

## Project Synopsis Of Max Power Limited

Project Title	78.5 MW gas fired power plant
Project Company	Max Power Limited
Major Sponsor	Max Infrastructure Limited
Location	BPDB Thermal power plant premise, Ghorashal, Narsingdi, Dhaka, Bangladesh
Contract signed	Contract for supply of power on rental basis, contract no. 09778 dated 27-Oct-2010 (phase I) and contract no. 09952 dated 19-Jun-2014 (phase II)
Contracted Capacity	78.5 MW
Status	Currently not in operation; Was in operation upto Jan 2021;
Fuel	Natural Gas
Fuel Supplier	Titas Gas Transmission and Distribution Company Limited
Fuel supply agreement	Same contract for supply of power
Commercial Operation Date (phase II)	09-Jan-2016
PPA contract validity	5 years up to 08-Jan-2021
Tenure of Phase I	3 years (27-May-2011 to 26-May-2014)
Buyer	Bangladesh Power Development Board (BPDB)
Voltage of step up power transformer	11/230 KV
Nearest sub station	Ghorashal PGCB Grid Sub station
Step-up Power Transformer Tap Changer Type	Built in on load
Heating value of natural gas	950 BTU/Scft (HHV)
EPC Contractor	Max Infrastructure Limited
Heat Rate	9521 BTU/kWh
Levelized Tariff	3.2948 TK/kWh
Reference plant factor	80%
Powertrain supplier	2 X LM6000 PC Sprint aero derivative Gas Turbine from GE, USA
Noise level at any point of Facility boundary	As per DoE of Bangladesh Guideline
Financiers	United Commercial Bank Limited

## **Technical Diary of Equipment**

**Max Power Limited**

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## 1 Gas Turbine Package

### 1.1 Gas Turbine

Manufacturer	General Electric
Model No.	: 7LM6000-PC-NDWG19
Serial No.	: Unit 01 : 191-765, Running Hour: 21,725.5 Unit 02 : 191-766, Tuning Hour: 20,144.4
Type	: Dual Shaft, Gas Fuel Fired with option of Liquid Fuel, Nox water injection, Aero-derivative Gas Turbine, 5 stage low pressure Compressor, 14 stages high pressure compressor, Single Annular Combustor design, 2 stage high pressure Turbine, 5 stage low pressure Turbine
Rated capacity	: 41.3 MW @35 Degree Centigrade
Engine Weight	: 13270 lbs (6019.171 kg)
LP Rotor	: 3600 rpm
HP Rotor	: 10300 - 10500 rpm
Lube oil supply press.	: 62-69 PSIG
Scavenge oil discharge Press.	: 27-29 PSIG
Start system	: Hydraulic
Fuel nozzle	: 30Nos.
Part .No.	: 0748290CNL31476P61
Year Of Manufacturing	: 2013

### 1.2 Transfer Gearbox

Manufacturer	FLENDER GRAFFENSTADEN
SIZE	: TX61/1CV
Model No.	: 189142893
Rated Input / Output (rpm)	: 3627/3000
Sr No	: Unit 01:11855 & Unit 02: 11854
Weight	: 14000
Gear Ration	: 1.209:1
Oil flow	: 690 L/min

### 1.3 Safe Set

Manufacturer	: VOITH TURBO
Safe Set Type	: 11530248
Max. Torque	: 500 KNm

## 2. Gas Turbine Auxiliaries

### 2.1 Hydraulic Starter System

#### 2.1.1 Hydraulic Oil Specification

Particulars	:	Performance
ISO VG,	:	46
Viscosity, ASTM D445 :	:	
cSt @ 100°C	:	6.7
cSt @ 40°C	:	44.2
Viscosity Index, ASTM D2270	:	98
Pour Point, °C, ASTM D97	:	-27
Flash Point, COC, ASTM D92	:	232
Foam, Seq I, Tendency/Stability, ASTM D892	:	20/0
Foam, Seq II, Tendency/Stability, ASTM D892	:	20/0
Foam, Seq III, Tendency/Stability, ASTM D892	:	20/0
Copper strip corrosion, 3 hrs @100°C, ASTM D130	:	1B
Rust protection Proc B, ASTM D665	:	PASS
****FZG Failure Load Stage, ISO 14635-1(mod)	:	12

#### 2.1.2 Hydraulic Oil Reservoir

Particulars	:	Description
Capacity	:	40 Gallons, SS Construction.
Heater	:	On at 90° F
Hydraulic Tank Heater	:	3 KW, 400 Volt, 3 Ph
Hydraulic Fluid	:	Hydraulic Oil 68
Hydraulic filter	:	Duramax ( P/N : P176567), Efficiency beta 1000 : 9 micron Media Type : Synthetic

#### 2.1.3 Hydraulic Motor

Particulars	:	Unit 01	Unit 02
Manufacturer	:	ABB	ABB
Model	:	M3GP 315SMC 2 IMB35/IM 2001	M3GP 315SMC 2 IMB35/IM 2002
Serial No.	:	3GF13173704	3GF13176441
Rating	:	160 KW	160 KW
Speed (RPM)	:	2981	2981
Enclosure	:	IP55	IP55
Current (A)	:	283	268
Volts (V)	:	400	400
Insulation Class	:	F	F

## 2.2 Turbine Lube Oil

### 2.2.1 Turbine LO Reservoir

Manufacturer	:	PATENT
Part Number	:	Unit 02: 701698 Unit 01: 701698
Capacity	:	568 liters
Reservoir Metal	:	Stainless steel
Heater	:	Capacity : 3 KW, Volt : 400 V, Amps: 4 A

### 2.2.2 Turbine LO Specification

Particulars		Unit 1 & 2
Manufacturer	:	Pall Industrial Hydraulic Corp.
Assembly P/N	:	HZ8640A20KNTWPTY302
Replacement Element P/N	:	HC9600FCN13Z
Efficiency beta 100	:	7 micron
Element Collapse rating	:	20 bar for housing with bypass valve
Specified LO Brand	:	Castrol 5000, Exxon Turbo Oil 2380, Mobil Jet Oil II

### 2.2.3 Turbine LO Heater

Rated Power	:	3 KW
Rated Voltage	:	400 Volt
Rated Current	:	4 Amp

### 2.2.4 Turbine LO Cooling System

<b>1. Turbine Lube Oil Cooler</b>		
Customer	:	GE AERO ENERGYPRODUCTS
CERTIFIED BY	:	Rainey Corporation
SERIAL NUMBER	:	R-8365-1A-A
P.O. NO.	:	410158601
C.A.	:	1/16" [1:6]
ITEM NO.	:	TLOC
MAXIMUM FLUSH RATE	:	18 GPM
GE PART NUMBER	:	216A4713P0003
BUNDLE WT. (DRY)	:	4000 LBS [1814 Kgs]
BUNDLE WT. (WET)	:	4600 LBS [2087 Kgs]
M.A.W.P.	:	150 PSIG @ 300 F 10.3 BARG @ 149 C
SHOP TEST PRESSURE	:	215 PSIG 14.8 BARG
SA-249 TP304	:	1" [25]
O.D.X.	:	0.049" [1.245] AW



## **2.3 Turbine Sprint System**

### **2.3.1 Sprint System Motor**

Model	:	SKS21SSAA170
SN	:	66FT182S030
HP	:	10
VOLTS	:	460
AMPS	:	11.2-13.6
FRAME	:	215TC
TYPE	:	KS
Max. Weight	:	220 lb
Replacement ODE bearing	:	6208ZC3
Replacement DE bearing	:	6209ZC4

### **2.3.2 Sprint System Pump**

Catalog Number	:	10SV17NC30
Connection	:	2"
Frequency	:	50 Hz
Pole	:	2
RPM	:	3500
Motor Frame Size	:	210 TC Motor Frame Size
Stage	:	17
Nominal Flow	:	53 GPM

## **2.4 Water Wash System**

### **2.4.1 Water Wash Motor**

Model	:	5KS145SAA144
HP	:	2
RPM	:	3520/2890
VOLTS	:	460//380
AMPS	:	2.7//3.1
TYPE	:	KS
FRAME	:	146TCZ
Nema Design	:	B
Replacement ODE Bearing	:	6205ZC3
Replacement DE Bearing	:	6206ZC3

### **2.4.2 Water Wash Pump**

Catalog Number	:	3SV13NA10
Connection	:	1 1/4"
Frequency	:	50 Hz
Pole	:	2
RPM	:	2900
Motor Frame Size	:	56C
Nominal Flow	:	16 GPM

### **2.4.3 Water Wash Reservoir**

Purchase Order N.	:	189154263/4.1
Order Date	:	30/07/2013
Supplier GSL/Site Code	:	620545-101
Year of Fabrication	:	2013
Part Number/DWG No.	:	285621
Job	:	WW Tank 13-015
MSZ	:	1352/15
Brand	:	PATENT metal Fabrication Limited

### **2.4.4 Water Wash Reservoir Water Heater**

<b>Particulars</b>		<b>Unit-1 &amp; 2</b>
Manufacturer	:	Chromalox
Rated Power	:	3 KW
Rated Voltage	:	400 Volt
Rated Amp.	:	

## **2.5 Turbine Ventilation System**

### **2.5.1 Turbine Ventilation Motor**

Brand	:	ABB
Product Number	:	M3GP280SMB4IMB3/IM1001
Power	:	90 KW
Insulation Cls.	:	F,IP55
Volts	:	660 V
Amps	:	95.6 A
RPM	:	1481
Weight	:	665 kg

### **2.5.2 Turbine Ventilation Fan**

Brand	:	TCF Aerovent
GE PO	:	189152471 L 5
GE P/N	:	571328G0001
FAN MODEL	:	490-TSL-1231
RPM	:	1231
CFM	:	60000
AEROVENT SO	:	13-409466-1-1

### 3 Generator Package

#### 3.1 Generator

<b>Manufacturer</b>	:	Brush
<b>Machine No.</b>	:	
<b>Model</b>	:	Brushless Generator Type BDAX7-290ERJT Suitable for LM 6000PC GT
<b>Type</b>	:	Turbo Generator
<b>Rating</b>	:	63500 kVA (50800 KW)
<b>Armature Amps</b>	:	3188 A
<b>Phases/Hz</b>	:	3 Ph./ 50 Hz
<b>Phase Sequence</b>	:	U-V-W
<b>Phase Conn.</b>	:	Star
<b>Armature Volts</b>	:	11500 V
<b>Field Amps.</b>	:	1034 A
<b>Excitation Volts</b>	:	205V
<b>P.F</b>	:	0.8 Lagging
<b>Speed</b>	:	3000 RPM
<b>Altitude</b>	:	up to 1000 m
<b>Ambient Temp.</b>	:	15°C
<b>Applicable national std.</b>	:	IEC 60034-3
<b>Rated stator line current</b>	:	3333 Amps
<b>Generator air flow</b>	:	18.0 m3/sec
<b>Protection</b>	:	IP20
<b>Rotor &amp; Stator Insulation</b>	:	Class F
<b>Coolant</b>	:	Air at 15°C
<b>Generator Space Heater</b>	:	

#### 3.2 Generator Brushless Exciter

<b>Manufacturer</b>	:	Brush
<b>Exciter frame size</b>	:	BXF 10.20-3S
<b>Machine No.</b>	:	923333.01
<b>Output DC Volts</b>	:	226
<b>Output DC Amps</b>	:	1138
<b>REV/ Min</b>	:	3000
<b>Field Amps</b>	:	7.3
<b>Field Volts</b>	:	54.7
<b>Protection</b>	:	IP20
<b>Applicable national std.</b>	:	IEC 60034-3
<b>Armature &amp; Field Insulation</b>	:	Class F
<b>Altitude</b>	:	Upto 1000m
<b>Ambient Temp.</b>	:	15°C

### **3.3 Generator PMG**

<b>Manufacturer</b>	:	Brush
<b>Frame size</b>	:	MXI 44.07-A1
<b>Machine No</b>	:	923333.01
<b>Volts</b>	:	190 V
<b>Amps</b>	:	15
<b>Rated frequency</b>	:	400 Hz
<b>Number of phases</b>	:	1
<b>Rev/Min</b>	:	3000

### **3.4 Generator Rotating Rectifier Assembly**

<b>Manufacturer</b>	:	Brush
<b>Number of diodes</b>	:	12
<b>Arrangement</b>	:	3 ph full wave bridge; 6 arms 2 fused diodes in parallel per arm.
<b>Diode repetitive peak reverse voltage</b>	:	2000 Volts
<b>Output DC Amps</b>	:	1138
<b>Diode rated mean forward current</b>	:	330 Amps
<b>Diode mean forward current at rated load</b>	:	172 Amps
<b>Diode reverse voltage at rated load</b>	:	202 Volts
<b>Fuse rating</b>	:	450 Amps

### **3.5 Generator Ventilation**

#### **Ventilation Fan Motor**

<b>Brand</b>	:	ABB
<b>Product Number</b>	:	M3BP250SMB4
<b>Power</b>	:	75 KW
<b>Insulation Cls.</b>	:	F, IP55
<b>Volts</b>	:	380-415 V
<b>Amps</b>	:	133-140 A
<b>RPM</b>	:	1474-1480

#### **Ventilation Fan**

<b>Brand</b>	:	TCF Aerovent
<b>GE PO</b>	:	189152867 L 6
<b>GE P/N</b>	:	571326G0001
<b>FAN MODEL</b>	:	42B725-VABD-1990
<b>RPM</b>	:	1990
<b>CFM</b>	:	39000
<b>AEROVENT SO</b>	:	13-409737-1-1

### **3.6 Generator LO**

#### **3.6.1 Generator LO Specification**

Particulars	:	Performance
ISO Viscosity Grade	:	32
Viscosity, ASTM D 445	:	
cSt @ 40° C	:	31
cSt @ 100° C	:	5.5
Viscosity Index, ASTM D 2270	:	102
Pour Point, °C, ASTM D 97	:	-36
Flash Point, °C, ASTM D 92	:	218
Density @15° C kg/l, ASTM D 4052	:	0.85
TOST, ASTM D 943, Hours to 2 NN	:	5000
FZG Scuffing, D5182, Fail Stage	:	8
Rust Prevention, ASTM D 665	:	
Distilled Water	:	Pass
Sea Water	:	Pass
Water Seperability, ASTM D 1401, Min. to 3 ml emulsion @54°C	:	15
Copper Strip Corrosion, ASTM D 130, 3 hrs @ 121° C	:	1B
Foam Test, ASTM D 892, Seq I Tendency/stability, ml/ml	:	20/0
Air Release, ASTM D 3427, 50° C, min.	:	2
The Brand We Use	:	DTE Oil Light-32

#### **3.6.2 Generator LO Reservoir**

Material	:	Stainless Steel
Capacity	:	3000 gals (11356 liters)
Reference	:	20461 _OMM-SPDGLO

#### **3.6.3 Generator LO Cooler**

<b>Generator Lube Oil Cooler</b>		
Customer	:	GE AERO ENERGYPRODUCTS
CERTIFIED BY	:	Rainey Corporation
SERIAL NUMBER	:	R-8365-1B-A
P.O. NO.	:	410158601
C.A.	:	1/16" [1:6]
ITEM NO.	:	G/GLOC
MAXIMUM FLUSH RATE	:	330 GPM
GE PART NUMBER	:	216A4713P0003
BUNDLE WT. (DRY)	:	13000 LBS
BUNDLE WT. (WET)	:	15600 LBS
M.A.W.P.	:	150 PSIG @ 300 F 10.3 BARG @ 149 C
SHOP TEST PRESSURE	:	215 PSIG 14.8 BARG
SA-249 TP304	:	1" [25]
O.D.X.	:	0.049" [1.245] AW

## **4 Gas Booster Compressor (GBC)**

<b>Compressor control panel</b>		
Manufacturer	:	Allied Circuits, LLC for Cameron Int. Corp. (centrifugal compressor division), Buffalo, New York, USA
Voltage	:	230 VAC
Frequency	:	50 Hz
Phase	:	1
Current rating	:	10:00 AM
Ingress	:	NEMA 4, IP65 (indoor)
Diagram number	:	FF7090-18969 with MOD
PLC	:	Alan-Bradley Panelview Plus 1000

### **4.1 GBC Motor**

Manufacturer	:	HYUNDAI
Type/Phase	:	3~ Induction Motor
Rated	:	1893 kW
Voltage	:	11000 V
Amps	:	116.2 A
Frequency	:	50 Hz
Frame size	:	560
Rotor type	:	Squirrel cage
Type	:	HNQ3 561-28E
Duty type	:	S1
Protection degree	:	IP 54
Service factor	:	1
Speed at full load	:	2982 RPM
Insulation class	:	F
Ambient temp.	:	40°C
Temperature rise	:	80°C
Efficiency	:	95%
Power factor	:	0.9
Bearing (DE)	:	Sleeve
Bearing N.D.E	:	Sleeve
Space Heater	:	1Ø 220V 400W
Code Letter	:	G
Weight	:	11000 kg
Explosion type protection	:	Ex nA II T3

## **4.2 GBC Compressor**

Model	:	3R3MSGPB-3ARC3G/30
Serial No	:	CB-18969/70
Description	:	3 Stage Methane Compressor
Rating	:	1893 KW
Manufacturer	:	Hyundai
Type	:	Induction Motor
Supplied By	:	Cameron
Voltage	:	11000 Volt
Mounted By	:	Cameron
Phase/Frequency	:	50 Hz
Inlet Pressure	:	13.28 BAR, G
Coolant Temp	:	45 °C
Input Speed	:	2982 RPM

## **4.3 GBC Lube Oil**

### **4.3.1 GBC Lube Oil Specification**

Particulars	:	Performance
ISO VG,	:	746
Viscosity, ASTM D445 :	:	
CSt @ 100°C	:	7
CSt @ 40°C	:	46
Viscosity Index, ASTM D2270	:	>100
Four Ball Wear Test : (40kg, 1200 rpm, 75° C, 1 hr) D4172	:	<.4 mm
Water Seperability: (54°C and 82°C) D1401	:	< 3mm at 15 minutes
Foaming Characteristics (Sq. I,II & III) Tendency/stability, D892	:	<10 ml/0
Gas Bubble Retention Time: at 40° C, D3427	:	< 5 minutes
Rust Test: Distilled Water, D665A Synthetic Sea Water, D665B	:	Pass Pass
Roating Bomb Oxidation Test: D 2272	:	>400 minutes
The Oil Brand we Use	:	Mobil DTE-746

### **4.3.2 GBC LO Tank Heater (4 nos)**

Manufacturer	:	Chromalox
Serial no	:	2195979-02
Rating	:	380 V, 3 Phase, 6 KW, 9.1 Amps
Type CFP	:	2/L
ExdelICT	:	3
Tamb	:	-50/+40'c
ITS 02 ATEX	:	1021x

### **4.3.3 GBC LO Pump**

Manufacturer	:	SIEMENS
Phase	:	3 ~MOT
Weight	:	44 kg, Th. Cl. 155 (F)
IEC/EN	:	60034 132S IMB5
INS	:	IP 55, -20°C <=TAMB<=50°C
Bearing DE	:	6208-2ZC3
Bearing NE	:	6208-2ZC3
Frequency	:	50 Hz
Voltage	:	380 Δ, 660 Y, 440 Δ
Ampere	:	10.4, 6, 9.9-9.5
kW	:	5.1, 5.1, 5.8-5.5
Cos	:	0.86, 0.86, 0.87-0.86

### **4.3.4 GBC LO Cooler**

CERTIFIED BY	:	ECODYNE Heat Exchangers, Houston, Texas.
MODEL NO.	:	13W-441-2F12
SERIAL NO.	:	S300000352-1BS / F
SERVICE	:	LUBE OIL COOLER
DRWG. NO.	:	14488-102A
CUST. ORDER NO.	:	4400006271
MAWP	:	1034 PSI AT 93 F TEST 1344 PSI
MDMT	:	-28 F AT 1034 PSI
CRN. NO.	:	AAA3807160-00000

### **4.4 GBC Fin Fan Cooler**

CERTIFIED BY	:	ECODYNE Heat Exchangers, Houston, Texas.
MODEL NO.	:	13W-441-2F12
SERIAL NO.	:	S300000352-1AS / F
SERVICE	:	NATURAL GAS COOLER
DRWG. NO.	:	14488-102
CUST. ORDER NO.	:	4400006271
MAWP	:	6067 PSI AT 204 F TEST 7887 PSI
MDMT	:	-28 F AT 1034 PSI
CRN. NO.	:	1113807160-00000

### **4.5 GBC Fin Fan Motor (2 nos)**

Manufacturer	:	TEC Westinghouse, Round Rock, Texas
Serial no	:	0Y7133073007
Weight	:	638 lbs
Code	:	G
S.F	:	1
Bearings	:	6212ZC35C/6312ZC350
Type	:	AEHH8B
Category No	:	HB0404
Output	:	40 HP / 29.84 KW
Frequency	:	50 Hz
Voltage	:	400 V



Current	:	53.19 A
R.P.M	:	1470
Pole	:	4
INS class	:	F
Phase	:	3
AMB	:	40°C
NEMA NOM. EFF.	:	93
MIN. EFF.	:	91

#### 4.6 GBC Gas Control Actuators

<b>Ball Valve (After Coalescer):</b>		
Type	:	TMBV
V. Sr. No.	:	NO430
Size	:	8"
BD. Bnt. CVR	:	WCB
Class	:	600
Trim	:	SS318
FTF	:	660 MM
MOP at T <sub>max</sub>	:	225 PSI, 800 Deg F
MOP at T <sub>min</sub>	:	- 20 Deg F, 1480 PSI
M/Y	:	08/15

<b>Ball Valve (Before Scrubber-2):</b>		
Model No.	:	5450
Class	:	1500-ANSI
WP	:	100 Deg F
T <sub>max</sub>	:	180 Deg F
Max Act. Pressure	:	35 PSI

<b>Actuator Valve:</b>		
Quantity	:	4
Type	:	EZ
S/N	:	F000687423
Rating	:	CL600/1500 PSI CWP
Size	:	34
Port Size	:	1
Body	:	STL
Bench Set	:	16-Jun
Travel	:	3/4

<b>Main Inlet Valve:</b>			
Quantity	02	:	2
Model	: SW12	:	SW12
Allowable Torque:	4000 NM	:	4000 NM
Speed ratio	: 80:1	:	80:01:00

<b>Main Inlet Solenoid Valve:</b>		
Model NO.: 33-36415	:	33-36415
Action air to: Open	:	Open
Supply Pressure: 21 PSI	:	21 PSI
Rating: 300 ANSI	:	300 ANSI

#### **4.7 GBC Filters**

<b>Dry gas filter</b>		
Manufacturer	:	Forain Milano-Italy ANGIOLETTI VESSEL
MFG Year	:	2006
Design Pressure	:	220 PSIG
HYDR. Test Pressure	:	330 PSIG
Gas Flow rate	:	20 MMSCFD
Date of TEST	:	26.04.2006
Shell	:	9.52 mm
Bottom Head	:	9.52 mm

<b>Scrubber</b>		
Manufacturer	:	Northern Design Services. INC., (231) 258-9900
MAWP	:	725 PSI
Temperature	:	125°F
MDMT	:	-20°F
MFG Year	:	2011
SHELL	:	24 OD X .688 X 84 S/S
S/N	:	10775
JOB	:	N1136
DWG	:	24S57

<b>Coalescer</b>		
Manufacturer	:	VALERUS
Serial	:	S10096
M.A.W.P	:	1440 PSI
Temperature	:	120°F
Year	:	2010
M.D.M.T	:	- 20°F
DWG#	:	FG210062
DESC.	:	24"O.D.X 12" 6"
EST. WT.	:	5278 LBS

## 5 Instrument Air System

### 5.1 Air Compressor Motor

Quantity	:	2 nos
Manufacturer	:	Siemens
Phase	:	3 Phase
Type	:	
Model No	:	
Weight	:	470 Kg
Bearing	:	DE (6215-C4), NDE (6215-C4)
Made in	:	Czech Republic
Rating	:	400 Δ, 50 Hz, 131 Amp, 0.87, 94.7 %, 2978, IE3

### 5.2 Air Compressor

<b>Air Compressor</b>		
Quantity	:	2 nos
Manufacturer	:	Atlas Copco
Type	:	ZT 75
Serial No	:	APF199424
Max. working pressure	:	8.6 bar ( e )
Input Power	:	78.6 KW
Rotational shaft speed	:	2980 r/min
Year of manufacture	:	2015
Weight	:	2000 Kg
Made in	:	Belgium

### 5.3 Compressor Oil

Particulars	:	Performance
Density at 15° C, ISO 3675	:	0.860 Kg/dm <sup>3</sup>
Viscosity at 40° C, ASTM D445	:	68 mm <sup>2</sup> /S
Viscosity Index, ASTM D 2270	:	133
Foam Stability, ASTM D 892	:	0/0/0 ml
Total Acid Number, ASTM D 974	:	.18 mg KOH/g
Rust Test, ASTM D 665B	:	Pass
Pour Point, ASTM D97 (° C)	:	-30
Oil Type	:	Mineral Based Oil with Tailored Additive Pack
Reference	:	Atlas Copco Lubricant Manual

#### **5.4 Compressed Air Reservoir**

Quantity	:	1 Nos
Manufacturer	:	Lohenner GmbH and Co.KG
Pressure vessel	:	Luft / air
Media	:	N2 , Ar
Capacity	:	3000L (V)
Allowable P.	:	11 bar PS max
Allowable P.	:	0 bar PS min
Allowable t.	:	Amb +50C T max.
Allowable t.	:	-10C T min.
Allowable t.	:	.....C/bar bei/at
Serial –no	:	215746
Year of manufacture	:	2015

#### **5.5 Air Dryer**

Quantity	:	2 Nos
Manufacturer	:	Atlas Copco Air Power N.V.
Type	:	FX 15 (A13)
Product Number	:	8102224444
Serial Number	:	CAI813078
Year of manufacture	:	2015
Weight	:	158 kg
Rating	:	3 Phase, 400 Volt, 50 Hz, 3.76 KW
Comp.Air Pmax	:	13 Bar €
Ambient Max	:	46 C
Refrig. Type	:	R 410 A
Refr. Pmax High	:	43 bar €
Operating Temp	:	3 Deg C to 60 Deg C
Amount	:	2.05 kg
P max Low	:	26.7 Bar
Made in	:	Italy

#### **5.6 Nitrogen Generator**

Quantity	:	2 Nos
Manufacturer	:	Parker Hannifin Manufacturing Ltd.
Prod No	:	MAXIGAS106ECBLL
Pt No	:	646500602
Sr No	:	14MX0290
Year of manufacture	:	04/11/14
Volume	:	170 Lt
Weight	:	394 kg/869 lb
Electrical Supply	:	115/230 VAC, 50/60 Hz,40w
Operating Press	:	6 Bar g / 88 psi g / 0.6 to 10 Bar g / 145 psi g / 1.0 MPa
Vessel Test Press	:	14.3 Bar g / 207.5 psi g / 1.43 Mpa
Operating Temp	:	5° C / 41° F to 50° C / 122° F

<b>Factory Settings</b>		
Inlet pressure	:	7.0 Bar g / 101 psi g
Outlet Pressure	:	5.6 Bar g / 81 psi g
Flow rate	:	45 m3/hr, 1586 scfh
Purity	:	5.0 % O2
Quantity	:	1 Nos
Manufacturer	:	Parker Hannifin Manufacturing Ltd.
Prod No	:	N2-25PBLN
Pt No	:	646503000
Sr No	:	17NSP0277
Year of manufacture	:	17/11/17
Volume	:	170 Lt
Weight	:	430 kg
Electrical Supply	:	100/240 VAC, 50/60 Hz, 55w
Operating Press	:	5 Bar g / 72.5 psi g to 13 Bar g / 188.5 psi g
Vessel Test Press	:	18.6 Bar g / 270 psi g
Operating Temp	:	5° C / 41° F to 50° C / 122° F

<b>Nitrogen vessel :</b>		
Quantity	:	2 Nos
Manufacturer	:	Parker domnick hunter
Serial Number	:	3.88848E+14
Pressure	:	0 bar g to 20 bar g / 0 psig to 290 psig
Temperature	:	1.5° C to 100° C / 35° F to 212° F
Made In	:	England

## 6 Water Treatment Plant

### 6.1 All Motors

Pump Type	Qty	Head (m)	Capacity (m3/h)	Motor Power (KW)	Phase	Motor Brand	Pump Brand	Remarks
1. Media Filter Pump	2	50	50	15	3	SIEMENS	GRUNDFOS	Centrifugal
2. ACF Pump	2	50	50	15	3	SIEMENS	GRUNDFOS	Centrifugal
3. Filter B/W Pump	1	32	150	22	3	GRUNDFOS	GRUNDFOS	Centrifugal
4. RO-1 Pump	1	166.5	30	15	3	GRUNDFOS	GRUNDFOS	Centrifugal
5. RO-2 Pump	2	135.6	17	11	3	GRUNDFOS	GRUNDFOS	Centrifugal
6. LPFP-1	1	35.8	30	5.5	3	GRUNDFOS	GRUNDFOS	Centrifugal
7. CIP Pump	1	N/A	50	3	3	SHANGHAI FANGLI MOTOR CO. LTD.	SHANGHAI FANGLI MOTOR CO. LTD.	Centrifugal
8. Makeup Water Pump	2	45.3	22	5.8	3	GRUNDFOS	GRUNDFOS	Centrifugal
9. Air Blower-1 (For AT)	1	N/A	N/A	5.5	3	DYNAMIC	N/A	Roots Blower
10. Air Blower-2 (For Backwash)	1	N/A	N/A	0.75	3	PIONEER VORTEX GAS PUMP	N/A	Roots Blower

### 6.2 Primary Filters Media (RO Stage – 01)

Brand	:	Donaldson Torit
Media	:	Needled Polyester
Length (inches)	:	48
Width (inches)	:	7.88
Shape	:	Rectangle
P/N	:	P199345-016-002

### 6.3 Secondary Filters Media (RO Stage – 02)

Brand	:	Donaldson Torit
Media	:	Denier Blend Black
Outer Dia. (inches)	:	19.25
Inner Dia. (inches)	:	9.25
Shape	:	Round
Temp. Limit	:	177° C
P/N	:	P199348-016-002

### 6.4 Polypropylene Filter (PP Filter)

Brand	:	Popular Everco
Type	:	Cartridge
Length (inches)	:	40
Outer Dia. (inches)	:	2.5
Efficiency	:	1 micron

## 6.5 Tanks & Vessels

Vessel Title		Total Volume (Litr)	Mass (Dry) (Kg)	Mass (Operating) (kg)
Mn Filter	:	11500	5000	22500
Dual Midea Filter	:	11500	5000	22500
Activated Carbon Filter	:	11500	5000	22500
Aeration Tower	:	6357	2000	3500
<b>Design Data (For Mn, Dual Media &amp; ACF Filter)</b>				
Design Pressure	:	100 psi	Operating Pressure	75 psi
Design Temp.	:	40° C	Operating Temp.	Ambient Temp.
Joint Efficiency	:	85	Operating Position	Vertical
Corrosion Allowance	:	.75 MM	Hydro static Test Pres.	130 psi
Codes	:	ASMEBPVC.VII, 1-2015	Hydro static Test Position	Vertical

## 6.6 Treated Water Specification

### Required Specification

Particulars	Limit	Test Method
Total Matter, ppm, max	5	ASTM D1888
Dissolved matter, ppm, max	3	ASTM D1888
PH	6.0 - 8.0	ASTM D1293
Conductivity, microhms/cm at 25 Deg C, Max	0.5 - 1.0	ASTM D1225
Sodium + Potassium, ppm, max	0.1	ASTM D1428
Silicon dioxide, ppm, max	0.1	ASTM D859
Chlorides, ppm, max	0.5	ASTM D512
Sulfates, ppm, max	0.5	ASTM D516

### Actual Specification

Particulars	Limit
Silica, ppm	0.022
Conductivity, uS/cm	<1
TDS	UDL
PH	5 - 5.5
TSS	UDL
Sulfate	UDL

## 7 Electrical System

### 7.1 HV Switchgear

#### 7.1.1 Power Transformer

Particulars	Specification
Quantity	: 1 No
Manufacturer	: INDO TECH TRANSFORMERS LTD.
Rated Power (MVA)	: 100/133
Rated Voltage at no load	: HV: 230 KV, LV: 11.5 KV
Amperes	: HV: 251.02/333.86, LV: 5020.58/6677.37
Insulation level	: HV; 950 kVP/395k Vrms, HVN: 95 kVP/38 kVrms, LV & LVN: 75 kVP/28 kVrms
Type of Cooling	: ONAN/ONAF
Impedance (%)	: 15.14 (At 75°C)
Frequency	: 50 Hz
Phases	: 3 ~
Vector group reference	: YNd1
Mass of core & Windings	: 73000 kg
Mass of Oil	: 46725 kg
Total Mass	: 172800 kg
Volume of Oil	: 52506 liters
Temp rise in oil & windings	: 60/65
Diagram Drawing /Year	: IT 3155530 / 2010
Serial No.	: ITK 45110/3367
Specification ref. no.	: IEC: 60076

#### 7.1.2 SF6 Circuit Breaker

Particulars	Specification
Manufacturer	: ABB ASEA Brown Boveri
Type	: 242PA 63-30
Serial No.	: 100626-03
Max. Voltage	: 242 KV
Continuous Current	: 3000 Amps
Short Circuit Current	: 63 KA
Voltage Range Factor "K"	: 10
Impulse Withstand	: 900 KV
Interrupt Time	: 3 Cycles
Frequency	: 50 Hz
Weight With Gas	: 14810 LBS
Weight Without Gas	: 14460
Gas per Breaker	: 350 LBS
Instruction Manual	: 6427-2B
PO	: DF-AC65-91WAO9311
Closing	: 90-14- VDC, 3.5 Amps
Tripping	: 70-14- VDC, 3.5 Amps
Aux Load	: 240 VAC, 2 Amps
Motor	: 125 VDC, 12 Amps



Normal Operating Pressure	:	87 PSIG
Low Pressure Alarm	:	76 PSIG
Low Press (Trip & Close Block)	:	72 PSIG

### **7.1.3 Current Transformer**

Particulars		Specification
Type	:	LB7-230W2
Quantity	:	6
Manufacturer	:	Dalian Instrument Transformer CO. Ltd. China
Standard Code	:	IEC60044-1
Highest voltage for equipment	:	252 kV
Rated insulation level	:	460/1050 kV
Terminal markings	:	1S1-1S2/2S1-2S2
Frequency	:	50 Hz
Rated current ratio (A)	:	2×750/1
Altitude	:	1000 m outdoor
Accuracy class	:	0.2s/0.2s
I <sub>th</sub> (2s)	:	61.5 kA
Rated output (V/A)	:	30/30
I <sub>dyn</sub>	:	154 kA
Oil weight	:	365 kg
Total weight	:	1300 kg
PO no.	:	442139053
Serial no	:	O1005

### **7.1.4 Potential Transformer**

#### **Potential Transformer - 1**

Particulars		Specification
Type	:	TYD230/V3-0.005H
Quantity	:	3
Manufacturer	:	Dalian Instrument Transformer CO. Ltd. China
Standard Code	:	IEC60044-5 2004
Ambient temperature	:	25-50°C
Rated voltage	:	230/√3 kV    115/√3 V    115/√3 V
Intermediate Voltage	:	33/√3 kV
Rated insulation level	:	Um252/AC460/BIL1050kV
Terminal markings	:	A-E 1a-1n 2a-2n
Frequency	:	50 Hz
Pollution classes	:	III
Rated capacitance of capacitor	:	Cr0.005μF
Rated ratio	:	6.9696
Short time over voltage factor	:	1.5U <sub>r</sub> 30s
Accuracy class	:	0.2    0.2
Capacitor serial no	:	J0768/J0772
Rated output	:	30 VA    30VA
weight	:	912 kg
PO no.	:	442123053

## Potential Transformer - 2

Particulars		Specification		
Type	:	JDQXF-230		
Quantity	:	3		
Manufacturer	:	Tai Kai Group. Shandong Taikai Instrument Transformer Co. Ltd.		
Standard	:	IEC 61869-1 IEC 61869-3		
Phase	:	single		
Equipment class	:	Out door		
Rated Primary Voltage	:	230/ $\sqrt{3}$ kV		
Rated Insulation Level	:	250/460/1050 kV		
Rated Voltage Factor/time	:	1.2		
Rated Frequency	:	50 Hz		
Altitude	:	2000 m		
Rated Pressure	:	0.5 Mpa at 20°C		
Minimum Operating Pressure	:	0.45 Mpa at 20°C		
Manufacture No.	:	1600047		
Gas weight	:	22 kg		
Gross weight	:	1200 kg		
Secondary connection Terminal	:	1a-1n	2a-2n	3a-3n
Rated Secondary voltage, V	:	110/ $\sqrt{3}$	110/ $\sqrt{3}$	110/ $\sqrt{3}$
Accuracy class	:	0.2	0.2	5p
Rated Output, VA	:	30	30	100

### 7.1.5 Disconnecting Switch

Particulars		Specification		
Type	:	VBPA/GS		
Manufacturer	:	Pascor		
Serial no.	:	4845A		
NOM. kV	:	230 KV		
Max. kV	:	242 KV		
Bil kV	:	900		
Cont. Amp	:	3000		
MOM. Amp	:	100		
A.C.C.C.	:	D06		
P.O.	:	7354-RO2		

## **7.2 MV Switchgear**

### **7.2.1 Auxiliary Transformers**

#### **Unit Auxiliary Transformer**

<b>Particulars</b>		<b>Specification</b>
Quantity	:	2
Manufacturer	:	INDO TECH TRANSFORMERS LTD.
Specification Ref. No.	:	IEC: 60076
Rated Power (kVA)	:	1500
Rated Volts	:	HV: 11500, LV: 400
Ampere	:	HV: 75.31, LV: 2165.06
Phase	:	HV: 3, LV: 3
Type of cooling	:	ONAN
Frequency	:	50 Hz
Impedance Volts (%)	:	6.36
Vector group ref no.	:	Dyn11
Mass of core & windings	:	2080 kg
Mass of Oil	:	1035 kg
Total weight	:	4915 kg
Volume of Oil	:	1220 Liters
Insulation Level	:	L1 75 AC28/ L1 AC3
Makers serial No.	:	IT 45141
Work Order NO.	:	IT 3447
Max. temp. rise in oil/winding	:	60/65
Year of Manufacture	:	2010
Customers Ref.	:	P.O. No. 442138256

#### **Aux. Transformer for GBC Area**

<b>Particulars</b>		<b>Specification</b>
Quantity	:	1
Manufacturer	:	Energypac Engineering Ltd. Bangladesh
Manufacturing sl no.	:	CRT/11/0.415/500/-014
Rated Power (kVA)	:	500
Type of cooling	:	AN
No. of phases	:	3
Frequency	:	50 Hz
Vector group	:	Dynn11
Impedance (%)	:	5.6
Temperature rise	:	100 K
Insulation level	:	HV LI 75 kV, AC 28 kV/ LV AC 3 kV
Environmental	:	E2 climate C2
Insulation system temp	:	155°C
Total Mass IPOO	:	1380 kg
Total Mass IP20	:	1525 kg
Year	:	2015
Rated current Line (A)	:	HV: 26.2, LV: 695.6

Rated Voltage					
HV			LV	Tap position	Lead joined
11550	:	415		1	8_7
11275	:			2	6_7
11000	:			3	6_5
10725	:			4	4_5
10450	:			5	4_3

### 7.2.2 Load Break Switch (LBS with Fuses)

Particulars		Specification
Quantity	:	3 Nos
Name	:	Break master Load Interrupter Switch
Req. Number	:	4081DHTB-L1
Factory Order Number	:	178L823599-4
Switch Serial No	:	86930-1
Manufacturer Date	:	12/15/10
Rated maximum Voltage	:	15 KV
Impulse Withstand ( B/L )	:	95 KV
Normal Freq. Withstand	:	36 XV
Frequency	:	50 Hz
Continuous Current	:	1200 A SYM
load Interrupting Current	:	1200 A SYM
Momentary Current	:	61 KA ASYM
Short Time Current	:	38 KA SYM
Time	:	2 SEC
Fault Closing Current	:	62 KA ASYM
Fuse Rating	:	100
Fuse Catalog No	:	9F62DDD100
Integrated Switch & Fuse Short Circuit Current	:	61 KA ASYM
Main Bus Ampacity	:	N/A
Main Bus Bracing	:	N/A
Enclosure Type	:	Outdoor ( Category B )
Made	:	GE ( Mexico ) ( 190B9965P1 )
Application	:	Auxiliary Transformer

### 7.2.3 52G Circuit Breaker (with CT & PT)

Particulars		Specification
Quantity	:	2 Nos
Name	:	Alternating Current Metal Enclosed Switchgear And Controlgear
Ref. Standrad	:	IEC 62271-200
Type	:	KYN 44 - 12
Rated Voltage	:	12 KV
Rated Short Time Withstand Current	:	50 KA
Rated Frequency	:	50 Hz
Rated Duration of Withstand Current	:	3 SEC
Rated Lighting Impulsive Voltage	:	75 KV
Rated Peak Withstand Current	:	100 KA
Rated Power Frequency Withstand Voltage	:	42 KV
Rated Current	:	4000 A
Degree of Protection (En./Com )	:	IP 4X/2X
Rated Current ( Main/ Branch Bus )	:	4000/4000 A
Degree of Accessibility	:	AF-BL
Rated Ratio ( CT )	:	4000 A
Internal Arc Test Current	:	40 KA
Rated Arc Level	:	IAC
Internal Arc Test Duration	:	0.5 SEC
Manufacturing Date	:	Jul-15
Serial Number	:	KK1505200002

### Potential Transformer:

Particulars		Specification		
Quantity	:	6 Nos		
Name	:	Potential Transformer		
Rated Voltage	:	11 KV		
Highest System voltage	:	12 KV		
Construction	:	Outdoor		
Insulation Level	:	28/75 KV		
No of Phase	:	Single		
Rated Frequency	:	50 Hz		
Ration	:	1000÷√3 / 110÷√3 - 110÷√3 V		
Total weight	:	85 KG		
Burden	:	100-50 VA		
Class of Accuracy	:	0.2/3P		
Serial No	:	11.P.D-31105		
Year of Manufactory	:	2015		
Ratio		Primary Connection		
		Secondary Connection		
		Metering		
		Protection		
1100÷√3 / 110÷√3 V	A - N	1a - 1n	100	0.2
1100÷√3 / 110÷√3 V	A - N		2a - 2n	50
Manufacturer		Energypac Engineering Ltd		

#### 7.2.4 GBC Motor Circuit Breaker

<b>GBC # 01 Motor Circuit Breaker</b>		
Manufacturer	:	Schneider Electric
Model	:	Evoils
IEC	:	62271-100, Ed 1.1 2003-05
Rated voltage	:	12 kV
Rated current	:	630 A
Short circuit rated breaking capacity	:	25 kA 3sec
Lighting impulse withstand	:	75 kV
Rated switching sequence	:	O-o, 3s-CO-15s-CO
Relay	:	ABB REM620

<b>GBC # 02 Motor Circuit Breaker</b>		
Manufacturer	:	ABB
Vmax/W	:	12.06.32
IEC	:	62271-100
Classification	:	M2
Serial No	:	1VC1BF00034183
PR Year	:	2015
Mass	:	100 Kg
Voltage	:	12 kV
Lighting impulse withstand voltage	:	75 kV
Power frequency withstand voltage	:	25 kV
Frequency	:	50/60 Hz
Normal current	:	630 A
Short time withstand current	:	31,5 kA
Duration of short circuit	:	3 s
Short circuit breaking current	:	31,5 kA
Making capacity (peaking value)	:	80 kA
At the voltage of	:	12 kV
D.C component	:	<=30%
Cable charging breaking current	:	25 A
Operating sequence	:	O-0, 3S-CO-15S-CO
Relay	:	REJ601

#### 7.2.5 Auxiliary Transformer Circuit Breaker

<b>GBC &amp; Auxiliary Transformer Incoming – Vacuum Circuit Breaker</b>		
Manufacturer	:	ABB (Italy)
Vmax/W	:	12.06.32
Classification	:	M2
IEC	:	62271-100
Serial Number	:	1VC1BF00034182
PR. Year	:	2015
Mass	:	100 kg
Voltage	:	12 kV
Lighting impulse withstand voltage	:	75 kV
Power frequency withstand voltage	:	28 kV

Frequency	:	50/60 Hz
Short time withstand current	:	31,5 kA
Duration of short circuit	:	3 s
Short circuit breaking current	:	31,5 kA
Making capacity (peak value)	:	80 kA
At the voltage of	:	12 kV
D.C component	:	<=30%
Cable-Charging breaking current	:	25 A
Operating sequence	:	O-0, 3S-CO-15S-CO

<b>GBC Area Auxiliary Transformer</b>		
Manufacturer	:	Energypac
IEC	:	60076-11
Manufacturing SL No	:	CRT/11/0.415/500-014
Rated Power	:	500 kVA
Type of cooling	:	AN
Year of manufacturing	:	2015
No. of Phases	:	3
Frequency	:	50 Hz
Vector group	:	Dyn11
Impedance	:	5.60%
Temperature rise K	:	100
Insulation level HV L1	:	75 kV, AC 28KV
Insulation level LV	:	AC 3 kV
Environmental	:	E2 CLIMATIC C2
Fire	:	F1
Total Mass IPOO	:	1380 kg
Total Mass IP20	:	1525 kg

## 7.3 LV Switchgear

### 7.3.1 GBC Area Distribution Air Circuit Breaker

Manufacturer	:	Schneider Electric
Model	:	Masterpact NW20 H1
IEC	:	60947-3
Network frequency	:	50/60 Hz
Control type	:	Push-Button
Utilization category	:	B
Mounting Mode	:	Drawout
Rated current	:	2000 A (40°C)
Rated insulation voltage (Ui)	:	1000 V
Rated impulse withstand voltage (Uimp)	:	12 kV
Rated operational voltage	:	220/440/480/690
Rated service breaking capacity	:	65 kA
Electrical durability	:	AC23A, 690 Volt, 2000 Amp

### 7.3.2 Auxiliary Switch Board

Particulars		Specification
Quantity	:	2 Nos ( For Both Unit )
Name	:	STD. Brake Circuit Breaker
Catalog No	:	SSD20G220
Serial No	:	P24000200500101
Ampers	:	2000 Amp ( Max )
Voltage	:	600 V
Pole	:	3 Pole
Rating Plug Type	:	GTP20
Frequency	:	50/60 Hz
Time Rating	:	Short Time Rating 40 KA 1/2 SEC, P0321
Volt	:	KA
240	:	85
480	:	65
600	:	50
Operating	:	To Charge Closing Spring Operate Handle Six Times
Close	:	Push "ON" Button
Open	:	Push "OFF" Button
To Lock OFF	:	1. Depress OFF Button
	:	2. Pull Out Padlock Hasp
	:	3. Install Padlock
Manufacturer	:	GE Consumer & Industrial Electrical Distribution
POM II	:	Power Quality Meter ( 2 Nos )



<b>800 A MCCB</b>	
Quantity	: 6 Nos
Name	: Circuit Breaker
Catalog No	: SKLC3608L4XX
Amperes	: 800 Amp
Voltage	: 600 V ( Max )
Phase	: 3 Phase
Rating Plug Type	: GTP
Lug Data	: 75*0 WIRE
Catalog No	: TCAL81
Wire Range	: 3/0 - 500 MCM CU
	: 3/0 - 500 MCM AL
Volt	: KA
240	: 100
480	: 65
600	: 42
Manufacturer	: GE Consumer & Industrial Electrical Distribution
Use	: 1 Nos Use For MCC ( 95 RM Cable ) 1 Nos Use For MCC ( 400 RM Cable ) 1 Nos Use For WTP , 1 Nos Use for Auxiliary Switch Board & 2 Nos Spare

<b>1200 A MCCB</b>	
Quantity	: 2 Nos
Name	: Circuit Breaker
Catalog No	: SKLC3612L4XX
Amperes	: 1200 Amp
Voltage	: 600 V ( Max )
Phase	: 3 Phase
Rating Plug Type	: GTP
Lug Data	: 75*0 WIRE
Catalog No	: TCAL125
Wire Range	: 250 - 500 kcmil CU
	: 250 - 500 kcmil AL
Volt	: KA
240	: 100
480	: 65
600	: 42
Manufacturer	: GE Consumer & Industrial Electrical Distribution
Use	: 1 Nos Use for MCC ( 400 RM Cable ) & 1 Nose Spare

### 7.3.3 Emergency Diesel Generator

<b>1. Diesel Generator set</b>		
Model	:	LG275C
Serial Number	:	1102110
Rated Output	:	250 kVA
Standby Output	:	275 kVA
Rated Current	:	380 A
Rated Voltage	:	220/380 V
Phase	:	3
Power Factor	:	0.80
Frequency	:	50
Insulation Class	:	H
Max. Ambient	:	40°C

<b>2. Engine</b>		
Manufacturer	:	Cummins Corporation Inc.
Engine Model	:	6LTAA8.9-G2
Engine Serial no	:	87773677
C.I.D./L.	:	8.9
CPL	:	3079
Family	:	L
RPM	:	1500
Low Idle RPM	:	900
Fuel rate at rated HP	:	195 mm <sup>3</sup> /ST
Valve lash cold	:	0.30
INT	:	0.61 EXH
Firing order	:	1-5-3-6-2-4
Engine ASSY NO	:	S030377
Shop order no	:	30377

<b>3. Alternator</b>		
Manufacturer	:	Cummins Generator Technologies (STAMFORD).
Serial Number	:	X11A010794
Order Number	:	N50477
Frame / Core	:	UCDI274K14
KVA base rate (BR)	:	250.0
KW base rate (BR)	:	200
Hz	:	50
RPM	:	1500
Volts	:	400
Phase	:	3
AMP base rate (BR)	:	360.8
PF	:	0.8
Rating	:	CONT
EX. Volts	:	57

EX. Amps	:	2.5
Ambient Temp °C	:	40
Enclosure	:	IP23
Insulation class	:	Class H
Stator WDG	:	311
Stator CONN	:	S Star
AVR	:	AS440
Mounting Type	:	IMB15
Cooling Method	:	IC01
Weight Kg	:	727

## **7.4 Electrical Protection**

### **7.4.1 Alternator Protection (M-3425A)**

Particulars		GTG # 01	GTG # 02
Model	:	M-3425A-CS5S001LOC1Th1H1X	M-3425A-CS5S001LOC1Th1H1X
Function	:	Alternator Protection	Alternator Protection
Firmware	:	D-0150V205.00.08	D-0150V05.00.08
Serial	:	9382	9378
Operating Voltage	:	60-140 VAC, 50/60 Hz	60-140 VAC, 50/60 Hz
Rated Current	:	5 Amp	5 Amp
Output	:	8	8

### **7.4.2 Transformer Protection (T60)**

Particulars		Specification
Name	:	T60 Transformer Protective Relay
Series	:	UR Series GE Multilin
Control Power	:	125-250 V $\approx$ 0.7A / 100 -240 V , 50/60Hz , 0.7 A
Contacts Inputs	:	300 V $\approx$ Max 10 mA
Model	:	T60K23HKHF8NH6PM8NP6DU8LW6C
Mods	:	None
Wiring Diagrams	:	828712
Inst. Manual	:	1601-0090
Serial Number	:	ABHC10001775
Firmware	:	A09MA581.000
Mfg . Date	:	13-Jan-11
PO Number	:	442139023
Item name	:	None
Made	:	U.S.A

### 7.4.3 Feeder Protection (F60)

Particulars		Specification
Name	:	F60 Feeder Protective Relay
Series	:	UR Series GE Multilin
Control Power	:	125-250 V $\approx$ 0.7A / 100 -240 V , 50/60Hz , 0.7 A
Contacts Inputs	:	300 V $\approx$ Max 10 mA
Model	:	F60K04HKHF8LH6PMXXP6DUXXW6C
Mods	:	None
Wiring Diagrams	:	832710
Inst. Manual	:	1601-0093
Serial Number	:	ABHC10001887
Firmware	:	A09MA581.000
Mfg . Date	:	Dec 06 2010
PO Num	:	442139023
Item name	:	None
Made	:	U.S.A

### 7.4.4 Feeder Protection (F35)

Particulars		Specification
Name	:	F35 Feeder Protective Relay
Series	:	UR Series GE Multilin
Control Power	:	125-250 V $\approx$ 0.7A / 100 -240 V , 50/60Hz , 0.7 A
Contacts Inputs	:	300 V $\approx$ Max 10 mA
Model	:	F35K04HKHF8LH6LM8NPXXUXXWXX
Mods	:	None
Wiring Diagrams	:	832735
Inst. Manual	:	1601-0106
Serial Number	:	AAIC10002362
Firmware	:	A09MA581.000
Mfg . Date	:	Dec 06 2010
PO Num	:	442139023
Item name	:	None
Made	:	U.S.A

## **8 Control System**

### **8.1 GTG Control System**

Model	:	MicroNet Plus
Manufacturer	:	WOODWARD, GE, USA

#### **8.1.1 GTG Hardware**

##### **TCP Panel**

Quantity	:	1 Nos per GTG
Actuator Controller	:	2 Nos per GTG
I/P 4-20 mA card	:	2 Nos per GTG
Speed Sens. Module	:	1 Nos per GTG
Digital O/P	:	2 Nos per GTG
Serial I/O card	:	1 Nos per GTG
Network Controller	:	1 No per GTG
C P U	:	2 No per GTG

##### **Distributed I/O**

Linknet 4-20 mA I/P	:	7 Nos per GTG
Linknet RTD 100 Ohm	:	7 Nos per GTG
Digital I/P	:	9 Nos per GTG

#### **8.1.2 GTG Software**

Name	:	Graphical Application Programmer (GAP) Ladder Logic
Version	:	3.09f

#### **8.1.3 Control System Overview**

Functions : 1) Core Fuel Control  
2) Fuel Metering System  
3) Sequencing

#### **8.1.4 Communication with Field I/O**

Linknet Network Controller Card & Field Linknets Communicate through a twisted pair of Belden I/O Cable

#### **8.1.5 Operator Interface (HMI)**

Software	:	Woodward Proficy iFIX 5.5
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## **8.2 Gas Metering Valve (Governor)**

### **Governor Actuator**

CODE	:	FCV 6201
Function	:	Fuel Control Valve
Manufacturer	:	WOODWARD
Valve size	:	2 Inch
Body	:	SS
Signal	:	Electrical Signal to Operate
Part No.	:	9907-960
Serial No.	:	18910074(U1) 18977420(U2)
Quantity	:	2 (1 per GTG)

### **Governor Controller**

Name	:	Digital Valve Positioner (DVP)
Manufacturer	:	FT. Collins Colorado USA
Function	:	Governor Controller
Customer P/N	:	398A4776P0001
Woodward P/N	:	8200-505 Rev. D
Serial No	:	18998863
Temp. Range	:	- 40 Deg C to 55 Deg C
Input Voltage	:	18 - 32 VDC
Input Power	:	240 Watts Max Continuous

## **8.3 Automatic Voltage Regulator (AVR / Exciter)**

Model	:	EX2100e PCM
P/N	:	151Z1235DB10SA01
Max Sym SCC	:	18000 Amps at 330 VAC
Max DC SCC	:	10000 Amps at 250 VDC
Max DC Output Voltage	:	250 VDC
Max DC Output Current	:	35 ADC

## **8.4 GTG Monitoring & Protection System**

### **8.4.1 Vibration Monitoring System**

#### **Software**

Manufacturer	:	Bently Nevada GE USA
Model	:	3500 series

#### **Hardware**

Low Voltage DC Power Input Module	:	Monitors supply Voltage
Aero GT Vibration I/O Module	:	Monitors CRF & TRF Vibrations
Proximeter I/O Module	:	Monitors Generator Bearing
Prox/Seismic I/O Module	:	Monitors GB end HS Pinion Vibrations
Tachometer I/O Module	:	Speed Element-Generator Rotor
4 channel Relay I/O Module	:	
Transient data interface I/O Module	:	

### **8.4.2 Fire & Gas Monitoring System**

Manufacturer : Wilson Fire Equipments, GE , USA

#### **Hardware**

1.I/P module
2.CO2 release module
3.Manual pull module
4.Fault module
5.Alarm module
6.Gas Module
7.Relay Module

## **8.5 GBC Control System**

Model	:	CompactLogix L33ER
Make	:	Allen Bradely, USA
Redundancy	:	Available

### **8.5.1 Hardware**

Quantity (Panel)	:	1 nos per GBC
Power Supply Module	:	1 nos per GBC
D/O Module	:	1 nos per GBC
D/I Module	:	1 nos per GBC
A/I Module	:	3 nos per GBC
A/O Module	:	1 nos per GBC
RTD/Resistance Module	:	4 nos per GBC
Redundancy	:	Yes

### **8.5.2. Software**

Name	:	RSLogix
Version	:	V20

### **8.5.3. Operating Console**

Quantity	:	1 nos per GBC
Name	:	PanelView Plus 1000
Redundancy	:	Available



## 9. Instrumentations

### 9.1 Turbine Instruments

Item No	Tag No	Device No	Make	QTY	Description
1	TE-6843-50	Temperature Element, LPT Inlet Gas (T48)	Supplied By GE-IAD	8	Thermocouple-Chromel-Alumel Type
2	SE-6800 SE-6801	Speed Element-HPC Magnetic Pickup (XN25)	Supplied By GE-IAD	2	Speed Element, Magnetic Reluctance, Pulse Generator
3	PT-6804 PT-6814	Pressure Transmitter, Turbine HP Compressor Discharge (PS3)	Druck	2	Pressure Transmitter (0-600PSI)
4	SE-6812 SE-6813	Speed Element-LPT Magnetic Pickup (XNSD)	Supplied By GE-IAD	2	Speed Element, Magnetic Reluctance, Pulse Generator
5	XE-6876 XQT-6876	Vibration Element-Compressor Rear Frame	Supplied By GE-IAD	1	Turbine-Vibration, Self-Generating Accelerometer, 50 pC/g output, Piezo Electric Output
6	XE-6877 XQT-6877	Vibration Element-Turbine Rear Frame	Supplied By GE-IAD	1	Turbine-Vibration, Self-Generating Accelerometer, 50 pC/g output, Piezo Electric Output
7	XE-6807-10 SE-6811	Vibration Element-Generator Bearing	Bently Nevada	5	3300 Proxipac XL Proximter, 8.5 In Probe Length
8	TE-6821A TE-6821B	Temperature Element-LP Compressor Inlet (T2)	Supplied By GE-IAD	1	Platinum RTD, Duel Element, 100ohm at 0 Deg C
9	BE-6816 BE-6817	Turbine Igniter	Supplied By GE-IAD	2	Ignition Exciter Module
10	FCV-6871	Flow Control Valve- Variable Bypass Valve (VBV)	Supplied By GE-IAD	1	Control Valve, LVDT Position Sensor, 0-2.27 inches, Assembly Includes 2 LVDTs & one actuator
11	FCV-6873	Flow Control Valve- Variable Stator Valve (VSV)	Supplied By GE-IAD	1	Control Valve, LVDT Position Sensor, 0-3.095 inches, Assembly Includes 2 LVDTs & one actuator
12	TE-6837A TE-6837B	Temperature Element-HP Compressor Inlet (T25)	Supplied By GE-IAD	1	Platinum RTD, Duel Element, 100ohm at 0 Deg C
13	TE-6838A TE-6838B	Temperature Element-HP Compressor Inlet (T3)	Supplied By GE-IAD	1	Thermocouple-Chromel-Alumel Type, Duel Element
14	PT-6859A PT-6859B	Pressure Transmitter, Turbine HP Compressor Discharge (P25)	Rosemount	2	Pressure Transmitter (0-150 PSI)
15	PT-6860	Pressure Transmitter, LP Turbine Inlet Discharge (P48)	Rosemount	1	Pressure Transmitter (0-150 PSI)
16	PT-6863	Pressure Transmitter, Inlet Static Pressure (P0)	YKOGAWA	1	Pressure Transmitter (0-16 PSIA)
17	MCD-6865 MCD-6866 MCD-6870	Magnetic Chip Detector, Turbine Lube System	Supplied By GE-IAD	3	Magnetic Chip Detector Element

18	PT-6861A PT-6861B	Pressure Transmitter, Thrust Balance (PTB1)	Rosemount	2	Pressure Transmitter (0-150 PSI)
19	TE--68311	Temperature Sensor Assembly	Rosemount	1	Platinum RTD, Duel Element, 100ohm at 0 Deg C, 12" Immersion Length
20	XE-6897 XE-6898	Vibration Element- Gearbox	Bently Nevada	2	Gearbox Vibration Element

## 9.2 Turbine Solenoid valves

<b>Code</b>		<b>SOV 62580</b>
Function	:	Gas Fuel Shut off Valve
Manufacturer	:	FLOWSERVE
Part No.	:	B200S10 L
Serial No.	:	1720442-003-004
Max air pr.	:	150 PSIG
Valve size	:	3 INCH
Body	:	Stainless Steel
Signal	:	Air to OPEN
Solenoid Make	:	NORGREN
Part No.	:	9713665
Rating	:	0.8W, 24VDC
Quantity	:	2 (1 per GTG)

<b>Code</b>		<b>SOV 6249</b>
Function	:	Gas Fuel Shut off Valve
Manufacturer	:	WOODWARD
Valve size	:	2 INCH
Body	:	Stainless Steel
Signal	:	Gas Line Pressure to Open
Solenoid Make	:	WOODWARD
Rating	:	24VDC
Part No.	:	1311-933
Quantity	:	2 ( 1 per GTG )

<b>Code</b>		<b>SOV 6208</b>
Function	:	Turbine Fuel Gas Vent
Manufacturer	:	Meggitt
Part No.	:	C520325-1
Valve size	:	1/2 INCH
Body	:	Stainless Steel
Signal	:	Electrical Signal to Close
Rating	:	24VDC
Quantity	:	2 (1 per GTG)

<b>Code</b>		<b>SOV 62002</b>
Function	:	Fuel Manifold Drain
Manufacturer	:	CIRCOR AEROSPACE INC.
Valve size	:	1 INCH
Body	:	Stainless Steel
Signal	:	Electrical Signal to Open
Rating	:	24VDC
Model No.	:	31840-1602
Quantity	:	2 (1 per GTG)

<b>Code</b>		<b>SOV 62252</b>
Function	:	Sprint water Shut off Valve
Manufacturer	:	CIRCLE SEAL CONTROLS, INC ATKOMATIC VALVE
Valve size	:	1 INCH
Body	:	Stainless Steel
Signal	:	Electrical signal to Open
Rating	:	24VDC
Model No.	:	31840-1598A
Serial No.	:	3-091625 (U1)
Quantity	:	2 (1 per GTG)

<b>Code</b>		<b>SOV 62502</b>
Function	:	Sprint water Drain Valve
Manufacturer	:	CIRCOR AEROSPACE INC.
Valve size	:	1 INCH
Body	:	Stainless Steel
Signal	:	Electrical signal to Open
Rating	:	24VDC
Model No.	:	32840-1650
Serial No.	:	13-0715148(U1)
Quantity	:	2 (1 per GTG)

<b>Code</b>		<b>SOV 6185</b>
Function	:	Power Turbine Cooling Air Purge Solenoid
Manufacturer	:	CIRCLE SEAL CONTROL
Valve size	:	3/4 inch
Body	:	Stainless Steel
Signal	:	Electrical signal to Open
Rating	:	24VDC
Model No.	:	15830-1596A
Quantity	:	2 (1 per GTG)

<b>Code</b>		<b>SOV 64083</b>
Function	:	Auxiliary Skid Exhaust Damper
Manufacturer	:	FLOWSERVE
Part No.	:	7HZ09C242
Max air pr.	:	10 bar
Damper size	:	39 inch * 39 inch
Body	:	Coro-lube™ coated aluminum construction
Signal	:	Air to OPEN
Solenoid Make	:	PARKER
Rating	:	10W, 24VDC
Quantity	:	2 (1 per GTG)

<b>Code</b>		<b>SOV 6540</b>
Function	:	Water Wash Purge Air
Manufacturer	:	CIRCOR AEROSPACE INC.
Model No.	:	158301596A
Max operating pr.	:	8.3 BAR
Valve size	:	3/4 INCH
Body	:	Stainless Steel
Signal	:	Electrical Signal to OPEN
Rating	:	24VDC
Quantity	:	2 (1 per GTG)

<b>Code</b>		<b>SOV 6504</b>
Function	:	Offline Water wash Shut off Valve
Manufacturer	:	CIRCLE SEAL CONTROLS, INC
Model No.	:	15830-1596A
Max operating pr.	:	120 PSIG
Valve size	:	3/4 INCH
Body	:	Stainless Steel
Signal	:	Electrical Signal to OPEN
Rating	:	24VDC
Quantity	:	2 (1 per GTG)

<b>Code</b>		<b>SOV 1619</b>
Function	:	Hydraulic Transmission Pump
Manufacturer	:	
Operating pr.	:	5200 psig
Signal	:	Electrical Signal to OPEN
Rating	:	24VDC
Quantity	:	2 (1 per GTG)

<b>Code</b>		<b>SOV 6359</b>
Function	:	Auto/Manual CO2 Release
Manufacturer	:	ASCO
Part No.	:	897494
Signal	:	Electrical Signal to OPEN
Solenoid Make	:	ASCO
Rating	:	36.2 W, 24VDC
Quantity	:	2 (1 per GTG)

<b>Code</b>		<b>SOV 6361</b>
Function	:	Auto/Manual CO2 Release
Manufacturer	:	ASCO
Part No.	:	897494
Signal	:	Electrical Signal to OPEN
Solenoid Make	:	ASCO
Rating	:	36.2 W, 24VDC
Quantity	:	2 (1 per GTG)

<b>CODE</b>	:	<b>FC 6246</b>
Function	:	Gas Flow Meter
Manufacturer	:	YOKOGAWA
Valve size	:	2 Inch
Body	:	SS
Signal	:	Electrical Signal to Operate
Model No.	:	DY050
Serial No.	:	S5N803755 332(U2) S5N803756 331(U1)
Quantity	:	2 (1 per GTG)

### **9.3 GBC Instrumentation**

#### **GBC Vibration System Instrumentation**

Bently Nevada 3300 RAM probes, with BN 990 transmitters for the following locations:

"X" probe per stage	:	1 nos
"Y" probe per stage	:	1 nos

#### **Lubrication System Instrumentation**

1. One oil level switch (for alarm only) per GBC
2. Qty (1) RTDs with thermowells at gearbox supply per GBC
3. One RTD with thermowell per GBC at the following locations
a. on oil reservoir
b. before oil cooler
c. after oil cooler
4. Qty (1) pressure transmitter at gearbox supply per GBC
5. One delta pressure transmitter across oil filter per GBC

#### **Gear Box Instrumentation**

1. Pinions: Horizontally-split, pivot shoe tilting pad bearings. Each bearing is supplied with one dual element 100-Ohm Platinum RTD located in the bearing drain per GBC
2. Bullgear: Combination journal/thrust bearings on low-speed shaft. Each bearing is fitted with a dual element, 100-Ohm, embedded RTD (one in the journal and one in the thrust) per GBC

#### **Process Piping**

1. One (1) Differential pressure/Flow transmitters with isolation valves across process gas flow metering orifice (for anti-surge control) per GBC
2. Temperature taps with thermo-wells will be provided at the inlet and discharge of the compressor per GBC.
3. Pressure transmitters will be provided for the compressor inlet and discharge per GBC.

## 10 DC Battery System

### 10.1 Auxiliary Transformer for DC Charger Supply

Particulars	Specification
Quantity	: 2
Manufacturer	: GE Energy Industrial solutions
Type	: QL
Rated Power (kVA)	: 30
Frequency (HZ)	: 50/60
Phase	: 3
Impedance (%)	: 5.4
Net weight	: 188.2 kg
Primary (H) Line-Line	: 415 Volt
Secondary (X) Line-Line	: 240 Volt
Secondary (X) 1 PH MID TAP	: 120 Volt
Enclosure type	: 2 (IP30)
Catalog No.	: 9T83B3332

### 10.2 Switchyard Control Voltage (125 VDC)

- **125 Volt DC Battery Charger:**

Quantity	: 1 Nos
Manufacturer	: SAFT (USA)
Model	: AT 10-130-025-0112000
Input voltage	: 120/220/240V,49/29/25Amps,50Hz,1Ph
Output voltage	: 130 V,25Amps DC
Sr No	: 314740/779730 IL

- **125 Volt DC Batteries:**

Quantity	: 1 Nos
Manufacturer	: FIAMM(China)
Type	: 12FLX400
Voltage	: 125 V
No of cells	: 10 Nos
Rating	:

### 10.3. DC Motor supply Voltage (125 VDC) System

- **125 Volt DC Battery Charger:**

Quantity	: 2 (one per GTG)
Manufacturer	: SAFT (USA)
Model	: AT 10-130-040-220-1101030000
Input voltage	: 230V,50/60Hz ,1Ph,57A
Output voltage	: 130 V,40A DC
Sr No	: 318040/860360

- **125 Volt DC Batteries:**

Quantity	:	2 (one per GTG)
Manufacturer	:	FIAMM(ITALY)
Type	:	2SLA500
Voltage	:	125 V
No of cells	:	60+60=120
Rating	:	500AH

### **10.4 Turbine Control Voltage (24 VDC)**

- **24 Volt DC Battery Charger:**

Quantity	:	2 (One per GTG)
Manufacturer	:	SENS (USA)
Model	:	E024-150-4DG30 (For GTG 1&2)
Input volt	:	230V AC, 50/60 Hz, 1 Ph, 35A mps (For GTG 1&2)
Output voltage	:	24 V, 150 Amp DC
Sr No	:	349999-37-13 & 347820-31-13 (For GTG 1)
	:	349994-37-13 & 349995-37-13 (For GTG 2)

- **24 Volt DC Batteries:**

Quantity	:	4 (Two per GTG)
Manufacturer	:	SAFT NIFE (SWEDEN)
Type	:	SBM323-3
Voltage	:	24V
No of cells	:	19+19=38Nos
Rating	:	

### **10.5 Fire & Gas Control Voltage (24 VDC)**

- **24 Volt DC Battery Charger:**

Quantity	:	2 (one per GTG)
Manufacturer	:	SENS (USA)
Model	:	E024-025-PDG30 (For GTG 1&2)
Input	:	120/208/240 V , 50/60 Hz, 1Ph, 11.5/6.4/5.8 Amps AC
Output	:	24 V, 25 Amps DC
Sr No	:	349993-37-13 For GTG 1 & 341458-14-13 For GTG 2

- **24 Volt DC Batteries:**

Quantity	:	2 one per GTG
Manufacturer	:	SAFT NIFE (SWEDEN)
Type	:	SBM56-2
Voltage	:	24 V
No of cells	:	19+19=38 Nos
Rating	:	



## **11 Filter House**

<b><u>1. First Stage Filter</u></b>	
Filter Name	: Viledon Pocket Filter T60
Make	: Viledon Company
Filter Element Type	: Compact Long Pocket Type
Filter Class	: M6 Class as per Din EN 779-2012 Standard
Dimensions Of Filter (L*W*D)	: 592mm*592mm*650mm
Dust Holding Capacity Per Filter	: 5000 (AC Fine / 800 pa)
Initial Pressure Drop (Pa)	: 65 (At nominal Volume rate i.e., 4250M <sup>3</sup> )
Final Pressure Drop (Pa)	: 450
No Of Filter Used	: 160 Pcs/GTG
Filter Media	: 100% Synthetic Non-Woven Progressive Density Type
Effective Filtering Area/Filter	: 6.2m <sup>2</sup>
Nominal Air Flow	: 4250 m <sup>3</sup> /h
Average Efficiency	: 63% (Down to 0.4 Micron Particle Size)
<b><u>2. Second Stage Filter</u></b>	
Filter Name	: Veledon Cassette Filter MX 98
Make	: Viledon Company
Filter Element Type	: Maxi Pleat Modular Cassette Type Filter.
Filter Class	: F9 Class as per Din EN 779-2012 Standard
Filter Media	: High Strength Micro Glass Fiber
Dimensions Of Filter (L*W*D)	: 592mm*592mm*610mm
Dust Holding Capacity Per Filter	: 1500 (AC Fine / 800 Pa)
Initial Pressure Drop (Pa)	: 175
Final Pressure Drop (Pa)	: 650
No Of Filter Used	: 160 Pcs/GTG
Average Efficiency	: 96%
Nominal Air Flow	: 4250 m <sup>3</sup> /h
Effective Filtering Area/Filter	: 12.0m <sup>2</sup>
<b><u>3. Third Stage Filter</u></b>	
Filter Name	: Veledon Cassette Filter MX 100
Make	: Viledon Company
Filter Element Type	: Modular Cassette Type Filter.
Filter Class	: E11 Class as per Din EN 1822 Standard
Filter Media	: High Strength Micro Glass Fiber
Dimensions Of Filter (L*W*D)	: 592mm*592*mm*610
Dust Holding Capacity Per Filter	: 610 (AC Fine / 800 pa)
Initial Pressure Drop (Pa)	: 195
No Of Filter Used	: 160 pcs/GTG
Average Efficiency	: >95 %
Nominal Air Flow	: 4250

## 12. Fire Fighting

### 12.1 Fire Pumps

#### Electrical Fire Pump

Power	:	Electric
Volts	:	415 Volt
HP	:	125
SF Amp	:	192 A
PH	:	3
Insulation Class	:	F
Duty	:	Cont
RPM	:	1475
Manufacturer	:	NIDEC Motor Corporation
Suppliers	:	Benmech Engineering
Pressure	:	10 Bar
Delivery	:	750 GPM
Pump Model	:	Vertical Turbine 350 QHBC
Stage	:	5
RPM	:	1790
Operation Limit	:	90 -145 PSI

#### Engine Driven Pump

Power	:	Diesel Engine
Model	:	CLARKE JU6H-UF30
Manufacturer	:	NIDEC Motor Corporation
Suppliers	:	Benmech Engineering
Engine RMP	:	2100 RPM
HP	:	160
Pressure	:	10 BAR
Delivery	:	750 GPM
Pump Model	:	Vertical Turbine 350 QHBC
Stage	:	5
RPM	:	1790 RPM
Operation Limit	:	80PSI – 145 PSI

#### Jockey Pump

Power	:	Electrical
Type	:	4" Submersible Pump FS98C/24
Manufacturer	:	NIDEC Motor Corporation
Suppliers	:	Benmech Engineering
PH	:	3
Voltage	:	400
HP	:	3
Capacity	:	20 GPM
Pressure	:	10 Bar
Operation Limit	:	120PSI – 145 PSI

## 12.2 Turbine Fire Fighting

### Fire & Gas System:

Per Unit Particulars	Thermal Spot Detector	IR Gas Detector	Combustible Gas Detector	Optical Flame Detector	Manual Release Station	Audible & Visual Alarm	Red Colored Beacon	Horn Ack.	Remarks
Turbine Enclosure	2	2	5	3	x	2	2	1	
Generator Enclosure	3	x	1	1	3	1	2	x	
<b>Total</b>	<b>5</b>	<b>2</b>	<b>6</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>4</b>	<b>1</b>	

Turbine Enclosure Temp. High Detection	:	232	Deg C
Generator Enclosure Temp High Detection	:	107	Deg C
LEL Alarm	:	15	% Inc
LEL Emergency Shutdown	:	25	% Inc

### CO2 System:

Minimum Press. For Healthy System	:	150	PSIG
CO2 Bottle for Main & Extended System	:	12 + 12	nos
Weight per CO2 Bottle	:	100	LBS

## 12.3 BOP Fire Fighting

### Heat Detector

Model	:	H355 (A)
Company	:	Honeywell
Range	:	130 <sup>®</sup> F (57 <sup>®</sup> C)

### Smoke Detector

Model	:	SD355 (A)
Company	:	Honeywell
Operation Range	:	4000 feet per minute (20m/s)

### Fire Control Panel

Model	:	MS 9600 LS
Quantity	:	5
Company	:	Honeywell

### Foam Trolley (200 L)

Quantity	:	3
Capacity	:	200 Liters
Hose	:	2 Nos
Hose Length	:	100 Feet
Foam	:	AFFF

### 12.4 Fire Extinguishers

S.L	Location	Type	Size (Kg)	Remarks
1	Max Store Inside	Dry Chemical Powder	5	
2	Max Store Outside	CO2	5	
3	Max Office Main Door	Dry Chemical Powder	5	
4	New Control Room	CO2	5	
5	New Control Room	CO2	5	
6	New Control Room	CO2	5	
7	New Control Room	CO2	5	
8	Admin Office Room	DCP	5	
9	Admin Office Room	CO2	5	
10	Old Control Room	DCP	5	
11	Old Control Room	CO2	5	
12	Office Kitchen	DCP	5	
13	Lobby Door Side	DCP	5	
14	New Control Room Door	CO2	50	
15	Staff Room	DCP	5	
16	Laundry Room	DCP	5	
17	Assembly Point	CO2	5	
18	Chemical Lab	CO2	5	
19	Chemical Lab	CO2	5	
20	Chemical Lab	CO2	5	
21	Emergency Generator	CO2	5	
22	Workshop	Dry Chemical Powder	5	
23	Workshop	CO2	5	
24	GBC	Dry Chemical Powder	50	
25	GBC	Dry Chemical Powder	5	
26	GBC	CO2	5	
27	GBC	CO2	5	
28	GBC	CO2	5	

29	Air Compressor	CO2	5	
30	Oil Store	FOAM	5	
31	Turbine			
32	Substation	Dry Chemical Powder	250	
33	Guest Room	CO2	5	
34	Guest Room	CO2	5	
35	Guest Room	CO2	5	
36	Guest Room	Dry Chemical Powder	5	
37	Guest Room	Dry Chemical Powder	5	
38	Water Treatment Plant	CO2	5	
39	Water Treatment Plant	Dry Chemical Powder	5	
40	Meeting Room	CO2	5	
41	Meeting Room	Dry Chemical Powder	5	
42	Kitchen	Dry Chemical Powder	5	
43	Kitchen	Dry Chemical Powder	5	
44	Deep Tube well Room	CO2	5	
45	Dining Room	CO2	5	
46	Turbine 01	Dry Chemical Powder	50	
47	Turbine 01	Dry Chemical Powder	5	
48	Turbine 01	Dry Chemical Powder	5	
49	Turbine 01	CO2	5	
50	Turbine 01	CO2	5	
51	Turbine 02	CO2	5	
52	Turbine 02	CO2	5	
53	Turbine 02	Dry Chemical Powder	50	
54	Max Micro Bus	Dry Chemical Powder	1	
55	Max Ambulance	Dry Chemical Powder	1	
56	Max Pick up	Dry Chemical Powder	1	

### 13 Laboratory

Equipment Name	:	UV/Visible Spectrophotometer
Model	:	DR6000
Instrument ID	:	1625878
Origin	:	HACH(USA)
Function	:	Spectroscopic Analysis such as Silica, Manganese, Iron etc.

Equipment Name	:	Spectrophotometer
Model	:	Optima SP-300
Rated Voltage	:	100~240 VAC
Frequency	:	50/60 Hz 1A
Serial Number	:	325158
Origin	:	JAPAN
Function	:	Spectroscopic Analysis such as Silica, Phosphate, Iron etc

Equipment Name	:	Laboratory drying oven
Model	:	SLN 32 STD
Serial Number	:	SN32SF 150468
Range	:	max.300°C
Function	:	Dry chemical and glassware.
Origin	:	Poland

Equipment Name	:	Karl-Fischer Titrator
Model	:	TitroLine 7500 KF trace
Measuring range	:	10µg - 100 mg / 1 ppm - 5% (recommended)
Measuring speed	:	Max. 1.5 mg/min
Number methods	:	50
Origin	:	Germany
Function	:	Water in Oil

Equipment Name	:	Water Bath
Model	:	JSEB-62T
Range	:	Ambient + 5°C - 99°C
Heater	:	3 KW
Electrical Requirement	:	220V, 60 Hz
Origin	:	Korea
Function	:	Conduct laboratory experiments(Heating purpose)

Equipment Name	:	Portable Particle Counting System (Heating purpose)
Model	:	PAMAS S40
Serial Number	:	400 - 3106
Ambient Temperature	:	5°C - 40°C
Relative Humidity	:	max. 70 %
Storage	:	more than 4000 measurements
Origin	:	Germany
Function	:	NAS/ISO classification of lube oil.

Equipment Name	:	Heating Mantle
Catalogue No.	:	1000.BS.05
Power	:	300 Watts
Voltage	:	230 VAC ± 10 %,50 Hz
Serial Number	:	2015/BS/215
Origin	:	India
Function	:	Heating purpose.

Equipment Name	:	Thermostat Cabinet
Model No	:	TS 606/2 - i
Brand Name	:	WTW
Serial Number	:	16100760
Origin	:	Germany
Function	:	Incubation of BOD sample

Equipment Name	:	DO Meter (YSI)
Model No	:	Pro20i
Dissolved Oxygen	:	0 to 20 mg/L
Origin	:	USA
Function	:	To measure DO in water

Equipment Name	:	Analytical Balance
Model No	:	AY220 Max. 220gm
Origin	:	Shimadzu (Japan)
Function	:	To measure Analytical weight

## 14 Vehicles

### Microbus - 01(10 Seats)

Vehicle number	:	DM-Cha-15-5694
Make	:	Toyota
Car Color	:	Silver
Engine CC	:	2000
CNG cyl. m3	:	2000
Chassis number	:	TRH200-0103139
Engine number	:	1TR-0786117
Fuel Tank liter	:	35

### Microbus – 02 (10 Seats)

Vehicle number	:	DM-Cha-53-4837
Make	:	Toyota
Car Color	:	Silver
Engine CC	:	2700
CNG cyl. m3	:	2700
Chassis number	:	TRH214-0004055
Engine number	:	2TR-0228871
Fuel Tank liter	:	35

### Ambulance

Vehicle number	:	DM-Caa-71-1229
Make	:	Toyota
Car Color	:	White
Engine CC	:	2700
CNG cyl. m3	:	2700
Chassis number	:	TRH214-0001318
Engine number	:	2TR-0066987
Fuel Tank liter	:	30

### Pick-Up (Double Cabin)

Vehicle number	:	DM-Tha-13-0176
Make	:	Toyota
Car Color	:	Green
Engine CC	:	3200
Chassis number	:	JN1CJUD22Z0-111410
Engine number	:	QD32-287740
Fuel Tank liter	:	40
Seat Capacity	:	6



**Pay Loader**

Model	:	S6D105-1
Company	:	Matsu Excavator Company Limited.
RPM	:	2500

**Fork-Lift**

Model	:	FD 150
Company	:	TCM
Capacity	:	15 Ton
Weight	:	17.24 Ton
Lifting Height	:	3 meter
Travel Speed	:	33 Km/h
Engine Power	:	125 KW
Tyres	:	P 4/2

**Over Head Crane**

Manufacture	:	Bishop Lifting Company
Quantity	:	2
Location	:	GT
Capacity	:	12 Tons
Length	:	15 feet
Height	:	9 feet

## **15 Others Auxiliaries**

<b>1. Oil Refilling Motor-1</b>		
Manufacturer	:	Kaili Motor Factory
Motor Name	:	Single-Phase Asynchronous Motor
Model	:	DO28022
Power	:	750 W
Frequency	:	50 Hz
Speed	:	2800 r/min
Insulation Class	:	E
Voltage	:	220 V
Current	:	5.9 A
Enclosure Protection Class	:	IP44

<b>2. Oil Refilling Pump-2</b>		
Manufacturer	:	Wenzhou Haiwan Pump
Pump Name	:	Gear Oil Pump
WCB	:	75
Pressure	:	0.3 MPa
Quantity	:	75 L/min

<b>3. Submersible Pump (Drinking Water)</b>		
Name of Pump	:	HCP Pump
Model	:	F-33P
Power	:	2.2 KW
Phase	:	1
Voltage	:	220-240 V
Current	:	15.0-14.4 a
Frequency	:	50 Hz
Insulation Class	:	B

<b>3. Submersible Pump (WTP)</b>		
Name of Pump	:	Pedrollo Pump
Model	:	MS152-20
Power	:	15 KW
Voltage	:	3 Phase, 400 Volt
Current, PF	:	30.4 Amp, 0.86
Frequency	:	50 Hz
Insulation Class	:	B
SF	:	1.15
IP	:	68
rpm	:	2885