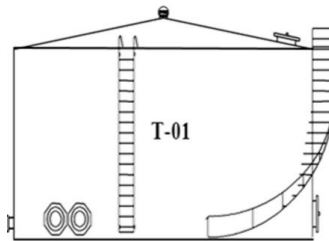


BAB III

SPESIFIKASI ALAT

3.1. Unit Penyimpanan

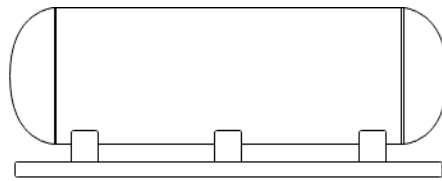
3.1.1. Tangki Aseton



Gambar 3. 1 Tangki Aseton (T-101)

Nama	: Tangki Penyimpanan Aceton
Kode	: T-101
Fungsi	: Menyimpan Aseton selama 10 hari produksi
Kondisi	: - Temperatur = 30°C - Tekanan = 1 atm - Wujud = cair
Tipe	: <i>Flat Bottom Cylindrical Vessel Conical Roof</i>
Jumlah	: 2 buah
Bahan konstruksi	: Carbon Steel SA-283 grade C
Dimensi	: - Diameter = 80 ft - Tinggi = 32 ft - Kapasitas Tangki = 21656,455 - Jumlah Course = 4
Tebal shell course	: Course 1 = Tebal Shell : 0,333; Panjang Shell : 25,089 Course 2 = Tebal Shell : 0,279; Panjang Shell : 25,087 Course 3 = Tebal Shell : 0,226; Panjang Shell : 25,086 Course 4 = Tebal Shell : 0,172; Panjang Shell : 25,084
Tinggi Head Tangki	: 10,243 ft
Tebal head Tangki	: 0,720 ft
Tinggi Total Tangki	: 42,243 ft

3.1.2. Tangki Hidrogen

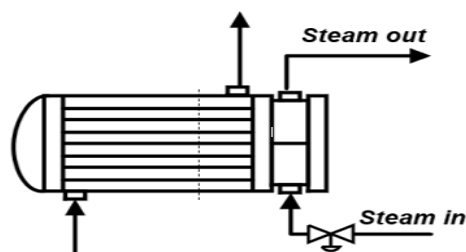


Gambar 3. 2 Tangki hidrogen (T-102)

Nama Alat	= Spesifikasi Tangki Penyimpanan Hidrogen (T-102)
Kode	= T-102
Fungsi	= Menyimpan bahan hidrogen fasa gas 7,89 atm dan 30 °C.
Lama penyimpanan	= 1jam
Bentuk	= <i>Cylindrical (bullet)</i> dengan tutup <i>hemispherical dished head</i>
Bahan	= high alloy steel SA-240 grade S
Temperatur	= 30°C
Tekanan	= 7,89 atm
Jumlah	= 9 buah
Kapasitas	= 56,4728 m ³ /tangki
Panjang tangki	= 42,0877 ft = 12,8283 m
Tinggi/Diameter dalam	= 7,6523 ft = 2,3324 m
Tebal <i>shell</i>	= 0,50 in = 0,0127 m
Tebal tutup samping	= 0,19 in = 0,0048 m

3.2. Unit Penukar Panas

3.2.1. Vaporizer



Gambar 3. 3 Vaporizer

Kode	= V-101
Tipe	= Shell and Tube Heat Exchanger

DIMENSI

SHELL

- $IDs = 23,25 \text{ in}$
- $De = 0,7107 \text{ ft}$
- $a = 0,435 \text{ ft}^2$
- Panjang Pipa = 160 ft

TUBE

- Jumlah tube = 76 buah
- Pitch = 1
- $OD = 0,75 \text{ in}$
- $ID = 0,62 \text{ in}$
- $A = 0,1963 \text{ ft}^2$
- $Rd = 0,001$

PRESSURE DROP

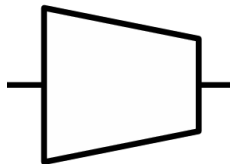
- $\Delta pa \text{ Perhitungan} = 0,00183702 \text{ psi}$
- $\Delta pa \text{ diizinkan} = 10 \text{ psi}$
- $\Delta Pp \text{ perhitungan} = 0,47925 \text{ psi}$
- $\Delta pa \text{ diizinkan} = 10 \text{ psi}$

Jumlah Hairpin = 4

Bahan Konstruksi = Stainless Steel SA-240 Grade 316

3.3. Unit Pemindah

3.3.1. Kompresor Aseton

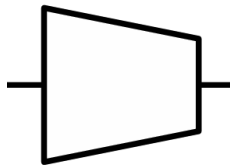


Gambar 3. 4 Kompresor (C-101)

Nama	: Compressor
Kode	: C-101
Fungsi	: Menaikkan tekanan aseton dari 1 atm ke 7,89 atm
Jumlah	: 1 utama + 1 cadangan
Jenis	: <i>Centrifugal</i>
Bahan Konstruksi	: Carbon steel
Jumlah Stage	: 2 stage

Temperatur Masuk	: 138°C
Temperatur Keluar	: 182,47°C
<i>Suction Pressure</i>	: 1 atm
<i>Discharge Pressure</i>	: 7,89 atm
Laju Alir Massa	: 8736,24 kg/jam
Laju Alir Volumetrik	: 5008,81 m ³ /jam
Efisiensi	: 68%
<i>Power Compressor (Daya)</i>	: 11,4 kW

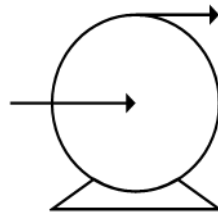
3.3.2. Kompresor H₂ Recycle



Gambar 3. 5 Compressor (C-102)

Nama	: Compressor
Kode	: C-102
Fungsi	: Menaikkan tekanan hidrogen dari 1 atm ke 7,89 atm
Jumlah	: 1 unit
Jenis	: <i>Centrifugal</i>
Bahan Konstruksi	: Carbon steel
Jumlah Stage	: 2 stage
Temperatur Masuk	: -19°C
Temperatur Keluar	: 41,34°C
<i>Suction Pressure</i>	: 1 atm
<i>Discharge Pressure</i>	: 7,89 atm
Laju Alir Massa	: 370,722 kg/jam
Laju Alir Volumetrik	: 2051,36 m ³ /jam
Efisiensi	: 67%
<i>Power Compressor (Daya)</i>	: 6,355 kW

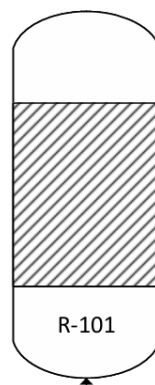
3.3.3. Pompa



Gambar 3. 6 Pompa Centrifugal (G-203)

Nama	: Pompa Produk (G-203)
Kapasitas	: 26,484 m ³ /jam
	: 116,6072 Gpm
	: 0,2598 ft ³ /s
Fungsi	: Mengalirkan produk ke tangki produk
Jenis Pompa	: Centrifugal
ID	: 3,5480 in
OD	: 4 in
sch	: 40
Daya Pompa	: 1 HP
Daya Motor	: 1 HP
Ketebalan Pipa	: 0,2260 in

3.4. Unit Reaktor Kimia



Gambar 3. 7 Reaktor Fixed-Bed Multitube (R-101)

Nama Alat	= Spesifikasi Reaktor Fixed-Bed Multitube (R-101)
Kode Alat	= R-101
Fungsi Alat	= Mereaksikan metanol dengan hidrogen menjadi aseton

Jenis Alat = *Fixed Bed Multitube*

Fasa = Gas-Gas

Kondisi Operasi

Tekanan = 180°C

Suhu = 7,9 atm

Waktu = 20 detik

Spesifikasi Alat

Tinggi Total = 210,4169 in = 5,3446 m

Detail *Shell*

OD = 78,0000 in = 1,9812 m

ID = 77,1250 in = 1,9590 m

Tebal = 0,4375 in = 0,0111 m

Tinggi = 180,0000 in = 4,5720 m

Detail *Tube*

OD = 1,5000 in = 0,0381 m

ID = 1,4000 in = 0,0356 m

Tebal = 0,0490 in = 0,0012 m

Tinggi = 180,0000 in = 4,5720 m

Jumlah = 1409 buah

Pitch = 1,8750 in = 0,0476 m (*Trangular pitch*)

Detail *Head*

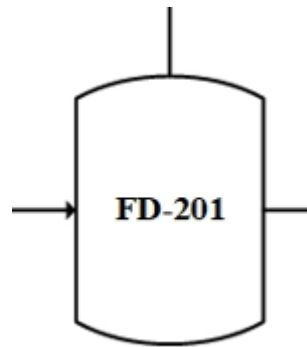
Jenis = *Torispherical Dished Head*

Tebal = 0,1875 in = 0,0048 m

Tinggi = 15,2084 in = 0,3863 m

3.5. Unit Pemisahan

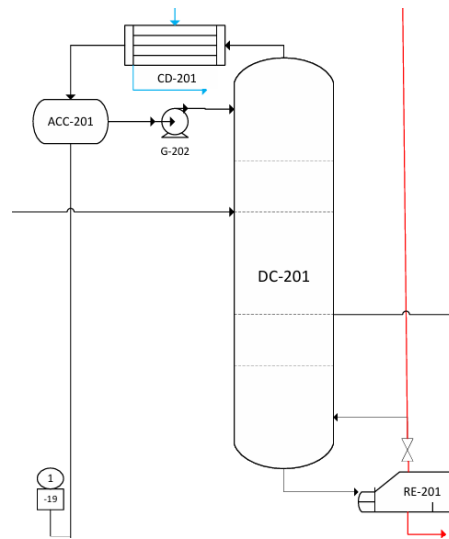
3.5.1. Flash Drum



Gambar 3. 8 Flash Drum (FD-201)

Fungsi	: Untuk menurunkan Tekanan dan memisahkan antara produk dan reaktan
Bentuk	: <i>Tangki Vertical dan Tutup Torispherical (Dishead)</i>
Tekanan Operasi	: 1 atm
Temperature operasi	: 22,3°C
Bahan	: Stailess Steel SA - 240 Grade 316
Diameter	: 1,375 m
Tinggi Shell	: 2,061 m
Tinggi Flash Drum	: 2,551 m
Tebal shell	: 0,188 in
Tebal head	: 0,1875 in
Hold up time	: 8 menit
Volume Hold up	: 1,024 m ³

3.5.2. Menara Destilasi 1



Gambar 3. 9 Menara Destilasi (DC-201)

Nama Alat	= Spesifikasi Menara Distilasi 1 (DC-201)
Kode Alat	= DC-201
Fungsi	= Memurnikan Produk Utama
Tipe Tray	= <i>Sieve Tray</i>
Tipe Kondensor	= <i>Full Reflux Condenser</i>

Kondisi Operasi

Tekanan	= 1 atm
Suhu Umpan	= 22,35°C

Detail Kolom

Material	= <i>Stainless Steel SA-167 grade 11 type 316</i>
Jumlah Stage	= 29 (Stage tanpa reboiler)
Stage Umpan	= 7
Tinggi Total	= 719,5264 in = 18,276 m

Detail Kolom *Recyifing*

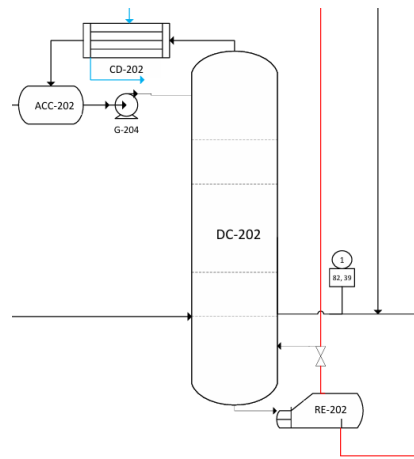
Jumlah Stage	= 6
OD Shell	= 55,3588 in = 1,4061 m
ID Shell	= 54,9838 in = 1,3966 m
Tebal Shell	= 0,1875 in = 0,0048 m

- Spesifikasi *Head*
 - Tipe *Head* = *Hemispherical Dished Head*
 - Tinggi *Head* = 29,6794 in = 0,7539 m
 - Tebal *Head* = 0,1875 in = 0,0048 m
- Spesifikasi *Tray*
 - Tinggi *Weir* = 50 mm
 - Diameter *Hole* = 5 mm
 - Tebal *Plate* = 5 mm
 - Jumlah Lubang = 1186

Detail Kolom *Stripping*

- Jumlah *Stage* = 23
- OD *Shell* = 76,4815 in = 1,9426 m
- ID *Shell* = 76,1065 in = 1,9331 m
- Tebal *Shell* = 0,1875 in = 0,0048 m
- Spesifikasi *Head*
 - Tipe *Head* = *Hemispherical Dished Head*
 - Tinggi *Head* = 40,2407 in = 1,0221 m
 - Tebal *Head* = 0,1875 in = 0,0048 m
- Spesifikasi *Tray*
 - Tinggi *Weir* = 50 mm
 - Diameter *Hole* = 5 mm
 - Tebal *Plate* = 5 mm
 - Jumlah Lubang = 2273

3.5.3. Menara Destilasi 2



Gambar 3. 10 Menara Destilasi (DC-202)

Nama Alat	= Spesifikasi Menara Destilasi 2 (DC-202)
Kode Alat	= DC-202
Fungsi	= Memurnikan Produk Utama
Tipe Tray	= <i>Sieve Tray</i>
Tipe Kondensor	= <i>Full Reflux Condenser</i>

Kondisi Operasi

Tekanan	= 1 atm
Suhu Umpan	= 22,35°C

Detail Kolom

Material	= <i>Stainless Steel SA-167 grade 11 type 316</i>
Jumlah Stage	= 27 (Stage tanpa reboiler)
Stage Umpan	= 7
Tinggi Total	= 699,3385 in = 17,763 m

Detail Kolom *Recyifing*

Jumlah Stage	= 6
OD Shell	= 83,5807 in = 2,123 m
ID Shell	= 83,2057 in = 2,1134 m
Tebal Shell	= 0,1875 in = 0,0048 m

- Spesifikasi Head

Tipe Head	= <i>Hemispherical Dished Head</i>
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Tinggi *Head* = 43,7904 in = 1,1123 m

Tebal *Head* = 0,1875 in = 0,0048 m

- Spesifikasi *Tray*

Tinggi *Weir* = 50 mm

Diameter *Hole* = 5 mm

Tebal *Plate* = 5 mm

Jumlah Lubang = 2716

Detail Kolom *Stripping*

Jumlah *Stage* = 21

OD *Shell* = 86,6238 in = 2,2002 m

ID *Shell* = 86,2488 in = 2,1907 m

Tebal *Shell* = 0,1875 in = 0,0048 m

- Spesifikasi *Head*

Tipe *Head* = *Hemispherical Dished Head*

Tinggi *Head* = 45,3119 in = 1,1509 m

Tebal *Head* = 0,1875 in = 0,0048 m

- Spesifikasi *Tray*

Tinggi *Weir* = 50 mm

Diameter *Hole* = 5 mm

Tebal *Plate* = 5 mm

Jumlah Lubang = 2918