

**CHENNAI PETROLEUM CORPORATION LIMITED**  
(A Group company of IndianOil)

**Brief write-up & List of Equipments – Slave Turbo Generators**

Two steam driven generators (SIEMENS make, Year 1982) designed to produce 2.75 MW each with fully condensing steam turbine (BHEL make, Year 1982) operating on steam (3.5 Kg/cm<sup>2</sup>, 190 deg.c, 9000 RPM are available.

Turbine is provided with Hydraulic speed governing system / vacuum condenser / oil circulation system with necessary coolers, oil storage Tank & Pumps (Both AC & DC).

Generators are of 6.6. KV, 1500 RPM, Closed air-cooled / Brush less type excitation system with inter connecting transformers of 1:1 ratio to match fault level and electronic controlled AVR & associated electronic relays.

**Details of STEAM TURBO GENERATORS (2 X 2.75 mw) with sub systems.**

**1. TURBINE:**

|                        |    |                                                        |
|------------------------|----|--------------------------------------------------------|
| Make                   |    | : BHEL –1982/Commissioning-1985                        |
| Maximum output         | .. | : 2.75 MW                                              |
| Normal output          | .. | : 2.58 MW                                              |
| Normal speed           | .. | : 9000 RPM                                             |
| Type                   | .. | : Single cylinder axial flow type,<br>Fully condensing |
| Stages                 | .. | : Single row impulse & 12 rows of<br>reaction          |
| Inlet steam pressure   | .. | : 3.5 kg/cm <sup>2</sup>                               |
| Temperature            |    | : 190 deg C                                            |
| Flow                   | .. | : --                                                   |
| Exhaust steam pressure |    | : 0.12 kg/cm <sup>2</sup>                              |

## 2. CONDENSER:

|                 |    |                              |
|-----------------|----|------------------------------|
| Type            | .. | : Surface condenser          |
| Cooling medium  | .. | : Water                      |
| Cooling surface | .. | : 325 m <sup>2</sup>         |
| Dimension       | .. | : 1870 mm Dia x 5360 mm Long |

### Ejectors for condenser vacuum:

One hogging ejector for starting and two service ejectors with coolers Using condensate water as the media. All three ejectors are used on steam at 3.5 kg/cm<sup>2</sup>. (As per design)

## 3. REDUCTION GEAR BOX:

|                   |    |                       |
|-------------------|----|-----------------------|
| Make              | .. | : MAAG of Switzerland |
| Rated power       | .. | : 2885 kw             |
| Rated speed input | .. | : 9050 rpm            |
| Output            | .. | : 1500 rpm            |
| Gear ratio        | .. | : 6.033               |

## 4. GOVERNING SYSTEM:

Hydraulic speed governor provided with mechanical over speed trip / Operation of emergency stop valve and two governing valves (servo operated).

## 5. OIL SYSTEM:

|                          |    |                                     |
|--------------------------|----|-------------------------------------|
| Main oil pump            | .. | : Main turbine driven               |
| Discharge pressure       | .. | : 9.5 kg/cm <sup>2</sup>            |
| Auxiliary oil pump       | .. | : 415 V, 3ph, Electric motor driven |
| Rating                   | .. | : 37 kw                             |
| Discharge pressure       | .. | : 9.5 kg/cm <sup>2</sup>            |
| Emergency oil pump       | .. | : 110 V DC motor driven             |
| Discharge pressure       | .. | : 2.5 Kg/cm <sup>2</sup>            |
| Governing oil pressure.. |    | : 9 kg/cm <sup>2</sup>              |
| Lube oil pressure        | .. | : 3 kg/cm <sup>2</sup>              |

## 6. LUBE OIL STORAGE TANK:

|                   |    |                                                |
|-------------------|----|------------------------------------------------|
| Storage capacity  | .. | : 5600 ltrs                                    |
| Lube oil cooler   | .. | : Dual redundant type with online change over. |
| Lube oil strainer | .. | : Dual redundant type with online Change over. |

## 7. CONDENSATE EXTERNAL PUMPS:

|              |    |                                              |
|--------------|----|----------------------------------------------|
| No. of pumps | .. | : 2 (Electric motor driven vertical mounted) |
| Rating       | .. | : 22 kw, 415V, 3 ph.                         |
| Flow         | .. | : 37 m3/hr                                   |
| Pressure     | .. | : 8 kg/cm2                                   |

## 8. GENERATOR:

|                    |    |                                      |
|--------------------|----|--------------------------------------|
| Make               | .. | : SIEMENS – German –1982 / Comm.1985 |
| Rating             | .. | : 3.44 MVA                           |
| Voltage            | .. | : 6600V                              |
| Current            | .. | : 301 A                              |
| Power factor       | .. | : 0.8                                |
| Speed              | .. | : 1500 rpm                           |
| Insulation         | .. | : Class F                            |
| Excitation         | .. | : Brush less type                    |
| Excitation volts   | .. | : 87 V                               |
| Excitation current | .. | : 340 A                              |

### DC GENERATOR:

|                    |    |            |
|--------------------|----|------------|
| Rating             | .. | : 35.1 kw  |
| Voltage            | .. | : 95 V     |
| Current            | .. | : 370 A    |
| Speed              | .. | : 1500 rpm |
| Excitation voltage | :  | : 123 V    |
| Excitation current | :  | : 2.9 A    |

## 9. AUTOMATIC VOLTAGE REGULATOR: (AVR):

|      |    |                   |
|------|----|-------------------|
| Type | .. | : Electronic type |
| Make | .. | : SIEMENS         |

## 10. GENERATOR COOLING SYSTEM:

Closed air circulation type with cooling water as media

|                    |    |             |
|--------------------|----|-------------|
| Cooling water flow | .. | : 358 l/min |
| Temperature        | .. | : 33 deg C  |

## 11. GENERATOR PROTECTION RELAYS WITH CONTROL PANELS:

|      |    |                |
|------|----|----------------|
| Make | .. | : ASEA –Sweden |
| Type | .. | : Electronic   |

## 12. INTER CONNECTION POWER TRANSFORMER:

Make .. : NGEF – 1983  
Type .. : ONTU 4000/11  
Rating .. : 4000 kva  
Rated voltage at no load: HV – 6900 V  
LV – 6900 V  
Rated current : HV – 334.7 V  
LV – 334.7 V

|                  | <u>HV</u> | <u>LV</u> |
|------------------|-----------|-----------|
| Insulation level | : KV - 20 | 20        |
|                  | KVp 60    | 60        |

Phases : 3  
Frequency : 50 hz  
Tap changer : Off circuit tap changing  
No of taps : 14  
Voltage range : 7245 V to 6555 V  
Vector group : Dyn 1  
Type of cooling : ONAN

## 13. NEUTRAL GROUNDING RESISTOR: (NGR) – 2 Nos.

Make: PEFCO FOUNDRY & CHEMICALS LTD, PUNE  
Resistance: 12.7 OHMS  
Current: 400 Amps  
Rating: 30 Seconds  
Amb.Temp: 45 DEG C  
Temp.Raise: 260 DEG C

## 14. LUBE OIL COOLER (Two Nos)

Make : BHEL  
Shell: Design pressure : 9 Kg/cm<sup>2</sup>  
Test pressure : 14 Kg/cm<sup>2</sup>  
Area : 18 m<sup>2</sup>  
Temp : 100 DEG C

Tubes: Design pressure: 6 Kg/cm<sup>2</sup>  
Test pressure: 9 Kg/cm<sup>2</sup>  
Temp: 100 DEG C

**15. CIRCUIT BREAKERS: 2 Nos.**

Make: NGEF LOW OIL CONTENT CIRCUIT BREAKER.

Type: E 7525/10

Voltage: 6.6/11 KV

Current: 2500 Amps

Frequency: 50 Hz

Breaking current: 44/39.4 KA

Peak making current: 120 KA

Oil per pole: 4 Kgs.

Weight: 220 Kgs.

Short time current: 50/40 KA for 1/3 Sec.

**16. SLAVE I & II – MOTOR CONTROL CENTRE (MCC) PANELS IN  
NGR ROOM.**