IBAAS 2025
TECHNICAL LECTURE SERIES

RED MUD – THE UNTAPPED POTENTIAL

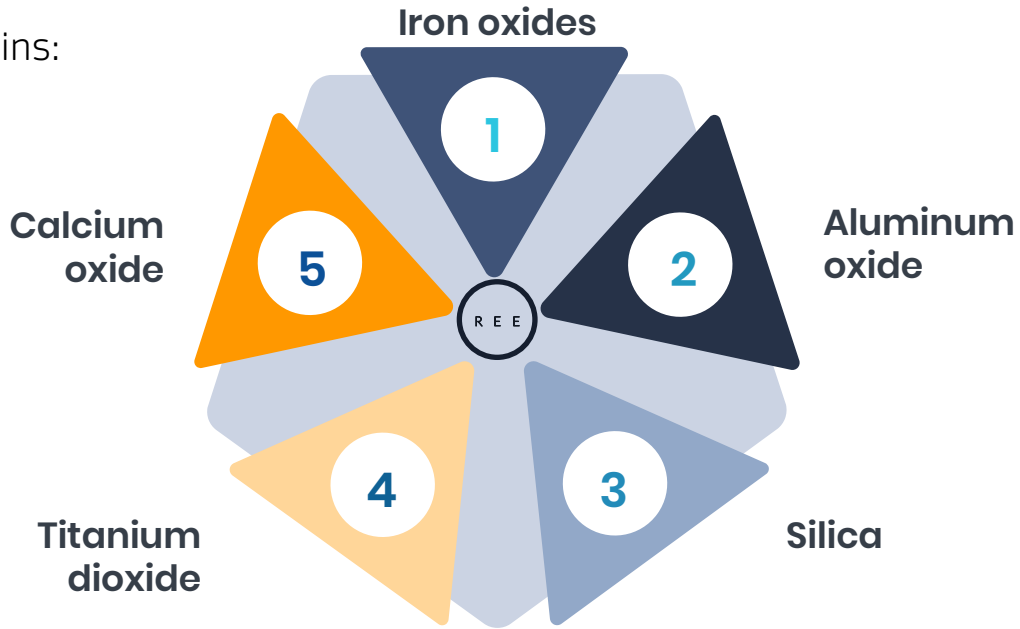
Sangita Sadafule

Dy. CEO Red mud, Vedanta

WHAT IS RED MUD?

Red Mud, also known as bauxite residue, is a by-product of the Bayer's process used to refine bauxite into alumina (aluminium oxide). During the Bayer process, bauxite ore is treated with caustic soda. The Alumina releases a red-coloured residue - Red Mud is generated

Red mud typically contains:



RED MUD GENERATION

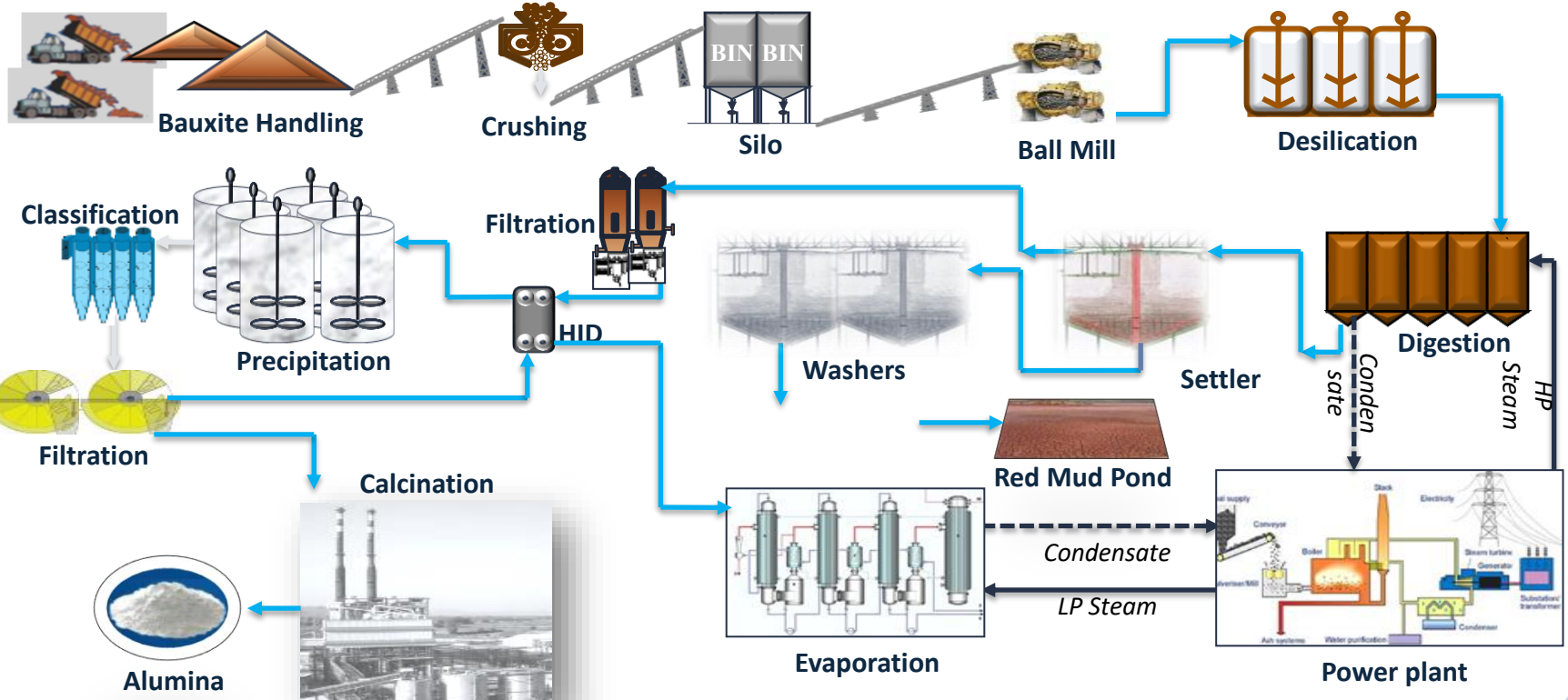
- For every ton of alumina : 1.5 – 2 tons of red mud is generated.

Red mud generation trend across major countries, 2018 to 2023 (in million tonnes)

Country	2018	2019	2020	2021	2022	2023
China	89.38	89.13	88.75	94.13	99.75	102.88
Australia	25.5	25.63	26.5	26.13	25.13	23.75
Brazil	10.13	10.88	12.88	15	12.5	12.5
India	8	8.38	8.25	8.75	9.38	9.13
Russia	3.5	3.5	3.63	3.75	3.88	3
Saudi Arabia	2.25	2.25	2.25	2.375	2.38	2.25

Source: AlCircle estimate, IAI, USGS

GENERATION OF RED MUD IN BAYER PROCESS



SWOT - Red Mud

01

Strength

- High mineral content
- Abundant availability
- Potential for reuse
- Environmental awareness

02

Weakness

- High alkalinity
- Storage challenges
- Limited commercial applications
- Transportation costs

03

Opportunities

- Metal recovery technologies
- Green construction
- Policy support
- Collaborations

04

Threat

- Environmental regulations
- Public perception
- Market volatility
- Natural disasters

HARNESSING STRENGHTS OF RED MUD – METAL EXTRACTION

AIT Technologies

Techno-commercial evaluation for pilot setup for Pig Iron & Mineral Wool extraction

Phoenix Tailings

Evaluation Agreement signed off to extraction Fe2O3 and pigments from RM.

Proman Dynatech

Use of Plasma Arc Furnace to make alloy steel.
Pilot plant is ready for commercial trials

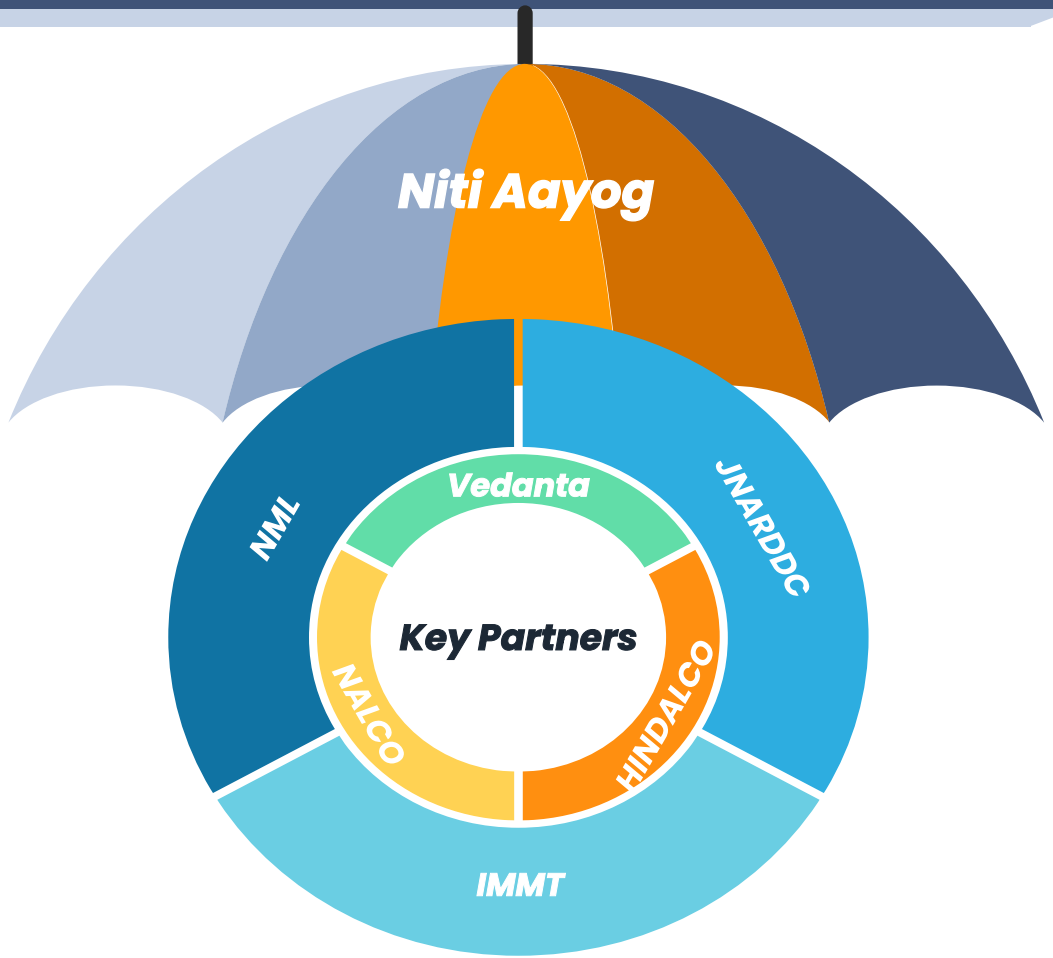
MTM

Use of Flash Joule Technology for extracting Fe and other metals from Red Mud

IIT Kharagpur (Dr. Chenna Bora)

Working on a patent from IIT , to reduce the red mud generation by extraction Fe2O3 from Bauxite

HARNESSING STRENGHTS OF RED MUD – METAL EXTRACTION



Objective

Enhance Commercial Applications of Red Mud

Strategic Approach

Government Policy Mandate for 100% Utilization in Key Sectors

01 **Cement Industry**

Proven technology for Red Mud integration

02 **Road Construction**

High potential in a rapidly developing infrastructure landscape like India

Benefits & Rationale

01 **Innovation Through Necessity**

Mandates drive innovation—similar success seen with Fly Ash utilization

02 **Economic Incentives**

Transportation and usage subsidies can catalyze adoption and scale

03 **Sustainability & Circular Economy**

Promotes eco-friendly practices and reduces industrial waste

CONVERTING WEAKNESS TO STRENGTH – HIGH ALKALINITY

Red Mud: A sustainable solution for FGD Solutions.

Use in Flue Gas Desulphurization (FGD)

01

Mechanism

- Reacts with So2 forming stable sulphates
- High Na2O/CaO content act as Alkali Sorbent

02

Advantages

- Cost Effective
- Reduces Red Mud Stockpiling
- Promotes Circular Economy

03

Sustainability Impact

- Converts waste to value
- Reduces SOx emissions
- Promotes industrial symbiosis

CONVERTING WEAKNESS TO STRENGTH – STORAGE CHALLENGES

Solution

- Afforestation converts dump into green zones as liquidation and maintaining them is cost and risk

R2G – Red to Green Revolution

Impact

- Significantly improves biodiversity
- Evidence: Industry Success and ongoing initiatives confirms viability

Strategic Opportunities for Value Creation

01

Metal Recovery Technologies

Advanced extraction methods enable profitable recovery of iron, aluminum, and rare earth elements

02

Green Construction Applications

Sustainable use in **bricks, tiles, and cement** as eco-friendly building materials

03

Policy Support & Incentives

Government backing for **industrial waste recycling** and **circular economy initiatives**

04

Industry–Academia Collaborations

Strategic partnerships to develop **scalable and innovative solutions**

Potential Pitfalls in Red Mud Management

01

Environmental Regulations

Stricter laws increase compliance costs for storage and disposal

02

Public Perception

Concerns over toxicity and safety hinder adoption in consumer-facing products

03

Market Volatility

Fluctuating commodity prices affect the economic feasibility of metal recovery

04

Natural Disasters

Risk of containment failure during floods or earthquakes may cause environmental damage

Conclusion

Reimagining Red Mud as a Resource

1. Red Mud is not a waste—it's a resource
2. Leading the way in valorization through innovation
3. Reimagining sustainability together
4. Vision: 100% utilization, no new storage areas
5. Cross-sector commercialization and circular economy model