



PRODUCT STANDARD
TURBINES AND COMPRESSORS
HYDERABAD

TC 6 4362

Rev No.: 00

Page 1 of 11

Specification for Lube Oil System Console
For Flue Gas Desulphurisation Plant

1. **GENERAL:**

1.1 **SCOPE:**

This Specification is intended to cover the minimum requirements of design, manufacture, assembly, testing at manufacturer's works, packing and delivery at site properly packed of a shop mounted Lube oil System console as per BHEL standard required for Flue Gas Desulphurisation plant.

The description of the specification is mainly intended to indicate the purchaser's philosophy and does not relieve the vendor from full responsibility for the design, fabrication, performance and safety for all the equipment being part of his supply.

1.2 **INSTALLATION:**

The unit shall be suitable for outdoor installation under roof.

1.3 The copper and copper alloys are not allowed.

2.0 **DESIGN:**

2.1 The Lube oil Console is a forced feed system to supply Lubrication oil to bearings of Compressor and speed increasing/decreasing gearbox as applicable. The system handles Turbine oil grade ISO VG 46 of reputed make.

The following are the system parameters

- Type of fluid : ISO VG 46/ 46T
Specific gravity – 0.88
Kinematic Viscosity – 18 cst at 65⁰C
& 280 cst at 10⁰C (During starting),
Air release time 5 Mins.
- Lube oil Reservoir : Atmospheric with air breather
- Pumps discharge Pr. : As specified in the Job specification.

2.2 The complete lube oil system shall be 'supplied' in accordance with scheme and General arrangement drawing as provided with specification.

2.3 Auxiliaries duplex filters & Oil coolers shall be in accordance with Section VIII of ASME Code to the extent required thereby and shall comply with the requirements of mandatory rules which will apply where the equipment is to be installed.

2.4 All the equipments and Instruments shall be suitable for the area classification specified in the job specification.

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PRODUCT STANDARD
TURBINES AND COMPRESSORS
HYDERABAD

TC 5 4362

Rev No.: 00

Page 2 of 12

- 2.5 The system shall be designed in line with the documents indicated below and the job specific requirements. The major job specific requirements and the documents in Table-B below shall be furnished along with enquiry. Other job specific documents shall be provided during the detailed engineering.

A) PRODUCT STANDARDS:

S.N o.	Specification Drawing No.	Description	Remarks
1	Annex-1	Lube Oil Pump Assembly	
2	Annex-2	Lube Oil Reservoir	
3	Annex-3	Painting as per BHEL standard	
4	Annex-4	P&ID of Oil system	
5	Annex-5	General Information	
6	Annex-6	Lube oil console GAD	
7	Annex-7	Oil cooler (Water Cooled)-PHE	
8	Annex-8	Lube oil duplex filter with change over device	
9	Annex-9	Reference List	
10	Annex-10	Deviation List	
11	Annex-11	Price Schedule	
12	Annex-12	Check list	
13	Annex-13	Lube Oil accumulators and charging kit	.
14	Annex-14	Instruments	
15	Annex-15	Quality and inspection	
16	Annex-16	A C Motors, IS 12615,IEC 60034	
17	Relevant standard	Centrifugal/Gear/Screw Horizontal Pumps - as per relevant standard	
18	General	List of commissioning Spares required	
19	As per supplier standard	Diaphragm Flexible Coupling	
20		PQC – Pre Qualification Criteria	

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COMP. FILE NAME

TC 5 4362-R00

Ref. Doc.



PRODUCT STANDARD
TURBINES AND COMPRESSORS
HYDERABAD

TC 5 4362

Rev No.: 00

Page 3 of 12

B) PROJECT DOCUMENTS: (As applicable)

Sl.No.	Description
1.	P&I Diagram for Lube oil System
2.	Lube oil Reservoir
3.	Oil cooler assembly.
4.	Pump Assembly
5.	Duplex filter assembly
6.	Lube Oil accumulator
7.	Lube Oil Console Drawing

B) OTHER MAJOR STANDARDS/ SPECIFICATIONS

Sl. No.	Spec No.	Description
1	Lube Oil reservoir	IS2062 GRE250(FE410W)QLTY-A
2	Piping from pump to Filter	PIPE(SMLS) CS SA106 GR B
3	ANSI B 16.5 class 150 / 300 as applicable	Flanges (including counter flanges and component flanges e.g. cooler, filter etc)
4	ASTM A193 B7	Studs - Galvanised
5	ASTM A194 2H	Nuts - Galvanised
6	IS 3063 Type B	Spring Washers
7	IS 5624 Type A	Foundation Bolts - Galvanised
8	Valves	Internal SS with CS Body

Note: Material Procurement from Chinese supplier is not acceptable.

3.0 DESCRIPTION OF SUPPLY:

- 3.1 The Lube oil system shall be as per BHEL specifications/ drawings enclosed with this specification. The scope of supply is clearly defined on these drawing.
- 3.2 The scope of supply shall include but not limited to the following:-
- 3.2.1 Oil Tank along with oil filters, breather & filter assembly, level gauge and other accessories.
 - 3.2.2 Centrifugal/Gear/Screw Pumps for Lube Oil Pumps.
 - 3.2.3 A.C drive Motor for Main oil pumps, Motor-pump coupling with coupling guard.
 - 3.2.4 Duplex Pressure filter with 3 way change over valves having common operating lever and ½" pressure equalisation line. (along with 2 sets of 10 microns operational filter elements, One set of 40 microns flushing filter elements with cleaning tool, if required & gaskets and "O" rings for the replacement of cartridges as applicable)

TD-106-1 Rev. 5	Form No.		PRODUCT STANDARD TURBINES AND COMPRESSORS <u>HYDERABAD</u>	TC 5 4362 Rev No.: 00 Page 4 of 12
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.		3.2.5 Water cooled Oil Cooler-PHE Type with isolation valve and counter flange at water inlet and outlet nozzle. 3.2.6 L.O Accumulators bladder type with capacity specified in job specifications shall be supplied. The material of construction shall be of Carbon steel. One number of charging kit shall be supplied along with accumulator. The accumulators shall be mounted in a single stand. by connecting. 3.2.7 Instrumentation i.e. Temperature Indicators, Temperature Elements , Thermo wells, Differential pressure gauges, pressure gauges, level gauges, Complete impulse tubing as per BHEL specifications. Note: The final sub-vendors shall be based on customer approved vendors list. 3.2.8 The tank shall be provided with lifting yoke for a four-point lift. The tank layout shall be designed so that after the components and all piping mounted on it are drained of oil, the package can be lifted without permanently distorting or otherwise damaging either the base plate or any, component mounted on it. 3.2.9 Complete piping as shown in the P&I Diagram including fittings, flanges, valves, Strainers, flow glasses, instrument tap-off points, supports etc., 3.2.10 Any other equipment explicitly not mentioned above but shown in customer approved P&I Diagram for each project required for efficient functioning of the system. 3.2.11 Documentation as described elsewhere in this specification. 3.2.12 Vendor shall take care of good accessibility for operation and maintenance of all parts. All Lube oil cooler/Duplex filter along with double 3-way transflow valve,thermometers, pressure gauges and other instruments shall be located on the tank within reach from the periphery. 3.3 <u>LUBE OIL RESERVOIR (Refer Annex-2)</u> 3.3.1 The general arrangement of lube oil reservoir indicating overall dimensions shall be as indicated in the job specific specifications. The reservoir shall have sufficient rigidity to prevent vibration, sagging and sealed against the entrance of dirt, water or other foreign material. The bottom of the oil tank shall provided with drain of ¾” size with cap connection.. 3.3.2 The internal design of reservoir shall be suitable for oil grade ISO VG 46 considering air release time of 5 mins. 3.3.3 The lube oil reservoir shall be provided with suitable connections for mounting various instruments etc. 3.3.4 The material of lube oil reservoir shall be IS2062 GRE250 (FE410W) QLTY-A. 3.3.5 The lube oil reservoir inside and outside shall be cleaned and painted as per BHEL Specification (Annex-3) 3.3.7 <u>Accessories:</u> The oil tank shall be provided with the following major accessories. a) Oil level gauges to cover minimum operating & Run down level markings.		
COMP. FILE NAME	TC 5 4362-R00			
Ref. Doc.				



PRODUCT STANDARD
TURBINES AND COMPRESSORS
HYDERABAD

TC 5 4362

Rev No.: 00

Page 5 of 12

- b) Inspection hole covers for tank cleaning through hand.
- c) Oil Drain connection with isolation valve and end plugs.
- d) Oil filling strainer (not shown in tank assy. drg) and breather connection.

3.3.8 Important features:

- a) All weld joints in the tank to be LPI tested as per AA0850131.
- b) The tank to be Leak tested as per HY0850196.
- c) The interior of the equipment shall be clean, free from scale, welding spatter and foreign objects.
- d) The inside and outside surfaces of the tank to be cleaned by grit blasting to SA2 ½ as per AA0674101.
- e) Lifting points and lifting yoke shall be provided and clearly identified.
- f) Painting shall be as per Annex-3

3.4 Pump Suction strainer and foot Valve.

The general arrangement drawing and details of pump suction strainer is shown in BHEL Drg . The size of the mesh shall be as per the pump supplier standard. Foot valve shall be provided in the suction side of the pump.

4. Piping:

- 4.1 All welding are to be done by qualified welders. The qualification records to be offered for review at BHEL. Records of welding are to be maintained for review.
- 4.2 All pipe lines to be thoroughly de-burred before fit-up. This includes the drilled holes in the pipelines for various instrument connections. Vendor has to maintain record of internal cleanliness of pipes for review.
- 4.3 All the pipe lines in the system to be root-TIG welded with purging.
- 4.4 The pipes to be bevelled at edge and the root gap to be ensured during fit-up to ensure complete penetration.
- 4.5 All Elbows and Tees will be BW type conforming to ANSI B16.9. This includes the fittings procured as a part of sub-assembly (e.g. coolers, filters etc).
- 4.6 All the flanges should be raised face type conforming to ANSI B 16.5. This includes the counter flanges to be supplied with the LO System and various flanges used in the sub components (e.g. coolers, filters etc).
- 4.7 All check valves should be wafer type. This includes the valves procured as a part of sub-assembly (e.g. coolers, filters etc).
- 4.8 All impulse lines must be of ½" SS. All instrument fittings shall be of SS316 material. All fasteners shall be 8.8 grade or better.
- 4.9 All pipelines to be pickled, neutralized and phosphatised/ passivated after complete welding. The pipelines to be suitably protected against corrosion during transportation, storing, etc as the oil charging will take minimum 6 months to one year at site.

TD-106-1 Rev. 5 Form No.		PRODUCT STANDARD TURBINES AND COMPRESSORS HYDERABAD		TC 5 4362
				Rev No.: 00
				Page 6 of 12
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5. Assembly: 5.1 Drain connections of coolers, Filters and Tank shall be terminated at appropriate location (preferably at one location), with isolation valves. All the impulse tubes will be aesthetically routed and suitably supported and clamped with a soft packing. 5.2 Oil side Vent lines of coolers and Filters shall be connected on top of the Lube oil tank. 5.3 All ball valves shall be of full bore size and with flange connections. Other items shall be as per the drawings and drawing notes, 5.4 Flange gaskets should be "Non asbestos" spiral wound type. 5.5 Counter flanges (as per the equipment flange) & fasteners shall be provided for all outlet/ inlet lines. 6. Supplier Documents: The vendor shall submit the following technical documentation 6.1 Along with offer (1 hard Copy) 6.1.1 G.A Drawing of Lube oil Console. 6.1.2 Vendor has to submit compliance for all specifications specified in this specification including the related annexure and attachments. Deviations, if any shall be brought out with reference no of the clause for BHEL/Customer approval. The offer without the deviation list shall be considered as compliance to all specification requirements. 6.1.3 Bill of Material of all the equipments, instruments, components etc. The Bill of Material should clearly show the make and model of each component, which are subjected to BHEL/CUSTOMER approval. 6.1.4 Technical data sheet for all the equipment as specified in the individual specifications. 6.1.5 Recommended spares list for Erection & Commissioning for entire lube oil console. As a minimum, set of O-rings and gaskets for critical equipments like Pumps, Filters and Pumps mechanical face seal shall be considered. 6.1.6 Recommended spares for two years normal operational spares list for all the instruments, equipments with item wise prices. The offer shall be valid for one year after placement of order and these shall be ordered as required later. 6.1.7 Typical Quality assurance plan (QAP) 6.1.8 Proven Track Record as indicated in Clause no 7.0 6.1.9 Compliance for Un-priced Price format 6.2 After placement of order (1 Hard copy and soft copy within 3 weeks) - 6.2.1 G.A Drawing of Lube oil Console. 6.2.2 Bill of Materials for all the equipments. 6.2.3 Data sheets of all equipments and instruments. 6.2.4 Documents as specified in individual equipment purchase specifications, like GA drawings, data sheets, performance curves, Terminal Box diagrams, catalogues, etc				

TD-106-1 Rev. 5 Form No.		PRODUCT STANDARD TURBINES AND COMPRESSORS HYDERABAD		TC 5 4362
				Rev No.: 00
				Page 7 of 12
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.				
COMP. FILE NAME	TC 5 4362-R00			
Ref. Doc.				
6.2.5 Instrumentation documents like Instrument schedule, Data sheets, Installation diagrams with Bill of Materials, loop diagrams, etc. 6.2.6 Isometrics with Bill of materials. 6.2.7 Test procedure. 6.2.8 Total Lubrication Schedule 6.2.9 Quality assurance plan (QAP) 6.3 <u>Final Documentation after approval</u> (2 copies and soft copy) - For submission to customer 6.3.1 All documents as specified in 6.2 above. 6.3.2 Storage, Installation, Operating and maintenance manual for the lube oil system and individual for all equipments like pump, motor etc. and instruments. Photographs for all views : 1 set (In CD, the digital photos shall be provided) 6.4 <u>After Inspection</u> (2 Hard)- For customer submission. 6.4.1 Inspection Report inclusive of Factory acceptance tests of individual equipments, Instruments & Total system 6.4.2 Test & Guarantee certificates 6.4.3 Statutory certificates like BIS, CMRI, CCOE, IBR, etc for all motors, Instruments, etc as applicable. 6.4.4 Photographs for all views : 2 sets (In DVDs, the digital photos shall be provided) 7.0 <u>Acceptance Criteria & Deviations</u> 7.1 The offered Lube Oil system shall be proven and validly similar to the specified operating parameters, pressures and configuration as compared to at least TWO UNITS designed, manufactured, tested and supplied from the proposed manufacturing plant and at least one of these units shall have been successfully operated in the field for at least 8000 hours of continuous operation without any major overhaul as on the date of issue of enquiry. 7.2 Vendor shall furnish complete reference list / details along with the offer. These details shall include Plant name, year of commissioning, number of operating hours completed and name of contact person(s) etc. for the skids similar to one being offered. 7.3 Whenever the vendors design philosophy does not meet the requirements set forth in this specification, the vendor shall clearly indicate in writing, and shall secure purchasers written approval before order placement. Purchaser will assume that proposal meets all the requirements stated herein except for the vendor specific agreed exceptions. 8.0 <u>Order of precedence:</u> In case of conflict among the documents, the following order of precedence shall be applied: 1) Purchase Order.				

TD-106-1 Rev. 5 Form No.		PRODUCT STANDARD TURBINES AND COMPRESSORS HYDERABAD		TC 5 4362
				Rev No.: 00
				Page 8 of 12
2) Job Specification 3) Present Specification. 9.0 Inspections and Tests: 9.1 All the equipment shall be subject to inspection and witnessed tests by inspector appointed by BHEL / Consultant/TPI as applicable to the project. 9.2 The vendor shall allow access to his work-shop to the purchaser's representative during the period when manufacture or equipment is in progress. 9.3 The vendor shall give instructions to his suppliers to allow access to their premises for the purpose of inspection or witnessed testing of sub contracted parts. 9.4 The vendor shall notify the purchase No less than 15 days before the oil system console or its components will be ready for inspection / Testing. 9.5 The schedule of minimum quality checks and procedure to be followed for conducting the functional operational tests are given in separate specification enclosed to this specification. 9.6 The complete Lube oil system shall be run in the vendor shop for test operation, sound level and cleanliness as per rated parameters. 9.7 The operational tests shall be conducted using Turbine oil indicated in clause no 2.1 above. All the instruments, electrical starters, equipment required for auto start of oil pumps and any others equipments required for conducting operational tests are to be arranged by the vendor. The offer shall include vendor's site visit one day, if required. 9.8 The vendor has to furnish QAP as per minimum requirements specified in TC54362 & Test procedure as per Annex-15 for the approval of BHEL/ customer/ end user. 10.0 MARKING, SHIPPING AND REJECTION 10.1 Name Plate: The vendor shall attach at a visible point on the unit, metal name plate of corrosion resistant material bearing the manufacturer's name, the unit item number, Equipment title, Manufacturers serial number and the main parameters of equipment. Also BHEL emblem also shall be mounted which shall be supplied as loose items. 10.2 Preparation for Shipment: 10.2.1 The following requirements indicated in BHEL specification & attached documents shall be followed with regards to cleaning and painting of oil Tanks, oil filters oil coolers and Piping. 10.2.2 The preparation shall make the equipment suitable for six months of outdoor storage from the time of shipment. 10.2.3 The equipment shall be prepared for shipment after all testing and inspection has been completed and the purchaser has approved the equipment. 10.2.4 Exterior machined surface shall be coated with suitable rust preventive. The interior of the equipment shall be clean, free from scale, welding spatter and foreign objects and sprayed with suitable oil soluble rust preventive, if required. 10.2.5 Counter flanges (same as equipment flange) shall be provided with rubber gaskets and full diameter fasteners (nuts, bolts & Washers).				
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COMP. FILE NAME TC 5 4362-R00				
Ref. Doc.				

TD-106-1 Rev. 5 Form No.		PRODUCT STANDARD TURBINES AND COMPRESSORS HYDERABAD		TC 5 4362
				Rev No.: 00
				Page 9 of 12
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.		10.2.6 Threaded openings shall be provided with steel caps or round-head steel plugs in accordance with ANSI B16.11. 10.2.7 Lifting points and lifting lugs should be clearly identified. 10.2.8 Complete lube oil system for carbon steel area is to be painted. Refer Annex-3 10.2.9 The equipment shall be identified with item and serial numbers one inside and another on the outside of the shipping container. 10.2.10 The lube oil system shall be shipped as a single assembly. The system shall be packed in a wooden case with proper cushions and suitable for easy handling by providing runners and lugs wherever required. The container shall be marked such that the lube oil system base rests on ground. Vendor to get the packing confirmed before proceeding for despatch for any BHEL-Customer specific requirements. 10.2.11 Each filter shall be shipped with clean elements installed and shall carry outside a securely affixed all weather proof tag stating, "SHIPPED WITH CLEAN AND FRESH FILTER ELEMENTS". 10.2.12 Material shipped separately shall be identified with securely affixed corrosion resistant metal tags indicating the item number as per the list. 10.2.13 Equipment shall be shipped with duplicate packing lists, one outside and one inside the container. Both the packing lists shall be sealed in a transparent moisture-proof enclosure. The external packing list shall be affixed to the container and shall be additionally protected by suitable metallic enclosure. 10.3 <u>Rejection:</u> Equipment or parts thereof and materials entering therein, indicating irremediable or injurious defects, improper fabrication, excessive repairs or that is not in accordance with the requirements of this specification shall be subject to rejection. They shall also be subject to rejection if such conditions are discovered after acceptance of the items at the manufacture's works. 11.0 <u>Test & Guarantee certificates:</u> 11.1 <u>Test certificates:</u> 2 copies of Inspection and test certificates shall be supplied for each item of the consignment quoting BHEL STD Number, Purchase Order No and manufacturer's identification serial numbers. 11.2 <u>Guarantee certificates:</u> 11.2.1 The complete Lube oil system console and the each equipment of the console shall be guaranteed for 18 months of trouble free performance from the date of shipment or 12 months from the date of commissioning whichever is earlier. 11.2.2 If any malfunction or defects occur during the guarantee period, the vendor shall make all necessary alteration, repairs, or replacement free of charge.		
COMP. FILE NAME TC 5 4362-R00	Ref. Doc.			

TD-106-1 Rev. 5		Form No.		PRODUCT STANDARD TURBINES AND COMPRESSORS HYDERABAD		TC 5 4362																																																																											
				Rev No.: 00																																																																													
				Page 10 of 12																																																																													
RECORD OF REVISIONS <table><thead><tr><th>Rev. No</th><th>Date</th><th>Revision Details</th><th>Revised</th><th>Approved</th></tr></thead><tbody><tr><td>00</td><td>20.10.11</td><td>First Issue</td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>							Rev. No	Date	Revision Details	Revised	Approved	00	20.10.11	First Issue																																																																			
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COMP. FILE NAME TC 5 4362-R00																																																																																	
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