STUCCO PRODUCTION WITH HAMMER MILL

Flash calcining with hammer mills is primarily applied in the manufacture of stucco plaster with shorter setting times, used for the fabrication of gypsum building elements such as plasterboards, gypsum fibre boards, plaster blocks and ceiling tiles. The shorter plaster setting time permits a higher production capacity of such plants.

The total investment cost for a hammer mill calcining system is lower than for long-time calcining systems, since the process steps of grinding, drying and calcining occur simultaneously (lower space requirement, smaller building dimensions, lower investment costs for the equipment). In the hammer mill calcining systems the consumption figures for thermal energy are lower than compared with long-time calcining systems. Hammer mills have a greater operational flexibility; the start-up and shut-down periods are shorter compared with long-time calcining systems.

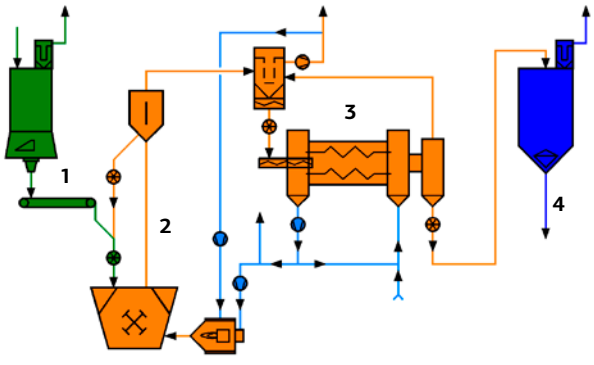
Hammer mills are the ideal equipment for calcining synthetic gypsum (FGD gypsum and other synthetic gypsum) but have also found acceptance when calcining natural gypsum. Pre-crushed natural gypsum, wet FGD gypsum or mixtures of natural gypsum and FGD gypsum are ground, dried, calcined and classified in the hammer mill. A hammer mill can accept 100% of wet FGD gypsum or 100% pre-crushed natural gypsum or any mixture of both materials. Recycled plasterboard can be used if it is crushed and the paper is separated.

A single hammer mill installation can provide a maximum of 50 t/h of stucco plaster. Grindability of natural gypsum and higher rates of free moisture are limiting factors for the installation. The presence of abrasive matters in natural gypsum, such as quartz, sand and dolomite must be taken into consideration if frequent replacement of the grinding elements is to be reduced. In case of natural gypsum the maximum feed size is approx. 50 mm. Predrying of FGD gypsum in a separate drying unit is not necessary. Product characteristics and fineness of the final product can be varied within a wide range.

The raw material is fed to the hammer mill via a metering belt. A rotary valve is required to protect the metering belt from high temperatures but also to prevent the calcining system from picking up ambient leakage air. If we use wet FGD gypsum we use a rotary valve with special cleaning device.

The rotary valve provides an even feed in co-current flow with process gas to the grinding section. Down sizing of the gypsum occurs between a multiple hammers assembly and grinding bars.

The rotor equipped with beaters runs in two special pillow blocks with self-aligning roller bearings, equipped with oil lubrication and an additional water cooling system. The rotor is driven via V-belt drive assembly. The rotor turning at high speed and accommodated in a machine casing and lined with wearing plates catches the feed material with great force and throws it against the grinding path equipped with exchangeable baffle plates. The feeding material is crushed down to the desired final size between the rotor hammers and the baffle plates. The grinding path is arranged in such a way that the product is thrown back into the impact area.



1 Material feed system
2 Hammer Mill for grinding and calcining
3 Cooler
4 Finished product storage

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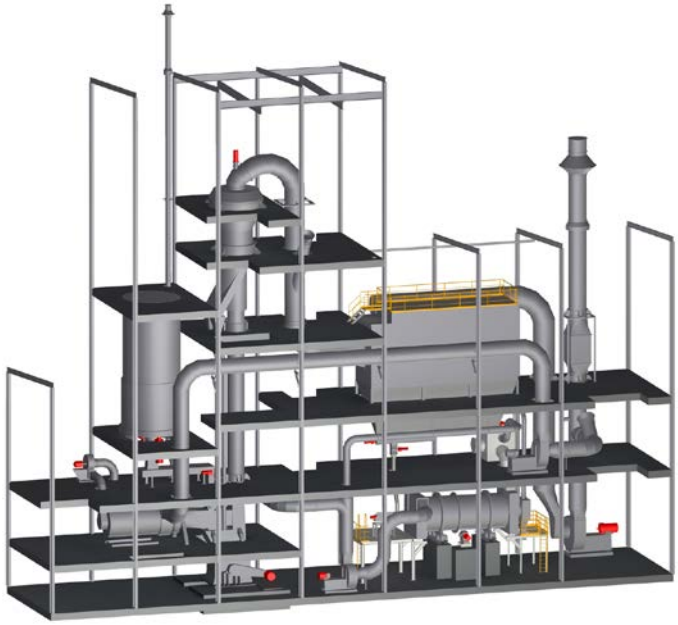

Further contact with the rising process gas provides the heat transfer for calcining the gypsum. The hammer mill and the dynamic classifier are connected via a transition duct and the coarse particle return line.The ground, dried and calcined material is discharged on the rotor circumference where it is picked up by the process gas flow, which feeds it through the classifier. The function of the classifier is based on aerodynamic principles which ensure that the process gas flow rate required for calcining and conveying is used at the same time for classifying the ground material. The classifier separates the ground and calcined material into fine finished product and grits. The grits fall back into the grinding zone.

The stucco fineness is determined by the rotor speed and its particle size distribution by the dynamic classifier. The finished calcined product leaves the classifier together with the process gas and is separated in a filter system.

The hot gases for heating the hammer mill are produced in a separate hot gas generator. Heavy oil, light oil and natural gas can be used for fuel. The fuel supply is automatically controlled in accordance with the heat requirement.

For the hammer mill calcining system Grenzebach proposes an indirect stucco cooling system with a rotary tubular stucco cooler to suppress uncontrolled calcination of hot material. To maintain constant cooling conditions in the stucco cooler, the cooling air inlet temperature is controlled to counteract variations caused by ambient temperature differences between day and night and winter and summer seasons. Soluble Anhydrite (AIII) is reduced by controlled pick up of vapour as part of the process gas. The required discharge temperatures are controlled by the cooling air flow. The finished stucco plaster is very consistent and homogeneous. Favourable thermal efficiency is achieved by recycling more than 50 % of the exhaust gas as well as using preheated cooling air from the cooler as combustion air for the hot gas generator. This recirculation of the exhaust gases creates a certain water vapour content during the calcining process, positively influencing the quality of the final product regarding the Anhydrite-III percentage, the setting times and the yield.

Particular features of hammer mill calcining system:

- Grinding, drying and calcining in one step
- Useable for grinding and calcining of 100 % of FGD or 100 % of natural gypsum or any mixture of both
- Quiet operation, no vibrations
- Favourable flow conditions
- Dynamic classifier
- High thermal efficiency from recirculation of dust-free flue gas, of exhaust gas and preheated cooling air
- Favourable control behaviour of the calcining process
- Standardised sizes up to an output of 50 tonnes per hour in one unit
- Simple design made of proven and reliable components
- Low electric power consumption
- Maximum availability
- Low investment cost

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