



PRODUCT STANDARD
STEAM TURBINE ENGINEERING

ST 39013

PAGE 16 OF 2728

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INVENTORY No.

P-5538

ANNEXURE-II

- 5.6 Gear
5.7 Worm
5.8 Oil injection nozzle

- 5.9 Other inlet and outlet parts
5.10 Other wetted bowl parts

6.0 DESIGN/CONSTRUCTION FEATURES OF ELECTRIC HEATER

6.1 Heater details

- | | |
|-----------------|------------|
| 6.1.1. Quantity | Nos. |
| 6.1.2 Kilowatts | KW |
| 6.1.3 Voltage | Volts (AC) |
| 6.1.4 Frequency | C/s |
| 6.1.5 Phase | |

- 6.2 i) Number of thermostats 3 (2 Nos. for oil temp. and one for water temp.)
- ii) Range
- iii) Model
- iv) Manufacturer

- 6.3 Heater control thermostat setting Cut in at °C
Cutout at °C

- 6.4 i) Rating of thermostat contacts 5 amps 240V A.C.
0.25 amps 220V D.C.
- ii) No. of contacts 2 NO + 2 NC

6.5 Heater tubes

- 6.5.1 Material
6.5.2 Number

WORKED BY A.K. JAIN

A.K. Jain 6.8.84

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PRODUCT STANDARD
STEAM TURBINE ENGINEERING

ST 39013

PAGE 17 OF 2723

SIGN & DATE

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SIGN & DATE

INVENTORY No.

P-5538

ANNEXURE-II

- | | | | |
|-------|--|--------------------|---|
| 6.5.3 | Length | mm | |
| 6.5.4 | Outside diameter | mm | |
| 6.5.5 | Tube wall thickness | mm | |
| 6.6 | Surface area of heater tubes. | mm ² | |
| 6.7 | <u>Tube Sheets</u> | | |
| 6.7.1 | Material | | |
| 6.7.2 | Number | | |
| 6.7.3 | Thickness | mm | |
| 6.8 | Tube bundle type | | Removable/
non-removable |
| 6.9 | Capacity of heater tank | M ³ | |
| 7.0 | <u>CENTRIFUGE FEED PUMP</u> | | |
| 7.1 | Quantity | Nos. | |
| 7.2 | Type | | Positive
displacement
(Rotary i.e.
Helical, Herring
bone, spur gear
or screw type) |
| 7.3 | Capacity | Lit/hr. | |
| 7.4 | Speed | RPM | |
| 7.5 | Discharge pressure | Kg/cm ² | |
| 7.6 | Relief valve setting | Kg/cm ² | |
| 7.7 | Max. allowable pump
working pressure. | Kg/cm ² | |
| 7.8 | <u>Connections</u> | | |
| | a) Inlet | mm | |
| | b) Outlet | mm | |

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PRODUCT STANDARD
STEAM TURBINE ENGINEERING

ST 39013

PAGE 18 OF 2728

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INVENTORY No.

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INVENTORY No.

P-5036

ANNEXURE-II7.9 Material

- a) Casing
- b) Shaft
- c) Shaft sleeves
- d) Gear/screw

7.10 Drive (AC Motor) As per enclosed annexure-3.

7.11 Motor rating KW

7.12 Bearing: i) No
ii) Type
iii) Manufacturer

7.13 BHP at rated capacity

8.0 CENTRIFUGAL DISCHARGE PUMP

8.1 Quantity Nos.

8.2 Type Positive displacement
(Rotary i.e. Helical,
Herring bone, spur gear
or screw type)

8.3 Discharge pressure Kg/cm²

8.4 Capacity Lit/hr.

8.5 Speed RPM

8.6 Relief valve setting Kg/cm²

8.7 Max. allowable pump working pressure. Kg/cm²

8.8 Connections

a) Inlet mm

b) Outlet mm

8.9 Material

- a) Casing
- b) Shaft

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PRODUCT STANDARD
STEAM TURBINE ENGINEERING

ST 39013

PAGE 19 OF 2728

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INVENTORY No.

P.5538

ANNEXURE-II

c) Shaft sleeves

d) Gear/Screws

8.10 Motor rating KW

8.11 Bearing: i) No.
ii) Type
iii) Manufacturer

8.12 BHP at rated capacity

9.0 **INSTRUMENTS**9.1 **Pressure Gauges:** (For detailed specification refer Annexure-IV.

a) Type

b) Number

4

c) Location

i) Inlet to pump
(Compound gauge)

ii) Outlet from feed pump

iii) Inlet to centrifuge

iv) Outlet from discharge
pump. (In case polishing filter,
outlet from polishing filter)

d) Range

Kg/cm²

e) Accuracy

±10% or better

f) Manufacturer

9.2 **Temperature Indicators:** (For detailed specification refer Annexure - IV)

a) Type

b) Number

3

c) Location

i) Inlet to electric heater

ii) Outlet from electric
heateriii) Water temperature of
indirect heater.

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PRODUCT STANDARD
STEAM TURBINE ENGINEERING

ST 38013

PAGE 20 OF 2728

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INVENTORY No.

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INVENTORY No.

P. 5538

ANNEXURE-II

- a) Range °C
e) Manufacturer
f) Model No.
g) Accuracy

9.3 Flow meter

- a) Type
b) Accuracy
c) Location downstream of centrifuge feed pump.
d) Connections, type & size.
e) Model No.
f) Range
g) Manufacturer

10.0 LEVEL SWITCH

(For detail specification, refer annexure -IV)

- a) Number 2
b) Type
c) Location 1) Indirect oil heater
11) antiflood device
d) Range
e) Manufacturer
f) Model No.
g) No. of contacts & contact rating. 2 Nos. SPDT contacts
5 A for 240 VAC
0.25 A for 220 VDC } (D2)

11.0 LEVEL GAUGE

- a) Number One
b) Location Indirect oil heater
c) Type

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					STEAM TURBINE ENGINEERING		ST 39013
SUPERSEDES INVENTORY No.				PAGE 21 OF 2728			
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.				d) Model No. e) Length f) Manufacturer			
				12.0 Indicating type differential pressure switch (across polishing filter if offered). a) Type b) Number One c) Location Polishing filter (if provided) d) Model No. e) Manufacturer f) No. of contacts & contact rating.			
				13.0 List of spares furnished for three(3) years normal operation and maintenance enclosed with bid. Yes/No			
				14.0 List of special tools furnished enclosed with bid. Yes/No			
				15.0 Any deviation against specification. Yes/No			
				16.0 If yes, details of all deviations (enclose separate sheet, if required).			
INVENTORY No.				WORKED BY A.K. JAIN			
P-5538				K. C. Sachan 6.8.84			
				CHECKED BY K.C. SACHAN			
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PRODUCT STANDARD

STEAM TURBINE ENGINEERING

ST 39013

PAGE 22 OF 2728

ANNEXURE-IIISPECIFICATION OF MOTOR

- 1.0 A suitable motor conforming to the purification unit requirement shall be supplied. The motor shall also meet the following requirements broadly. The motor shall confirm to IS: 4722, IS: 325, IS: 2253, IS: 2254, IS: 4029, IS: 3202 & IS: 2148 or equivalent BS: specification.
- 1.1 Application
To drive feed pump (suction & discharge) and centrifuge.
- 1.2 Type of Motor : Squirrel cage, induction motor.
- 1.3 KW Rating at 50°C ambient temp. : (It shall have at least 10-15% reserve capacity than required for drive the unit when it is discharging max. quantity at max. viscosity).
- 1.4 KW actually required by driven equipment under specified operation/ start-up conditions. : Unit capacity
- 1.5 Min. Voltage required under starting conditions to bring driven equipment upto rated speed. : 80% rated
- 1.6 Full load speed : It shall be commensurate with pump & centrifuge speed as per design.
- 1.7 Full load current : As per design.
- 1.8 Starting current : Not to exceed 60% of I-rated.
- 1.9 Starting Torque : 1.3 (Min) of rated torque
- 1.10 Break down torque : 2.05 times (min) of rated value.
- 1.11 Efficiency at full load : 90% (Min)
- 1.12 Power factor at full load: 0.85 (Min)

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P. 5538

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PRODUCT STANDARD
STEAM TURBINE ENGINEERING

ST 39013

PAGE 23 OF 27 28

SIGN & DATE

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INVENTORY No.

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INVENTORY No.

P. 5533

ANNEXURE-III

- 1.13 Motor shall be designed to withstand the voltage and torque stresses developed due to difference between the motor residual voltage and incoming supply voltage equal to 150% of the rated motor voltage during fast changeover of buses.
- 2.0 STARTING DATA
- 2.1 Starting : Suitable for DOL starting
- 2.2 Acceleration time with: To be furnished by supplier.
full load connected.
- 2.3 Permissible starting : 3-Starts equally spread over
duty cycle, No. of an hour.
starts. 2-consecutive starts from hot
condition without any injurious
heating to the winding.
- 2.4 Overload (% of full : Motor shall be capable for
load) that can be running at full load with 80% of
carried by motor without rated voltage for 5 minutes and
impairing over all 70% of rated voltage for 1 sec.
performance and period for Locked rotor withstand time under hot
which this overload is condition at rated voltage shall be at
applicable. least 2.5 secs more than starting time. (01)
- 2.5 Location : Turbine hall, indoor
oil room - (01)
- 2.6 Class of Insulation : Class-B, fungus resistant
Tropicalised as per IS: 3202 (01)
- 2.7 Shaft disposition : As per Unit's supplier
mounting requirement.
- 2.8 Method of connections :
driven equipment : -uo-
- 2.9 Direction of rotation : To suit pumps & centrifuge
and corresponding
terminal designation
- 2.10 Enclosure and : Totally enclosed fan cooled and
ventilation explosion proof.
- 2.11 Bearing : As per supplier's design,
min life 30,000 hrs. (c)
- 2.12 Grounding Device : Suitable arrangement shall be provided
for earthing the motor at two separate and
distinct connection points. Design of earthing conductor
shall be as per IS: 4722 - 1992.
Explosion proof terminal box
- 2.13 Terminal box : To be provided with double compression
Cable gland for Al cable.
Fault level : 45 KA for 0.01 Sec. (01)

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PRODUCT STANDARD
STEAM TURBINE ENGINEERING

ST 39013

PAGE 24 OF 2728

SIGN & DATE

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INVENTORY No.

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INVENTORY No.

P-5538

ANNEXURE-III**3.0 SPECIAL REQUIREMENTS****3.1** The motor shall be rewoundable**3.2** The motor shall have on line greasing facility.**3.3** The motor construction shall be suitable for easy disassembly and reassembly.**3.4** The terminal box shall be suitable for top and bottom entry of cables and shall be suitable for PVC insulated PVC sheathed armoured aluminium cables and shall be capable of being rotated by 180° in steps of 90°.**4.0** Documents to be supplied with delivery with each unit. These shall be supplied in 15 copies each or two copies and a set of reproducible per set.**4.1 Characteristics.** (at 80%, 100% and 110% of rated voltage)**4.1.1** Starting current v/s time**4.1.2** Torque v/s slip**4.1.3** Thermal with stand**4.2** Type and frame size**4.3** Starting time**4.3.1** With 100% voltage at terminal**4.3.2** With 85% voltage at terminal**4.3.3** With 80% voltage at terminal**4.4** Safe install time at 100% rated voltage under hot condition.**4.5** Motor GD²**4.6** Total wt. of motor.**4.7** Expected life of bearing (but not < 30000 hrs.)**4.8** Type & size of cable for which gland is provided, in the terminal box.**4.9** Type & routine test certificate as per IS: 4722.**4.9.1** In addition to cl 4.9, the following tests shall also be carried out

i) Degree of protection test as type test

ii) 20% over speed test for 2 minutes as routine test.

iii) Measurement of vibration as routine test as per IS 12075

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PRODUCT STANDARD
STEAM TURBINE ENGINEERING

ST 39013

PAGE 25 OF 2728

SIGN & DATE

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INVENTORY No.

P-5538

ANNEXURE-IVPRESSURE GAUGE.

The pressure gauge should confirm to the following technical specifications:-

- a) The sensing element shall be SS-316 bourden tube
- b) The dial size shall be approx. 150 mm diameter.
- c) The casing shall be epoxy coated diecast aluminium with threaded bezel ring.
- d) The movement shall be stainless steel rotary gear with nylon bearings.
- e) The process connection shall be $3 \frac{1}{2}"$
- f) The over range protection should be 150% of max. range.
- g) The pointer shall be micrometer adjustable with zero adjustment facility on front.
- h) The accuracy shall be $\pm 1\%$ of full scale.
- i) The gauge is to be provided with pulsation dampeners

TEMPERATURE INDICATOR

Type Mercury in steel dial thermometer Rigid steam type with thermowell.

Case Dia cast aluminium alloy moisture proof case, heavily enamelled black & sloved.

Dial Size 150mm

Range As per design

Accuracy 1 % of total range

Bulb Material $\frac{1}{2}"$ bulb diameter made of SS.316

Thermowell SS-AISI316 (with thread size $G \frac{1}{2}"$) - (b)

Ambient Temp. 60°C max.

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PRODUCT STANDARD
STEAM TURBINE ENGINEERING

ST 39013

PAGE 26 OF 2728

SIGN & DATE

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ANNEXURE-IVMAGNETIC LEVEL SWITCH

Process Connection : - N625 (6)

Material All parts coming in contact with the liquid made of stainless steel SS 316. (D)

Electrical Characteristics

Switch: Single pole double throw change over switch with silver contact for handling the following currents.

AC 250V - ^{5.0}~~1.0~~ A (02)DC ~~upto 24V-2.5 A~~
220V - 0.25 AOperating characteristics

Differential - 6 MM i.e. 3 MM on either side of centre line.

Working Pr. & Temp. : As per design.

Ambient Temp. 60°C max.

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ST 39013

ANNEXURE - V

PAGE 27 OF 28

DPS : DIFF. PRESS. SWITCH
FG : FLOW GAUGE

S : SOLENOID VALVE

C : COMPOUND GAUGE

P1--P4 : PRESSURE GAUGE

T1--T3 : THERMOMETER

TS1 : THERMOSTAT FOR WATER

TS2, TS3 : THERMOSTAT FOR OIL

X : STOP VALVE NORMALLY OPEN

Y : STOP VALVE NORMALLY CLOSE

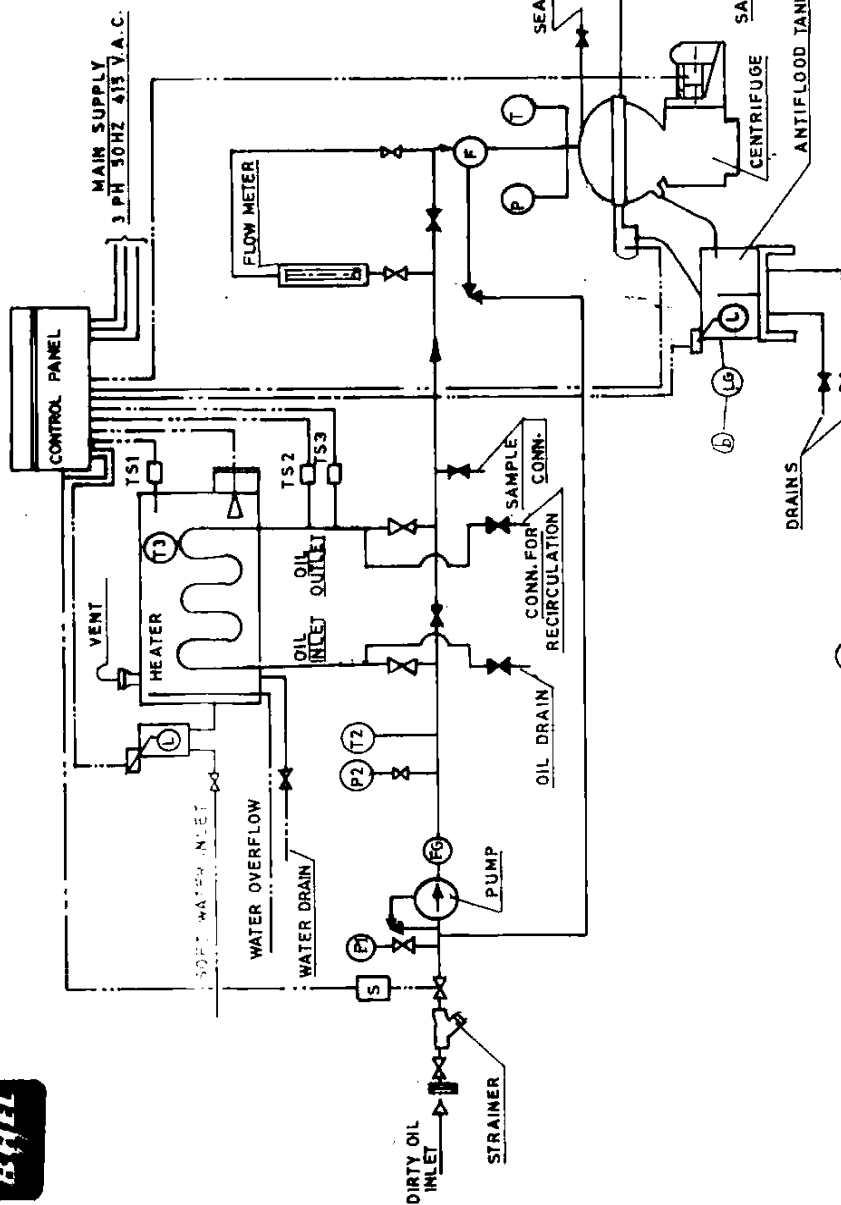
L : LEVEL SWITCH

F : FLOW CONTROL VALVE

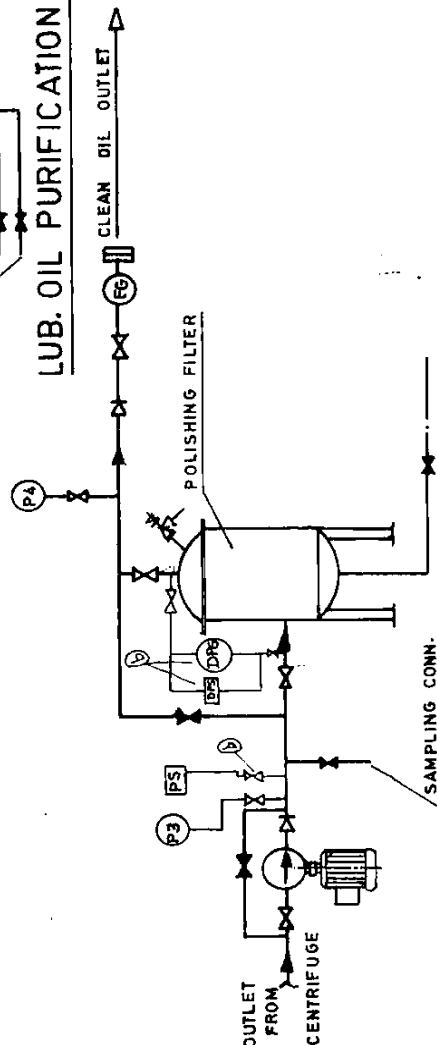
PS : PRESS. SWITCH

LG : LEVEL GAUGE

DPS : DIFF. PRESS. GAUGE



LUB. OIL PURIFICATION SCHEME WITHOUT POLISHING FILTER



L.O.P. SCHEME WITH POLISHING FILTER

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		PRODUCT STANDARD STEAM TURBINE ENGINEERING								ST 39013								
		PAGE 2728 OF 2728																
RECORD OF CHANGES																		
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			01	01	STE-84-549	SH. NO. 7, 8, 22, 23 & 24	<i>Ans</i>	28.12.84										
			02	06	STE-85-279	Page. 4, 5, 16, 20 and 26.	<i>Ans</i>	16.4.85										
			03	06	STE-86-355	page No 1 to 28 Page No 27 added	<i>Ans</i>	28.10.86										
			04	08	STE-87-373	Page No 12, 1	<i>Ans</i>	6.10.87										
			a	03	STE-92-650	Sht. 1 and 14 Sht. no 6, Supersedes by new sheet under the same Sht. No.	<i>Sms</i>	28.11.92										
			b	12	STE-95-570	Sh. no. 2, 4, 5, 13, 19, 24, 25, 26 & 27.	<i>Ans</i>	23.1.96										
			c	2	STE-2001-370	Sh. no. 22 & 23	<i>Ans</i>	18.10.01										
DISTRIBUTION OF PRINTS																		
DEPTT.		TGE	STE	AME	DME	HGE	HTE	ACE	HXE	MTE	CFX	IN-SUL SYS.	HLE	TSX	THC	PPX	MCX	CSX
			✓											✓				
DEPTT.		AIX	MSX	CCX	FAX	TFX	TLX	TTX	TTX-ST	TTX-HT	TTX-EM	WT	QAX	QCX	PCM	WC 202	WC 205	WC 227
													✓					
DEPTT.		FBM BL II	HTM	STM	WC 632	ACM	CIM	FBM BLV	SUM	WWM	FBM BL VIII	PMG						
												✓						
REVISION																		
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