

## DAFTAR ISI

HALAMAN JUDUL .....	i
LEMBAR PENGESAHAN .....	ii
LEMBAR PERNYATAAN .....	iv
HALAMAN MOTTO .....	v
HALAMAN PERSEMBAHAN .....	vi
INTISARI .....	vii
ABSTRACT .....	viii
KATA PENGANTAR.....	ix
DAFTAR ISI.....	x
DAFTAR GAMBAR.....	xviii
DAFTAR TABEL .....	xxvi

### BAB I. PENDAHULUAN

1.1 Latar Belakang .....	1
1.2 Rumusan Masalah .....	2
1.3 Batasan Masalah .....	2
1.4 Tujuan Pemodelan .....	2
1.5 Manfaat Pemodelan .....	3

### BAB II. DASAR TEORI

2.1 Sistem Perpipaan .....	4
2.1.1 Jenis-jenis pipa.....	5
2.1.2 Bahan-bahan pipa secara umum .....	5
2.1.3 Bahan-bahan pipa secara khusus.....	5
2.2 Komponen Sistem Perpipaan .....	6
2.2.1 Pipa-pipa ( <i>pipes</i> ) .....	6
2.2.1.1 Pipa las spiral ( <i>spiral welding pipe</i> ) .....	6
2.2.1.2 Pipa tanpa sambungan ( <i>seamless steel</i> ) .....	7
2.2.1.3 Pipa dilas ( <i>butt-welded pipe</i> ) .....	7

2.2.1.4 Tubing .....	7
2.2.2 Flens ( <i>flange</i> ) .....	8
2.2.2.1 Flens buta ( <i>blind flange</i> ) .....	9
2.2.2.2 Flens las di leher ( <i>weld neck flange</i> ) .....	9
2.2.2.3 Flens orifis las di leher ( <i>weld neck orifice flange</i> ) .....	9
2.2.2.4 Flens sambungan langsung ( <i>Slip on flange</i> ) .....	10
2.2.2.5 Flens sambungan sock dilas ( <i>socket welding flange</i> ) .....	10
2.2.2.6 Flens sambungan ulir ( <i>threaded flange</i> ) .....	11
2.2.2.7 Flens tonggak ( <i>stub flange</i> ) .....	11
2.2.2.8 Flens sambungan LAP ( <i>LAP joint flange</i> ).....	12
2.2.3 Katup ( <i>valve</i> ).....	13
2.2.3.1 Katup pintu ( <i>gate valve</i> ).....	13
2.2.3.2 Katup bola ( <i>ball valve</i> ) .....	13
2.2.3.3 Katup dunia ( <i>globe valve</i> ) .....	14
2.2.3.4 Katup cek ( <i>check valve</i> ) .....	15
2.2.3.5 Katup kupu-kupu ( <i>butterfly valve</i> ) .....	15
2.2.3.6 <i>Safety valve</i> .....	16
2.2.3.7 Katup jarum ( <i>needle valve</i> ) .....	16
2.2.3.8 Katup diafragma ( <i>diaphragm valve</i> ) .....	17
2.2.4 Sambungan ( <i>fitting</i> ) .....	18
2.2.4.1 Siku ( <i>ellbow</i> ) .....	18
2.2.4.2 Sambungan <i>Tee</i> .....	18
2.2.4.3 Sambungan <i>reducer</i> .....	19
2.2.4.4 Sambungan <i>Stub-in</i> .....	19
2.2.4.5 Sambungan <i>cap</i> .....	20
2.2.5 Baut-baut ( <i>boltings</i> ) .....	20
2.2.5.1 Baut mesin ( <i>machine bolt</i> ) .....	20
2.2.5.2 Baut paku ( <i>stud bolt</i> ) .....	20
2.2.6 Gasket Pipa.....	21
2.2.6.1 Standar untuk gasket.....	21
2.2.6.2 Pemilihan gasket.....	21

2.2.6.3 Jenis-jenis gasket.....	22
2.2.7 Alat-alat khusus ( <i>special items</i> ) .....	23
2.2.7.1 Saringan Tipe T.....	24
2.2.7.2 Saringan tipe Y.....	24
2.2.7.3 Tipe sementara ( <i>temporary type</i> ) .....	25
2.2.7.4 Saringan tipe bucket.....	26
2.2.8 Perangkap uap ( <i>steam trap</i> ) .....	26
2.3 Pemilihan Bahan.....	27
2.4 Jenis-jenis penyambungan.....	27
2.4.1 Sambungan las ( <i>but weld joint</i> ) .....	28
2.4.2 Sambungan ulir ( <i>trhreaded</i> ) .....	28
2.4.3 Menggunakan flens ( <i>flange</i> ) .....	29
2.5 Kontruksi Sambungan Perpipaan.....	29
2.5.1 Sambungan langsung ( <i>stub in</i> ) .....	29
2.5.2 Sambungan dengan penguatan.....	29
2.5.3 Sambungan menggunakan alat penyambung ( <i>fitting</i> ) .....	30
2.5.3.1 Siku ( <i>ellbow</i> ) .....	30
2.5.3.2 Sambungan Te ( <i>tee</i> ) .....	31
2.5.3.3 Pemerkecilan ( <i>reducer</i> ) .....	31
2.5.3.4 Kap ( <i>cap</i> ) .....	32
2.5.3.5 Silang ( <i>cross</i> ) .....	32
2.5.4 Sambungan pipa cabang menggunakan <i>O'let</i> .....	33
2.6 Diameter, Ketebalan dan Schedule.....	33
2.6.1 Diameter.....	34
2.6.2 <i>Schedule</i> pipa.....	34
2.7 Penggambaran Proses Perencanaan Sistem Perpipaan.....	35
2.7.1 Penggambaran diagram alir proses ( <i>process flow diagram</i> ) .....	35
2.7.1.1 Diagram blok aliran proses ( <i>block fliw diagram process</i> ) .....	37
2.7.1.2 Skematik ( <i>schematic</i> ) .....	38
2.7.1.3 Diagram aliran proses ( <i>flow diagram process</i> ) .....	39
2.7.2 Penggambaran P&ID ( <i>piping and instrumentation diagram</i> ) ..	40

2.7.3	Penggambaran tata letak peralatan pabrik ( <i>plot plant</i> ) .....	42
2.7.4	Gambar peralatan.....	46
2.7.5	Gambar komposit.....	47
2.7.5.1	Gambar <i>piping plant</i> .....	48
2.7.5.2	Gambar tampak atas.....	50
2.7.5.3	Gambar tampak samping.....	50
2.7.5.4	Penggambaran tampak muka ( <i>cross section</i> ) .....	51
2.7.5.5	Penggambaran perpipaan dan peralatan tampak atas.....	51
2.7.6	Penggambaran isometrik.....	53
2.7.7	Penggambaran <i>spool</i> .....	55
2.7.8	Gambar instrumentasi.....	57

### **BAB III. Software AVEVA PDMS Versi 12.0 SP6.25**

3.1.	Pengenalan PDMS.....	59
3.1.1.	Hirarki PDMS.....	60
3.1.2.	Penamaan dalam PDMS.....	61
3.1.3.	PDMS <i>database</i> dan Komponen <i>Admin</i> .....	61
3.1.3.1.	<i>Team</i> .....	61
3.1.3.2.	<i>User</i> .....	61
3.1.3.3.	<i>Databases</i> (DB's) .....	62
3.1.3.4.	<i>Multiple Database</i> (MDB) .....	62
3.2.	Modul PDMS.....	62
3.2.1.	Monitor.....	62
3.2.2.	<i>Design</i> .....	62
3.2.3.	<i>Spooler</i> .....	63
3.2.4.	<i>Draft</i> .....	63
3.2.5.	<i>Isodraft</i> .....	64
3.2.6.	<i>Paragon</i> .....	65
3.2.7.	<i>Propcon</i> .....	65
3.2.8.	Modul <i>Lexicon</i> .....	65
3.2.9.	Modul <i>Specon</i> .....	66

3.2.10. Modul <i>Administration</i> .....	66
3.3. Pengoperasian PDMS.....	66
3.3.1. <i>Member list</i> .....	68
3.3.2. Penggunaan <i>Main Menu Bar</i> .....	69
3.3.3. <i>Menu Umum</i> .....	69
3.3.3.1. <i>Members</i> .....	70
3.3.3.1.1. <i>Control</i> .....	70
3.3.3.1.2. <i>Go to</i> .....	70
3.3.3.1.3. <i>Drawlist</i> .....	70
3.3.3.2. <i>Design Menu</i> .....	71
3.3.3.3. <i>View Menu</i> .....	73
3.4. Prinsip Dasar Pemodelan <i>Equipment</i> .....	75
3.4.1. <i>Equipment</i> .....	77
3.4.2. <i>Primitive</i> .....	77
3.4.3. Pengukuran.....	78
3.5. <i>Piping Modeling</i> .....	79
3.5.1. <i>Hierarchy piping modeling</i> .....	80
3.5.2. <i>Piping design modul</i> .....	81
3.5.3. <i>Branch</i> .....	83
3.5.4. <i>Head dan Tail pada branch</i> .....	84
3.5.5. Komponen <i>branch</i> .....	86
3.5.6. <i>P-Point</i> Komponen.....	87
3.5.7. Komponen dengan ketinggian yang berbeda ( <i>Slope</i> ) .....	90
3.6. <i>Clash Utility</i> .....	91
3.7. <i>Pipe Insulation</i> .....	92
3.8. <i>Reports</i> .....	93
3.9. <i>Backing Sheet</i> .....	93
3.10. PDMS Review.....	94

## **BAB IV. METODOLOGI**

4.1. Diagram Alir Pemodelan di PDMS 12.0 SP6.25.....	99
4.2. Persiapan Data Pemodelan .....	100
4.2.1. Gambar P&ID.....	101
4.2.2. Gambar <i>Equipment</i> D1201.....	102
4.2.3. Gambar <i>Equipment</i> C1101.....	103
4.2.4. Gambar <i>Equipment</i> P1501A/B.....	104
4.2.5. Gambar <i>Equipment</i> P1502A/B.....	105
4.2.6. Gambar <i>Equipment</i> E1302A.....	106
4.2.7. Gambar <i>Equipment</i> E1302B.....	107
4.2.8. Gambar <i>Equipment</i> E1301.....	108
4.2.9. Gambar <i>Plot Plant</i> .....	109
4.2.10. Gambar <i>Pipe Layout</i> .....	110

## **BAB V. PROSES PEMODELAN PDMS**

5.1. <i>Login</i> Aplikasi PDMS.....	111
5.2. <i>Hierarchy</i> Pemodelan PDMS.....	112
5.2.1. Pembuatan <i>SITE</i> .....	112
5.2.2. Pembuatan <i>ZONE</i> .....	112
5.3. Pemodelan <i>Equipment</i> .....	113
5.3.1. Pemodelan <i>Equipment</i> D1201 ( <i>Stabilizer Reflux Drum</i> ) .....	116
5.3.2. Pemodelan <i>Equipment</i> C1101 ( <i>Stabilizer</i> ) .....	128
5.3.3. Pemodelan <i>Equipment</i> P1501 A/B ( <i>Reflux Pump</i> ) .....	137
5.3.4. Pemodelan <i>Equipment</i> P1502A/B ( <i>Overhead Product Pump</i> )....	143
5.3.5. Pemodelan <i>Equipment</i> E1302A ( <i>Reflux Condenser</i> ) .....	148
5.3.6. Pemodelan <i>Equipment</i> E1302B ( <i>Reflux Condenser</i> ) .....	153
5.3.7. Pemodelan <i>Equipment</i> E1301 ( <i>Stabilizer Reboiler</i> ) .....	157
5.4. Membuat Jalur Pipa.....	162
5.4.1. Pemodelan Pipa 250-B-A3B-5.....	163
5.4.2. Pemodelan Pipa 200-B-A3B-4.....	170
5.4.3. Pemodelan Pipa 100-C-F1C-13.....	172

## **BAB VI. HASIL PEMODELAN 3D PDMS**

6.1. Gambar Susunan 3D.....	175
6.2. Hasil Pemodelan <i>Equipment</i> 3D.....	175
6.3. Hasil Pemodelan Pipa 3D.....	178
6.4. Hasil Pemodelan 3D <i>Equipment</i> dan <i>Piping</i> .....	185
6.5. Hasil Pemodelan 3D <i>General Plant</i> .....	185
6.6. Gambar Isometri dan <i>Material take-off</i> (MTO) .....	186
6.7. Gambar 2D <i>General Site View</i> .....	186
6.8. Gambar 2D <i>Equipment Location</i> .....	187
6.9. Gambar 2D <i>Pipe Layout</i> .....	188
6.10. Gambar 2D <i>Reflux Pumps</i> (P1501A & P1501B).....	189
6.11. Gambar 2D <i>Over Head Product Pumps</i> (P1502A &P1502B).....	190
6.12. Gambar 2D <i>Stabilizer Reflux Condenser</i> E1302A.....	191
6.13. Gambar 2D <i>Stabilizer Reflux Condenser</i> E1302B.....	192
6.14. Gambar 2D <i>Reboiler</i> E1301.....	193
6.15. Gambar 2D <i>Cracking Tower</i> C1101.....	194
6.16. Gambar 2D <i>Reflux Drum</i> D1201.....	195
6.17. Gambar 2D <i>Piping Isometric Sht 1 of 4</i> .....	196
6.18. Gambar 2D <i>Piping Isometric Sht 2 of 4</i> .....	197
6.19. Gambar 2D <i>Piping Isometric Sht 3 of 4</i> .....	198
6.20. Gambar 2D <i>Piping Isometric Sht 4 of 4</i> .....	199

## **BAB VII. PENUTUP**

7.1. Kesimpulan.....	200
7.2. Saran.....	201

<b>DAFTAR PUSTAKA .....</b>	<b>202</b>
<b>LAMPIRAN .....</b>	<b>206</b>