One Source

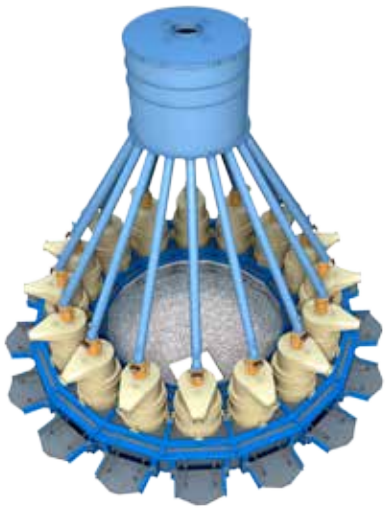
Minerals MCP™ Limestone Preheater

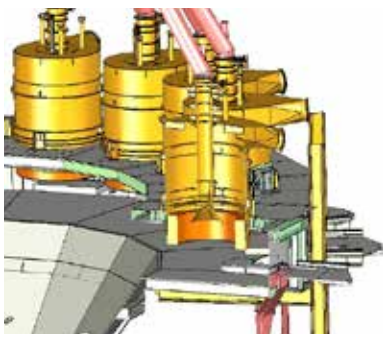
FLSmidth

Multiple Cassette Preheaters

Design features

- **Individual symmetrical stone chimneys for uniform stone flow**
- **Adjustable stone bed depth**
- **Full 360° annular gas distribution through each stone chimney**
- **Full feed shelf stone movement**
- **Ultra low ram pressure**
- **Flat non-load bearing preheater roof**





The FLSmidth Multiple Cassette Preheater (MCP™ Preheater) patented design is the next generation of stone preheaters from FLSmidth.

Preheater operation

Annular shaft style and individual chimney style preheaters have had incremental improvements over the years. Annular shaft preheaters are now offered with partition walls between the rams, deeper beds, and individual take-offs. The FCP individual chimney preheater now offers a more open cross section and air beams to lower pressure drop. FLSmidth has developed the MCP Preheater to provide a truly novel design delivering "the best of both," with improved capital costs and better performance.

In the MCP Preheater, hot gases leaving the kiln are drawn around the full circumference at the cassette level. Gas enters the cassette from all sides equally due to the unique MCP Preheater geometry. From here, the gas is drawn up through the descending stone. The gas exits the stone bed and moves through a dedicated aspirator.

In the MCP Preheater, each ram defines a distinct cassette, or chimney, for solids and gas to interact. The MCP Preheater's cassettes are symmetrical and constructed from a refractory lined cylinder rather than refractory walls & columns. Also the cassettes penetrate the flat roof offset from the back wall and adjacent cassettes. This creates a full circumference for hot kiln gasses to enter the cassette, ensuring uniform gas distribution.

The stone bin is separate from the preheating area, allowing stone to flow through chutes to the preheating zone. These stone chutes serve as restrictions to help reduce stone bin false air. During a ram stroke, stone moves from the stone bin periphery to a stone chute. From here, the stone is discharged to the preheating zone. Stone is delivered to the cassette on the centerline to help with uniform stone distribution. Stone moves counter-current to hot kiln gases promoting preheating and precalcining. When stone reaches the cassette bottom, it spills out at its angle of repose into adjacent ram stone piles, the back wall, and the feed apron. This configuration establishes a free gas path to the full cassette circumference. Upon reaching the ram level, hot precalcined stone is pushed out the fully annular stone discharge opening and onto the feed apron. From here it is pushed into the kiln.

Benefits

Preheater benefits

The FLSmidth MCP preheater represents the next generation of pebble lime preheaters. It has proven itself to be the most trouble-free and efficient preheater available in the industry. It is unparalleled in its simplicity of design and flexibility.

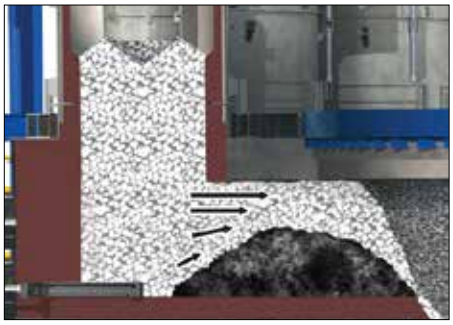
The FLSmidth MCP stone bed can be adjusted while running. This feature serves two purposes – 1) to tune individual cassettes allowing for stone segregation in the feed bin and 2) to allow operation with multiple stone size distributions while easily maintaining optimum fuel efficiency.

The patented reverse distributor moves coarse stone to the cassette center reversing the classic stone pile distribution of fines-center / coarse-periphery. This feature forces uniform gas flow across the entire cassette cross-section facilitating heat transfer to the entire stone size distribution.

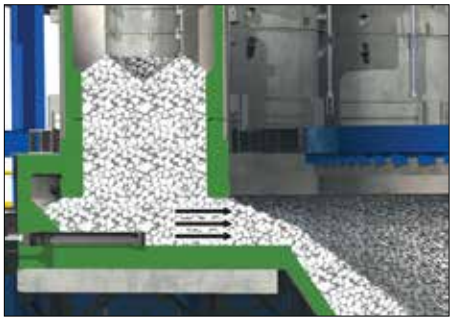
A key part of the MCP design is the fully circumferential gas path available to the kiln offgas. This patented element completes the MCP preheater's symmetry ensuring equal heat transfer and low pressure drop.

Because of the fully circumferential gas path, a much smaller shelf to roof dimension is required. This allows the MCP preheater to be designed with a flat, short shelf. The ratio of roof height and ram to shelf lip is patented by FLSmidth. In the figure adjacent, one can see the advantage to this improved geometry. With conventional preheater technology, a dead stone area exists. Because of the long feed shelf, it is physically impossible for the ram to move the bottom stone bed. Over time this area fills with fines and sinters, eventually forcing a shutdown for cleaning. With the FLSmidth MCP patented shelf geometry, there is no dead zone and material is not allowed to stagnate because the shelf is continuously cleaned.

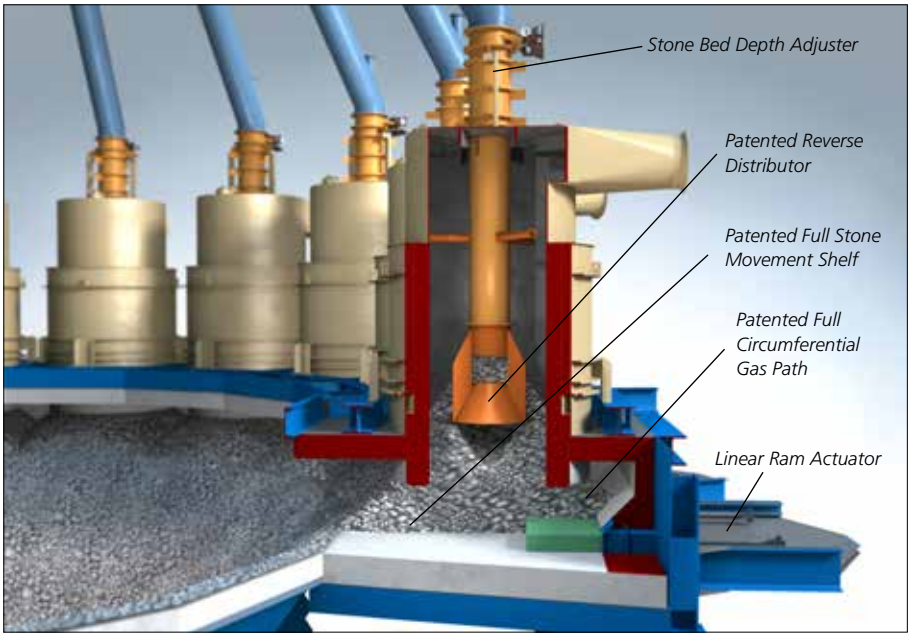
This geometry greatly reduces the force needed to move stone off the feed shelf. The result is greatly reduced hydraulic pressure and less stone crushing, resulting in reduced wear on the hydraulic components and less fines generation.



Old Style Feedshelf



New MCP Feedshelf



Hydraulics

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FLSmidth offers the most advanced hydraulic package for preheaters. The FLSmidth unit offers complete isolation from the external environment, eliminating external dust & water contamination. The unit is designed to be located at ground level, greatly improving access for maintenance.

Each ram is powered by a hydraulic cylinder. The stroke of each cylinder is controlled by a signal from an LVDT (linear variable displacement transducer) mounted in the cylinder with adjustable set points, which together determine the cylinder's stroke length, therefore determining the kiln feedrate. The LVDT's allow continuous feedback to the operator as to the exact ram position.

The ram hydraulic power unit has two pressure compensated variable displacement pumps, one operating, and the other for stand-by. The maximum system pressure is limited by a relief valve. While a ram is stroking, the valve acts as a safety relief to prevent the operating pressure from exceeding the set point. During the interval between strokes, the pump pressure compensator adjusts to reduce the pump outlet pressure, and during stroking the pressure compensator adjusts to pressurize the ram supply system. Two hydraulic accumulators are mounted on the ram supply header in order to reduce the pressure spikes in the hydraulic system. These coupled with very slow ram speeds eliminates "hydraulic hammer."

The actual control of the limestone feed rate is determined by the length of time elapsed between the start of the push stroke of one ram and the start of the push stroke of the next ram. The system is designed to allow multiple rams to move simultaneously. If for any reason the ram does not reach the programmed position of the LVDT in a predetermined amount of time, an alarm is sounded.

A glycol/oil cooler is furnished in an oil cooling and filtering loop, which contains a separate pump. This loop cools and filters the hydraulic fluid in the hydraulic oil reservoir in order to maintain a desirable temperature. Heaters in the oil tank are furnished to insure that the oil is sufficiently warm for start-up.

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