm) | 1 atm |
| ID (m) | 6,21 m |
| OD (m) | 6,35 m |
| Tinggi (m) | 10,86 m |
| Tebal (m) | 0,07 m |
| Bahan Konstruksi | <i>Stainless Stell 316</i> |

6.2. TANKI-02 (T-02)

| IDENTIFIKASI | |
|-----------------------------|--|
| Nama Alat | Tanki Gas |
| Kode Alat | T – 02 |
| Jumlah | 10 unit |
| Fungsi | Tempat penyimpanan bahan baku Hidrogen |
| DATA DESIGN | |
| Tipe | Spherical Tank |
| Kapasitas (m ³) | 772,14 |
| Temperatur (°C) | 30 |
| Tekanan (Atm) | 10 |
| DATA DESAIN | |
| Diameter (m) | 11,8 |
| Tebal (m) | 0,04 |
| Bahan Konstruksi | <i>Carbon Steel</i> |

6.3. TANKI-03 (T-03)

| IDENTIFIKASI | |
|-----------------------------|---|
| Nama Alat | Tanki Liquid |
| Kode Alat | T – 03 |
| Jumlah | 4unit |
| Fungsi | Tempat penyimpanan produk asetaldehida |
| DATA DESIGN | |
| Tipe | Silinder vertikal dengan tutup elipsoidal |
| Kapasitas (m ³) | 411,03 |
| Temperatur (°C) | 10 |
| Tekanan (Atm) | 1 |
| ID (m) | 5,79 m |
| OD (m) | 5,93 m |
| Tebal (m) | 0,07 |
| Tinggi (m) | 10,14 |
| Bahan Konstruksi | <i>Stainless Stell 316</i> |

6.4. TANKI-04 (T-04)

| IDENTIFIKASI | |
|-----------------------------|--|
| Nama Alat | Tanki Liquid |
| Kode Alat | T – 04 |
| Jumlah | 4 unit |
| Fungsi | Tempat penyimpanan produk samping (aseton, etanol dan air) |
| DATA DESIGN | |
| Tipe | Silinder vertikal dengan tutup elipsoidal |
| Kapasitas (m ³) | 387,39 |
| Temperatur (°C) | 77 |
| Tekanan (Atm) | 1 |
| ID (m) | 5,69 m |
| OD (m) | 5,76 m |
| Tinggi(m) | 9,96 |
| Tebal (m) | 0,035 |
| Bahan Konstruksi | <i>Stainless Stell 316</i> |

6.5. KOMPRESSOR-01 (K-01)

| DATA DESIGN | | |
|---------------------|----------------------------|----------------------|
| Tipe | Centrifugal Compressor | |
| Temperature design | 10 | °C |
| Tekanan design | 6,8 | Atm |
| Kapasitas | 238,81 | ³ ft /min |
| DATA MEKANIK | | |
| Stage 1 : | | |
| Tekanan masuk | 1 | atm |
| Tekanan keluar | 2,61 | atm |
| Temperatur masuk | 10 | °C |
| Temperatur keluar | 13,2 | °C |
| Stage 2 : | | |
| Tekanan masuk | 2,61 | atm |
| Tekanan keluar | 6,8 | atm |
| Temperatur masuk | 13,2 | °C |
| Temperatur keluar | 17,24 | °C |
| Power | 0,7569 | Hp |
| Bahan konstruksi | <i>Stainless Stell 316</i> | |

6.6. POMPA-01 (P-01)

| IDENTIFIKASI | | |
|---|--|-------------------------|
| Nama Alat | Pompa | |
| Kode Alat | P-01 | |
| Fungsi | Mengalirkan larutan Asam asetat dari T-01 menuju MP-01 | |
| Tipe | <i>Centrifugal Pump</i> | |
| Temperatur (° C) | 30 | |
| Densitas (Kg/m ³) | 1.037,73 | |
| Laju Alir Massa (Kg/jam) | 28.631,61 | |
| Viskositas (cp) | 1,045 | |
| Tekanan Uap (mmHg) | 19,198 | |
| Faktor Keamanan (%) | 10 | |
| Kapasitas Pompa (lb/min) | 133,63 | |
| <i>Volumetric Flowrate</i> , (ft ³ /det) | 0,298 | |
| | <i>Suction</i> | <i>Discharge</i> |
| NPS (in) | 3.0000 | 2.5000 |
| SN | 40.0000 | 40.0000 |
| ID (in) | 3.0680 | 2.4690 |
| OD (in) | 3.5000 | 2.8750 |
| L (m) | 3.0000 | 5.0000 |
| <i>Velocity</i> (ft/det) | 5.8035 | 8.9621 |
| | <i>Suction</i> | <i>Discharge</i> |
| <i>Total Friction Loss</i> (ft.lbf/lb) | 1.5527 | 0.3917 |
| Tekanan Operasi (psi) | 14,696 | 44,08 |
| NPSH (ft) | 55,92 | |
| <i>Required Motor Driver</i> (Hp) | 5 | |
| Jumlah | 1 | |
| Bahan | <i>Stainles Steel 316</i> | |

6.7. POMPA-02 (P-02)

| IDENTIFIKASI | | |
|--|---|-------------------------|
| Nama Alat | Pompa | |
| Kode Alat | P-01 | |
| Fungsi | Mengalirkan larutan dari MP-01 menuju EV-01 | |
| Tipe | <i>Centrifugal Pump</i> | |
| Temperatur (° C) | 84,5 | |
| Densitas (Kg/m ³) | 978,29 | |
| Laju Alir Massa (Kg/jam) | 28.631,61 | |
| Viskositas (cp) | 0,52 | |
| Tekanan Uap (mmHg) | 238,72 | |
| Faktor Keamanan (%) | 10 | |
| Kapasitas Pompa (lb/min) | 141,76 | |
| <i>Volumetric Flowrate, (ft³/det)</i> | 0,316 | |
| | <i>Suction</i> | <i>Discharge</i> |
| NPS (in) | 3.0000 | 2.5000 |
| SN | 40.0000 | 40.0000 |
| ID (in) | 3.0680 | 2.4690 |
| OD (in) | 3.5000 | 2.8750 |
| L (m) | 3.0000 | 6.0000 |
| <i>Velocity (ft/det)</i> | 6.1567 | 9.5075 |

| | <i>Suction</i> | <i>Discharge</i> |
|--|---------------------------|-------------------------|
| <i>Total Friction Loss (ft.lbf/lb)</i> | 1.6765 | 3.4099 |
| Tekanan Operasi (psi) | 44,08 | 58,05 |
| NPSH (ft) | 97,95 | |
| <i>Required Motor Driver (Hp)</i> | 5 | |
| Jumlah | 1 | |
| Bahan | <i>Stainles Steel 316</i> | |

6.8. POMPA-03 (P-03)

| IDENTIFIKASI | | |
|--|--|-------------------------|
| Nama Alat | Pompa | |
| Kode Alat | P-03 | |
| Fungsi | Mengalirkan larutan dari KOD-01 menuju KD-01 | |
| Tipe | <i>Centrifugal Pump</i> | |
| Temperatur (° C) | 10 | |
| Densitas (Kg/m ³) | 411,36 | |
| Laju Alir Massa (Kg/jam) | 28.655,72 | |
| Viskositas (cp) | 1,13 | |
| Tekanan Uap (mmHg) | 6,9 | |
| Faktor Keamanan (%) | 10 | |
| Kapasitas Pompa (lb/min) | 337,4 | |
| <i>Volumetric Flowrate, (ft³/det)</i> | 0,7 | |
| | <i>Suction</i> | <i>Discharge</i> |
| NPS (in) | 4.0000 | 3.0000 |
| SN | 40.0000 | 40.0000 |
| ID (in) | 4.3340 | 3.0680 |
| OD (in) | 4.5000 | 3.5000 |
| L (m) | 5.0000 | 5.0000 |
| <i>Velocity (ft/det)</i> | 7.3371 | 14.6528 |

| | <i>Suction</i> | <i>Discharge</i> |
|--|---------------------------|-------------------------|
| <i>Total Friction Loss (ft.lbf/lb)</i> | 1.5679 | 11.3865 |
| Tekanan Operasi (psi) | 14,696 | 16,2 |
| NPSH (ft) | 70,254 | |
| <i>Required Motor Driver (Hp)</i> | 3 | |
| Jumlah | 1 | |
| Bahan | <i>Stainles Steel 316</i> | |

6.9. Pompa-04 (P-04)

| IDENTIFIKASI | | |
|--|--|-------------------------|
| Nama Alat | Pompa | |
| Kode Alat | P-04 | |
| Fungsi | Mengalirkan larutan dari ACC-01 menuju KD-01 | |
| Tipe | <i>Centrifugal Pump</i> | |
| Temperatur (° C) | 10 | |
| Densitas (Kg/m ³) | 411,36 | |
| Laju Alir Massa (Kg/jam) | 15.980 | |
| Viskositas (cp) | 1,13 | |
| Tekanan Uap (mmHg) | 6,9 | |
| Faktor Keamanan (%) | 10 | |
| Kapasitas Pompa (lb/min) | 188,14 | |
| <i>Volumetric Flowrate, (ft³/det)</i> | 0,42 | |
| | <i>Suction</i> | <i>Discharge</i> |
| NPS (in) | 2.5000 | 2.0000 |
| SN | 40.0000 | 40.0000 |
| ID (in) | 2.4690 | 2.0670 |
| OD (in) | 2.8750 | 2.3750 |
| L (m) | 2.0000 | 3.0000 |
| <i>Velocity (ft/det)</i> | 7.3371 | 14.6528 |

| | <i>Suction</i> | <i>Discharge</i> |
|--|---------------------------|-------------------------|
| <i>Total Friction Loss (ft.lbf/lb)</i> | 28.0168 | 47.2435 |
| Tekanan Operasi (psi) | 1,2 | 1,3 |
| NPSH (ft) | 47,1 | |
| <i>Required Motor Driver (Hp)</i> | 3 | |
| Jumlah | 1 | |
| Bahan | <i>Stainles Steel 316</i> | |

6.10. POMPA-05 (P-05)

| IDENTIFIKASI | | |
|--|---|-------------------------|
| Nama Alat | Pompa | |
| Kode Alat | P-05 | |
| Fungsi | Mengalirkan larutan dari KD-01 menuju KD-02 | |
| Tipe | <i>Centrifugal Pump</i> | |
| Temperatur (° C) | 79 | |
| Densitas (Kg/m ³) | 417,43 | |
| Laju Alir Massa (Kg/jam) | 15.736,5 | |
| Viskositas (cp) | 0,551 | |
| Tekanan Uap (mmHg) | 194,7 | |
| Faktor Keamanan (%) | 10 | |
| Kapasitas Pompa (lb/min) | 182,58 | |
| <i>Volumetric Flowrate, (ft³/det)</i> | 0,41 | |
| | <i>Suction</i> | <i>Discharge</i> |
| NPS (in) | 4.0000 | 3.0000 |
| SN | 40.0000 | 40.0000 |
| ID (in) | 4.3340 | 3.0680 |
| OD (in) | 4.5000 | 3.5000 |
| L (m) | 5.0000 | 5.0000 |
| <i>Velocity (ft/det)</i> | 4,6 | 2,014 |

| | <i>Suction</i> | <i>Discharge</i> |
|--|---------------------------|-------------------------|
| <i>Total Friction Loss (ft.lbf/lb)</i> | 0.9813 | 2.0139 |
| Tekanan Operasi (psi) | 4,9 | 42,03 |
| NPSH (ft) | 21,42 | |
| <i>Required Motor Driver (Hp)</i> | 7 | |
| Jumlah | 1 | |
| Bahan | <i>Stainles Steel 316</i> | |

6.11. POMPA-06 (P-06)

| IDENTIFIKASI | | |
|--|---|-------------------------|
| Nama Alat | Pompa | |
| Kode Alat | P-06 | |
| Fungsi | Mengalirkan larutan dari KD-01 menuju KD-02 | |
| Tipe | <i>Centrifugal Pump</i> | |
| Temperatur (° C) | 10 | |
| Densitas (Kg/m ³) | 334,5 | |
| Laju Alir Massa (Kg/jam) | 22.924,5 | |
| Viskositas (cp) | 0,25 | |
| Tekanan Uap (mmHg) | 0,0044 | |
| Faktor Keamanan (%) | 10 | |
| Kapasitas Pompa (lb/min) | 331,92 | |
| <i>Volumetric Flowrate, (ft³/det)</i> | 0,74 | |
| | <i>Suction</i> | <i>Discharge</i> |
| NPS (in) | 4.0000 | 3.0000 |
| SN | 40.0000 | 40.0000 |
| ID (in) | 4.3340 | 3.0680 |
| OD (in) | 4.5000 | 3.5000 |
| L (m) | 3.0000 | 3.0000 |
| <i>Velocity (ft/det)</i> | 8,4 | 14,42 |

| | <i>Suction</i> | <i>Discharge</i> |
|--|---------------------------|-------------------------|
| <i>Total Friction Loss (ft.lbf/lb)</i> | 0.9813 | 2.0139 |
| Tekanan Operasi (psi) | 1,2 | 14,7 |
| NPSH (ft) | 16,03 | |
| <i>Required Motor Driver (Hp)</i> | 5 | |
| Jumlah | 1 | |
| Bahan | <i>Stainles Steel 316</i> | |

6.12. POMPA-07 (P-07)

| IDENTIFIKASI | | |
|--|--|-------------------------|
| Nama Alat | Pompa | |
| Kode Alat | P-07 | |
| Fungsi | Mengalirkan larutan dari ACC-02 menuju KD-02 | |
| Tipe | <i>Centrifugal Pump</i> | |
| Temperatur (° C) | 77 | |
| Densitas (Kg/m ³) | 407,4 | |
| Laju Alir Massa (Kg/jam) | 15.906,52 | |
| Viskositas (cp) | 0,199 | |
| Tekanan Uap (mmHg) | 826,11 | |
| Faktor Keamanan (%) | 10 | |
| Kapasitas Pompa (lb/min) | 189,11 | |
| <i>Volumetric Flowrate, (ft³/det)</i> | 0,42 | |
| | <i>Suction</i> | <i>Discharge</i> |
| NPS (in) | 3.0000 | 2.5000 |
| SN | 40.0000 | 40.0000 |
| ID (in) | 3.0680 | 2.4690 |
| OD (in) | 3.5000 | 2.8750 |
| L (m) | 2.0000 | 2.0000 |
| <i>Velocity (ft/det)</i> | 8.2130 | 12.6830 |
| | <i>Suction</i> | <i>Discharge</i> |
| <i>Total Friction Loss (ft.lbf/lb)</i> | 1,52 | 1,103 |
| Tekanan Operasi (psi) | 1,2 | 14,7 |
| NPSH (ft) | 57,84 | |
| <i>Required Motor Driver (Hp)</i> | 1 | |
| Jumlah | 1 | |
| Bahan | <i>Stainles Steel 316</i> | |

6.13. POMPA-08 (P-08)

| IDENTIFIKASI | | |
|--|--|-------------------------|
| Nama Alat | Pompa | |
| Kode Alat | P-08 | |
| Fungsi | Mengalirkan Pelarut dari Utilitas menuju AB-01 | |
| Tipe | <i>Centrifugal Pump</i> | |
| Temperatur (° C) | 30 | |
| Densitas (Kg/m ³) | 455,74 | |
| Laju Alir Massa (Kg/jam) | 13.497,12 | |
| Viskositas (cp) | 1,33 | |
| Tekanan Uap (mmHg) | 115,6 | |
| Faktor Keamanan (%) | 10 | |
| Kapasitas Pompa (lb/min) | 143,43 | |
| <i>Volumetric Flowrate, (ft³/det)</i> | 0,32 | |
| | <i>Suction</i> | <i>Discharge</i> |
| NPS (in) | 2.5000 | 2.0000 |
| SN | 40.0000 | 40.0000 |
| ID (in) | 2.4690 | 2.0670 |
| OD (in) | 2.8750 | 2.3750 |
| L (m) | 3.0000 | 8.0000 |
| <i>Velocity (ft/det)</i> | 9.6198 | 13.7154 |
| | <i>Suction</i> | <i>Discharge</i> |
| <i>Total Friction Loss (ft.lbf/lb)</i> | 6.5819 | 6.9672 |
| Tekanan Operasi (psi) | 14,7 | 99,9 |
| NPSH (ft) | 57,84 | |
| <i>Required Motor Driver (Hp)</i> | 12 | |
| Jumlah | 1 | |
| Bahan | <i>Carbon Steel</i> | |

6.14. POMPA-09 (P-09)

| IDENTIFIKASI | | |
|---|--------------------------------------|-------------------------|
| Nama Alat | Pompa | |
| Kode Alat | P-09 | |
| Fungsi | Mengalirkan Asam asetat menuju MP-01 | |
| Tipe | <i>Centrifugal Pump</i> | |
| Temperatur (°C) | 127 | |
| Densitas (Kg/m ³) | 401,2 | |
| Laju Alir Massa (Kg/jam) | 15.736,5 | |
| Viskositas (cp) | 0,334 | |
| Tekanan Uap (mmHg) | 972,6 | |
| Faktor Keamanan (%) | 10 | |
| Kapasitas Pompa (lb/min) | 189,99 | |
| <i>Volumetric Flowrate</i> , (ft ³ /det) | 0,423 | |
| | <i>Suction</i> | <i>Discharge</i> |
| NPS (in) | 4.0000 | 3.0000 |
| SN | 40.0000 | 40.0000 |
| ID (in) | 3.1700 | 3.0680 |
| OD (in) | 4.5000 | 3.5000 |
| L (m) | 5.0000 | 10.0000 |
| <i>Velocity</i> (ft/det) | 4.7884 | 8.2514 |
| | <i>Suction</i> | <i>Discharge</i> |
| <i>Total Friction Loss</i> (ft.lbf/lb) | 1,3 | 8,3 |
| Tekanan Operasi (psi) | 41,2 | 44,1 |
| NPSH (ft) | 137,1 | |
| <i>Required Motor Driver</i> (Hp) | 5 | |
| Jumlah | 1 | |
| Bahan | <i>Stainles Steel 316</i> | |

6.15. REAKTOR-01 (R-01)

| IDENTIFIKASI | |
|--------------------------|--|
| Nama Alat | Reaktor |
| Kode Alat | R-01 |
| Jumlah | 1 Unit |
| Operasi | <i>Continue</i> |
| Fungsi | Tempat terjadinya reaksi antara Asam asetat) dengan Hidrogen membentuk asetaldehid dan produksamping |
| DATA DESAIN | |
| Tipe | <i>Multitubular Fixed Bed Reaktor</i> |
| Temperatur (° C) | 315 |
| Tekanan (atm) | 3,95 |
| Diameter (m) | 6,02 |
| Volume (m ³) | 43 |
| Tinggi (m) | 11 |
| Tebal Dinding (m) | 0,0624 |
| Tebal Jacket (m) | 0,0622 |
| Katalis | Palladium,Mollybdenum,silicon oksida |
| Diameter Katalis (m) | 0,00085 |
| Bahan Konstruksi | Stainlles steel 316 |

6.16. HEAT EXCHANGER-01 (HE-01)

| IDENTIFIKASI | |
|---------------------|--|
| Nama Alat | Heat Exchanger-01 |
| Jumlah | 1 buah |
| Operasi | Kontinyu |
| Fungsi | Memanaskan aliran dari MP-03 sebelum masuk R-01 dan mendinginkan fluida panas dari R-01 menuju CO-01 |

| DATA DESIGN | |
|--|--------------------------------------|
| Type | <i>Shell and Tube Heat Exchanger</i> |
| Bahan Konstruksi | Stainlees steel 316 |
| Rd Calculated (BTU/jam ft ² °F) | 0,003 |
| U _c (BTU/jam ft ² °F) | 622,9 |
| U _D (BTU/jam ft ² °F) | 496,1 |
| H _o (BTU/jam ft ² °F) | 936,9 |
| H _{io} (BTU/jam ft ² °F) | 1.858,4 |
| ΔPs (Psi) | 1,8615 |
| P _T (Psi) | 1,182 |

6.17. REBOILER-01 (RB-01)

| IDENTIFIKASI | |
|---------------------|---|
| Nama Alat | Reboiler-01 |
| Jumlah | 1 buah |
| Operasi | Kontinyu |
| Fungsi | Tempat memanaskan kembali komponen pada KD-01 |

| DATA DESIGN | |
|--|-----------------------------------|
| Tipe | <i>Double pipe Heat Exchanger</i> |
| Bahan Konstruksi | Stainlees steel 316 |
| Rd Calculated (BTU/jam ft ² °F) | 0,0095 |
| Uc (BTU/jam ft ² °F) | 13,47 |
| UD (BTU/jam ft ² °F) | 11,94 |
| Ho (BTU/jam ft ² °F) | 21,8 |
| Hio (BTU/jam ft ² °F) | 35,38 |
| ΔPs (Psi) | 0,37 |
| PT (Psi) | 0,21 |

6.18. REBOILER-02 (RB-02)

| IDENTIFIKASI | |
|---------------------|---|
| Nama Alat | Reboiler-02 |
| Jumlah | 1 buah |
| Operasi | Kontinyu |
| Fungsi | Tempat memanaskan kembali komponen pada KD-02 |

| DATA DESIGN | |
|---|-----------------------------------|
| Tipe | <i>Double pipe Heat Exchanger</i> |
| Bahan Konstruksi | Stainlees steel 316 |
| Rd Calculated (BTU/jam ft ² °F) | 0,003 |
| Uc (BTU/jam ft ² °F) | 29,28 |
| U _D (BTU/jam ft ² °F) | 26,92 |
| Ho (BTU/jam ft ² °F) | 166 |
| Hio (BTU/jam ft ² °F) | 35,5 |
| ΔPs (Psi) | 1,7 |
| P _T (Psi) | 3,7 |

6.19. EVAPORATOR-01 (RB-01)

| IDENTIFIKASI | |
|---------------------|---|
| Nama Alat | Evaporator-01 |
| Jumlah | 1 buah |
| Operasi | Kontinyu |
| Fungsi | Untuk mengubah asam asetat menjadi fase uap |

| DATA DESIGN | |
|--|--------------------------------------|
| Tipe | <i>Shell and Tube Heat Exchanger</i> |
| Bahan Konstruksi | Stainlees steel 316 |
| Rd Calculated (BTU/jam ft ² °F) | 0,003 |
| U _c (BTU/jam ft ² °F) | 54,33 |
| U _D (BTU/jam ft ² °F) | 48,02 |
| H _o (BTU/jam ft ² °F) | 198,06 |
| H _{io} (BTU/jam ft ² °F) | 74,87 |
| ΔP _s (Psi) | 0,52 |
| P _T (Psi) | 0,82 |

6.20. HEATER-01 (H-01)

| IDENTIFIKASI | |
|---|--|
| NamaAlat | Heater-01 |
| Jumlah | 1 buah |
| Operasi | Kontinyu |
| Fungsi | Menaikan temperature output MP-02 sebelum masuk ke MP-03 |
| DATA DESIGN | |
| Tipe | <i>Shell and Tube Heat Exchanger</i> |
| BahanKonstruksi | Carbon steel |
| Rd Calculated (BTU/jam ft ² °F) | 0,012 |
| Uc (BTU/jam ft ² °F) | 150,65 |
| U _D (BTU/jam ft ² °F) | 49,86 |
| Ho (BTU/jam ft ² °F) | 246,3918 |
| Hio (BTU/jam ft ² °F) | 387,69 |
| ΔPs (Psi) | 2,92 |
| P _T (Psi) | 1,49 |

6.21. HEATER-02 (H-02)

| IDENTIFIKASI | |
|---|---|
| NamaAlat | Heater-02 |
| Jumlah | 1 buah |
| Operasi | Kontinyu |
| Fungsi | Menaikan temperature output HE-01 sebelum masuk ke R-01 |
| DATA DESIGN | |
| Tipe | <i>Shell and Tube Heat Exchanger</i> |
| BahanKonstruksi | Stainlees steel 316 |
| Rd Calculated (BTU/jam ft ² °F) | 0,003 |
| Uc (BTU/jam ft ² °F) | 141,65 |
| U _D (BTU/jam ft ² °F) | 99,07 |
| Ho (BTU/jam ft ² °F) | 821,31 |
| Hio (BTU/jam ft ² °F) | 171,69 |
| ΔPs (Psi) | 3,18 |
| P _T (Psi) | 0,823 |

6.5. Heater-03 (H-03)

| IDENTIFIKASI | |
|---|---|
| NamaAlat | Heater-03 |
| Jumlah | 1 buah |
| Operasi | Kontinyu |
| Fungsi | Menaikan temperature output KOD-01 sebelum masuk ke KD-01 |
| DATA DESIGN | |
| Tipe | <i>Double Pipe Heat Exchanger</i> |
| BahanKonstruksi | Stainlees steel 316 |
| Rd Calculated (BTU/jam ft ² °F) | 0,0030 |
| Uc (BTU/jam ft ² °F) | 28,43 |
| U _D (BTU/jam ft ² °F) | 26,19 |
| Ho (BTU/jam ft ² °F) | 54,05 |
| Hio (BTU/jam ft ² °F) | 166,04 |
| ΔPs (Psi) | 6,17 |
| P _T (Psi) | 0,39 |

6.22. HEATER-04 (H-04)

| IDENTIFIKASI | |
|---|--|
| NamaAlat | Heater-04 |
| Jumlah | 1 buah |
| Operasi | Kontinyu |
| Fungsi | Menaikan temperature output RB-01 sebelum masuk ke KD-02 |
| DATA DESIGN | |
| Tipe | <i>Double Pipe Heat Exchanger</i> |
| BahanKonstruksi | Stainless Steel 316 |
| Rd Calculated (BTU/jam ft ² °F) | 0,0030 |
| Uc (BTU/jam ft ² °F) | 16,304 |
| U _D (BTU/jam ft ² °F) | 15,44 |
| Ho (BTU/jam ft ² °F) | 22,4 |
| Hio (BTU/jam ft ² °F) | 59,89 |
| ΔPs (Psi) | 1,99 |
| P _T (Psi) | 0,1 |

6.23. HEATER-05 (H-05)

| IDENTIFIKASI | |
|---|--|
| NamaAlat | Heater-05 |
| Jumlah | 1 buah |
| Operasi | Kontinyu |
| Fungsi | Menaikan temperature output AB-01 sebelum masuk ke FD-01 |
| DATA DESIGN | |
| Tipe | <i>Shell and Tube Heat Exchanger</i> |
| BahanKonstruksi | Carbon steel |
| Rd Calculated (BTU/jam ft ² °F) | 0,004 |
| Uc (BTU/jam ft ² °F) | 55,79 |
| U _D (BTU/jam ft ² °F) | 45,57 |
| Ho (BTU/jam ft ² °F) | 31,12 |
| Hio (BTU/jam ft ² °F) | 5,76 |
| ΔPs (Psi) | 3,66 |
| P _T (Psi) | 1,09 |

6.24. ACCUMULATOR-01 (ACC-01)

| IDENTIFIKASI | |
|-----------------------------|---|
| Nama Alat | Accumulator-01 |
| Kode Alat | ACC-01 |
| Jumlah | 1 buah |
| Fungsi | Menampung larutan keluaran CD-01 dan mengalirkan sebagian produk menuju KD-01 |
| DATA DESAIN | |
| Tipe | Silinder vertikal dengan tutup ellipsoidal |
| Kapasitas (m ³) | 1,85 |
| Temperatur (°C) | 10 |
| Tekanan (Bar) | 1 |
| Diameter (m) | 0,181 |
| Panjang (m) | 4,488 |
| Tebal (m) | 0,0362 |
| Waktu Tinggal (menit) | 6 menit |
| Bahan konstruksi | <i>Stainlees steel 316</i> |

6.25. ACCUMULATOR-02 (ACC-02)

| IDENTIFIKASI | |
|-----------------------------|--|
| Nama Alat | Accumulator-02 |
| Kode Alat | ACC-02 |
| Jumlah | 1 buah |
| Fungsi | Tempat menampung sementara kondensat produk dari CD-02 |
| DATA DESAIN | |
| Tipe | Silinder Vertikal dengan Tutup Ellipsoidal |
| Kapasitas (m ³) | 5,599 |
| Temperatur (°C) | 77 |
| Tekanan (Bar) | 1 |
| Diameter (m) | 0,55 |
| Panjang (m) | 2,47 |
| Tebal (m) | 0,0324 |
| Waktu Tinggal (menit) | 6 menit |
| Bahan konstruksi | Stainlees steel 316 |

6.26. ABSORBER-01 (AB-01)

| IDENTIFIKASI | |
|---------------------|---|
| Nama Alat | Absorber-01 |
| Kode Alat | AB-01 |
| Jumlah | 1 buah |
| Operasi | Continue |
| Fungsi | Untuk menyerap senyawa non-condensable gas menggunakan H ₂ O |
| DATA DESAIN | |
| Tipe | Packed Tower |
| Tekanan (atm) | 6,8 |
| Temperature (°C) | 4 |
| Diameter kolom (m) | 1,1179 |
| Tinggi Absorber (m) | 5,82 |
| Tebal Dinding (m) | 0,0052 |
| Packing : | |
| Jenis Packing | Ceramic Rasching Rings |
| Nominal size (mm) | 38 (1,5 in) |
| Bahan konstruksi | <i>Carbon Steel</i> |

6.27. KOLOM DISTILASI (KD-01)

| IDENTIFIKASI | | |
|--|----------------------------|---------------|
| Nama Alat | Kolom Destilasi | |
| Alat Kode | KD-01 | |
| Jenis | <i>Sieve Tray Column</i> | |
| Jumlah | 1 buah | |
| Operasi | Kontinyu | |
| Fungsi | Memisahkan asetaldehid | |
| DATA DESAIN | | |
| | <i>Top</i> | <i>Bottom</i> |
| Tekanan (atm) | $4,8 \times 10^{-0}$ | 0,034 |
| Temperatur (° C) | 21 | 79 |
| KOLOM | | |
| | <i>Top</i> | <i>Bottom</i> |
| Diameter (m) | 4,9689 | 8,2495 |
| <i>Tray spacing</i> (m) | 0,4500 | 0,6000 |
| Jumlah <i>tray</i> (buah) | 4 | 18 |
| Tebal Silinder (m) | 0,0103 | 0,0106 |
| Material | <i>Stainlees steel 316</i> | |
| PLATE | | |
| | <i>Top</i> | <i>Bottom</i> |
| <i>Downcomer area</i> (m ²) | 2,3258 | 6,4108 |
| <i>Active area</i> (m ²) | 17,0561 | 47,0123 |
| <i>Hole Diameter</i> (mm) | 6,0000 | 5,0000 |
| <i>Hole area</i> (m ²) | 1,7056 | 4,7012 |
| Tinggi <i>weir</i> (mm) | 50,0000 | 50,0000 |
| Panjang <i>weir</i> (m) | 3,826 | 6,434 |
| <i>Plate thickness</i> (mm) | 5,0000 | 5,0000 |
| <i>Pressure drop per tray</i> (mmH ₂ O) | 89,954 | 84,623 |
| Tipe aliran cairan | Single pass | Single pass |
| Desain % <i>flooding</i> (%) | 85 | 85 |
| Jumlah <i>hole</i> (buah) | 60.355 | 166.357 |

6.28. KOLOM DISTILASI (KD-02)

| IDENTIFIKASI | | |
|--|--|---------------|
| Nama Alat | Kolom Destilasi | |
| Alat Kode | KD-02 | |
| Jenis | <i>Sieve Tray Column</i> | |
| Jumlah | 1 buah | |
| Operasi | Kontinyu | |
| Fungsi | Memisahkan asam asetat dari produk samping | |
| DATA DESAIN | | |
| | <i>Top</i> | <i>Bottom</i> |
| Tekanan (atm) | 1 | 2,9 |
| Temperatur (°C) | 97,5 | 157 |
| KOLOM | | |
| | <i>Top</i> | <i>Bottom</i> |
| Diameter (m) | 7,6781 | 11,4040 |
| <i>Tray spacing</i> (m) | 0,9000 | 0,9000 |
| Jumlah <i>tray</i> (buah) | 3 | 3 |
| Tebal Silinder (m) | 0,0103 | 0,0110 |
| Material | Stainless Steel 316 | |
| PLATE | | |
| | <i>Top</i> | <i>Bottom</i> |
| <i>Downcomer area</i> (m ²) | 5,5534 | 12,2508 |
| <i>Active area</i> (m ²) | 40,7248 | 89,8389 |
| <i>Hole Diameter</i> (mm) | 6,0000 | 6,0000 |
| <i>Hole area</i> (m ²) | 4,0725 | 8,9839 |
| Tinggi <i>weir</i> (mm) | 50,0000 | 50,0000 |
| Panjang <i>weir</i> (m) | 5,9889 | 8,8951 |
| <i>Plate thickness</i> (mm) | 3,0000 | 3,0000 |
| <i>Pressure drop per tray</i> (mmH ₂ O) | 97,319 | 91,895 |
| Tipe aliran cairan | Single pass | Single pass |
| Desain % <i>flooding</i> (%) | 85 | 85 |
| Jumlah <i>hole</i> (buah) | 141.108 | 317.902 |

6.29. COOLER-01 (C-01)

| IDENTIFIKASI | | | |
|---------------------|--|---------------------|----------------------------|
| Nama Alat | Cooler-01 | | |
| Jumlah | 1 buah | | |
| Operasi | Kontinyu | | |
| Fungsi | Menurunkan suhu Produk dari HE-01 menuju CO-02 | | |
| DATA DESIGN | | | |
| Tipe | Shell and Tube Heat Exchanger | | |
| Bahan Konstruksi | stinles steel 316 | | |
| Rd Calculated | 0,0032 | | |
| U _C | 145,8000 | | |
| U _D | 101,11 | | |
| Tube Side | | Shell Side | |
| Jumlah | 256 | ID | 25 in |
| Panjang | 12 ft | <i>Baffle space</i> | 12,5 in |
| OD, ID | 1 in | <i>Pass</i> | 4 |
| BWG | 18 | ΔP | 0,2732 psi |
| <i>Pitch</i> | 1 ¼ in <i>triangular pitch</i> | a" | 0,2618 ft ² /ft |
| <i>Pass</i> | 4 | | |
| ΔP | 0,4172 psi | ΔP | 2,89 psi |

6.30. COOLER-02 (C-02)

| IDENTIFIKASI | | | |
|---------------------|--|---------------------|----------------------------|
| Nama Alat | Cooler-02 | | |
| Jumlah | 1 buah | | |
| Operasi | Kontinyu | | |
| Fungsi | Menurunkan suhu Produk dari CO-01 menuju PC-01 | | |
| DATA DESIGN | | | |
| Tipe | Shell and Tube Heat Exchanger | | |
| Bahan Konstruksi | <i>stainless steel 316</i> | | |
| Rd Calculated | 0,003 | | |
| U _c | 321,33 | | |
| U _D | 199,5 | | |
| Tube Side | | Shell Side | |
| Jumlah | 206 | ID | 33 in |
| Panjang | 12 ft | <i>Baffle space</i> | 16,5 in |
| OD, ID | 1,5 in | <i>Pass</i> | 2 |
| BWG | 18 | ΔP | 0,9261 psi |
| <i>Pitch</i> | 1,8750 in <i>triangular pitch</i> | a" | 0,3925 ft ² /ft |
| <i>Pass</i> | 2 | | |
| ΔP | 0,2034 psi | ΔP | 6,03 psi |

6.31. COOLER-03 (C-03)

| IDENTIFIKASI | | | |
|---------------------|--|-----|----------------------------|
| Nama Alat | Cooler-03 | | |
| Jumlah | 1 buah | | |
| Operasi | Kontinyu | | |
| Fungsi | Untuk menurunkan temperature dari 157 sampai 127 | | |
| DATA DESIGN | | | |
| Tipe | Double Pipe Heat Exchanger | | |
| Bahan Konstruksi | stainlees steel 316 | | |
| Rd Calculated | 0,003 | | |
| U _c | 12,7671 | | |
| U _D | 12,2962 | | |
| | Annulus | | Inner |
| IPS | 10 in | IPS | 6 in |
| SN | 40 | SN | 40 |
| OD | 10,75 in | OD | 6,6250 in |
| ID | 10,02 in | ID | 6,6250 in |
| a'' | 2,8140 ft ² /ft | a'' | 1,7340 ft ² /ft |
| ΔP | 2,7124 psi | ΔP | 0,4760 psi |

6.32. CHILLER-01 (C-01)

| IDENTIFIKASI | | | |
|---------------------|----------------------------|-----|---------------------------|
| Nama Alat | Chiller-01 | | |
| Jumlah | 1 buah | | |
| Operasi | Kontinyu | | |
| Fungsi | Untuk mendinginkan pelarut | | |
| DATA DESIGN | | | |
| Tipe | Double Pipe Heat Exchanger | | |
| Bahan Konstruksi | Stainless Steel 316 | | |
| Rd Calculated | 0,003 | | |
| U _C | 88,6460 | | |
| U _D | 72,297 | | |
| | Annulus | | Inner |
| IPS | 8 in | IPS | 6 in |
| SN | 40 | SN | 40 |
| OD | 8,6250 in | OD | 6,6250 in |
| ID | 7,9810 in | ID | 6,6250 in |
| a'' | 2,258 ft ² /ft | a'' | 1,734 ft ² /ft |
| ΔP | 0,891 psi | ΔP | 0,0023 psi |

6.33. CHILLER-02 (C-02)

| IDENTIFIKASI | | | |
|---------------------|----------------------------|-----|---------------------------|
| Nama Alat | Chiller-02 | | |
| Jumlah | 1 buah | | |
| Operasi | Kontinyu | | |
| Fungsi | Untuk mendinginkan pelarut | | |
| DATA DESIGN | | | |
| Tipe | Double Pipe Heat Exchanger | | |
| Bahan Konstruksi | Stainless Steel 316 | | |
| Rd Calculated | 0,003 | | |
| U _c | 63,6259 | | |
| U _D | 56,4434 | | |
| | Annulus | | Inner |
| IPS | 8 in | IPS | 6 in |
| SN | 40 | SN | 40 |
| OD | 8,6250 in | OD | 6,6250 in |
| ID | 7,9810 in | ID | 6,6250 in |
| a'' | 2,358 ft ² /ft | a'' | 1,734 ft ² /ft |
| ΔP | 1,9586 psi | ΔP | 0,0038 psi |

6.34. CONDENSOR (CD-01)

| IDENTIFIKASI | |
|---|--|
| Nama Alat | Condensor-01 |
| Jumlah | 1 buah |
| Operasi | Kontinyu |
| Fungsi | Untuk menguapkan kembali produk bottom KD-01 |
| DATA DESIGN | |
| Tipe | <i>Double Pipe Heat Exchanger</i> |
| Bahan Konstruksi | Stainless Steel 316 |
| Rd Calculated (BTU/jam ft ² °F) | 0,0030 |
| Uc (BTU/jam ft ² °F) | 2,06 |
| U _D (BTU/jam ft ² °F) | 2,04 |
| Ho (BTU/jam ft ² °F) | 2,8 |
| Hio (BTU/jam ft ² °F) | 8,05 |
| ΔPs (Psi) | 0,149 |
| P _T (Psi) | 0,1200 |

6.35. CONDENSOR (CD-02)

| IDENTIFIKASI | |
|---|--|
| Nama Alat | Condensor-02 |
| Jumlah | 1 buah |
| Operasi | Kontinyu |
| Fungsi | Untuk menguapkan kembali produk bottom KD-02 |
| DATA DESIGN | |
| Tipe | <i>Double Pipe Heat Exchanger</i> |
| Bahan Konstruksi | Stainless Steel 316 |
| Rd Calculated (BTU/jam ft ² °F) | 0,0030 |
| Uc (BTU/jam ft ² °F) | 36,0775 |
| U _D (BTU/jam ft ² °F) | 32,5541 |
| Ho (BTU/jam ft ² °F) | 62,59 |
| Hio (BTU/jam ft ² °F) | 76,83 |
| ΔPs (Psi) | 3,32 |
| P _T (Psi) | 0,028 |

6.36. KNOCK OUT DRUM-01 (KOD-01)

| IDENTIFIKASI | |
|---------------------|--|
| Nama Alat | Knock Out Drum |
| Kode Alat | KOD-01 |
| Jumlah | 1 buah |
| Fungsi | Untuk memisahkan fluida gas dan cair setelah PC-01 |
| DATA DESIGN | |
| Tipe | Silinder vertikal dengan tutup elipsoidal |
| Kapasitas | 8,995 m ³ |
| Temperatur | 10 °C |
| Tekanan | 1 atm |
| Diameter dalam | 1,25 m |
| Tinggi | 8,23 m |
| Tebal | 0,004 m |
| Waktu tinggal | 6,01 menit |
| Bahan konstruksi | Stainless Steel 316 |

6.37. FLASH DRUM-01 (FD-01)

| IDENTIFIKASI | |
|---------------------|--|
| Nama Alat | Flash Drum |
| Kode Alat | FD-01 |
| Jumlah | 1 buah |
| Fungsi | Untuk memisahkan fluida gas dan cair setelah AB-01 |
| DATA DESIGN | |
| Tipe | Silinder vertikal dengan tutup elipsoidal |
| Kapasitas | 10,077 m ³ |
| Temperatur | 139 °C |
| Tekanan | 4 atm |
| Diameter dalam | 1,3 m |
| Tinggi | 8,48 m |
| Tebal | 0,004 m |
| Waktu tinggal | 6,79 menit |
| Bahan konstruksi | Carbon Steel |

6.38. PARSIAL CONDENSER-01 (PC-01)

| IDENTIFIKASI | |
|---------------------|--|
| Nama Alat | Partial Condenser |
| Jumlah | 1 buah |
| Operasi | Kontinyu |
| Fungsi | Menurunkan temperatur dan mengkondensasikan condensaable gas |
| DATA DESIGN | |
| Tipe | <i>Shell and Tube Heat Exchanger</i> |
| Bahan Konstruksi | Stainles Steel 316 |
| Rd Calculated | 0,0043 |
| U _C | 669,5 |
| U _D | 249 |
| H _O | 1.425,9 |
| H _{io} | 1.261,89 |
| ΔP _s | 0,99 |
| P _T | 1,86 |

