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| **Hindalco Renusagar U5 1 x 80 MW PF Captive Power Plant**  **Flue Gas Desulfurization Project (FGD) with GORETM SO2 Control System**  **FGD - FGTR Effulent Transfer Pumps - Technical Specification**  **`**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **ISSUED FOR** | APPROVAL | INFORMATION | MANUFACTURING | CONSTRUCTION | AS-BUILT | | | | | | | | |
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| Flue Gas Desulfurization Project (FGD) with GORETM SO2 Control System | | | Gore Doc. No.: RPDU5.PG.036 | | | |  |
| **FGD - FGTR Effulent Transfer Pumps - Technical Specification** | | | GORE Job No.: RPDU5 | | | | Rev. : 0 |
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**ANNEXURES**

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ANNEXURE-III : QUALITY CONTROL PLAN

1. **General**  
   1) Hindalco Industries Limited (HIL)-Renusagar intends to install Flue Gas Desulphurisation Project (FGD) in their Unit-5 ,1 x 80 MW captive power Plant using **GORE TM** technology. The flue gas from the existing ID Fan outlet shall be taken to new Booster Fan suction and the discharge of the fan shall be taken to Mist Cooling Unit where water shall be sprayed in atomised form to cool the hot flue gas and also saturate the same. The cold and moisture saturated flue gas shall be further taken for desulpharisation into the Flue Gas Treatment Reactor (FGTR). This FGTR unit shall have Modules through which Flue gas shall pass and SOx will be trapped and dilute 10% H2SO4 acid solution shall be generated.The Flue gas after passing through the mist eliminator and exits through the Wet Stack at top of the FGTR unit.The 10% H2SO4 solution generated shall be transferred to the Acid Concentration Plant to generate 95% concentrated H2SO4 acid and thereby recovering water for the same.

**Centrifugal Pumps** shall be used to transfer process fluids to transfer various liquids from storage to process units.

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2) This specification covers the design, engineering, manufacture, assembly, testing at manufacturer's works, supply and delivery to project site properly packed for transportation, including shop painting, freight, transit insurance, all taxes, duties, octroi, other charges/levies as applicable, testing and commissioning at site of all materials and equipment inclusive of accessories as specified and as required for **Centrifugal Pumps with Drive Motors, Couplings(with guards), Baseframes & Foundation Bolts, Inlet and Outlet counterflanges withnuts, bolts, gaskets and accessories** complete with all materials and accessories for safe and trouble-free operation of same.

1. **Codes and Standards** : The design, manufacture, inspection and testing of the equipment covered under this specification shall conform, in general, to the standards and codes (latest editions) mentioned below:
2. International Organisation for Standardisation (ISO);ISO3585/3586/3587/4704
3. Bureau of Indian Standards (BIS)
4. British Standards (BS); BS EN 1595
5. American National Standards (ANSI).
6. Steel Pipe Flanges & Flanged Fittings (ASME B 16.5)
7. ASTM. Standards for materials
8. API : American Petroleum Institute.
9. In case of any contradiction between the above standards and data specification sheets, the stipulations in the data sheets shall prevail and shall be binding on the Supplier/ Bidder.
10. **System Description** : The flue gas shall be taken from the discharge duct of existing ID Fans and transferred to the inlet of new Booster Fan. The discharge of booster fan shall be sent to the inlet of Mist Cooling unit for moisture saturation and reduction in temperature. In the Mist cooling Unit water will be sprayed in mist form for evaporative heat exchange and thereby reducing flue gas temperature and achieving saturated condition. After the mist cooling unit, the flue gas is sent to the FGTR Reactor Tower to trap SOx. As SOx is trapped in the tower,10% dilute H2SO4 solution is generated. The flue gas after treatment shall exit through the Wet Stack at the top of the tower.

The FGTR unit is a vertical tower type structural unit having Catalyst reactor modules at different levels stacked one above the other. The flue gas passes through these modules from bottom to top direction. In the process SOx and moisture separates from the flue gas as 10% H2SO4 solution. This acidic solution falls down from module surface in droplet form and gets collected in the bottom hoppers.

In the FGTR Wash Spray Nozzles, Misting Nozzles and Make up water Nozzles are provided which continuously circulate acidic solution.

Thus the flue gas, while travelling through the FGTR, shall remain saturated with 10% H2SO4 solution and shall also have solution droplets carried over along it.

The FGTR unit will have a Wet Stack at the top of it through which the treated flue gas shall exit to atmosphere.

The 10% H2SO4 solution generated shall be transferred to the Acid Concentration Plant to generate 95% concentrated H2SO4 acid and thereby recovering water for th.e same.The recovered water from the Acid plant shall be of 0.25% H2SO4 concentration.

Pumps shall be used to transfer process fluids to transfer various liquids from storage to process units as indicated below. The process fluid is acidic in nature with different concentration of H2SO4 acid varying from 0.25% to 95% as indicated in the datasheet.

However, This FGTR Effluent Transfer Pumps (FETP) pumps shall transfer 10% H2SO4 acid solution from the FGTR to the Effluent Storage Tank in the Acid Concentration Plant.

1. **Scope of supply , and supervision of erection and commissioning :**

The scope for Pumps with Drives & accessories shall consist of :

1. FGTR Effluent Transfer Pumps (FETP) & Motor Drives ( 1w+1s), and accessories.
2. Mechanical Seal for Pumps.
3. Coupling with Guards, Common Baseframes, Foundation Bolts, Casing vents, Drains etc as required.
4. All inlet and outlet counterflanges with nuts, bolts and gaskets.
5. Set of special tools and tackles.
6. Mandatory spares if specified. Price of same shall be evaluated.
7. Erection and commissioning spares.
8. List of recommended spares with Unit Rate for three (3) years of trouble-free operation. The Price of Recommended spares shall not be evaluated.

1. **Scope of services** :

The following services shall be provided by the bidder for all equipment and accessories listed above:

1)Complete design and engineering required for Pump selection,

2)Detail engineering for all related items, supports etc.& submission of all necessary documentation, drawings, and operation and maintenance manuals.

3) Inspection and testing of all equipment at manufacturer's shop.

4) Packing for road transportation as applicable.

5) Transportation of all equipment including transit insurance up to site.

6) Supervision of Erection and commissioning of items supplied.

7) Witnessing of Performance test of equipment at site and fulfilment

of Guaranteed Data /Parameters.

1. **Exclusions :**

Following items are out of scope of Bidder:

1. Erection at site.
2. All piping, cabling and instruments.
3. **Terminal Point :**

The terminal point shall be as follows.

1. Inlet of suction counter-flange and outlet of discharge counter-flanges.
2. At motor terminal box.
3. **Design and construction requirements and important considerations**

1) For selection and sizing of equipment the technical data sheet (Annexure-1) may be referred.

2) Material of construction – The material of construction shall be minimum as indicated in the technical datasheet. However,the bidder may select higher grade based on requirement of the specific function as deemed suitable.

3) Adequate margin shall be considered for selection and sizing of equipment.

4) Pump Casing- Pump casing shall be provided with adequate number of vents unless the pump is made self‑venting. Casing drain, as required, shall be provided complete with drain valves. Pump design must ensure that the nozzles are capable of withstanding external reactions more than those specified in codes

5) Impeller - The rotor assembly shall be dynamically balanced and designed with critical speed substantially above the operating speed.

6) Shaft - Shaft size shall be so selected that the critical speed shall be away from the operating speed as recommended in applicable Code/ Standard. The critical speed shall also be at least 10% away from runaway speed.

7) Bearings - Bearings shall be easily accessible without disturbing the pump assembly. A drain plug shall be provided at the bottom of each bearing housing. Heavy duty sleeve/ ball/ roller type bearings shall be provided to take care of the radial loads.

8) Mechanical seal - Mechanical seal shall be provided. The seal material shall have low co-efficient of friction and shall be suitable for fluid handled.

9) **PG Test and Performance Guarantee** – The bidder is required to demonstrate where possible that the pumps will operate to the required proficiency.

Pumps are to be fully guaranteed as specified.

Supplier shall demonstrate PG test for stipulated time as agreed with Purchaser and following shall be the minimum items :

9-1) The pump shall be suitable for continuous operation at any point within the "Range of Operation" as stipulated in the data specification sheets.

9-2) Pump shall preferably have a continuously rising head‑capacity characteristics from the specified duty point towards shut‑off point, the maximum being at shut‑off to enable parallel operation. Under all circumstances, the 'range of operation' of the pump shall exclude any unstable operating zone of the head ‑ capacity curve. The power capacity characteristics shall be non‑overloading type for the range of operation specified.

9-3) The pump set along with the drive motor shall run smoothly without undue noise and vibration. Acceptable peak to peak vibration limits shall be generally guided by the Hydraulic Institute Standards of USA.

9-4) The contractor under this specification shall assume full responsibility for the operation of the pump and motor as one unit.

9-4) The following parameters shall be guaranteed - Pump rated capacity, Pump TDH, efficiency at design point and power consumption at the rated point at motor terminal.

1. **Not used**
2. **Not used**
3. **Documents/Drawings to be submitted along with the bid as “Must Items” for a responsive bid.**

**E-1 Along with Bid**

1. Scope of supply without any ambiguity.
2. Datasheet, Technical Particulars of offered item(s).
3. Pump curves & basic GA.
4. MOC of all items.
5. Not used.
6. QAP.
7. Guaranteed Performance Data.
8. Price Schedule.
9. Delivery Schedule.
10. Details of Commissioning manpower.
11. Document submission schedule as per Deliverable List (post order) in Annexure.
12. Terms of Payment.
13. **Deviation List if any. Without any deviation list, bid shall be construed exactly as per requirement of Scope Document / Technical Data Sheet.**
14. Catalogue of all equipment.
15. List of commissioning and maintenance spares.
16. Recommended Spare parts list for Three (3) year’ operation.

**E-2 Post Order**

1. Pump curves, Datasheet, Technical Particulars of offered item(s) along with its constructional features and Performance detail.
2. Dimensional General arrangement Drawings.
3. Cross sectional Drawings with partlist and MOC.
4. Operation & Maintenance Manual.
5. QAP showing the Customer / Third Party Inspector (TPI) Hold Points.
6. Weight data for erection & loading data (static & dynamic) for civil design by other.
7. Material Test certificates shall be furnished.

**F List Of Preferred Make:**

1. Moniba Pumps, Vasai, Maharashtra
2. Anticorrosive Equipment, Mumbai, Maharashtra
3. Process Pumps (I) Pvt. Ltd.
4. Engineers Combine, Mumbai, Maharashtra
5. Any Other from Hindalco’s List