Bauxite Calcination Plant by Rotary Kiln with Fine Grinding Ball Mill.

Refractory Grade Calcined Bauxite
Calcined bauxite is produced by sintering/calcining of low iron, low alkali containing raw bauxites at temperatures of 1600 - 1800 degree Celsius. In this calcination process the high refractory mineral phase’s corundum and mullite are formed. Therefore calcined bauxite is one of the most important raw materials for the production of shaped and unshaped refractories for the steel industry, foundries, glass and cement plants. Calcined bauxite is available "run of kiln" i.e. uncrushed or in fractions and as ball milled powder according to customers’ requirements, in bulk or bagged.
Calcined Bauxite is obtained by calcining (heating) superior grade Bauxite at high temperature (from 850 oC to 1600 oC). This removes moisture thereby increasing the alumina content. Compared to an alumina content of about 57 % to 58 % in raw Bauxite, Calcined Bauxite has an alumina content of 82 % to 86 %. The heating is carried out in rotary kilns. Calcination is done at different temperatures ranging from 850 oC to 1600 oC depending upon the customer’s application.
Calcined bauxite is used in a number of applications:

- **Refractory Grade Calcined Bauxite (CB - I and CB - II Grade):** To make refractory grade, Bauxite is thermally treated at 1600 °C to produce Calcined Bauxite where the Alumina content is mostly above 82%.

- **Brown Fused Alumina, Proppants and Road Surfacing:** To make the above grades, Bauxite is thermally treated at 1000 °C – 1200 °C to produce Calcined Bauxite where the Alumina content is anywhere between 80-88% depending on the requirement.

- **Anti-skid protection.** Calcined Bauxite is an ideal aggregate for anti-skid applications. It is used extensively for vehicle skid prevention and on surfaces requiring additional safety. The bauxite may be trowelled into fresh concrete, added to paints or applied to surfaces using resin cements and adhesives.
- **Anti-slip protection.** This material is ideal for reducing the risk of pedestrians slipping and is used in many industrial, commercial and residential applications. These include pedestrian crosswalks, stairways, factory floors and work zones, sidewalks, ship decks, boat docks, pool decks, bathtubs, and

- **High friction surface treatment (HFST).** HFST is a cost-effective method to reduce skidding and is mainly used to make roadways safer. It is used on horizontal curves and ramps, intersections, steep grades, bridge decks, roundabouts and pavement surfaces. Studies have indicated that the application of HFST reduces vehicle crashes by up to 100%. The material is applied to surfaces using a polymer binder.
• **Refractories.** Refractories are insulating materials that maintain their strength and chemical properties at high temperatures. Calcined bauxite is used globally for its anti-skid and high friction properties to make roadways safer. It is a strong and highly durable material, which makes it ideal to prevent slips on factory floors and other surfaces.
Calcined Bauxite Benefits

• Extreme hardness and wear resistance
• High resistance to weathering, abrasion, and polishing
• High durability
• Chemically stable when exposed to intense heat and acid or alkaline agents
Market Outlook

India currently imports 60% of its Calcined Bauxite from China. Spurred by expansion of domestic steel production, a scarcity of acceptable quality of bauxite from China and raising import cost, drives are now under way in India to produce high grade bauxite from domestic bauxite sources. At present, India is very minor producer of non-metallurgical bauxite, despite having occurrence of high grade bauxite in west coast and central India. This is attributed to limited effort to test high grade bauxite occurrence in region outside the main bauxite producing area around Gujarat.
Demand for calcined bauxite in production of ceramic proppants is expected to grow by more than 5%py out to 2021 as North America and China target greater exploitation of unconventional oil and gas reservoirs.

**Calcined Bauxite Production:** India produces about 400,000 tons of calcined bauxite
# Indian Calcined Bauxite Producers

<table>
<thead>
<tr>
<th>Existing Units</th>
<th>Annual Capacity (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bombay Minerals Pvt. Ltd. (Ashapura Minechem)</td>
<td>66,000</td>
</tr>
<tr>
<td>Nataraj Ceramics Pvt. Ltd. (Captive)</td>
<td>33,000</td>
</tr>
<tr>
<td>Gujarat Mineral Development Corporation (GMDC)</td>
<td>45,000</td>
</tr>
<tr>
<td>Orient Abrasives Ltd. (Captive)</td>
<td>33,000</td>
</tr>
<tr>
<td>Carborandum Universal Ltd. (Captive)</td>
<td>50,000</td>
</tr>
<tr>
<td>Navnagar Minerals Pvt. Ltd.</td>
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</tr>
<tr>
<td>Krishnamayee Minerals Industries Pvt. Ltd.</td>
<td>33,000</td>
</tr>
<tr>
<td>Other producers: Meena Agency (30,000), SCABAL (24,000), Kishan Minerals / Madhu Refractories (18000), Gjanan Refractories (12,000) &amp; Sarvesh Refractories (9600) etc.</td>
<td>100,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>393,000</strong></td>
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</tbody>
</table>
Global Calcined Bauxite market size will increase to Million US$ by 2025, from Million US$ in 2017, at a CAGR of during the forecast period.

Demand for calcined bauxite-based refractories used principally in steel production continues unabated. The majority of standard refractory products incorporate a calcined or fire-treated form of bauxite for their raw material base. China is now also the leading producer of refractories. Outputs tends at about 23m. tonnes.

In the present paper, various aspects of calcined bauxite are discussed. India’s present position is compared with leading high grade bauxite producers of World i.e. China and Guyana. Based on various R&D work, proposals are put forward to produce high grade bauxite in India by complex mining / sorting and beneficiation.
Bauxite and Alumina in Refractories

- World Refractories production ~39 million T
- Calcined Bauxite 1.6 million T
- BFA 1.2 million T Requires 1.4 million T

Calcined Bauxite

- Alumina 1.9 Million Tonnes
  - Tabular, WFA, CAC, calcined, spinel, mullite,

Ceramic Fibres

- Refractory clays and Magnesia still largest
Machinery Photographs

Elevator Bucket

Rotary Kiln
Cyclone Dust Collector

Burner
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<tr>
<th>Particulars</th>
<th>Existing</th>
<th>Proposed</th>
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<th>Particulars</th>
<th>Existing</th>
<th>Proposed</th>
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<td>Franchise &amp; Other Deposits</td>
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<td>Provision for Contingencies</td>
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## Project at a Glance

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<th>Annualised EPS</th>
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<th>Book Value Per Share</th>
<th>Debt Per Share</th>
<th>Dividend Per Share</th>
<th>Retained Earnings %</th>
<th>Payout %</th>
<th>Probable Market Price</th>
<th>P/E Ratio</th>
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## Project at a Glance

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<th>Equity as-Equity</th>
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<th>Return on Net Worth</th>
<th>Profitability Ratio</th>
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<td>Individ</td>
<td>Cumulative</td>
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<td>(Number of times)</td>
<td>(Number of times)</td>
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<td>1.61</td>
<td>1.61</td>
<td>2.21</td>
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<td>18.80 %</td>
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<td>0.23</td>
<td>22.07 %</td>
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## Project at a Glance

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<th>BEP</th>
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<td>Cash BEP (% of Installed Capacity)</td>
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<tr>
<td>Total BEP (% of Installed Capacity)</td>
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<td>IRR, PAYBACK and FACR</td>
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<td>Internal Rate of Return .. ( In %age )</td>
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<tr>
<td>Payback Period of the Project is ( In Years )</td>
<td>2 Years 3 Months</td>
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<tr>
<td>Fixed Assets Coverage Ratio ( No. of times )</td>
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</table>
1. **What is Bauxite Calcination industry?**

2. **How has the Bauxite Calcination industry performed so far and how will it perform in the coming years?**

3. **What is the Project Feasibility of Bauxite Calcination Plant?**

4. **What are the requirements of Working Capital for setting up Calcined Bauxite plant?**
5. What is the structure of the Calcined Bauxite Business and who are the key/major players?

6. What is the total project cost for setting Calcined Bauxite Business?

7. What are the operating costs for setting up Calcined Bauxite plant?

8. What are the machinery and equipment requirements for setting up Calcined Bauxite plant?
9. Who are the Suppliers and Manufacturers of Plant & Machinery for setting up Calcined Bauxite plant?

10. What are the requirements of raw material for setting up Bauxite Calcination plant?

11. Who are the Suppliers and Manufacturers of Raw materials for setting up Bauxite Calcination Business?

12. What is the Manufacturing Process of Calcined Bauxite?
13. What is the total size of land required for setting up Calcined Bauxite plant?

14. What will be the income and expenditures for Bauxite Calcination Business?

15. What are the Projected Balance Sheets of Bauxite Calcination plant?

16. What are the requirement of utilities and overheads for setting up Bauxite Calcination plant?

17. What is the Built up Area Requirement and cost for setting up Bauxite Calcination Business?
18. What are the Personnel (Manpower) Requirements for setting up Bauxite Calcination Business?

19. What are Statistics of Import & Export for Calcined Bauxite?

20. What is the time required to break-even of Calcined Bauxite Business?

21. What is the Break-Even Analysis of Bauxite Calcination plant?

22. What are the Project financials of Bauxite Calcination Business?
23. What are the Profitability Ratios of Calcined Bauxite Project?

24. What is the Sensitivity Analysis-Price/Volume of Bauxite Calcination plant?

25. What are the Projected Pay-Back Period and IRR of Bauxite Calcination plant?

26. What is the Process Flow Sheet Diagram of Calcined Bauxite project?
27. **What are the Market Opportunities for setting up Calcined Bauxite plant?**

28. **What is the Market Study and Assessment for setting up Calcined Bauxite Business?**

29. **What is the Plant Layout for setting up Calcined Bauxite Business?**
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   1.1. **DISTRICT PROFILE & GEOTECHNICAL SITE CHARACTERIZATION**
   1.1.1. General
   1.1.2. Demographics
   1.1.3. Naya Raigarh
   1.1.4. Map
   1.1.5. Culture
   1.1.6. Economy
   1.1.7. Transportation

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3. **COMPOSITION & PROPERTIES OF BAUXITE**
   3.1. COMPOSITION
   3.2. PRINCIPAL CHEMICAL CONSTITUENTS OF VARIOUS BAUXITES
   3.3. MAJOR BAUXITE DEPOSITS
   3.4. FORMULATION
   3.5. PROPERTIES

4. **USES & APPLICATIONS**
   4.1. BAUXITE–ITS TRANSFORMATION & APPLICATION
   4.2. CALCINATION PROCESSES APPLICATIONS
   4.3. CALCINED BAUXITE BENEFITS
   4.4. CHEMICAL COMPOSITION OF BAUXITE

5. **B.I.S. SPECIFICATIONS**
   5.1. IS 10817~BAUXITE FOR REFRACTORY INDUSTRY
   5.2. IS 3605~BAUXITE FOR CHEMICALS AND PETROLEUM INDUSTRIES
5.3. IS 5953~BAUXITE FOR USE IN THE PRODUCTION OF ALUMINA
5.4. IS 8228~BAUXITE SAND
5.5. IS 8988~BAUXITE POWDER FOR FOUNDRY WASHES

6. MARKET SURVEY
6.1. CALCINED BAUXITE AND INDIA
6.2. SUPPLY SECURITY
6.3. GLOBAL DEMAND
6.4. MARKET DEMAND
6.5. MARKET OUTLOOK
6.6. PRINCIPAL PRODUCERS OF CALCINED BAUXITE

7. INDIAN CALCINED BAUXITE - STATUS & FUTURE PROSPECTS
7.1. CALCINED BAUXITE PRODUCTION
7.2. QUALITY OF INDIAN CALCINED BAUXITE
7.3. SELECTED STATE-WISE MONTHLY PRODUCTION OF BAUXITE IN INDIA

8. EXPORT & IMPORT: ALL COUNTRIES
8.1. EXPORT: ALL COUNTRIES
8.2. IMPORT: ALL COUNTRIES

9. FINANCIALS & COMPARISON OF MAJOR INDIAN PLAYERS/COMPANIES
9.1. ABOUT FINANCIAL STATEMENTS OF CMIE DATABASE
9.2. PROFITS & APPROPRIATIONS
9.3. TOTAL LIABILITIES
9.4. TOTAL ASSETS
9.5. NET CASH FLOW FROM OPERATING ACTIVITIES
9.6. SECTION – I
9.6.1. Name of Company with Contact Details
9.6.2. Name of Director(S)
9.6.3. Credit Ratings
9.6.4. Plant Capacity
9.6.5. Location of Plant
9.6.6. Name of Raw Material(S) Consumed With Quantity & Cost
9.7. SECTION – II
9.7.1. Assets
9.7.2. Cash Flow
9.7.3. Cost as % Ge of Sales
9.7.4. Growth in Assets & Liabilities
9.7.5. Growth in Income & Expenditure
9.7.6. Income & Expenditure
9.7.7. Liabilities
9.7.8. Liquidity Ratios
9.7.9. Profitability Ratio
9.7.10. Profits
9.7.11. Return Ratios
9.7.12. Structure of Assets & Liabilities (%)
9.7.13. Working Capital & Turnover Ratios

10. COMPANY PROFILE OF MAJOR PLAYERS

11. EXPORT & IMPORT STATISTICS DATA OF INDIA
11.1. EXPORT STATISTICS DATA FOR CALCINED BAUXITE
11.2. IMPORT STATISTICS DATA FOR CALCINED BAUXITE

12. PRESENT MANUFACTURERS
13. AVAILABILITY OF BAUXITE
13.1. BAUXITE RESERVES IN INDIA
13.2. WORLD'S MAJOR BAUXITE RESERVES

14. BAUXITE MINING

15. SPECIFICATION OF BAUXITE CALCINATION PLANT

16. MANUFACTURING PROCESS
16.1. LIST OF EQUIPMENTS
16.2. CALCINATION PROCESS

17. PROCESS FLOW DIAGRAM

18. MACHINERY DETAILS

19. BUYER’S LIST
19.1. CONTACT DETAILS OF BUYER’S
19.2. NAME OF DIRECTOR(S)
19.3. CREDIT RATINGS
19.4. PLANT CAPACITY
19.5. LOCATION OF PLANT
19.6. COMPANY WISE CONSUMPTION DETAIL OF THE RAW MATERIALS

20. STATUTORY/GOVERNMENT APPROVALS
20.1. BACKWARD AND FORWARD INTEGRATIONS

21. SUPPLIERS OF PLANT & MACHINERY

22. SUPPLIERS OF RAW MATERIAL

23. PHOTOGRAPHS/IMAGES FOR REFERENCE
   23.1. RAW MATERIAL PHOTOGRAPHS
   23.2. PRODUCT PHOTOGRAPH
   23.3. MACHINERY PHOTOGRAPHS

24. PLANT LAYOUT

25. QUOTATION OF PLANT, MACHINERY AND EQUIPMENTS FROM SUPPLIER
Project Financials

- Project at a Glance
- Assumptions for Profitability workings
- Plant Economics
- Production Schedule
- Land & Building

Annexure

1. Assumptions for Profitability workings
2. Plant Economics
3. Production Schedule
4. Land & Building
   Factory Land & Building
   Site Development Expenses
• **Plant & Machinery**
  - Indigenous Machineries
  - Other Machineries (Miscellaneous, Laboratory etc.)

• **Other Fixed Assets**
  - Furniture & Fixtures
  - Pre-operative and Preliminary Expenses
  - Technical Knowhow
  - Provision of Contingencies

• **Working Capital Requirement Per Month**
  - Raw Material
  - Packing Material
  - Lab & ETP Chemical Cost
  - Consumable Store
<table>
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<th>Category</th>
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<td>Utilities &amp; Overheads (Power, Water and Fuel Expenses etc.)</td>
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<td>Royalty and Other Charges</td>
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<td>Selling and Distribution Expenses</td>
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<tr>
<td>Preference Share Capital</td>
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• Annexure 1 :: Cost of Project and Means of Finance

• Annexure 2 :: Profitability and Net Cash Accruals

- Revenue/Income/Realisation
- Expenses/Cost of Products/Services/Items
- Gross Profit
- Financial Charges
- Total Cost of Sales
- Net Profit After Taxes
- Net Cash Accruals
Annexure 3 :: Assessment of Working Capital requirements

- Current Assets
- Gross Working Capital
- Current Liabilities
- Net Working Capital
- Working Note for Calculation of Work-in-process

Annexure 4 :: Sources and Disposition of Funds
• Annexure 5 :: Projected Balance Sheets
  - ROI (Average of Fixed Assets)
  - RONW (Average of Share Capital)
  - ROI (Average of Total Assets)

• Annexure 6 :: Profitability Ratios
  - D.S.C.R
  - Earnings Per Share (EPS)
  - Debt Equity Ratio
• Annexure 7 :: Break-Even Analysis

- Variable Cost & Expenses
- Semi-Variable/Semi-Fixed Expenses
- Profit Volume Ratio (PVR)
- Fixed Expenses / Cost
- B.E.P
• Annexure 8 to 11 :: Sensitivity Analysis-Price/Volume

- Resultant N.P.B.T
- Resultant D.S.C.R
- Resultant PV Ratio
- Resultant DER
- Resultant ROI
- Resultant BEP
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  ▪ Equity Capital
  ▪ Preference Share Capital
• Annexure 13 :: Quantitative Details-Output/Sales/Stocks
  ▪ Determined Capacity P.A of Products/Services
  ▪ Achievable Efficiency/Yield % of Products/Services/Items
  ▪ Net Usable Load/Capacity of Products/Services/Items
  ▪ Expected Sales/ Revenue/ Income of Products/ Services/ Items
• Annexure 14 :: Product wise Domestic Sales Realisation

• Annexure 15 :: Total Raw Material Cost

• Annexure 16 :: Raw Material Cost per unit

• Annexure 17 :: Total Lab & ETP Chemical Cost

• Annexure 18 :: Consumables, Store etc.

• Annexure 19 :: Packing Material Cost

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• Good Present/Future Demand
• Export-Import Market Potential
• Raw Material & Manpower Availability
• Project Costs and Payback Period

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