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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**  **`**  **Specification of Multi Louvre Dampers with Pneumatic Actuator & acc.**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **ISSUED FOR**  Image of Word symbol of a checkmark.) | APPROVAL | INFORMATION | MANUFACTURING | CONSTRUCTION | AS-BUILT | | | | | | | | |
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| **Specification of Multi Louvre Dampers with Pneumatic Actuator & Acc** | | | GORE Job No.: RPDU5 | | | | Rev. : 00 |
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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.

**Multi Louvre Dampers** for isolation purpose shall be used at the new and existing duct as described elsewhere in this document.

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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 **Multi Louvre Dampers with Pneumatic Actuators Solenoid operated** **, Torque & Limit Switches, Inlet and Outlet counterflanges with nuts, 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. ASME: American Society of Mechanical Engineers; ASME SEC VIII
10. TEMA: Tubular Exchanger Manufacturer Association.
11. 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.
12. **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 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.

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.

To avoid water droplets being carried over to the stack, Demister shall be installed at the FGTR outlet section. The Demister shall trap liquid droplets from the flue gas.

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

The existing system of each unit has two ID fans handling the flue gas and discharging through chimney. From the individual discharge duct of the ID fans, new ducts will be put with Isolation dampers. Isolation dampers shall also be put in the existing individual discharge ducts of ID fans after the tap-off for new duct is taken. The dampers shall be **Multi Louvre Dampers with Pneumatic Actuator** for isolation purpose.

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

The scope for Multi Louvre Dampers Complete with Pneumatic Actuators & accessories plant shall consist of :

1. Multi Louvre Dampers assembly complete with Pneumatic Actuators solenoid operated and accessories.
2. Instruments with accessories.

3) Air tubing, Air Filter-Regulator-Lubricator units as required etc

4) All inlet and outlet counterflanges with nuts, bolts and gaskets.

4) Sets of fixing bolts, fixing frame, support plate, grounding pad, lifting lugs, eye bolts, for each expansion joint sets.

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 Dampers & Actuators 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 ducts, support structures and local instruments.
3. Instrument Cables.
4. Power cables.
5. Air line beyond terminal point.
6. **Terminal Point :**

The terminal point shall be as follows.

1. Damper inlet & outlet counter-flanges.
2. Instrument Air line at a pressure of 4-5 kg/cm2 within 1 meter from the damper shall be provided.
3. Instrument /signal cables from limit switches – shall be terminated at the Field Junction Box ( including Junction Box) to be located max 10 meters from the remotest damper
4. Power Supply—240VAC single phase shall be provided at the solenoid terminal.
5. **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) The dampers should be 99.5% leak proof. The dampers, frames, blades etc. shall be designed to operate satisfactorily over the full design life of the plant, unless specified otherwise in this document.

The design of the equipment shall take into account wind, seismic, specified climatic and meteorological factors, effects of positive and negative pressures and temperatures and the method of shipment, handling, storage and erection.

The dampers must be of robust construction and due allowance must be made for the temperatures, pressures and differentials under which the dampers are to operate. It should be noted that the dampers might be located in an unsupported length of flue / duct and as such may be subjected to a bending moment.

Dampers must be designed to avoid the deposition or collection of dust and minimize erosion from dust. The design shall minimize the resistance to flow with the blades in the open position.

5) Frames

All actuator loads are to be accommodated by the damper frame. The damper frames are to be sufficiently rigid to permit free movement of the blades and shafts without relying on stiffening from the Purchaser’s ductwork. The final actuator location must be agreed between the contractor and us prior to issue of drawings for review.

6) Shafts

The damper shafts must be made from a material suitable for the environmental conditions. Any plating or surface treatment is to be of sufficient thickness and finish to provide adequate bearing life.

7) Actuators

ISOLATION (ON-OFF) type Multi louver dampers will be operated by Pneumatic actuator. The required location of the actuator, to suit Purchaser’s plant layout, is to be advised by the Purchaser.

8) Sealing Efficiency

The required sealing efficiency has been specified as a percentage of the duct cross sectional area. Dampers should have a sealing efficiency of 99.5%.

9) Transportation Jigs

Wherever possible dampers shall be supplied fully assembled to site. Consideration must be given to preventing distortion of the damper during shipment and erection. Any jigs or temporary bracing considered by the Contractor must provide necessary. It must be painted a distinctive colour and clear instructions provided concerning its removal before operation. A positive means of locking the damper blades in the closed position during transport and erection must be provided. Clear instructions are to be provided concerning its removal before operation.

10) Component Identification

All equipment shall be provided with labels, nameplates Tag numbers and DU numbers provided by us.

Where the equipment supplied comprises multi-part assemblies, these shall be identified prior to shipment with markings corresponding to those on the drawings and materials list.

At least one of these assemblies shall be fitted with permanent durable nameplate carrying the identification of the whole plant item.

Finished items such as actuators shall each have a permanent durable nameplate.

During transportation and storage all items shall be identified by appropriate durable markings on the label, outer packing or crate.

11) **PG Test and Performance Guarantee** – The contractor is required to demonstrate where possible that the damper will operate to the required proficiency.

Dampers fitted with actuators must be stroked in the works to ensure correct blade movement.

The contractor must establish the leakage path by measuring with feeler gauges, (Or other suitable method) and establish the sealing efficiency as a percentage of cross sectional area.

The contractor shall determine the leakage rate for the design conditions specified in the data sheets The contractor shall provide details of all test procedures.

Dampers 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 :

a) Leakage Rate – As per Technical datasheet annexed.

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. Brief Datasheet, Technical Particulars of offered item(s).
3. Nozzle Datasheet.
4. MOC of all items.
5. GA & Layout drawings for Dampers.
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. Design Calculation, Operation & Control Philosophy,Technical 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.