



The 1120 ANR mill stands at 9 metres high, and is the largest to be built by Hosokawa Alpine.

Alpine scales up GCC grinding

HOSOKAWA ALPINE Aktiengesellschaft, specialists in powder and particle processing, has announced the manufacture of six 1120 ANR Mills, a form of vertical agitated media mill, which will be shipped to China later this year. The products from the 1120 ANR mills will be purchased by Sun Paper, the 4th biggest paper producer in China for use in its nearby paper plant. GCC will be ground by the mills to produce pre- and top-coat grades.

At nine metres in height, with a volume of 4,800 litres and operational weight of nearly 38 tonnes, each of the mills is capable of producing six tph of filler grade, with all six mills capable of processing around 110,000 tpa. Higher grades of GCC for coating paper or board are produced at a lower throughput rate.

The 1120 ANR is the largest of several sizes of this particular type of mill, and is the largest mill Alpine have built to date. Characterising the design is an open vertical mill tank with bottom feed and top discharge. The GCC slurry is pumped slowly upwards, through the grinding media, which are agitated by slowly revolving pins. Owing to the slow movement of the slurry through the mill, the grinding beads are not forced upwards and an open design can be implemented with no complicated sealing mechanism. Furthermore, the open design allows for the refill of beads without a break in production.

As the fineness of grinding is controlled by residence time in the mill, no speed control is needed for the revolving pins, further simplifying the design.

Design philosophy

Contrary to many of its competitors, the philosophy of the ANR mill design is based

on having a large mill volume and low rotor speed. Amongst many of the benefits cited by Alpine it is also claimed that such a design can reduce energy consumption remarkably when compared to smaller, faster mills.

Bigger is better

Large dimensional parts are believed to result in lower wear, and thus a longer lifetime for the machine. Furthermore, the presence of a large surface area gives a larger cooling surface, and so the mill is cheap to cool, with no expensive chiller needed. Indeed, all the mill has in the way of cooling technology is a water-filled cooling jacket.

One down side of this design is that as the size of the machines increases, so does the investment, a factor that could be of importance to some producers.

Slowly but surely

Lower speeds than usual are also beneficial as abrasion and thus wear on the parts is reduced, increasing the lifetime of rotors and other parts. Additionally, a reduction in speed also lowers turbulence. This is an important consideration, as lower turbulence equates to higher efficiency and so lower energy consumption.

Grinding media

Owing to the weight of the filled mill, grinding in the mill is greatly assisted by gravity, which increases the pressure of the grinding media on the slurry. This factor allows the grinding media to be of lower density than media used in mills where gravity is not present. Therefore, whereas fast grinding mills will typically use high density zircon oxide beads (PSZ), the

1120 ANR uses zirconium silicate beads (SAZ), which are of a medium bulk density.

Calculations performed by Alpine, indicate that the use of SAZ beads offer additional energy and cost savings, of which a few are listed below:

- SAZ beads are more stable at the bottom of the mill where temperatures are high, and so last for longer
- SAZ beads are approximately 20% of the price of PSZ beads
- Owing to their lower density, less energy is required to stir the SAZ beads
- A lower input of energy in the system results in a lower generation of heat, again reducing costs

System control

When used in combination, the six mills can be used to offer complete solutions, producing a variety of products depending on the types of GCC required by Sun Paper. Coarser filler grades can be produced in one stage, whereas the finer grades may require two to three stages.

By setting up the mills in series, slurry can be pumped between the mills in order to continuously produce a variety of grades. To control the processes, computer systems, including PLC control software, are also to be installed in the plant to allow constant assessment.

The system shall allow constant monitoring, and as a result, will act to both optimise the process, as well as to give maintenance assistance. Benefits include a short reaction time for optimisation and trouble shooting, and system checks both to improve optimisation, and to help reduce downtime, should problems occur. 