

RAPIDFLOW CALCINERS FOR SUPERIOR RAPIDFLOW PLASTER

The **Rapidflow Calciner** was developed in Australia to fulfill a need for commercial quantities of affordable and consistent plaster exhibiting superior strength characteristics.

The initial demand for this superior plaster evolved through the development and subsequent production of the now widely used walling product known as **Rapidwall** www.rapidwall.com.au.

Rapidwall is a precast, glass fibre reinforced gypsum-plaster walling product designed for structural use in general construction. Accordingly, a superior quality plaster is required to provide the necessary strength characteristics for this application. Almost all commercial grade plaster produced in Australia is done so for the wall board industry and it is generally low strength plaster.

The novel design features of the **Rapidflow Calciner** are as follows:
 >**Beta Plasters** are produced by conventional means, such as kettles and rotary kilns, provide only relative low strength plasters with high water take-up during setting.

>**Beta Plasters** calcined under steam pressure in autoclaves provide a higher strength material with low water take-up during setting. However these plasters are generally uneconomical in comparison to **Beta plasters**.

>The **Rapidflow Calciner** differs significantly from other fluidised bed calciner designs in that the introduction of hot calcining gases into the fluidised bed of material is better controlled. Accordingly, this new calciner is capable of producing a significantly higher strength plaster under atmospheric conditions.

>The proportions and forms of dihydrate, hemihydrate and anhydrite in the plaster product are very sensitive to calcining temperature conditions. The **Rapidflow Calciner** design ensures a very low temperature gradient is maintained across the bed of material being processed. As a result, the calcining conditions can be more readily controlled to provide the required plaster product to specification.

>The **Rapidflow Calciner** achieves this primarily because the design of the distributor plate provides a pronounced velocity gradient across the lower region of the fluidised bed with the effect of keeping the whole bed of material in suspension. Under these conditions there is no opportunity for material to settle out or partially defluidise where it could be subjected to over-temperature conditions.

>The **Rapidflow Calciner** incorporates a novel distributor plate design that allows this new plant to fluidise and therefore calcinate a wide size-range of materials varying from a maximum of 12mm for natural gypsum down to less than 100 micron for synthetic gypsum.
 >The advantage of the **Rapidflow Calciner** is that it is not sensitive to feed material size. This results in more economical feed preparation systems and increased plant versatility.

The **Rapidflow Calciner** accepts feed materials with significant quantities of free moisture without the need in the process for costly pre-drying stage.
 >Natural gypsums with up to 10% free moisture and synthetic gypsums with up to 20% free moisture can be directly processed.

>Unlike conventional calciners, an air sweeping effect at the distributor plate level serves to provide to the **Rapidflow Calciner** a self cleaning mechanism when emptying the calciner bed. Directed air sweeps any remaining material from the unit thereby allowing the rapid introduction of new feed material of a different type without cross-contamination.

The release of water vapour in kettle-type gypsum calciners brings about a state of natural fluidisation within that assists heat transfer through the bed of gypsum material. If poorly controlled this natural state of fluidisation can compromise the process and the quality of the particular plaster being produced.
 >A **Rapidflow Calciner** does not rely upon the release of water vapour or the natural fluidisation characteristics of the gypsum to establish fluidisation of the material. Instead fluidisation is readily controlled to suit the physical properties of the material being calcined thereby enabling a controllable and repeatable process to exactly replicate a product to specification.

The gypsum calcination process is very sensitive to temperature. To ensure product consistency the calcination process must provide minimal temperature gradients throughout the bed of calcining material.
 >A **Rapidflow Calciner** readily achieves this due to the controlled fluidisation process that provides excellent mixing and heat transference from the calcining gases to the calcining material.
 >The **Rapidflow Calciner** is able to control temperatures to one degree celcius allowing specific process operating parameters to be established to achieve repeatedly the required plaster product specifications irrespective of the feed material.

>The **Rapidflow Calciner** distributor plate design ensures that all of the material in the bed remains suspended in the fluidising gas stream ensuring that no calcining material is exposed to over temperature conditions.

In the case of finer synthetic-type gypsums it is important that they reside in the calciner for a sufficient period to ensure that the calcination process is properly completed. In more conventional calciners the finer materials may be entrained in the exhaust gas system where the exposure to the required process conditions is limited.
 >The **Rapidflow Calciner** is designed to operate continuously under closely controlled conditions using a wide variety of feed materials. A fines-recycling system is provided that can be controlled to ensure that the minimum necessary material residency is always established and maintained under the required process conditions.

The **Rapidflow Calciner** can be either directly or indirectly fired.
 >Where a clean fuel such as natural gas is available a direct firing system can be used, simplifying the calciner design. Where other fuels or waste heat streams are to be used the calciner readily adapts to indirect firing. The calciner can also be adapted to utilise waste-heat recoverd from the calciner exhaust stream. The adoption of this feature will naturally reduce the plant operating costs and the total energy embodied in the end product.

>The **Rapidflow Calciner** is built in South Australia from materials and equipment readily available and sourced entirely from within Australia. The cost of a **Rapidflow Calciner** is currently significantly less than an equivalent plant sourced from overseas.

> The operating costs of a **Rapidflow Calciner** are significantly less than a more conventional calciner that requires pre-drying of the feed material. Being a fluidised bed calciner the inherent maintenance costs can be expected to be minimal with most maintenance requirements centering on the ancillary plant such as dust collection and material handling equipment.

>The **Rapidflow Calciner** can be readily built scaled up or down to produce from five tonne per operating hour without any loss of control over the process conditions.

>The lower size limit is set through consideration of the economic viability of the plant and the upper size limit is set by the physical limitations of the calciner component design and the size of the ancillary equipment.

HIGH STRENGTH BETA PLASTER

MATERIAL SIZE RANGE

WET FEED MATERIALS

SELF CLEANING

CONTROLLED FLUIDISATION

TEMPERATURE CONTROL

FEED MATERIAL RESIDENCY

ADAPTABLE FIRING

PLANT CAPACITY

LOWER COSTS



Ten tonne per hour **Rapidflow Calciner**
Kilmore, Victoria, Australia

