

Between centrifugal sifter and mill

Unique solution for reducing lumps and agglomerates

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The Nibbler is a special system component for reducing lumps and oversize granules in powders. It does so with the aid of integrated paddles and a suitable screen, which allows product with a defined particle size to pass through the machine. Nibblers are mainly used in inline processes downstream of sack dipping stations or container filling units. They increase product quality following dryers or filters and handle reworking or recycling tasks.

Many of the fine powders which are used in the chemical and food industries have a tendency to form lumps or agglomerates. These are a result of the powder production processes. One example might be products which pass through a belt dryer in order to reduce their moisture content. Large lumps break after they leave the belt and must be reduced in size. Many products with a particle size of less than 100 μm are hygroscopic. Storage and transport in a humid environment encourages the formation of lumps and blocks (Fig. 1). Final products, however, must normally have a uniform particle size distribution to ensure efficient processing. These requirements need to be by intermediate products as well, in order for the next process steps to comply with the conditions and requirements of the recipe. This is explained by the following three examples:



Fig. 1 The initial product, an organic salt, forms large lumps. They are reduced in the Nibbler to 8 mm, 4 mm or 5 mm, according to the screen that is used.

- Lumps and granules have a negative effect on the efficiency of powder mixing processes. The finer the components, the more homogeneous the mix. Lumps increase the mixing time and energy input.

These lumps can be reduced by a Nibbler at the time the machine is filled, downstream of the sack dipping station.

- Heat exchange in other reaction processes is generally caused by fine particles having large specific surfaces. Lumps in these products lead to non-uniform heating, melting or dissolution results.

- Many logistics concepts cause powders to be conveyed by pneumatic systems from silos to processes. Large lumps and agglomerates in the intermediate product can have a serious impact on conveying efficiency and block the system. Lump-free granules and powders allow the conveying speed and energy input to be adjusted to the optimum level.

Breakers, mills and centrifugal sifters are used in industrial process to reduce or separate lumps. Nibblers represent a reliable alternative (see table).

Applications of the Nibbler

Product	Applications	Granule size before passing through the Nibbler [mm]
Urea/carbamide/carbonyl diamide	Installed downstream of silo and upstream of pneumatic conveying systems	30
Instant breakfast drinks	Installed downstream of belt dryers	40 to 50 (cakes)
Sugar	Downstream of sack dipping station and upstream of pneumatic conveying line	30
Plastic chips	Downstream of sack dipping and upstream of mixers	2 x 30 x 80
Disulphide	Downstream of container emptying station and upstream of pneumatic conveying line	60 x 60 x 10
Epoxy resin	Downstream of sack dipping	10
Magnesium fluoride	Downstream of sack dipping and upstream of mixers	6 to 8





Fig. 2 NBS 200x200 Nibbler with screen: products pass vertically from the top of the machine to the bottom. Rotating paddles force the product through the hole in the screen or sieve.

The Nibbler

Figure 2 shows a small Nibbler, 200x200 in size, with an average capacity of 1 t/h. This machine is usually operated inline and installed below the container filling station, the sack and bag dipping stations and the silos and hoppers. The product containing lumps or agglomerates is driven by gravity into the region of the horizontally arranged paddles. These paddles rotate, thereby forcing the product through the screen, where shear forces reduce the size of the lumps. Granules remain in the screen as long as they are too large to pass through it.

Depending on the product hardness, the Nibbler is equipped either with a metal

screen or a metal sieve housing. The screen is designed with a kind of teeth, which can cut the product and therefore reduce the size of the particles (hence the name Nibbler). The sieve or screen can be pulled out of the machine easily in order to clean the Nibbler. Automatic cleaning-in-place applications enable the Nibbler to be flooded and washed perfectly.

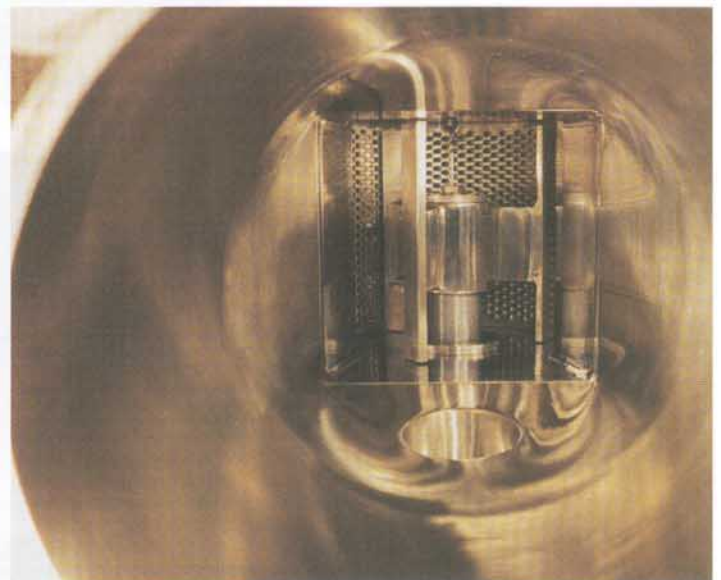
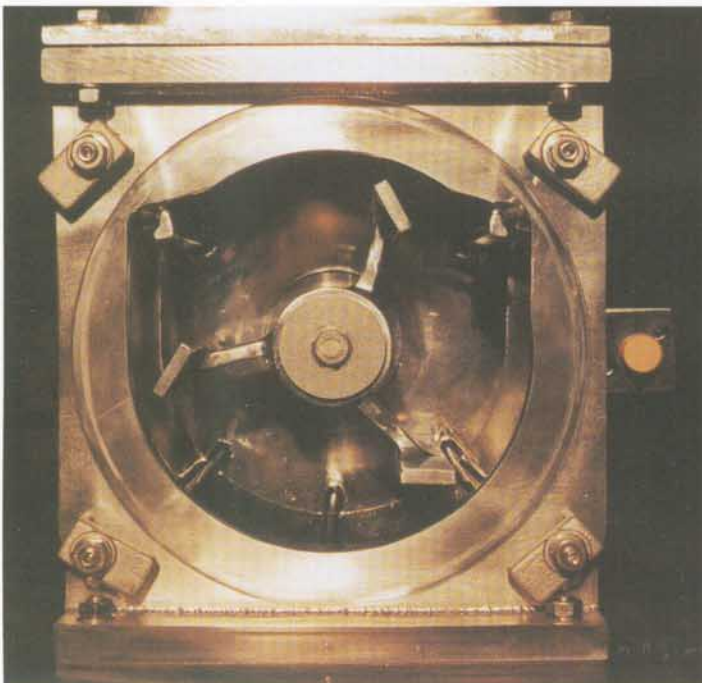
Combination of paddle and sieve

The Nibbler is a combination of a paddle and a sieve, similar to a centrifugal sifter or mill. The torque - and thus also the force -

of the Nibbler is however considerably higher than it is with a sifter. The Nibbler is even able to work the product out of a mass flow. Mills rotate with many more revolutions per minute than the Nibbler. The circumferential speed of the paddles is less than 1 m/s. Consequently, no dust or fines are formed. Products which pass through the Nibbler are relieved of their lumps without increasing the amount of fines. Although many products develop lumps during storage, their initial particle size is restored in the Nibbler. This is an advantage if the shape of the surface is important. The Nibbler is also suitable in hazardous areas due to the low rotating speed of the paddles. The Nibbler can be adapted to the process and the product by equipping it with frequency converters and by adjusting the clearance between the paddle and the screen.

Many applications

The Nibbler is used for many different kinds of powders and granules. The table shows various typical applications for products in the chemical and food industries. Even suspensions can be treated with this machine, in which case the manufacturer recommends prior product trials. The typical capacities vary from a few kg/h to several tons. Screen sizes between 2 mm and 25 mm can be supplied. Doors for inspection and cleaning simplify maintenance and cleaning. A special version for the pharmaceutical industry is also available.



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