

### System and Method for producing Magnetite from Red Mud Using Two Stage Reactors

#### IITM Technology Available for Licensing

#### PROBLEM STATEMENT

- In the present era, it is noted that there is growth of Aluminum Industries and associated disposal problems; environmental health is at stake, and therefore, remedial actions are required. Further, red mud also possesses some valuable elements such as iron which can be extracted in the form of Magnetite instead of large-scale dumping in the environment.
- By literature survey, it is found that the conventional process is not efficient in terms of the conversion process. Hence, there is a need for a system to mitigate the above challenges efficiently.

#### INTELLECTUAL PROPERTY

IITM IDF Ref. 2009; IN Patent No: 410117  
PCT Application No. PCT/IN2021/050386

#### TECHNOLOGY CATEGORY/MARKET

**Technology:** Producing Magnetite from Red Mud using Two Stage Reactors;

**Industry:** Mineral, Environment Engineering, Waste Management, Manufacturing/Chemical

**Applications:** Waste management;

**Market:** The global magnetite iron ore market is projected to grow at a CAGR of 5.8% from 2023 to 2031.

#### TRL (TECHNOLOGY READINESS LEVEL)

TRL-4, Proof of Concept ready, tested in lab.

#### TECHNOLOGY

- The present invention describes a **system for continuous extraction of magnetite from red mud**.
- Said system comprises a plurality of **two stage reactors** attached in a serial connection; and **operates in charging mode, pre-heating mode, first & second reaction modes, & discharging mode sequentially** with a predetermined time lag of **5-15 minutes**.

- The system includes a **wet magnetic separator** configured to **separate magnetite** from non-magnetic particles in the slurry.
- The **reactors** are **configured** to operate in **charging, preheating, reaction and discharging modes** with a **time lag  $\Delta t$** , and wherein the each **two-stage reactor** operating in the **reaction modes mode produces hot gas**, that is supplied to another two-stage reactor operating in **pre-heating mode**, & each **two-stage reactor operating** in the discharging mode receives cold gas that is heated and supplied as hot input gas to another two-stage reactor operating in pre-heating mode.
- Further, said patent describes a **method for producing magnetite from red mud** using a plurality of two stage reactors.
- The **system** for producing magnetite from red mud is depicted in the figures. (Refer Figures)

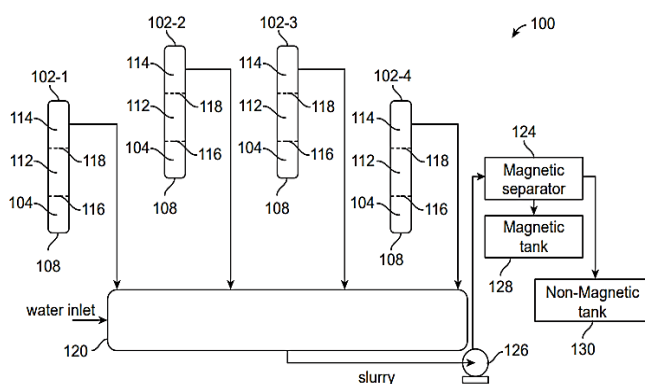


Fig. 1: Illustrates the claimed System

#### RESEARCH LAB

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### KEY FEATURES / VALUE PROPOSITION

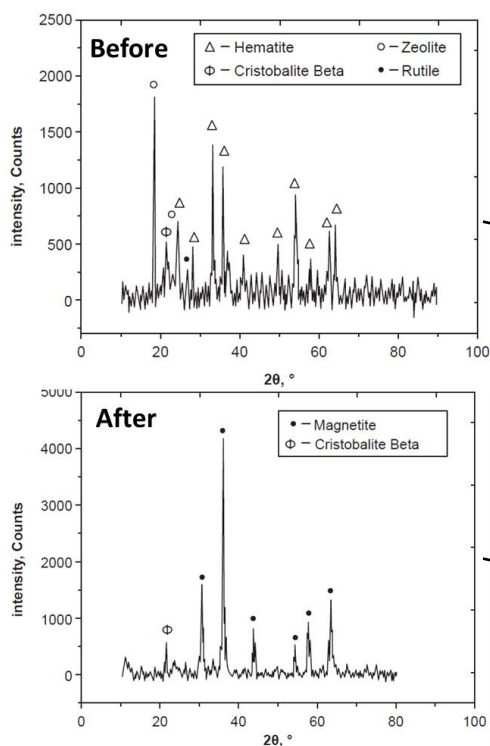
#### ❖ Technical Perspective:

- The reactors are connected **serially** to transfer pre-heated air, improving **energy efficiency during magnetite production**.
- The magnetite slurry is processed using magnetic separation to **obtain a 95% or better magnetite concentration**.

#### ❖ Industrial Perspective:

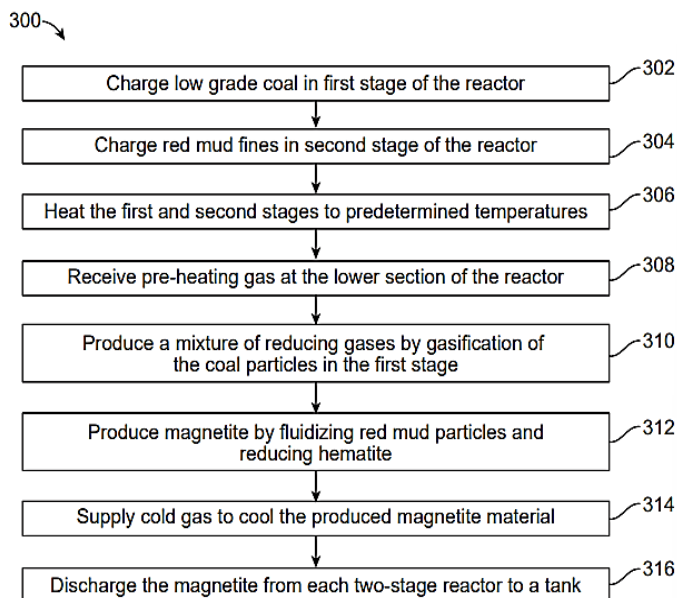
- **Cost effective** system and process.
- **Fast and efficient** process.
- **Direct charging** of red mud fines.
- Use of **thermal grade coal**.

### Result of Magnetite Production



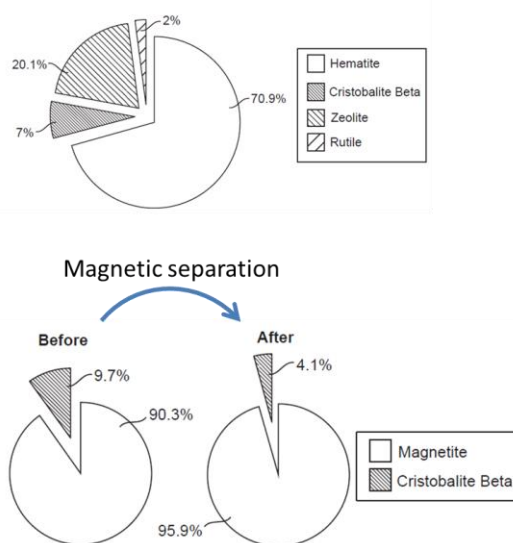
**Fig. 3:** Illustrates XRD Spectra of sample before (top) and after (bottom) reduction roasting by two-stage reactor process

### Image



**Fig.2:** Illustrates the flow diagram for method of producing magnetite from red mud

### Results



**Fig. 4:** Illustrates phase fraction before (top) and after (bottom left) reduction roasting, and after further magnetic separation (bottom right)

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