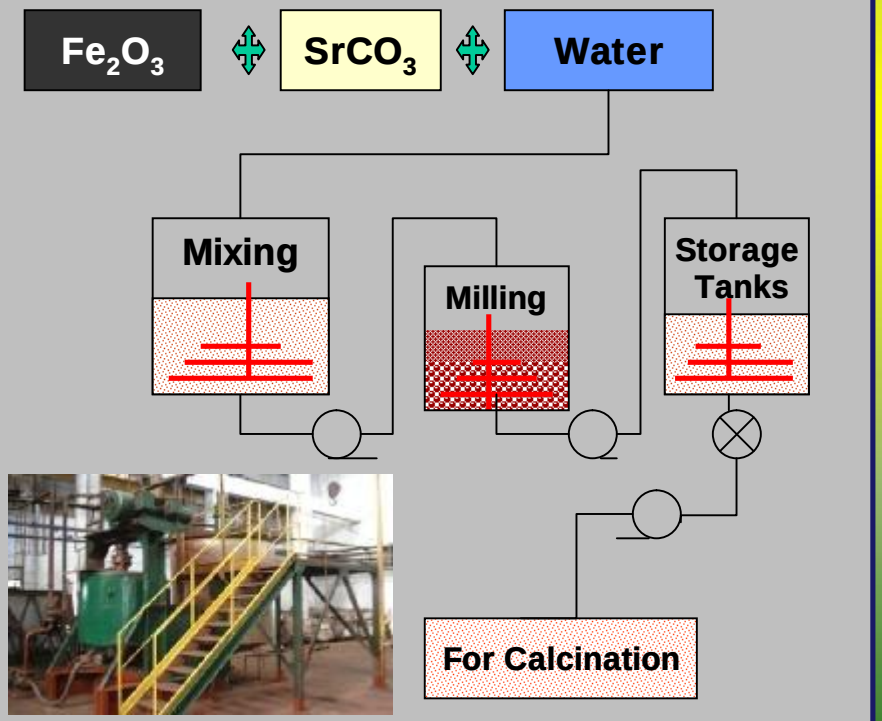
Mixing Process

Raw material from suppliers → **P1** → Mix in required Particle Size in slurry form



Brief Description : -

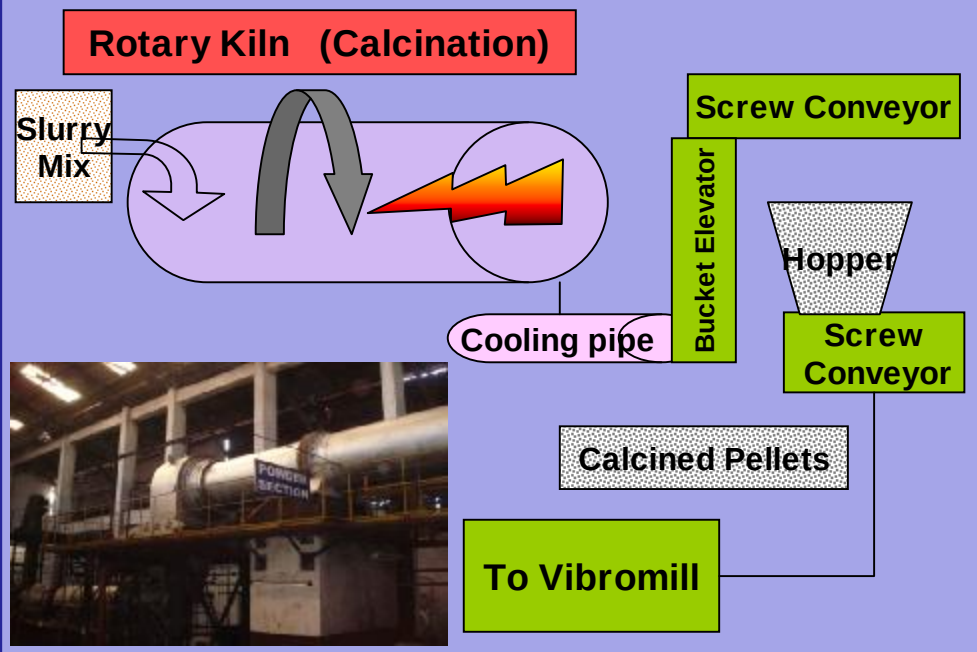
Raw materials, viz., Ferric Oxide and Barium / Strontium Carbonate are weighed, mixed and milled together with water in predetermined proportion to form a composite mixer.

Critical Parameters :-

1. Weighment of Raw material.
2. Moisture %.
3. Particle Size

Calcination Process

Mix in required Particle Size in slurry form → **P2** → Calcined pellets



Brief Description : -

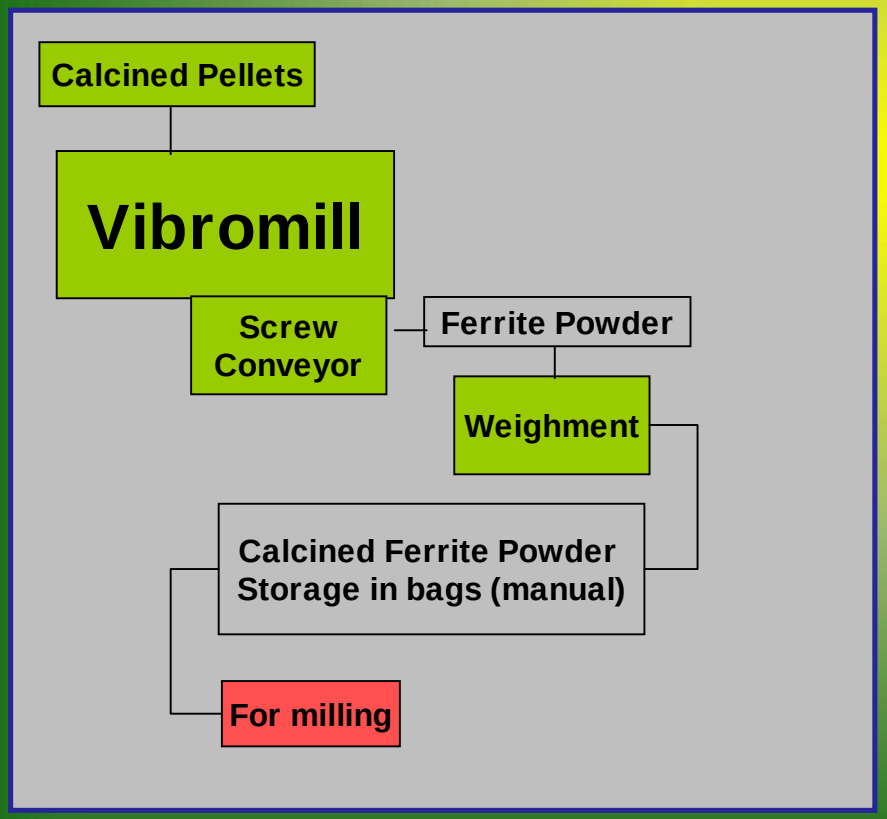
The mixture is calcined in a Rotary Kiln at a high temperature. Rotary Kiln uses LPG as fuel to achieve the necessary temperature. In this process, chemical reaction takes place and a weight loss of around 10% occurs and expelled in the form of CO_2 from the system. Calcination serves to convert the mix into the hexaferite phase in the form of crystals (pellets).

Critical Parameters :-

1. Bulk Density
2. Temperature
3. Feed Rate

Coarse Milling Process

Calcined pellets → **P3** → Ferrite powder in required particle size



Brief Description : -

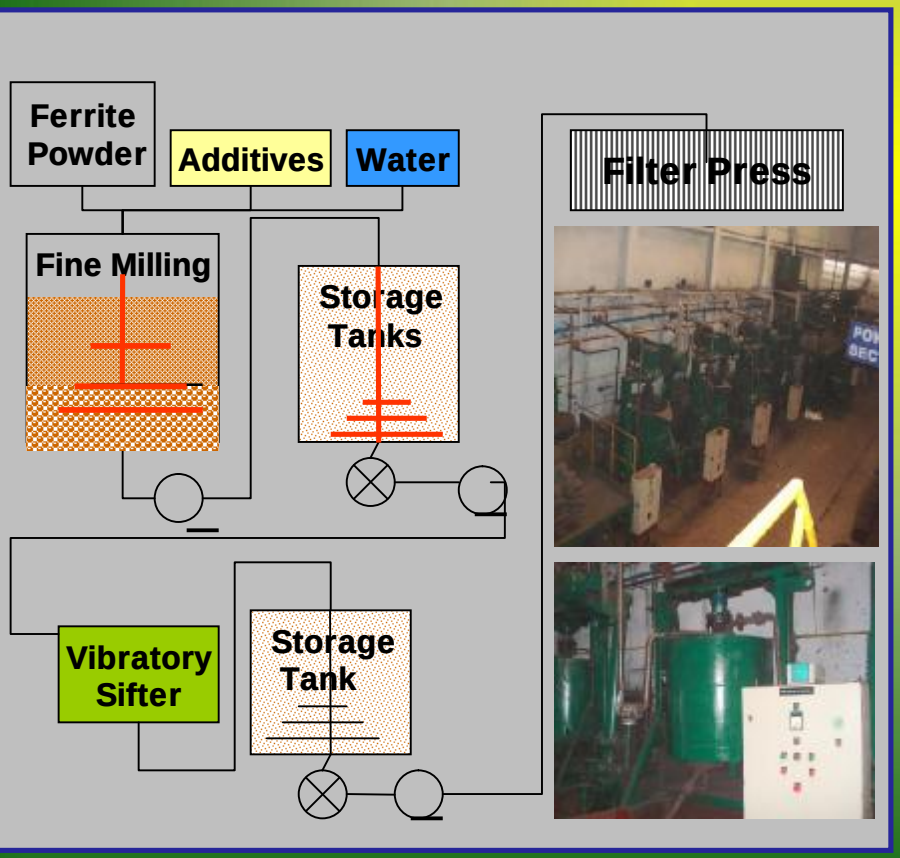
The Calcined material is Coarse-milled in Vibro-Mill to reduce the particle size. Vibro mill use long rods for grinding media, the rods grind the pellets by tumbling within the mill.

Critical Parameters :-

1. Mesh Analysis
2. Feed rate

Fine Milling Process

Ferrite (calcined) Powder → **P4** → Slurry



Brief Description : -

The Calcined powder is milled in Attritor by adding water to reduce particle size further up to 0.85 ~ 1.1 microns, the output of which is called Fine-milled Slurry. Steel balls are used in Attritor as milling media. Additives used in the process to enhance magnetic properties.

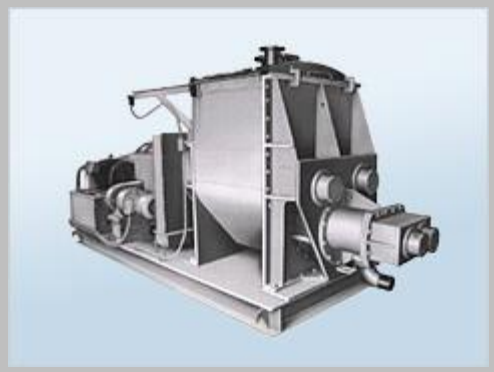
Critical Parameters :-

1. Particle Size
2. Recirculation
3. Current

Kneading Process

Thin Slurry → **P4 (ii)** → Thick Slurry

Slurry from Attritors
↓
Sieving Unit
↓
Pump
↓
Filter Press
↓
Kneader Ruder
↓
Slurry in cans for Compaction



Brief Description : -

The Fine-milled slurry contains a moisture percentage of 60%, which is reduced to approx.30% after passing through Filter Press and Kneader Ruder. A twin-screw type kneader-ruder helps for totally discharging every bit of material for better homogenization.

Critical Parameters :-

1.% Solid (moisture)
2.Kneading Time
3.Sieving unit condition
4.Slurry density

Compaction Process

Thick Slurry → **P5** → Green Compacts

Slurry from Cans

Molding presses

Greens on ceramic trays & conveyor

Dryer

Brief Description : -

The Fine-milled Slurry with around 30% moisture is compacted with the help of Presses to form the shape and size of the magnets by means of different moulds. During this process the particles are oriented in required direction. The moisture content is reduced to around 13% after compaction. Filter Cloth and Filter Mesh are used to filter water from fine-milled slurry. The compacted magnets are called Green Magnets. The green compacts are loaded into Dryer and Roller Hearth Kiln.

Critical Parameters :-

1. Final Compacting pressure
2. Green Density
3. Magnetic Current
4. Green Thickness
5. Vacuum pressure

Sintering Process

Green Compacts → **P6** → Sintered Magnets

Green Compacts

↓

Dryer

↓

Roller Hearth Kiln (RHK)

↓

Storage of Sintered MagnetS

Brief Description : -

The Green magnets loaded on refractory tiles are passed through a Dryer and then through a Roller Hearth Kiln. Sintering process takes place at a temperature of around 1250°C. The Roller Hearth Kiln is an imported furnace, which uses air and propane mixture as fuel to achieve the necessary temperature. The refractory tiles are passed through the furnace by means of SS rollers and SiC Rollers. Sintered magnets are checked by QA for specified Magnetic Properties and Dimensions.

Critical Parameters :-

1. Sintering Temperature
2. Air Pressure
3. Speed
4. Magnetic Properties

Process Flow Chart & Quality Checking

Drying & Sintering

Grinding & Cleaning

Greens → **P6** → Sintered magnets → **P7** → Ground magnets

P6

Greens

Dryer

Roller Hearth Kiln (Sintering)

Storage of Sintered magnets

Temp in diff zones is monitored

Magnetic properties & flux is checked

P7

Sintered magnets

All dimensions are checked

Grinding

Ultrasonic Cleaning

To Packing

PDI

Grinding Process

Sintered Magnets → **P7** → Ground Magnets

Sintered Magnets

↓

Grinding

↓

Ultra Sonic Cleaning

↓

Packing

Brief Description : -

Sintered magnets need to be ground to maintain the thickness in a specified range. Ground magnets are finished product. Sintered magnets are ground by means of profile Grinders, Sintered magnets are passed through these grinding wheels to maintain dimensions of magnets within a specified range. After the grinding process, the magnets are checked by Quality Assurance Department for cracks, chipping and other physical defects. The accepted magnets are packed in cartons and stored in Finished Goods Store for onward dispatch to the customers.

Critical Parameters :-

1. Ground Thickness
2. Width, OR, IR
3. Perpendicularity
4. Cleaning of magnets (Dust Free)
5. Packing As per Standard