

# CHAPTER III

# PROCESS EQUIPMENT DESCRIPTION

## SECTION 1

### MAIN AIR COMPRESSOR SYSTEMS

#### 1-1. EQUIPMENT DATA.

##### MAIN AIR COMPRESSORS (B01.10 AND A01.10)

Manufacturer .....	Joy Manufacturing Co.		
Model .....	TA 35RZ		
Type .....	Centrifugal		
Capacity, lb/hr, dry (each) .....	15,115		
Number of Stages .....	3		
Design Conditions (each) .....			
Stage .....	<b>1</b> .....	<b>2</b> .....	<b>3</b>
Inlet Pressure, psia .....	14.5 .....	32.1 .....	55.0
Inlet Temperature, °F .....	95 .....	100 .....	104.0
Discharge Pressure, psia .....	33.0 .....	56.1 .....	111.6
Discharge Temperature, °F .....	277 .....	220 .....	267
Speed, rpm .....	31,255 .....	31,255 .....	46,203

##### DRIVE MOTOR (01.11 FOR COMPRESSOR A01.10)

Manufacturer .....	Siemens-Allis
Type .....	Squirrel Cage Induction
Enclosure .....	WP1
Frame .....	5011US
Speed, rpm .....	3600
Rating, hp .....	900
Service Factor .....	1.0
Electrical Characteristics .....	2300 VAC, 3Φ, 60 Hz

##### DIGESTER GAS ENGINE DRIVE (01.11.10 FOR COMPRESSOR B01.10)

Engine	
Manufacturer .....	Waukesha
Model .....	P9390G
Type .....	4-cycle, V-16
Level Heating Value .....	550 BTU/scf
Speed .....	900 rpm
Oil Pressure .....	45 psig
Oil Pump .....	Gear type, shaft-driven
Speed Increaser and Clutch	
Manufacturer .....	Philadelphia Gear Corp.
Model .....	Gear-Pak HL80/105 HPS-1
Gear Ratio .....	1:4.15
Input Speed .....	900 rpm
Output Speeds .....	0-3550 rpm

Oil Pump		
Capacity	80 gpm	
Motor	15 hp @ 3600 rpm	
Electric Power	460 VAC, 3-phase, 60-Hz	
<b>INLET AIR FILTER (01.12)</b>		
Manufacturer	Universal	
Type	Special FSH-14-4	
Pre-Filter	W2-40 (4)	
Final Filter	P-11 (4)	
<b>LUBE OIL RESERVOIR (B01.10M/A01.10M)</b>		
Capacity, gal.	123/171	
<b>MAIN LUBE OIL PUMP (B01.10K/A01.10H)</b>		
Manufacturer	Roper/Roper	
Model	18AM-21, Type 1/18F-20-4763	
Capacity, gpm	34/44	
Speed, rpm	1750/3550	
Driver	Electric Motor/Compressor Shaft	
Manufacturer	Siemens-Allis/N/a	
Frame	184TC/N/a	
Speed, rpm	1750/N/a	
Rating, hp	5/N/a	
Electrical Characteristics	3/60/460/N/a	
<b>LUBE OIL COOLER (B01.10L AND A01.10L)</b>		
Manufacturer	ITT Standard	
Type	FEF	
Size	06060	
Flow Data	<b>Shell</b> . . . . . <b>Tube</b>	
Fluid	Lube Oil . . . . . 30% Glycol	
Design Pressure, psi	300 . . . . . 200	
Design Temperature, °F	300 . . . . . 300	
<b>LUBE OIL FILTER (B01.10 AND A01.10J)</b>		
Manufacturer	Consler (Duplex)	
Model	KLD120-015FL/001	
Filtration, Microns	10	
<b>AUXILIARY LUBE OIL PUMP (B01.10H/A01.10K)</b>		
Manufacturer	Roper	
Model	18AM-21, Type 1	
Capacity, gpm	34	
Drive Motor		
Manufacturer	Gast/Siemens-Allis	
Model	8AM-NRV-28	
Enclosure	N/a/TEFC	
Frame	N/a/182TC	
Speed, rpm	N/a/1750	
Rating, hp	N/a/5	
Electrical Characteristics	N/a/460 VAC, 3 $\phi$ , 60 Hz	

**LUBE OIL HEATER (B01.10G AND A01.10G)**

Manufacturer .....	Vulcan
Model .....	A20/4000/46-1
Power, watts .....	3000
Electrical Characteristics .....	480 VAC, 3 $\phi$ , 60 Hz

**AFTERCOOLER (B01.13 AND A01.13)**

Manufacturer .....	American Standard	
Type .....	Shell and Tube	
Flow Data .....	<b>Shell</b> .....	<b>Tube</b>
Fluid .....	Air and Water	Glycol and Water
	Vapor .....	
Test Pressure, psi .....	225 .....	225
Design Pressure, psi .....	150 .....	150
Design Temperature, °F .....	350 .....	300

**DEFROST HEATER (15.50)**

Manufacturer .....	Warren Electric Corp.
Model .....	XKF-25-480-35IC-LT
Number of Elements .....	12
Power, Kilowatts .....	25
Electrical Characteristics .....	480 VAC, 30 $\phi$ , 60 Hz, Delta Connected

**1-2. GENERAL.**

There are two complete main air compressor systems, the B01.10 and the A01.10. Each system is capable of supplying the plant with its full requirement of air; the A01.10 system is intended to be a backup.

The main air compressors are three stage centrifugal units. The B01.10 compressor is driven by an engine fueled by digester gas. The A01.10 compressor is driven by an electric induction motor. Each compressor is driven through bull-and-pinion gear speed increasers. Discharge streams from the two compressors merge just before the inlet to the 01.14 aftercooler separator.

For a detailed description of the main air compressor systems, refer to Volume II, Vendors' Literature.

**1-3. SPEED INCREASERS.**

A horizontally split integral gear case contains each compressor's speed increaser. The compressor drive shaft drives a large bull gear that, in turn, drives two pinion gears which are mounted on the impeller shafts. The bull gear rotates at 3,578 rpm, driving the first and second stage pinions at 31,255 rpm, and driving the third stage pinion at 46,203 rpm.

**1-4. INSTRUMENTATION.**

Each compressor has pressure, temperature, oil level, and vibration sensors monitoring its operation, with switches that automatically actuate alarms or shut the compressor down if a condition occurs that could damage the compressor. Refer to Appendix C of this manual for a list of settings for these switches.

**1-5. SURGE CONTROL.**

Flow element FE-1 measures the main air compressor discharge flow. Flow information is transmitted to the surge controller by flow transmitter FT-1. Pressure and temperature of the compressor discharge flow are transmitted to the surge controller by pressure transmitter PT-1 and temperature transmitter TT-1.