



सीएसआईआर - राष्ट्रीय धातुकर्म प्रयोगशाला  
CSIR - NATIONAL METALLURGICAL LABORATORY  
(Council of Scientific & Industrial Research)



Burmamines, Jamshedpur - 831 007  
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**CORRIGENDUM**

**Tender Reference No. :- NML/PUR/10/OTE(1185)/24-25**

**Tender ID :- 2025\_CSIR\_226705\_1**

**Item Name :- Design and fabrication of Calcination Kiln Circuit for  
calcination of Dolomite.**

**NOTE: The Bids must be submitted in the Central Public Procurement Portal (URL:<https://etenders.gov.in/e procure/app>) only. Manual/Offline bids shall not be accepted under any circumstances. Bidders should quote in INR only.**

Consequent to the Pre-Bid Meeting held on 25/02/2025, the revised technical specifications are attached in Annexure-I.

The bidders are requested to submit their bid based on this revised technical specifications as per Annexure-I.

All other terms and conditions shall remain same.

Stores & Purchase Officer,  
CSIR-NML, Jamshedpur



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### ANNEXURE-I

#### DESIGN AND FABRICATION OF CALCINATION KILN CIRCUIT FOR CALCINATION OF DOLOMITE

Calcination of dolomite involves heating dolomite at an elevated temperature to release the carbon dioxide, resulting in calcined dolomite as product. In a calcination kiln circuit, the process incorporates following steps: feeding of crushed dolomite to the rotary kiln through vibro-feeder connected to feed hopper, high temperature (~1300°-1400°C) treatment in the kiln, cooling of calcined dolomite in rotary cooler, and treating exhaust gas with dust particles in cyclone connected to induced draft fan and chimney through suitable duct.

#### 1. Components of Calcination kiln circuit

- a. Rotary calciner with all accessories (live ring, roller, girth gear with pinion, Mechanical Thrust drive, gear lubrication system Refractory supply and application, Sealing and Insulation of ducting etc.)
- b. Rotary cooler with all accessories (live ring, roller, Mechanical Thrust drive, girth gear with pinion, gear lubrication system, Sealing and Insulation of ducting, Refractory supply and application etc.)
- c. Vibro Feeder and feed hopper
- d. Induced Draft Fan with exhaust gas ducting
- e. Cyclone separator with exhaust gas ducting
- f. Combustion system complete (with air compressor, fuel tank and burner)
- g. Motorized Control panel
- h. Working platform and stair case along with railing for easy maintenance of the overall circuit
- i. Supporting MS stand for the kiln, rotary cooler, cyclone separator and feed charging arrangements.
- j. Chimney with all accessories

#### 2. Specifications of the input charge material and output

Charge material	Raw Dolomite ( MgO: 18 to 21% CaO: 25 to 28 % Acid insolubles <3% Alkalies< 0.1%)
Specific gravity (g/cc) of dolomite	2.5-2.9
Input Material Temperature	Ambient condition
Feed Size Range	+5 mm to -20 mm



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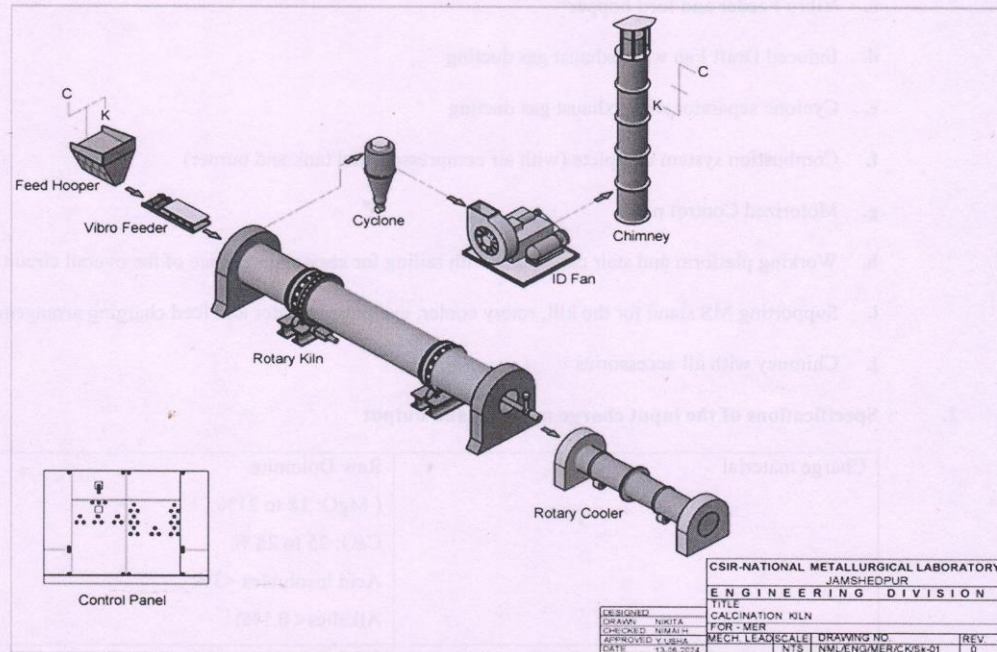
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Loose bulk density for size range	1.2-1.6 g/cc
Nature of material	Free flowing
Calcination temperature requirement	1400°C (± 50°)
Residence/Retention time requirement	For the commissioning trails of calcination of Dolomite: <ul style="list-style-type: none"> <li>• 60-80 min in rotary kiln</li> <li>• 15-30 min in Rotary cooler</li> </ul>
Specific heat capacity for dolomite	900-1000 J kg <sup>-1</sup> K <sup>-1</sup> at 20 °C
Feed LOI	45-50% wt. reduction
Output Product	Calcined dolomite
Product LOI	<2%
Product Temperature	<100 °C after discharge from rotary cooler
Nature of process	Endothermic

3. **General Schematic:** This layout is to understand the general arrangement of the kiln. However, the party has to share their own Engineering design, layout, load dimension and electrical requirements during technical bid.



4. **Performance & Design Parameters:**

MAIN ROTAY CALCINER/KILN



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Arrangements required in the Rotary calciner	<ul style="list-style-type: none"> <li>The rotary kiln shell having a suitable diameter and length rotates in suitable live rings by way of girth gear and matching pinion positioned in middle of kiln.</li> <li>The kiln shell consists of three zones: material charging zone, intermediate zone, and firing zone.</li> <li>The drive arrangement shall consist of drive motor with variable frequency drive, helical gearbox and resilient /gear/pin hush coupling.</li> <li>The material inlet hood/smoke chamber shall be stationary with special constructional features and shall have provision for receiving, hot gas inlet and outlet of exhaust gas and dust particles.</li> <li>In both the hood end, i.e. smoke chamber and burning hood, effective sealing is provided between rotating shell and stationary hood to prevent leakage of waste gas.</li> </ul>
Capacity of Kiln	2 Ton Per Day (Feed Capacity) minimum
Maximum Operating temperature of the kiln	1400 °C (± 50°)
Firing Medium	Diesel Oil
Type of calciner	Direct heating
Length	<ul style="list-style-type: none"> <li>9000 mm or higher</li> <li>Should be a suitable value to incorporate feed rate with a working volume ranging from 15-22%</li> </ul>
Shell material, coating, and thickness	<ul style="list-style-type: none"> <li>Suitable grade of Steel and 6 mm or higher</li> <li>Suitable coating on outer shell for withstand temperature and atmospheric condition</li> <li>Suitable to withstand the full load condition (shell with refractories and with material loaded at full load condition)</li> </ul>
Internal Diameter (excluding shell)	<ul style="list-style-type: none"> <li>920 mm or higher</li> <li>Should be a suitable value to incorporate feed rate with a working volume ranging from 15-22%</li> </ul>
Refractory & insulation	<ul style="list-style-type: none"> <li>215 mm (minimum refractory thickness) with suitable insulation to get skin temperature below 150 °C when operated at 1300 °C or higher under continuous mode</li> </ul>
Refractory lining	<ul style="list-style-type: none"> <li>70 % minimum (Al<sub>2</sub>O<sub>3</sub>) Alumina brick in firing zone/uniform heating zone</li> <li>55% minimum (Al<sub>2</sub>O<sub>3</sub>) Alumina brick minimum bricks remaining (feed zone/ preheating zone and discharge zone)</li> </ul>
Kiln rpm and control	<ul style="list-style-type: none"> <li>0.25-4 rpm with variable frequency drive (VFD) controller</li> <li>Control connected to Human Machine Interface</li> </ul>
Kiln inclination	<ul style="list-style-type: none"> <li>Hydraulic based</li> <li>Inclination: should be variable between 0-5 degrees</li> <li>Control connected to Human Machine Interface</li> </ul>
Live ring	<ul style="list-style-type: none"> <li>2/3 Nos. and it should be made of suitable wear resistant material to withstand load with suitable mechanical thrust drive to each live ring</li> </ul>
Support rollers	<ul style="list-style-type: none"> <li>4/6 Nos. and it should be made of suitable wear resistant material to withstand load</li> </ul>



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Girth Gear with matching pinion	<ul style="list-style-type: none"> <li>1 No and it should be made of suitable wear resistant material to withstand load</li> </ul>
Hood Support Frame	<ul style="list-style-type: none"> <li>Suitable grade of Steel</li> </ul>
Thermocouple	<ul style="list-style-type: none"> <li>Suitable 4 thermocouples at 4 points connected to Human Machine Interface/Control panel</li> <li>K type thermocouple in other zones- 3 Nos (charging zone- 1 No, intermediate zone-2 Nos at regular interval)</li> <li>R/S type thermocouple in firing/heating zone -1 No</li> <li>NABL calibration certificates or calibration from equivalent agency to be provided for the thermocouples at the time of delivery and trials</li> </ul>
Sealing	<ul style="list-style-type: none"> <li>Suitable sealing to minimize heat, material and gas losses between rotating shell and stationary hood</li> <li>Multilayered composite type or spring steel based or equivalent</li> </ul>
<b>ROTARY COOLER</b>	
Type	Air cooled
Design criterion	<ul style="list-style-type: none"> <li>Initial temperature of the feed to the rotary cooler should be the temperature at which the material gets discharged from the rotary calciner.</li> <li>final product temperature (&lt;100°C)</li> <li>Suitable sprinkling arrangement to achieve desired cooling rate of the shell</li> </ul>
Mechanism of transfer of material from rotary calciner	Sealed feeder chute to be provided for facile transfer of calcined material to rotary cooler for cooling
Diameter of Cooler	<ul style="list-style-type: none"> <li>600 mm or higher</li> <li>Should be suitable to incorporate discharger rate from the rotary calciner.</li> </ul>
Length of Cooler	<ul style="list-style-type: none"> <li>6000 mm or higher</li> <li>Should be suitable to incorporate discharge rate from the rotary calciner.</li> </ul>
Shell material and Plate thickness	<ul style="list-style-type: none"> <li>Suitable grade of Steel and 6mm or higher</li> <li>Suitable coating on outer shell for withstand temperature and atmospheric condition</li> <li>Suitable to withstand the full load condition (shell with refractories and with material loaded at full load condition)</li> </ul>
Inclination and Rotation	<ul style="list-style-type: none"> <li>Hydraulic based</li> <li>Rotation: as per the feed rate from rotary calciner</li> <li>VFD controlled rotation</li> </ul>
Plate thickness under tier	30 mm or suitable to withstand load
No of live ring	2 Nos. (minimum) made of suitable wear resistant material to withstand load
No of support roller	4Nos. (minimum) made of suitable wear resistant material to withstand load
Girth Gear with matching pinion	1No. made of suitable wear resistant material to withstand load
Drive	Suitable Motor 4 pole with gear box & resilient coupling/gear coupling
Bearing & housing	Suitable for the arrangement
Cooler Discharge Hood	Suitable grade of Steel
Refractory lining thickness	Minimum 115 mm or sufficient thickness to protect the shell material



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<b>COMBUSTION SYTEM</b>	
Details of covered item	<ul style="list-style-type: none"> <li>• Diesel fired burner</li> <li>• Suitable air compressor</li> <li>• Burner must have automatic air/fuel ratio</li> <li>• Fuel container (Diesel oil)-250L (minimum)</li> <li>• Fuel transport and pipeline arrangement</li> <li>• Mass flow meters for fuel and Air flow adjustments</li> <li>• Suitable window with required accessories to be provided near burner to look the nature of flame into the kiln under operation</li> <li>• Suitable control to be provided at the control panel at 10-15 m from the rotary kiln</li> </ul>
<b>VIBRATORY FEEDER&amp; HOPPER</b>	
Feed hopper capacity	200 kg (minimum)
Weighing system in hopper	Load cell to be provided or suitable weight indicator system in hopper
General description for vibratory feeder	It is required to feed the material from weighing bin to the main rotary calciner under a given vibration. It helps to control the feeding rate as per requirement, and rate can be changed by changing speed of the motors.
Material to be charged	Crushed Dolomite
Feed Size:	+5 mm to -20 mm
Temperature	Ambient
Nature of material	Free flowing
Charging Capacity	Suitable to maintain feed rate to achieve up to 100 kg/h feed capacity (variable)
Type of Motor	Unbalanced Vibro Motor
Duty cycle	continuous
<b>CHIMNEY</b>	
Required arrangements of chimney	The basic dimension such as height and tip diameter at the top are 30 meter (minimum) and 250 mm (minimum), respectively. The base plate and compression plate are designed using suitable method.
Design criteria	<ul style="list-style-type: none"> <li>• The design of Chimney confirms to IS 6533: 1989 (Part-1 &amp; Part-2) or equivalent</li> <li>• Suitable base plate and compression plate to be provided</li> <li>• Suitable Manhole to be provided</li> <li>• Wind load to be computed with reference to IS standard</li> <li>• Exhaust entry duct to be provided</li> <li>• Helical strakes, lightning arrestor with earthing arrangement, platform with railing, and ladder with cage along with full length</li> <li>• Refractory lining to be provided in the entire length</li> <li>• Suitable chimney shell material to be used</li> </ul>
Length	30000 mm (minimum)
Refractory	Entire length of the chimney should be lined



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Exhaust capacity	The flue gases emitted during heat exchange between the fuel and material to be calcined along with combustion air. In addition, gases will also be produced during calcination of the material. Induced draft fan and chimney should be compatible to handle the emissions generated during heating and from calcination
<b>SUPPORT STRUCTURE</b>	
Required arrangements of support structure	<ul style="list-style-type: none"> <li>Support structure of cyclone, ducting, operating platform, smoke chamber, burning hood, working platform should be provided with railing and toe guard.</li> <li>Suitable working platform/staircase along with railing should be provided for the following               <ol style="list-style-type: none"> <li>Easy maintenance of the rotary calciner</li> <li>Material transport to the silos/feeder bins</li> </ol> </li> <li>To withstand the overall structure</li> </ul>
Inclusions	<ul style="list-style-type: none"> <li>Piping</li> <li>Mounting structure</li> <li>Material transfer chutes</li> <li>Base frame</li> <li>Connecting bolts</li> <li>All related drives</li> </ul>
<b>EXHAUST SYSTEM</b>	
Induced Draft Fan	<ul style="list-style-type: none"> <li>As per required capacity to maintain required temperature and production condition for processing of 2 TPD feed capacity</li> <li>VFD controlled</li> <li>Manual dampers to be provided</li> <li>Capacity should be sufficient to maintain the required negative pressure and ensuring temperature profile inside the kiln.</li> </ul>
Exhaust pipe	<ul style="list-style-type: none"> <li>Full exhaust pipe (duly refractory coated) from feed zone till ID Fan</li> </ul>
Cyclone dust separator	<ul style="list-style-type: none"> <li>% separation efficiency for feed size: 95% (minimum) for down to 15 micron</li> <li>Provided with Rotary airlock valve (RAV)</li> </ul>
<b>Motor Control Centre (MCC) &amp; LOCAL PUSH BUTTON STATION</b>	
Motor Control Centre (MCC) & Local Push Button Station	<ul style="list-style-type: none"> <li>Motor Control Control &amp; Control panel with drives should be placed adjacent to the kiln in a room alongside the PLC (Programmable Logic control), which remains as an alternative for semi-automatic operation of the Rotary Kiln with man-machine interface and of various associated parts.</li> <li>Local push button should be provided to all the main equipment and necessary interlocking should be provided for smooth operation of the kiln.</li> <li>Emergency stop button should be provided</li> </ul>



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	<ul style="list-style-type: none"> <li>Centralized control of the complete circuit shall be provided to Central control room at 10-15 m from the rotary kiln.</li> </ul>										
<b>ELECTRICAL CABLING</b>											
Required arrangements	<ul style="list-style-type: none"> <li>Interconnected power and control cable including earthing between MCC, local push button, various drives, control panel and other mounted electrical should be provided and should be taken by separate cable racks marked with aluminum tags for proper identification and maintenance.</li> </ul>										
Drawing requirements	Circuit diagram for the control panel										
Manuals	Trouble shooting manuals to be provided for all the electrical equipment.										
<b>OTHER ESSENTIAL FEATURES</b>											
Operation	<ul style="list-style-type: none"> <li>Calcination kiln should be operated both in automatic and manual mode</li> </ul>										
Support structure	<ul style="list-style-type: none"> <li>MS Support structure for all the components of calcination circuit should be provided</li> <li>There should be minimum civil requirements for the overall structure</li> </ul>										
Components of the kiln	<ul style="list-style-type: none"> <li>Any equipment or unit operation are of standard and reputed make only. Following should be preferred</li> </ul> <table border="1" style="width: 100%;"> <tr> <td>Induction Motors</td> <td>ABB/Siemens/Crompton/SEW/equivalent make</td> </tr> <tr> <td>Gear Boxes</td> <td>Elecon/SEW/Transmatic/equivalent make</td> </tr> <tr> <td>Electrical control &amp; Switches</td> <td>L&amp;T/GE/Schneider/equivalent make</td> </tr> <tr> <td>VFD</td> <td>ABB/L&amp;T/Schneider/ equivalent make</td> </tr> <tr> <td>Burner</td> <td>Riello/Weishaupt/Oxilon/ equivalent make</td> </tr> </table>	Induction Motors	ABB/Siemens/Crompton/SEW/equivalent make	Gear Boxes	Elecon/SEW/Transmatic/equivalent make	Electrical control & Switches	L&T/GE/Schneider/equivalent make	VFD	ABB/L&T/Schneider/ equivalent make	Burner	Riello/Weishaupt/Oxilon/ equivalent make
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VFD	ABB/L&T/Schneider/ equivalent make										
Burner	Riello/Weishaupt/Oxilon/ equivalent make										
Provisions	<ul style="list-style-type: none"> <li>Provisions should be provided to integrate wet scrubber, conveyor and bucket elevator in the proposed system.</li> <li>Additional ports in the exhaust shall be provide for future exhaust requirements</li> <li>Centralized control of the complete circuit shall be provided to Central control room at 10-15 m from the rotary kiln.</li> </ul>										
BIS conformation	<ul style="list-style-type: none"> <li>All electrical items/connections and mechanical fabrications shall be BIS conformed.</li> </ul>										

5. **Scope of work**

- NML Scope:** Single point power supply and civil foundation and grouting.
- Vendor Scope:**
  - Design, fabrication, supply, installation and commissioning, and trials.





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- Fabrication of the equipment shall be based on the Final approved Drawing (FAD) along with layouts by CSIR-NML. In case of any doubts over dimensions or specifications, clarifications must be sought from CSIR-NML before fabrication.
- Technical nameplates shall be provided on the entire electrical and mechanical component.

**6. Comprehensive warranty**

- 1 years from date of installation and commissioning trials
- 2 years of AMC charges to be quoted, and AMC charges should be part of price comparison
- Original warranty receipt from the OEM should be provided and will be considered (beyond 1 year warranty where applicable)

**7. Installation, Commissioning and Trials**

- Under Vendor Scope
- Delivery within 6 months after the receipt of PO
- For trails, raw material and Diesel will be under the scope of NML

**8. Essential documents to be submitted by Vendor**

- Equipment layout and design to be submitted along with technical bids.
- Past Purchase orders for the same or similar equipment to be provided from reputed Government institution/PSUs/Reputed organizations.
- Load layout to be provided at the time of technical bids.
- All electrical requirements to be shared at the time of technical bids
- All items, which are not defined in the design specifications and are essential to run the kiln, must be quoted in the technical bid
- Operating, safety, troubleshooting and maintenance manuals of all components in the calcination circuit to be provided.
- Standard operating procedures of the equipment shall be provided
- Vendors should provide detailed information for the arrangements against all points mentioned in this Annexure-I
- Since the design and fabrication is in vendor scope, all the technical design and pre-installation requirements should be disclosed during technical bids.

**9. Acceptance criterion**

- Meeting the technical requirements as highlighted in section 2 and 4, and at least 2 successful trails of the calcination of dolomite.

**10. Training**

- Training of three technical staffs in handling, operation and troubleshooting of each components of kiln.
- Operating manual is to be provided for operation of each components of kiln.