

Rotary Ash Extractor

BIDDER PRE QUALIFICATION CRITERIA

1.0 Technical Criteria

1.1 The prospective supplier must be an OEM possessing proven technology for Design, Engineering, Manufacturing of Rotary Extractor.

1.2 The prospective supplier should be able to provide non-infringing technology solutions.

1.3 The prospective supplier should have designed, manufactured and installed rotary Extractor for high pressure application with following specification

- Operating pressure of 25 bar or higher
- Solids handling capacity of minimum 8 TPH
- Should be designed for fly/bottom ash

1.4 The rotary extractor supplied should be operational/ should have operated successfully for a minimum period of two years.

1.5 Bidder must submit performance/ satisfactory operation/ commissioning certificate(s) from the end user/customer as a proof.

2.0 Financial Criteria

2.1

a) Indigenous bidders shall submit copies of annual reports (balance sheets), profit & Loss Statement for the last three years (or from date of incorporation whichever is less) and GST Certificate.

b. Foreign bidders shall submit latest audited report from any reputed third party business rating agency like D&B report / credit reform etc.

c. Net worth of the bidder should be positive in any one of the past three financial years as per the Audited annual accounts.

2.2 For verification purpose all submitted documents shall be self-attested and stamped by the bidder.

2.3 Work /Purchase Order copies and their commissioning/ performance/ satisfactory operation/ certificates must be from the end user/customer of the plant.

2.4 Reference documents for supplies in foreign countries in support of Technical PQC furnished by the BIDDERS shall be verified and certified by independent third party inspection agency or their Indian subsidiaries.

Note: PURCHASER reserves the right to verify the information provided through suitable means viz. e-mail, telephonically, video calling or visit of PURCHASER team as per discretion of PURCHASER. Supplier shall also agree to facilitate the visit of PURCHASER team to his customer's premises, if considered necessary by PURCHASER. Travel, boarding and lodging expenditure for such visits shall be borne by PURCHASER.

Rotary Ash Extractor

BIDDER PRE QUALIFICATION CRITERIA

1.0 Technical Criteria

1.1 The prospective supplier must be an OEM possessing proven technology for Design, Engineering, Manufacturing of Rotary Extractor.

1.2 The prospective supplier should be able to provide non-infringing technology solutions.

1.3 The prospective supplier should have designed, manufactured and installed rotary Extractor for high pressure application with following specification

- Operating pressure of 25 bar or higher
- Solids handling capacity of minimum 8 TPH
- Should be designed for fly/bottom ash

1.4 The rotary extractor supplied should be operational/ should have operated successfully for a minimum period of two years.

1.5 Bidder must submit performance/ satisfactory operation/ commissioning certificate(s) from the end user/customer as a proof.

2.0 Financial Criteria

2.1

a) Indigenous bidders shall submit copies of annual reports (balance sheets), profit & Loss Statement for the last three years (or from date of incorporation whichever is less) and GST Certificate.

b. Foreign bidders shall submit latest audited report from any reputed third party business rating agency like D&B report / credit reform etc.

c. Net worth of the bidder should be positive in any one of the past three financial years as per the Audited annual accounts.

2.2 For verification purpose all submitted documents shall be self-attested and stamped by the bidder.

2.3 Work /Purchase Order copies and their commissioning/ performance/ satisfactory operation/ certificates must be from the end user/customer of the plant.

2.4 Reference documents for supplies in foreign countries in support of Technical PQC furnished by the BIDDERS shall be verified and certified by independent third party inspection agency or their Indian subsidiaries.

.

Note: PURCHASER reserves the right to verify the information provided through suitable means viz. e-mail, telephonically, video calling or visit of PURCHASER team as per discretion of PURCHASER. Supplier shall also agree to facilitate the visit of PURCHASER team to his customer's premises, if considered necessary by PURCHASER. Travel, boarding and lodging expenditure for such visits shall be borne by PURCHASER.

BHARAT HEAVY ELECTRICALS LIMITED

TIRUCHIRAPPALLI-620 014



Technical Purchase Specification for

ROTARY COAL FEEDER

Specification No.: TCG:002

Revision No.: 00

<i>Rev. No.</i>	<i>Rev. Date</i>	<i>Clause</i>	<i>Description</i>	<i>Chd. & Appd.</i>
---------------------	----------------------	---------------	--------------------	-----------------------------

	<i>Name</i>	<i>Signature</i>	<i>Date</i>
<i>Prepared</i>	M Noorul Fazil	-Sd-	22.08.2022
<i>Checked</i>	Srinivasu Aragula	-Sd-	23.08.2022
<i>Approved</i>	G Saravana Kumar	-Sd-	24.08.2022
<i>C&I spec.</i>	K. Veeramani	-Sd-	03.09.2022



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No. 00

Sheet 2 of 14

1. PART I - TECHNICAL SPECIFICATION

1.1 SCOPE

This specification defines the minimum technical requirements for the Design, manufacture, Inspection, testing, painting, packing and supply of Rotary Coal Feeder (hereon mentioned as Feeder) along with motor, couplings, gear box, base frame, and commissioning spares etc. It also covers the Supply of special tools required for operation and maintenance of *Rotary Coal feeder*.

This Specification along with **Annexures** that includes Vendor Check List shall form part of the Purchase Order and be binding.

1.2 APPLICATION

The Rotary Coal Feeder is intended to feed sub bituminous coal from coal receiver to the gasifier through the ejector in transport airline. It is to be noted that the total feeder system is subjected to pressure, unlike in general pneumatic conveying lines. That is the hopper above the feeder will be at operating pressure (refer below) and the feeding line below the extractor will also be at operating pressure.

1.3 DESIGN CONSIDERATION

1. The Rotary Coal feeder shall be designed to operate at variable speeds, transporting coal of minimum-12.5 MT/hr to a maximum 33.5 MT/hr at an operating pressure of around 33 kg/cm² (g).
2. **Special Sealing arrangement should be considered for leak proof of the feeder as the total feeder is subjected to pressure and leakage should be avoided. Sealing of leakage is very critical for operation of the entire plant, hence special care should be taken for seal arrangements. In 1.3.15, purging airline is suggested to be considered suitably by vendor.**
3. The rotary feeder casing shall be of fabricated type. It is to be stress relieved after the welding operation.
4. The inner surface of the casing shall be lined with stainless steel or be nickel plated to prevent corrosion.
5. The casing shall be provided with replaceable sleeve. The inner surface is to be nitride hardened to make it wear resistant.
6. The pockets/buckets shall be lined with Stainless Steel.



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No. 00

Sheet 3 of 14

7. The Rotary feeder diameter and sizing shall be optimized considering the maximum amount of material to be transported, the particle size distribution, variation in bulk density, temperature of the material and filling efficiency etc.
8. Radial clearance selected should consider the following aspects as minimum.
 - a) Expansion due to temperature.
 - b) Material size distribution.
9. The Rotary Coal Feeder should be provided with zero speed switch.
10. Provision shall be given for reverse rotation of the Rotary Coal Feeder.
11. Rotary Coal Feeder shall be designed suitable to outdoor application.
12. Suitable stuffing boxes are to be provided on either side of the casing where the shaft passes through the casing to withstand design pressure as specified in **Annexure-A**.
13. For overload protection shear pin shall be provided in the drive end shaft.
14. Suitable weather protection cover shall be provided to the drive system.
15. **Purging Air:** The Rotary Coal feeder shall have three separate purging air loops.
 - 15.1. Loop I may lead to the annular air spaces at the shaft seals. It is to prevent ingress of coal breeze which may lead to premature wear of the seals.
 - 15.2. Loop II shall purge the sidewalls of the rotor. It is to prevent coal from getting between the walls of the rotor and those of the casing in order to forestall chocking and possible freezing.
 - 15.3. Loop III shall lead to the rotor pockets/buckets at the shaft level. It is to ensure that gases cannot get from the gasifier into the coal conveying system upstream of the rotary feeder. The purging air may be used to reduce the operating temperature of the rotary valve. The purging air system for the Rotary Coal feeder shall be designed to ensure that the air passes to the individual loops and can be optimized during start-up or normal operation.

End connection/Terminal point of purging airline connection shall be explicitly indicted by vendor in the drawing for further connection.
16. The air purge supply lines shall be provided.
17. The connecting faces for the associated components and the inlet and outlet flanges shall be machined.
18. The Rotary Coal feeder has to be designed to operate continuously at the material temperature specified in **Annexure-A**.
19. All materials used shall be of tested quality.



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No. 00

Sheet 4 of 14

1.4 SPARES

Vendor to furnish the list of recommend spares required for 2 years of trouble free operation.

1.5 PACKING

The feeder shall be packed in such a way that it does not get damaged during transport. It shall be properly covered with thick tear proof polythene sheet and dispatched in suitable moisture proof wooden / steel crates.

1.6 DEVIATION

Vendor shall highlight the deviations from the specification (if any) or special features of the feeders, which are not covered in the specification during the offer stage itself.

1.7 GENERAL

- 1) For technical input data refer enclosed **Annexure-A**.
- 2) For composition of fuel, refer **Annexure-B**.
- 3) For electrical, control and instrumentation, refer **Annexure-C**.

2.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA & QC)

2.1 Quality Control

The supplier must include in the supply a proven quality control and quality assurance system that will ensure the quality of Rotary Feeder. The quality control system must follow ISO 9001 guidelines.

2.2 Quality assurance

The supplier shall be responsible for providing the necessary Quality Assurance and Quality Control procedures, maintaining continual surveillance and inspection activities during the entire periods of the Fabrication and Testing. Inspections report and tests to be provided to BHEL during the fabrication period and before shipment of the ROTARY FEEDER are:

Test and inspection reports shall be furnished for at least:

- a. Hydrostatic test for Feeder casing
- b. Leak test for assembly
- c. Accuracy test (Type test)

Irrespective of the requirement of conducting the type tests under this procurement, the supplier shall submit the reports of the type tests carried out within last **five years** from the date of bid opening. These reports should be for the tests conducted on the equipment



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No. 00

Sheet 5 of 14

same (**model / type / size / rating**) to those proposed to be supplied under this procurement and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The Purchaser reserves the right to waive conducting of any or all of the specified type tests under this contract, in which case the type test charges shall not be payable for the type tests waived by the Purchaser.

3.0 TECHNICAL DOCUMENTATION

The following technical manuals shall be provided. Total of two (2) hard copies and one (1) copy on magnetic media (USB memory stick) shall be provided sixty (60) days after issue of purchase order.

Items No. 3.1 till 3.7 shall be provided also with the proposal only in English language:

- 3.1 Operation manual in English.
- 3.2 Safety instruction in English.
- 3.3 Maintenance manual in English.
- 3.4 Repair and overhaul manual.
- 3.5 Complete and comprehensive Parts Catalogue (including pictures if applicable) manufacturer P/N and OEM P/N.
- 3.6 Maintenance/repair manuals and parts catalogue for other repairable components if were not included in the ROTARY FEEDER manual.

Note: The above listed documents can be combined & supplied as Operation & Maintenance (O&M) Manual.

- 3.7 Supplier shall submit a quoted (including prices) recommended spare parts list. The list should cover all spare parts consumption for 2 years operation and shall include at least the following Information: Manufacturer P/N, description, quantity required.

4.0 DOCUMENTS TO BE FURNISHED WITH THE OFFER

- 4.1 Product literature and drawings in support of the offer shall be submitted with the quotation to evaluate the offer.
- 4.2 Rotary Feeder technical specification. Parts Catalogue with detailed Bill of material (BOM) and weight particulars.
- 4.3 General arrangement drawing with major dimensional details and with sufficient views (cross sectional) for clear understanding of the Rotary feeder indicating the space requirement and bill of material of construction.
- 4.4 The drawing showing the supporting arrangement on floor taking into consideration of vibration including static & dynamic loading details at each support to be submitted for purchaser's information.
- 4.5 Design calculation for Speed, Capacity etc.
 - 4.5.1 Selection of drive system (drive motor, gearbox, coupling and rotor)
 - 4.5.2 Capacity of the rotary feeder.



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No. 00

Sheet 6 of 14

- 4.5.3 No load and full load power calculation considering the minimum and maximum operating conditions.
- 4.6 The supplier shall return a copy of this specification and note at the end of each paragraph if the offered equipment complies or not with this specification with supplier sign and seal.
- 4.7 Filled in data sheets as per **Annexure-A**.
- 4.8 Procedure for leak tightness test.
- 4.9 Procedure for liner plate replacement.
- 4.10 Safety instruction.
- 4.11 Recommended spare parts list.
- 4.12 Commissioning spares, if required.

5.0 DOCUMENTS TO BE FURNISHED AFTER AWARD OF CONTRACT

- 5.1 Rotary Feeder - Data sheet as per **Annexure-B** complete in all respect. Detailed dimensional general arrangement drawing of the total system with cross sectional details, bill of materials and weight of individual parts for purchaser's approval. (Approval does not relieve the vendor from responsibility).
- 5.2 Design calculation as per clause 4.5 of this specification.
- 5.3 Torque requirement of Rotary Feeder and selection of drive rating
- 5.4 Speed Vs torque characteristic curve for motor.
- 5.5 The drawing showing the supporting arrangement on floor including static & dynamic loading details at each support to be submitted for purchaser's approval.
- 5.6 Overload shear pin calculation.
- 5.7 List of bought out items & their Specifications.
- 5.8 **ROTARY FEEDER TEST CERTIFICATES**
Test certificates shall be furnished before despatch of components. Test certificate for the following shall be furnished.
 - 5.8.1 Material test certificate for all the major components.
 - 5.8.2 Performance TC for the intended duty conditions.
- 5.9 Quality Control/Inspection documents generated during the stages of inspection, performance inspection, and final inspection.
- 5.10 Warranty certificate shall be furnished by the vendor.
- 5.11 Recommended spares for 2 years trouble-free service with unit price.
- 5.12 List of special tools & list of commissioning spares as applicable.
- 5.13 Operation & Maintenance (O & M) Manual
 - 5.13.1 O & M manuals should be submitted to BHEL/Tiruchirappalli prior to despatch of the equipment in digital format.

6.0 INSPECTION

- 6.1 All test certificates shall be furnished for buyer's reference and records. The ROTARY FEEDER equipment shall, on its completion and before being placed in service, be subjected to inspection by BHEL inspector or BHEL nominated



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No. 00

Sheet 7 of 14

inspection authority during manufacture/testing stages, to determine that the assembly confirms to applicable requirements.

- 6.2 ROTARY FEEDER Equipment shall be inspected and tested as per approved quality plan. The certificates and documents generated during inspection of above shall be furnished to BHEL.

7.0 FINAL TESTS AND ACCEPTANCE

The ROTARY FEEDER shall be tested at the supplier premises and in the site together with BHEL's representative to demonstrate conformance to the specification and functioning. The following tests shall be performed:

- 7.1 Checking and repairing of voyage damages.
7.2 Visual test and complete equipment check-up.
7.3 Functional test. (Functional tests are defined as establishment of rated performance of feeder at site at rated condition for stipulate time period mutually agreed between purchaser/end user and supplier).

Acceptance certificate will be issued after successful completion of the functional tests and submission of all relevant documentation.

8.0 WARRANTY

8.1 Warranty Period

The warranty period shall be 18 months from date of supply or 12 months from data of commissioning whichever is earlier.

8.2 Warranty claims

In case of a failure during the warranty periods, BHEL/End Customer shall issue a corresponding Warranty Claim stating the nature of the failure, the demands for repair etc. The obligation of the contractor with regard to the Warranty jobs and claims shall include parts and labour. If emergency work is needed, or if the contractor fails to perform satisfactory, the site will carry out the repair work and the contractor shall reimburse all corresponding costs to the End Customer.



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No. 00

Sheet 8 of 14

9. PART II- ANNEXURES – A, B, C & D



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No. 00

Sheet 9 of 14

ANNEXURE-A

9.1 DATA SHEET

No	Description	Unit	DATA	Vendor to confirm/specify details
1.	Handling Material		Coal and Bed material	
2.	Handling Material Characteristics		Refer Annexure-B	
3.	Operating/Design temperature	°C	Max 200 °C/300°C	
4.	Design pressure	kg/cm ² (abs)	32.63	
5	Quantity	Nos	8	
6.	Normal Capacity	T/hr	25	
	Maximum Capacity	T/hr	33.5	
	Minimum Capacity	T/hr	12.5	
7	Inlet & Outlet line size	mm	Flanged, NB300	
8	Rotary feeder inlet & outlet flanges		Circular flanges to match above line size	
9	Method of speed control		VFD	
10	Gear Box	ratio	Suitable, to be mentioned by vendor	
11	Duty		Continuous	
12	Type of mounting		On spring hangers	
13	Position		Vertical (top to bottom)	
14	Painting Surface preparation		Commercial blast cleaning	
	Primer		One coat of Zinc Chrome primer (Alkyd Base) to IS-104 by brush/spray. DFT=30µm per coat.	
	Finish Coat		Finish coat shall be of 2 coats of Synthetic Enamel Ion oil Alkyd to IS2932(latest) DFT=20µm per coat.	
	Shade		Smoke grey	
15	Overall Dimensions(lxbxh)	mm	Vendor to specify	



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No.

00

Sheet 10 of 14

No	Description	Unit	DATA	Vendor Confirmation
16	Type of Rotary feeder		Vendor to specify	
17	Total weight of Feeder	Kg	Vendor to specify	
18	Feeder Motor Rating		Vendor to specify	
19	Overall height, inlet to outlet flange	mm	Vendor to furnish	
20	Special Sealing arrangement		Vendor to specify	
21	Purge Airline		Vendor to fill the details below	
21.1	Min. pressure			
21.2	Flow for shaft seals			
21.3	Flow for side plates			
21.4	Flow for pocket/bucket purging			
22	Rotor M.O.C (Material of construction)			
23	Diameter of rotor	mm		
24	Rotor length	mm		
25	Rotor shaft speed			
26	Scraper diameter	mm		
27	Casing M.O.C			
28	Casing sleeve M.O.C			
29	No of pockets/bucket	No.		
30	Volume of each pocket/bucket			
31	Pocket/ Bucket liner material			
32	Pocket/ Bucket liner thickness			
33	Shaft M.O.C			
34	Maximum peripheral speed at rotor sealing strips			
35	Nominal torque on auto guard-coupling			



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No.

00

Sheet 11 of 14

36	Max. torque on Auto guard-coupling			
37	Radial clearance between rotor & Body at ambient and at working Temp.	mm		
38	List of Special Tools & commissioning spares		Vendor to furnish	
39	List of recommended spares for 2 yrs operation.		Vendor to furnish	

Special Sealing arrangement should be considered for the feeder, as the total feeder is operating at higher pressure, leakage should be avoided. Suitable purge system may be considered.



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No. 00

Sheet 12 of 14

ANNEXURE-B

9.2 Characteristics of Handling Material (Typical):

Sl No	Parameter	Coal
1	Size mm	< 6
2	Bulk density kg /m ³	1000
3	Particle density kg/m ³	2400
4	PROXIMATE ANALYSIS % wt	
	Moisture	11.97
	Ash	33.69
	Volatile mater	23.95
	Fixed Carbon	29.64
5	ULTIMATE ANALYSIS % wt	
	Carbon	42.12
	Hydrogen	2.57
	Sulphur	0.38
	Nitrogen	0.86
	Oxygen	7.66
6	COMPOSITION Constituent % wt	Coal Ash
	Silica- SiO ₂	63.2
	Alumina- Al ₂ O ₃	23.7
	Iron oxide- Fe ₂ O ₃	6.9
	Titanium oxide- TiO ₂	1.4
	Calciumoxide- CaO	1.7
	Magnesium oxide-MgO	0.7
	Sodium oxide-Na ₂ O	0.8
	Potassium oxide- K ₂ O	1.4
7	Nature	Highly Abrasive and Erosive



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No.

00

Sheet 13 of 14

ANNEXURE -C

9.3 ELECTRICAL, CONTROL & INSTRUMENTATION

Provided separately as a ANNEXURE C



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY COAL FEEDER

Spec. No: **TCG 002**

Rev. No. 00

Sheet 14 of 14

ANNEXURE-D

9.4 CHECKLIST (To be filled and submitted by the vendor along with the offer)

The following document should be checked and signed by the authorized signatory. Offers not containing any of the documents will be liable for rejection without any further intimation. Vendor in his judgment may add further information, if required.

S.NO	DESCRIPTION	Submitted Yes / No
1.	Point wise confirmation of the specification	
2.	General arrangement of Rotary Feeder with major dimensional details	
3.	The drawing showing the supporting arrangement	
4.	Filled Annexure-A	
5.	Design calculation as per clause 4.5 of Specification	
6.	Procedure for liner plate replacement.	
7.	Procedure for leak tightness test.	
8.	Typical erection and commissioning procedure.	
9.	PQR documents (if applicable)	
10.	List of special tools & list of start-up / commissioning spares.	
11.	List of recommended spares for 2 years trouble free Operation.	
12.	Typical O & M manual.	
13.	Schedule of deviations	
14.	Annexure-C duly signed with vendor seal	

Signature of authorized signatory with office seal.

BHARAT HEAVY ELECTRICALS LIMITED

TIRUCHIRAPPALLI-620 014



Technical Purchase Specification for

ROTARY ASH EXTRACTOR

Specification No.: TCG:005

Revision No.: 00

<i>Rev. No.</i>	<i>Rev. Date</i>	<i>Clause</i>	<i>Description</i>	<i>Chd. & Appd.</i>

	<i>Name</i>	<i>Signature</i>	<i>Date</i>
<i>Prepared</i>	<i>Balaji D</i>	<i>-Sd-</i>	<i>24.06.2026</i>
<i>Checked</i>	<i>M Venkateswarlu</i>	<i>-Sd-</i>	<i>24.06.2026</i>
<i>Approved</i>	<i>Srinivasu Arugula</i>	<i>-Sd-</i>	<i>24.06.2026</i>



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY ASH EXTRACTOR

Spec. No: **TCG 005**

Rev. No. 00

Sheet 2 of 12

1. PART I - TECHNICAL SPECIFICATION

1.1 SCOPE:

1. Design, manufacture, Inspection, testing, painting, packing and supply of Rotary Ash Extractor along with motor, couplings, gear box, base frame, and commissioning spares etc.
2. Supply of special tools required for operation and maintenance of *Rotary Ash Extractor*.

1.2 APPLICATION:

The Rotary Ash Extractor is intended to Extract ash from the gasification system operating at high pressure of 30 Kg/cm²(g). It is to be noted that the total extractor is subjected to pressure, unlike in general pneumatic conveying lines. The extraction pipe above the extractor and the ash hopper which is below extractor both will be at operating pressure of 30 Kg/cm²(g).

1.3 DESIGN CONSIDERATION:

1. The Rotary Ash Extractor shall be designed to operate at variable speeds, extracting ash of specified quantity at an operating pressure of around 30 Kg/cm²(g). The capacity of extractors is given in the Annexure A
1. Special Sealing arrangement should be considered for leak proof of the extractor as the total extractor is subjected **to pressure containing syngas (CO + H₂ mixture) and leakage should be strictly avoided**. Sealing of leakage is very critical for operation of the entire plant, hence special care should be taken for seal arrangements. In 1.3.15, purging inert line is suggested to be considered suitably by vendor
2. The rotary extractor casing shall be of fabricated design. It is to be stress relieved after the welding operation.
3. The casing inner surface shall be lined with stainless steel or nickel plated to prevent corrosion.
4. The casing shall be provided with replaceable sleeve. The inner surface is to be nitride hardened to make it wear resistant.
5. The pockets/buckets shall be lined with Stainless Steel.



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY ASH EXTRACTOR

Spec. No: **TCG 005**

Rev. No. 00

Sheet 3 of 12

- 6.** The Ash Extractor diameter and sizing shall be optimized considering the maximum amount of material to be transported, the particle size distribution, variation in bulk density, temperature of the material and filling efficiency etc.
- 7.** Radial clearance selected should consider the following aspects as minimum.
- 8.1 Expansion due to temperature.
- 8.2 Material size distribution.
- 9 The Rotary Ash Extractor should be provided with zero speed switch.
- 10 Provision shall be given for reverse rotation of the Rotary Ash Extractor.
- 11 Rotary Ash Extractor shall be designed suitable to outdoor application.
- 12 Suitable stuffing boxes are to be provided on either side of the casing where the shaft passes through the casing to withstand design pressure as specified in Annexure-A.
13. For overload protection shear pin shall be provided in the drive end shaft.
14. Suitable weather protection cover shall be provided to the drive system.
15. Purging Air:
- The Rotary Ash Extractor shall have adequate purging inert gas loops to prevent ash ingress and premature failures.
- 15.1 Loop-I may lead to the annular spaces at the shaft seals. It is to prevent ingress of ash breeze which may lead to premature wear of the seals.
- 15.2 Loop-II shall purge the sidewalls of the rotor. It is to prevent ash from getting between the walls of the rotor and those of the casing in order to forestall chocking and possible freezing.
- The purging air system for the Rotary ash Extractor shall be designed to ensure that the inert gas passes to the individual loops and can be optimized during start-up or normal operation. The inert gas purge supply lines shall be provided.
- End connection/terminal point of purging airline connection shall be explicitly indicated by vendor in the drawing.
16. The connecting faces for the associated components and the inlet and outlet flanges shall be machined.
17. The Rotary Ash Extractor has to be designed to operate continuously at the material temperature specified in Annexure-A.



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY ASH EXTRACTOR

Spec. No: **TCG 005**

Rev. No. 00

Sheet 4 of 12

18. All materials used shall be of tested quality.

1.4 SPARES:

Vendor to recommend spares required for 2 years of trouble free operation.

1.5 PACKING

The ash extractor shall be packed in such a way that it does not get damaged during transport. It shall be properly covered with thick tear proof polythene sheet and dispatched in suitable moisture proof wooden / steel crates.

1.6 DEVIATION

Vendor shall highlight the deviations from the specification (if any) or special features of the feeders, which are not covered in the specification during the offer stage itself.

1.7 GENERAL

1. For technical input data refer enclosed **Annexure-A**.
2. For composition of fuel, refer **Annexure-B**.
3. For electrical, control and instrumentation, refer **Annexure-C**.

2. QUALITY ASSURANCE AND QUALITY CONTROL (QA & QC)

2.1 Quality Control

The supplier must include in the supply a proven quality control and quality assurance system that will ensure the quality of ROTARY ASH EXTRACTOR. The quality control system must follow ISO 9001 guidelines.

2.2 Quality assurance

The supplier shall be responsible for providing the necessary Quality Assurance and Quality Control procedures, maintaining continual surveillance and inspection activities during the entire periods of the Fabrication and Testing. Inspections report and tests to be provided to BHEL during the fabrication period and before shipment of ROTARY ASH EXTRACTOR.

Test and inspection reports shall be furnished for at least:

- a. Hydrostatic test for ROTARY ASH EXTRACTOR casing.
- b. Leak test for ROTARY ASH EXTRACTOR assembly.



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY ASH EXTRACTOR

Spec. No: **TCG 005**

Rev. No. 00

Sheet 5 of 12

c. Accuracy test (Type test)

Irrespective of the requirement of conducting the type tests under this procurement, the supplier shall submit the reports of the type tests carried out within last **five years** from the date of bid opening. These reports should be for the tests conducted on the equipment same **(model / type / size / rating)** to those proposed to be supplied under this procurement and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The Employer reserves the right to waive conducting of any or all of the specified type tests under this contract, in which case the type test charges shall not be payable for the type tests waived by the Employer.

3. TECHNICAL DOCUMENTATION

The following technical manuals shall be provided. Total of two (2) hard copies and one (1) copy on magnetic media (USB memory stick) shall be provided sixty (60) days after issue of purchase order.

Items No. 3.1 till 3.7 shall be provided also with the proposal only in English language:

- 3.1 Operation manual in English.
- 3.2 Safety instruction in English.
- 3.3 Maintenance manual in English.
- 3.4 Repair and overhaul manual.
- 3.5 Complete and comprehensive Parts Catalogue (including pictures if applicable) manufacturer P/N and OEM P/N.
- 3.6 Maintenance/repair manuals and parts catalogue for other repairable components if were not included in the HAG manual.

Note: The above listed documents can be combined & supplied as Operation & Maintenance (O&M) Manual.

- 3.7 Supplier shall submit a quoted (including prices) recommended spare parts list. The list should cover all spare parts consumption for 2 years operation and shall include at least the following Information: Manufacturer P/N, description, quantity required.

4.0 DOCUMENTS TO BE FURNISHED WITH THE OFFER

- a. Product literature and drawings in support of the offer shall be submitted with the quotation to evaluate the offer.
- b. ROTARY ASH EXTRACTOR technical specification. Parts Catalogue with detailed Bill of material (BOM) and weight particulars.



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY ASH EXTRACTOR

Spec. No: **TCG 005**

Rev. No. 00

Sheet 6 of 12

- c. General arrangement drawing with major dimensional details and with sufficient views (cross sectional) for clear understanding of the ROTARY ASH EXTRACTOR indicating the space requirement and bill of material of construction.
- d. The drawing showing the supporting arrangement on floor taking into consideration of vibration including static & dynamic loading details at each support to be submitted for purchaser's information.
- e. P&IDs for ROTARY ASH EXTRACTOR.
- f. Design calculation for ROTARY ASH EXTRACTOR
 - 1. Torque and motor selection
 - 2. Volume or discharge capacity calculations
 - 3. Speed vs Discharge curve and backup calculations
- g. The supplier shall return a copy of this specification and note at the end of each paragraph if the offered equipment complies or not with this specification with supplier sign and seal.
- h. Filled in data sheets.
- i. Procedure for leak tightness test.
- j. Procedure for refractory replacement.
- k. Safety instruction.
- l. Recommended spare parts list.
- m. Commissioning spares, if required.

5.0 DOCUMENTS TO BE FURNISHED AFTER AWARD OF CONTRACT

- a. ROTARY ASH EXTRACTOR – Filled in Data sheet , which shall be complete in all respects.
- b. Detailed dimensional general arrangement drawing of the total system with cross sectional details, bill of materials and weight of individual parts for purchaser's approval. (Approval does not relieve the vendor from responsibility).
- c. Design calculation as per clause 3.8-f of this specification.
- d. The drawing showing the supporting arrangement on floor including static & dynamic loading details at each support to be submitted for purchaser's approval.
- e. List of bought out items & their Specifications.
- f. ROTARY ASH EXTRACTOR test certificates
 - i. Test certificates shall be furnished before despatch of components.
Test certificate for the following shall be furnished.
 - ii. Material test certificate for all the major components.
 - iii. Performance TC for the intended duty conditions.
- f. Quality Control/Inspection documents generated during the stages of inspection, performance inspection, and final inspection.
- g. Warranty certificate shall be furnished by the vendor.
- h. Recommended spares for 2 years trouble-free service with unit price.
- i. List of special tools & list of commissioning spares as applicable.
- j. Operation & Maintenance (O & M) Manuals should be submitted to BHEL/Tiruchirappalli prior to despatch of the equipment in digital format.



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY ASH EXTRACTOR

Spec. No: **TCG 005**

Rev. No. 00

Sheet 7 of 12

6.0 INSPECTION

- 6.1 All test certificates shall be furnished for buyer's reference and records. The ROTARY ASH EXTRACTOR shall, on its completion and before being placed in service, be subjected to inspection by BHEL inspector or BHEL nominated inspection authority during manufacture/testing stages, to determine that the assembly conforms to applicable requirements.
- 6.2 ROTARY ASH EXTRACTOR Equipment shall be inspected and tested as per approved quality plan. The certificates and documents generated during inspection of above shall be furnished to BHEL.

7.0 FINAL TESTS AND ACCEPTANCE

The ROTARY ASH EXTRACTOR shall be tested at the supplier premises and in the site together with BHEL's representative to demonstrate conformance to the specification and functioning. The following tests shall be performed:

- 7.1 Checking and repairing of voyage damages.
- 7.2 Visual test and complete equipment check-up.
- 7.3 Functional test (Functional tests are defined as establishment of rated performance of feeder at site at rated condition for stipulate time period mutually agreed between purchaser/end user and supplier).

Acceptance certificate will be issued after successful completion of the functional tests and submission of all relevant documentation.

8.0 WARRANTY

8.1 Warranty Period

The warranty period shall be 18 months from date of supply or 12 months from data of commissioning whichever is earlier.

8.2 Warranty claims

In case of a failure during the warranty periods, BHEL/End Customer shall issue a corresponding Warranty Claim stating the nature of the failure, the demands for repair etc. The obligation of the contractor with regard to the Warranty jobs and claims shall include parts and labour. If emergency work is needed, or if the contractor fails to perform satisfactory, the site will carry out the repair work and the contractor shall reimburse all corresponding costs to the End Customer.



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY ASH EXTRACTOR

Spec. No: **TCG 005**

Rev. No. 00

Sheet 8 of 12

9. PART II- ANNEXURES – A, B & C



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY ASH EXTRACTOR

Spec. No: **TCG 005**

Rev. No. 00

Sheet 9 of 12

9.1 DESIGN INPUT DATA (ANNEXURE-A)

No	Description	Unit	DATA
1.	Handling Material		Ash
2.	Handling Material Characteristics		Refer Annexure-B
3.	Operating/Design temperature	°C	Max 250 °C / 300°C
4.	Operating/Design pressure	kg/cm ² (abs)	32.63 / 35.9
5.	Syngas Cooler System Normal Capacity: 5 T/hr Maximum Capacity: 6 T/hr Minimum Capacity: 2 T/hr Quantity : 2 (1 for evaporator and 1 for super-heater)		Cyclone and Syngas Filter System Normal Capacity: 10 T/hr Maximum Capacity: 12 T/hr Minimum Capacity: 5 T/hr Quantity: 2
6	Inlet line size	mm	Flanged, 200 NB
7.	Outlet line size	mm	Flanged, 200 NB
8.	Method of speed control		VFD
9.	Gear Box	ratio	Vendor to fill
10	Duty		Continuous and Heavy duty
11	Type of mounting		On spring hangers
12	Position		Vertical(top to bottom)
13	Painting Surface preparation		Commercial blast cleaning
	Primer		One coat of Zinc Chrome primer (Alkyd Base) to IS-104 by brush/spray. DFT=30µm per coat.
	Finish Coat		Finish coat shall be of 2 coats of Synthetic Enamel on oil Alkyd to IS2932(latest) DFT=20µm per coat.
	Shade		Smoke grey



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY ASH EXTRACTOR

Spec. No: **TCG 005**

Rev. No.

00

Sheet 10 of 12

9.2 Characteristics of Handling Material (Typical) (ANNEXURE-B):

Sl No	Parameter	Fly Ash
1	Size	< 300 micron
2	Bulk density kg /m ³	800
3	Particle density kg/m ³	2400
4	COMPOSITION Constituent	Coal Ash % wt
	Silica- SiO ₂	63.2
	Alumina- Al ₂ O ₃	23.7
	Iron oxide- Fe ₂ O ₃	6.9
	Titanium oxide- TiO ₂	1.4
	Calcium oxide- CaO	1.7
	Magnesium oxide-MgO	0.7
	Sodium oxide-Na ₂ O	0.8
	Potassium oxide- K ₂ O	1.4
5	Nature	Highly Abrasive and Erosive



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY ASH EXTRACTOR

Spec. No: **TCG 005**

Rev. No. 00

Sheet 11 of 12

9.3 ELECTRICAL, CONTROL & INSTRUMENTATION (ANNEXURE-C):

Provided separately as a ANNEXURE C



BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT - TIRUCHIRAPPALLI
Technical specification for ROTARY ASH EXTRACTOR

Spec. No: **TCG 005**

Rev. No. 00

Sheet 12 of 12

9.4 CHECKLIST (ANNEXURE-D)

(To be filled and submitted by the vendor along with the offer)

The following document should be checked and signed by the authorized signatory. Offers not containing any of the documents will be liable for rejection without any further intimation. Vendor in his judgment may add further information, if required.

S.NO	DESCRIPTION	Submitted Yes / No
1.	Point wise confirmation of the specification	
2.	General arrangement of Rotary extractor with major dimensional details	
3.	The drawing showing the supporting arrangement	
4.	Filled Annexure-A	
5.	Design calculation as per clause 4.f of Specification	
6.	Procedure for liner plate replacement.	
7.	Procedure for leak tightness test.	
8.	Typical erection and commissioning procedure.	
9.	PQR documents (if applicable)	
10.	List of special tools & list of start-up / commissioning spares.	
11.	List of recommended spares for 2 years trouble free Operation.	
12.	Typical O & M manual.	
13.	Schedule of deviations	
14.	Annexure-C duly signed with vendor seal	

Signature of authorized signatory with office seal.

Annexure C

Controls & Instrumentation Specification – Rotary air lock feeder / Rotary Ash Extractor /Ash Screw conveyor

1. Scope of Supply

- Variable Frequency Drive (VFD) system housed in control cabinet complete with power, control and signal wiring and the same will be located in CCR (common control room).
- Local field instruments and speed sensors with all mounting accessories, wired to local junction boxes.
- Integral control cabinet (if applicable).
- Local Start/Stop with Forward/Reverse provision.
- Field cabling between Mechanical Equipments and integral control cabinet/local push buttons.
- Signal isolators and converters mounted and wired inside VFD panel.
- Flame proof Double compression nickel plated brass cable glands for instruments, sensors, junction boxes, motors and local/remote connections suitable for area classification. Unused cable entries shall be plugged with flame proof nickel plated brass plugs.
- Any additional sensors, protection devices, interlocks, permissives, local indications, VFD panel indications, selector switches, push buttons, transmitters and control functions necessary for safe and reliable operation shall be included within vendor scope.
- Apart from main supply, 10% or min 1set of Electronic cards, power supply cards and field instruments, speed sensors shall be supplied along with main supply as a loose item.

2. Hazardous Area and Enclosure Requirements

- Field sensors/instruments, local junction boxes, motor and other electrical accessories shall be suitable for syngas environment (highly corrosive gas) and also to meet requirements of Hazardous area classification: Zone-2, Gas Group IIC, T3 & Ex-d flameproof certified as per IEC 60079.
- Minimum enclosure protection for field enclosures and local junction boxes: IP65.
- Motor enclosure & Terminal box protection: IP55 or better.
- All Equipment shall be suitable for ambient temperature of 50°C.

3. Control System, Instrumentation and DCS Interface

The control system shall support both local and remote operation and shall be provided with all necessary instrumentation, monitoring functions, protections, interlocks, permissives, and trip logic required for safe and reliable operation of the equipment and process. Suitable Hardwired interfaces shall be provided for command inputs, status indications, alarms, analog and digital signals, and feedback to and from the plant control system. Necessary local & VFD panel indications shall also be provided, along with any additional functions and signals required by the OEM design and applicable standards.

Control logics of this system shall be implemented in customer's DCS.

All Hardwired analog and digital signals shall be suitably terminated at the VFD panel and made available for DCS interfacing.

4. VFD Panel

- VFD shall be latest microprocessor-based technology with built-in keypad & display.
- VFD shall be compliant to EMI/EMC requirements.
- VFD panel shall be Indoor free-standing construction with lock & key arrangement.
- Fully compartmentalized design meeting IP-42 rating.
- Panel sheet thickness shall be of minimum 2 mm CRCA sheet steel.
- Bottom gland plate & Mounting plate minimum 3 mm thick.
- Powder-coated finish (**Paint Shade will be indicated during drawing approval stage**).
- Force cooling by exhaust fans.
- Filtered ventilation louvers on the panel doors.
- Neoprene gasket shall be provided.
- Panel illumination and utility socket shall be provided.
- Terminal blocks located at least 300 mm above bottom plate.
- 20% spare terminals shall be provided.
- VFD panels will be located in CCR, approximately 400 m away from field equipment.
- Input and output chokes/reactors shall be mandatory considering 400 m cable length for harmonic mitigation and motor insulation protection.
- Lifting hooks shall be provided.
- Suitable provisions shall be made available on the panels for Earthing.
- Approximate Panel dimension 600(W)X500(D)X2100(H)
- Base channel of 100mm height and 15mm thick Anti-Vibration pad shall be provided.
- Panel Name plate & tags shall be provided.

5. Motor Requirements

- Supply voltage: 415 V $\pm 10\%$, 3-phase, 50 Hz $\pm 5\%$, 3 wire.
- Continuous duty rating (S1).
- Applicable standard IEC 60034
- Suitable for VFD operation.
- Motor shall be suitable for syngas environment (highly corrosive gas) and also to meet requirements of Hazardous area classification: Zone-2, Gas Group IIC, T3 & Ex-d flameproof certified as per IEC 60079
- Minimum IE3 efficiency.
- Ambient temperature 50°C
- Insulation Class F with Class B temperature rise.
- Motor Terminal box rotatable by 360° in 90° increments.
- Stainless steel nameplate.
- Motor sealing shall prevent ingress of combustible gases.
- Suitable provisions shall be made available on the motor for earthing.

6. Power supplies provided under BHEL scope

Sl. No.	Description	Terminal Point	Purpose
1	415 V $\pm 10\%$, 3-phase, 50 Hz $\pm 5\%$. 3 wire Supply.	VFD Panel Incoming Terminals	Individual Drive Power
2	240 VAC, 1 Phase, 50 Hz UPS Supply	VFD Panel Incoming Terminals	Control Power for each panel
3	240 VAC, 1 Phase, 50 Hz Normal Supply	VFD Panel Incoming Terminals	Utility Power – For each panel

Note: Any additional power supplies required shall be internally derived, except for the power supply covered under BHEL's scope as specified herein.

7. Commissioning Spares

During commissioning, replacement of failed components shall be carried out by the vendor without any commercial implication to BHEL.

8. Exclusion:

- Interconnecting cables between field Junction box and VFD panel in CCR are under BHEL scope.

9. Documentation

9.1 Along with offer:

- Deviations from specification shall be explicitly listed in the Deviation Schedule.
- Absence of deviations shall imply full compliance with the specification.
- Technical leaflets/catalogues of all offered items.
- Torque Vs HZ curve for VFD.
- Vendor to provide complete cable schedule and cable sizing requirements for interconnection of field JB and VFD panel.
- List of the interfacing signals from field to control room. This list shall contain list of analog signals and digital signals.
- Overall dimension of VFD panel.
- Weight of each panel.
- Heat dissipations of the panel.
- Fixing details/Foundation details.
- List of Commissioning spares.
- Recommended O&M spares list.
- System write-up briefing power and control signal flow with block diagram.
- Power consumption of the VFD panel.
- Analog & Digital control diagrams required shall be furnished by the vendor for DCS implementation.

9.2 After PO (for Customer's Review):

- Control circuit diagram.
- Panel OGA, Internal arrangement drawing
- Panel base frame drawings giving fixing details.
- Terminal block arrangement drawing for making interconnections.
- Detailed System write-up briefing power and control signal flow.
- Motor datasheet including performance curves, GA & TB details.
- Analog & Digital control diagrams required shall be furnished by the vendor for DCS implementation.
- Power consumption of the VFD panel.
- Heat dissipations of the panel.
- Type test certificates such as Motor type tests, flame proof/ Enclosure protection for all applicable items.

9.3 Final documents:

- As built drawings as listed above in 9.2.
- O&M manual soft copy.
- Test & guarantee certificates.
- Programmable parameters of VFD drive.

10. Packing:

Vendor standard seaworthy packing.

11. General Note:

- The requirements specified are minimum requirements only.
- All Bought out items shall be from Reputed sources only.
- Vendor remains responsible for providing a complete, safe, reliable and fully functional system.
- Any deviations shall be explicitly indicated in the Deviation Schedule; otherwise, full compliance with the specification shall be deemed.

Item Annexure (Annexure E)

Material Code	Description	PR item qty.	PR Unit	Destination	Technical specification	Controls & Instrumentation Specification	Package	Delivery period
58011CG150AA	ROTAARY COAL FEEDER	8	NO	Coal to Amm Nitrate 2000 TPD - Gasifier-site	TCG 002/REV 00	Annexure C	Schedule 01	9 months from Manufacturing Clearance
58011CH150AB	ROTARY ASH EXTRACTOR	4	NO	Coal to Amm Nitrate 2000 TPD - Gasifier-site	TCG 005/REV 00		Schedule 02	9 months from Manufacturing Clearance