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| A picture containing icon  Description automatically generated | | Owner:  HINDALCO INDUSTRIES LIMITED  Ahura Centre, 1st Floor, B Wing, Mahakali Caves Road, Andheri (East), Mumbai - 400 093, India | | | | | |
|  | | EPCM Contractor:  W. L. GORE & ASSOCIATES (Pacific) Pte, Ltd. India Branch  703, A-Wing, 215 Atrium, Andheri Kurla Road, Mumbai 400059, India | | | | | |
|  | | Nominated Subcontractor - Engineering, Quality Control, Supervision:  SMARTLuth Solution and Service Pvt. Ltd.  Unit No: 503, 5th Floor, ECO Centre,. EM-4 Sector-V, Salt Lake City, Kolkata - 700091, India | | | | | |
| **Hindalco Renusagar U5 1 x 80 MW PF Captive Power Plant**  **Flue Gas Desulfurization Project (FGD) with GORETM SO2 Control System**  **FGD & SAC- Steel Tanks-PTS Purchasing 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.PA.010**  **RPDU5.PA.310** | | | |  |
| **FGD & SAC- Steel Tanks-PTS Purchasing Technical Specification** | | | GORE Job No.: RPDU5 | | | | Rev. : 0 |
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CONTENTS – SECTION-1

**CLAUSE. NO. DESCRIPTION PAGE NO.**

A. GENERAL 3

A-a CODES AND STANDARDS 3

A-b SYSTEM DESCRIPTION 4

A-c SCOPE OF SUPPLY AND SUPERVISION OF 5

ERECTION & COMMISSIONING

A-d SCOPE OF SERVICES 5

A-e EXCLUSIONS 6

A-f TERMINAL POINT 6

B. DESIGN & CONSTRUCTION REQUIREMENT & 6

IMPORTANT CONSIDERATION

C. OUTLINE DRAWING NO. 8

D. NOT USED 8

E. DRAWINGS / DOCUMENTS TO BE SUBMITTED 9

**ANNEXURES**

ANNEXURE-1&2 : TECHNICAL DATA SHEET

ANNEXURE-3 : QUALITY CONTROL PLAN

ANNEXURE-4 : COMMERCIAL TERMS & CONDITIONS

ANNEXURE-5 : TANKS OUTLINE DRAWINGS

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 Demister shall exit 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.

**Storage Tanks** shall be used in the plant located at FGTR area and Acid Concentration Plant area for the purpose of storing Fresh Make up water, Acid solutions of 10% and 95% concentration and Recovered water to act as buffer storage against process fluctuation for envisaged time..

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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, supervision of erection, testing and commissioning at site of all materials and equipment inclusive of accessories as specified and as required for **Storage Tanks (with inner lining where mentioned) and accessories as per drawing enclosed with this specification and complete with ladders, handrailing, nozzles, flanges and counterflanges withnuts, bolts, gaskets, set of foundation bolts for all tanks 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. IS : 803
10. 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.
11. **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 (MCU) water shall 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 shall be sent to the FGTR Reactor Tower to trap SOx. As SOx is trapped in the tower,10% dilute H2SO4 solution shall be 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.

The FGTR unit shall 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.

Storage Tanks shall be used for storing various process fluids as indicated below :

1. **Fresh Water Tank (S21001-EN01-05PBL-221024)-–** This shall be used to storage fresh make up ( filter water quality ) to cater to various needs like Demister backwash, Ash Filter backwash, FGTR make up and supply to Emergency Overhead tank. This shall be located in the FGTR plant area.
2. **Process Water Tank (S21001-EN01-05GNK-221026)** – This will store fresh make up water as indicated above. Additionally this will also be used to store the 0.25% H2SO4 solution generated as recovered water from the Acid Plant. This shall be located in the FGTR plant area.
3. **Emergency Overhead Tank (S21001-EN01-05PBL-221049)** – This will store fresh make up water for a specific purpose of supplying water to MCU during power outage to cool incoming flue gas. This shall be located in the FGTR plant area and installed at an high elevated level platform.
4. **Effluent Storage Tank (S21001-EN01-05HSM-221051)** – This shall be used to store 10% H2SO4 solution generated in the FGTR. This shall be located in the Acid Plant area.
5. **SAC Recovered water tank (S21001-EN01-05GNE-221053)** – This shall store recover water from acid plant having 0.25% concentration of H2SO4.Location shall be acid plant area.
6. **95% Conc H2SO4 Acid Tank (S21001-EN01-05GNE-221055)-** This shall store 95% concentrated H2SO4 acid produced from acid plant and shall be used for loading to tankers. Location shall be acid plant area.

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

The scope for Tanks & accessories shall consist of :

1. One (1) no. Carbon Steel Fresh Water tank and accessories.
2. One (1) no. Carbon Steel Process Water tank , with Inner FRP lining and accessories.
3. One (1) no. Carbon Steel Emergency overhead tank and accessories.
4. One (1) no. Carbon Steel Effluent Storage tank, with Inner FRP lining and accessories.
5. One (1) no. Carbon Steel Recovered Water tank , with Inner FRP lining and accessories.
6. One (1) no. Carbon Steel Concentrated Acid tank, with Inner FRP lining and accessories.
7. Inner lining of FRP (Fibre reinforced plastic) as mentioned for some tanks above in the datasheet and drawings.
8. Complete accessories like Ladders, Handrails, Manholes with covers and fasteners, Earthing strips etc as indicated in datasheet/drawings.
9. Nozzles, flanges, counterflanges with nuts, bolts and gaskets.
10. Sets of foundation bolts and nuts.

**c-1.** **Optional Offer** – There may be a situation when it is decided to NOT use FRP lining for the said tanks and instead coating of Glass Flake Lining is used. In that case glass flake lining package vendor shall do the coating of tanks. Hence Bidder of Tank package as per this specification shall also give optional offer of ONLY Carbon steel Tanks without any FRP lining.

1. **Scope of services** :

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

1)The tanks, if required to be fabricated at site, shall be assessed by the bidder and indicated while submitting bid.

2) Complete detail design and engineering required for tanks as per GA drg and Datasheet enclosed with this specification.

2a) Detail engineering for all related items, supports etc & submission of all necessary documentation, drawings.

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

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. All piping, valves beyond battery limit as per drawing.
2. **Terminal Point :**

The terminal point shall be as follows.

1. Inlet / Outlet of Nozzles.
2. **Design and construction requirements and important considerations**

1) For details of the tanks’ GA drawings and the technical data sheet (Annexure-1&2) may be referred.

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

3) This specification describes Carbon steel tanks with corrosion resistant and durable FRP( Fibre reinforced plastic ) inner lining and also Carbon steel tanks without any inner lining. These are clearly indicated in the enclosed datasheet and drawings. All materials including FRP materials and sealant in contact with contained water shall be non-toxic.

4) The scope shall include Complete assembly of Carbon Steel shell and roof, Internal FRP linings where indicated, reinforcing members, internal & external ladders and fitting nozzles for piping and foundation bolts as detailed in drawings and datasheet.

**B-1) Fabrication**

1. Tanks shall be suitably constructed for safe, proper and continuous storage

of liquid as described in datasheet. The design code, material standard, minimum plate thickness, size and other details shall be as per the datasheet and drawings. The plate thicknesses indicated in the data sheets/drawings are the minimum.

1. The plates shall be cold rolled through plate bending machine by several

number of passes to true curvature.

1. For fabrication at the plant area, suitable place duly approved and demarcated by client shall only be used
2. Tank seams shall be so positioned that they do not pass through tank

connections. For cylindrical vessels consisting of more than two sections, longitudinal seams shall be offset.

1. Where possible, the inside seam weld shall be ground smooth, suitable for

application of corrosion resistant liner.

1. Reinforcement pads in tank connections shall be provided as per applicable

code & the reinforced connection shall be completely pre-assembled into a shell plate.

1. All welding shall be done as per latest revision of codes and standards. All

welds are to be continuous welds. Bidder shall clearly state in his offer the make and type of welding rods proposed by him for fabrication.

1. Inside lining of tanks shall be done to ensure quality so that there is no air gap between the lining and carbon steel plate. The procedure shall be submitted to client for approval before start of manufacturing.

**B-2) Connections**

1. Bidder shall furnish all piping material required for the tank connections as

indicated in tender drawings.

1. Unless otherwise specified, for all flanged connections bidder shall furnish

suitable counter flanges and the necessary nuts, bolts, gasket. Blank flanges shall be provided on spare connection. Nuts and bolts must be suitable for corrosive liquid / environment.

1. Flange faces of all nozzles shall be machined and square with the vessel

Centre lines.

1. Unless otherwise stated bolts and nuts shall be of hexagonal head.

1. The material and thickness of gaskets shall be suitable for the specified

service. On completion of hydraulic test, Bidder shall replace the gaskets used during testing at his own cost.

1. The vessel and tanks shall be provided with accessories as indicated in the

GA drawing and datasheet. All the accessories shall conform to relevant standard.

**B-3) Installation**

1. For installation of tank, the recommendation, regarding installation in relevant standards shall be followed in general. In addition to those recommendation, the following shall also be taken care of.
2. All fabricated part, before assembly, shall be transported by the Bidder by

his own arrangement to tank installation site. All preliminary work and fabrication in part or full shall be done at the Bidder’s fabrication yard or shop as much as possible to suit his transportation arrangement subject to Purchaser’s approval.

1. All material before final installation over the foundation at the respective

locality shall be inspected and faired as necessary to ensure that any damage received during transportation is corrected before erection to the satisfaction of the Engineer. Particular attention shall be given towards removal of buckles and other form of distortion in shell and bottom plates. Irregularities and dirt which would prevent metal to metal contact at the jointing faces shall be removed.

**B-4) Welding**

1. Welding shall be in accordance with the requirement of

IS 803/ASME SEC-VIII, API 620 /API 650 as may be applicable.

1. Welding sequence shall be adopted in such a way so as to minimise the

distortion due to welding shrinkage. Bidder shall indicate in his drawing the sequence of welding proposed by him which should meet prior approval of the Engineer.

1. Electrodes to be used for welding shall be as per the applicable IS Code and

approved by the Engineer prior to use. Manufacturer’s test certificate for guaranteed performance shall have to be provided when called for.

1. Inspection of welds shall be carried out in accordance with IS-823 or equivalent standards

**B-5) Special Cleaning, protection, painting.**

1. After fabrication tank surfaces shall be cleaned thoroughly in accordance with SSPC‑SP5, White Metal Blast Cleaning to remove all loose dirt, rust, mill scales and any deleterious material.
2. All exterior surfaces shall be cleaned of grease, dirt, weld spatter etc.
3. Interior surfaces shall be lined as specified in the datasheet and exterior surfaces shall be coated with the primer and finish paints in required number of coats as specified in the datasheet/ drawings. The procedure preparation of the surfaces before application of any protective coating/paint shall be subject to the approval of the Purchaser. Procedure for internal lining shall be subject to approval of the Purchaser.

**B-6)** **PG Test and Performance Guarantee** – The contractor is required to demonstrate PG test and performance guarantee as per drawing and datasheet.

Hydrotest of tanks shall be carried out.

For FRP lining inside suitable tests for leakproofness like spark test shall be done. Test for bond strength of FRP, adhesiveness, thickness etc as applicable shall also be done for FRP lining. In this regard the successful bidder shall submit QAP for approval from Purchaser.

1. **Outline Drawing Numbers:**
2. **PROCESS WATER TANK- S21001-EN01-05GNK-221026-R0**
3. **FRESH WATER TANK- S21001-EN01-05PBL-221024-R0**
4. **OVERHEAD TANK- S21001-EN01-05PBL-221049-R0**
5. **EFFLUENT STORAGE TANK- S21001-EN01-05HSM-221051-R0**
6. **SAC RECOVERED WATER TANK- S21001-EN01-05GNE-221053-R0**
7. **SAC 95% STORAGE TANK - S21001-EN01-05GNE-221055-R0**
8. **Not used**
9. **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. Not used.
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. Detail GA & Fabrication drawings for approval.
2. Not used
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 for civil design by other.
7. Material Test certificates shall be furnished.