VIBRA SCHULTHEIS

Vibration and Innovation

Vibration technology

Conveying, screening
Batching, discharging
Spreading, vibrating

Process engineering

Drying, cooling
Instantizing, calcining
Roasting, crystallizing

Plant engineering

Planning and delivery of turnkey processing and drying plants

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Vibration and **Innovation**

With a tradition of innovative developments specially tailored to individual customer requirements and almost 60 years of accumulated experience, VIBRA SCHULTHEIS enjoys a reputation as a leading, internationally recognized partner in the field of vibration technology and process engineering.

Our worldwide client base includes major corporations as well as many small-to-medium sized companies in the chemical, pharmaceutical, and food industries. Approximately 50% of all machinery and plant manufactured is exported. Customer relationships are fostered by a team of highly qualified project engineers backed up by a large number of agents in Germany and abroad.

The technical solutions described in this brochure are just a few of the innovative designs evolved for specific vibration and processing tasks.

Fluid-bed dryer for quasi-continuous batch operation

A three-stage, vibrating fluid-bed dryer for gentle drying of highly sensitive food ingredients was designed and produced for an international manufacturer. This machine type – which integrates all the advantages of batch operation while taking adequate account of the continuously operating preceding stage – was selected following intensive preliminary tests because it assures exact compliance with and reproducibility of the specified residence time and temperature profile for the complete product.

The dryer shown in Figure 1 has a fluidizing plate area of 10 m^2. Its three cascaded product chambers, separated from one another by pneumatically operated vertical weirs, are clearly visible. The dryer's vibration angle can be varied by means of the electronically controlled VARIO motor without interrupting operation.

In the first step, the required product is conveyed to the first chamber, where it is predried with a defined quantity of hot air. When the permissible product temperature is reached, the first weir opens and the product enters the second chamber. At the same time, the first chamber is filled with fresh, moist product. The third chamber is filled in the same way, and the product discharge that follows the drying and cooling process is also based on this principle. During the drying phase, the product bed can be homogenized with the

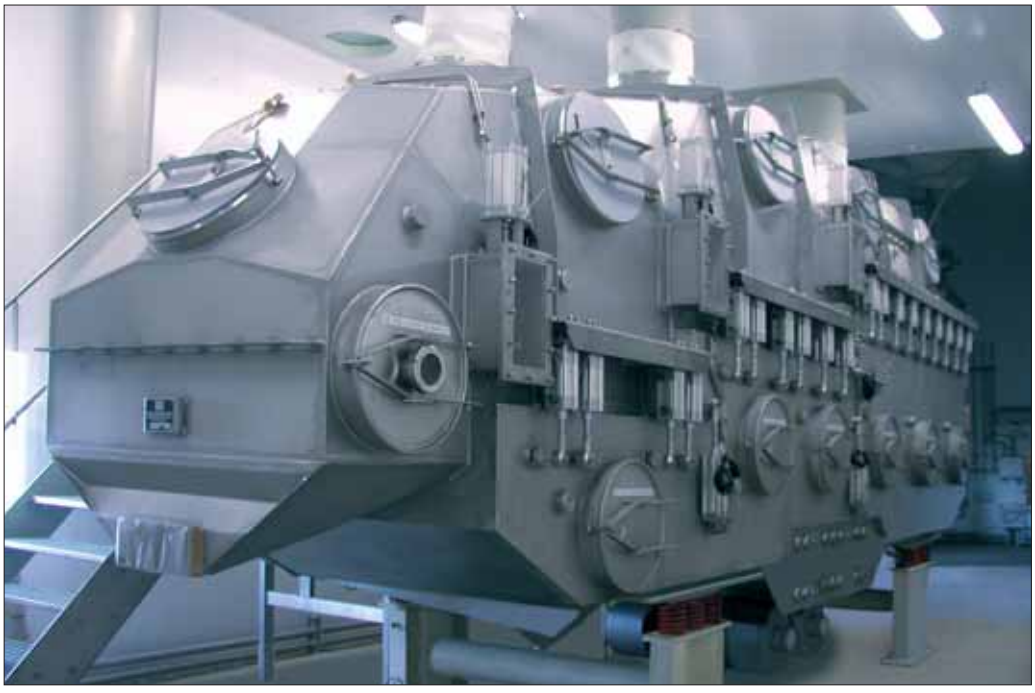

Fig. 1

VARIO controller by applying a vertical vibration or a vibrating motion counter to the conveying direction. In addition, the conveying motion from one chamber to the next and the discharge from the dryer can be supported by optimizing the vibration angle.

The dryer is manufactured in line with strict hygienic standards to minimize the risk of germ formation in the sensitive product. The fluidizing plates, which are assembled from conveniently sized sections, are locked inside the dryer housing by pneumatically operated eccentric fasteners and can be easily removed on rollers for cleaning.

The fluid-bed dryer shown in Figure 2 has a similar design and is used to dry a high water content food product in batch mode. This product, which is previously suspended in a large quantity of water, is dewatered and predried in the dryer. Post-drying takes place in a round fluid-bed dryer installed downstream. Any faulty product ingredients are then removed by a vibrating screening machine.

The product-contacting parts of the plant, which is made completely of stainless steel, comprise stainless steel elements with a highly polished finish. All external surfaces are ground.

Fig. 2

Cooling spiral conveyor for pharmaceutical applications

Specially designed vibrating spiral conveyors are ideal for cooling and vertically conveying extruded preliminary products in the pharmaceutical industry.

Fig. 3.1

Fig 3.2

The all-stainless steel machine shown here (Figures 3.1 and 3.2) consists of a cooling spiral conveyor and two enclosed vibrating trough conveyors for feed and discharge on a shared, mobile base frame.

The machine is completely dustproof. The conveying troughs can be uncoupled from the mounting plates for cleaning in a matter of seconds. The spiral decks are likewise readily accessible for cleaning by removing the guard. The cooling water connections are positioned such that they do not obstruct the cleaning process. The feeding trough is equipped with a reversible vibrator to enable wasted batches to be removed.

Fluid-bed dryer for spray granulation

The static fluid-bed dryer shown in Figure 4 is used for spray granulation of a detergent intermediate product. Made entirely of stainless steel, this dryer has a fluidizing plate area of 26 m^2. The product is fed in a liquid state and sprayed into the drying chamber through nozzles arranged on the side. In addition to the hot air that enters via the fluidizing plate, energy is also supplied by means of the heat exchanger inserts situated in the fluid bed. These steam heated inserts are mounted on rollers and can be laterally withdrawn from the dryer housing for cleaning and maintenance. The fines that are discharged together with the exhaust air are returned to the drying process.

Fig. 4

Vibrating filling machine for drying pans

A vibrating conveyor system with several vertically arranged trays, to which product is supplied from a common feed bin, was developed for filling drying pans that are conveyed through vacuum dryers on several levels.

The special design of the feed bin and the electromagnetic vibrator, which activates all trays together, assure a homogeneous product stream on all paths and thus homogeneous filling of the product pans on the different levels.

Fig. 5

Test screening machines for milk powder, baby foods, and similar products

These screening machines, which are made completely of stainless steel – including the mounting plates – and available in three sizes with a screening area from 0.85 to 2,2 m^2, comply with the customer's high hygienic and sanitary requirements in every respect. The machines are also extremely easy to operate and optimized for rapid screen replacement and cleaning.

Fig. 6.1
SR 12/7-l-S vibrating screening machine with pneumatic screen tensioning

All product-contacting surfaces are immaculately finished and the screen case is designed with absolutely no dead spaces or gaps. The machine cover is manufactured from transparent, impact-resistant polycarbonate or stainless steel. A removable silicone rubber profile gasket inserted in the screen case flange facilitates dust-free operation between the case and the cover. The screens can be removed or installed in a few simple steps because the cover is fastened with rugged, quick-release spring tensioners made of stainless steel and a pneumatic screen tensioning device is provided for tensioning the screen cloths, which are framed without gaps.

Fig. 6.2
Cover fastening

Crystallization process for plastics pellets with a vibrating swirl tray conveyor

A patented method based on a vibrating swirl tray conveyor was developed for crystallizing plastics pellets. This continuous process allows the pellets to be efficiently produced or recycled.

The photograph below shows a typical machine design: the cold, amorphous strand pellets are fed via a batching trough conveyor to the crystallizing swirl tray conveyor, where they are continuously fluidized by hot air and homogeneously transported to the end of the conveyor by means of a vortex motion. Thanks to the reversible VARIO drive, the process is started without any startup losses and discharging is both rapid and complete. Further transport and cooling take place in a downstream cooling spiral conveyor. This process offers several advantages:

- **Compact design**
- **Narrow residence time range, homogeneous crystallization**
- **Low energy consumption**
- **Rapid cleaning due to the absence of internal obstructions**

Fig. 7

Natural-frequency vibrating conveyors in modular design

In both the chemical and the food industries, vibrating conveyors are required to handle high conveying capacities – and often also considerable conveying distances – for logistical tasks between the production and packaging stages. Freely configurable branching devices in the form of remote-controlled gates, flaps, or switches are necessary to achieve the desired distribution of the mass flows between various packaging lines. Right from the outset, a conveyor is expected to be sufficiently flexible to adapt to other conveying distances according to future requirements. These requirements are optimally met by natural-frequency vibrating conveyors in a modular design, in other words with interchangeable vibrator, spring, and intermediate discharge elements.

The working spring stations, which are designed as standard units, are mounted between the conveying trough and the countervibrating frame by means of bolt connections (Figure 10). The linkage is integrated in the working spring stations. A self-synchronizing, twin motor vibrating unit acts as the vibrator (Figure 11). This vibrator is insulated against structure-borne noise and characterized by practically silent operation. It has neither a coupling nor a belt drive, endures continuous duty and requires almost no maintenance. The intermediate discharge points can be implemented with manually or pneumatically operated flaps or gates. Figure 12 shows a triple-track natural-frequency trough conveyor with six discharge flaps.

Fig. 8

Fig. 9

Two typical reference plants are shown in Figures 8 and 9. Figure 8 is a partial view of a vibrating conveyor system with an overall length of 120 m used to convey potato chips at a rate of 50 m^3/h. Figure 9 depicts a 25 m long vibrating trough conveyor with several remote-controlled intermediate discharge points for conveying 60 m^3/h of filler.

Fig. 10

Fig. 11

Fig. 12

The modular design of these natural-frequency conveyors also provided the inspiration for the vibration-assisted fluid-bed dryers shown in Figure 13.

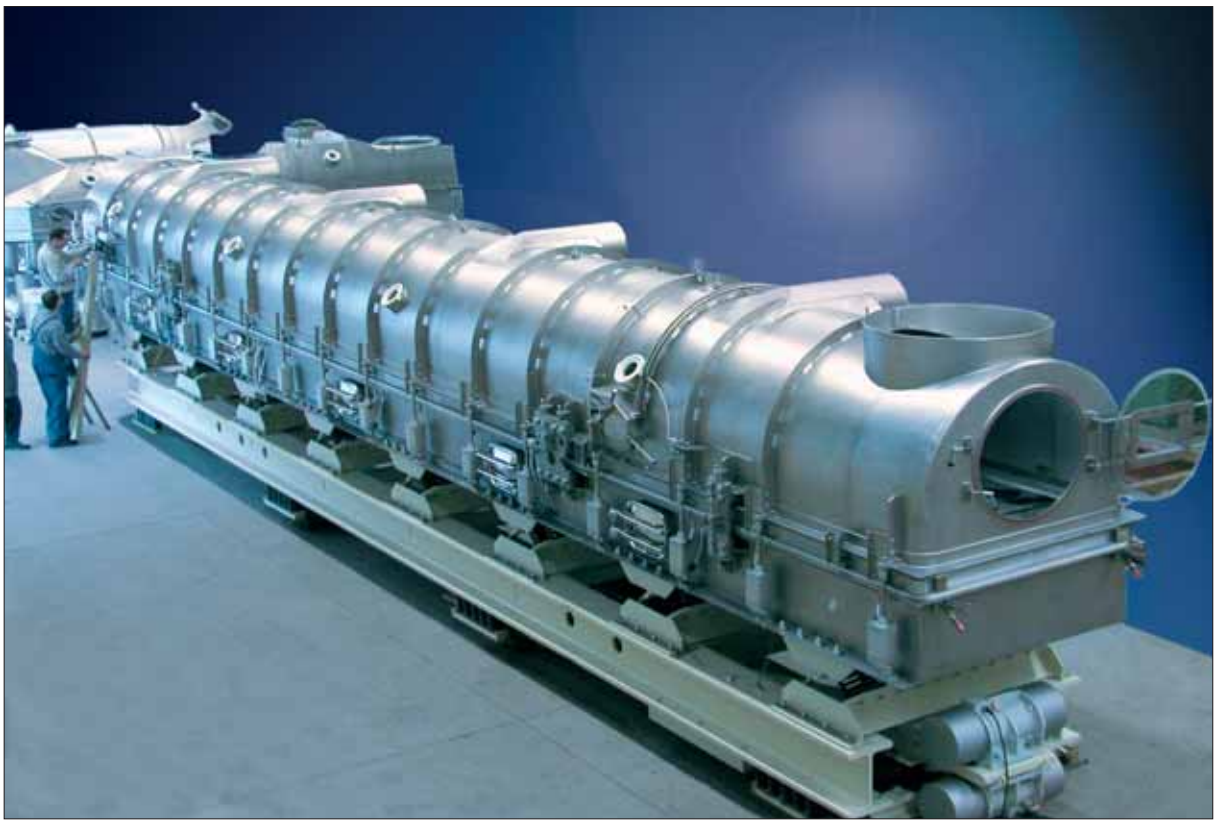

Fig. 13

Cooling vibrating conveyor

for cooling 15 t/h of roasted product down from 800°C

This plant consists of three U-shaped cascaded, vibrating trough conveyors with a total heat exchanger surface of approximately 30 m^2 and a trough width of 1400 mm.

The biggest of the three units is a 12 m long natural-frequency trough conveyor, which is designed like the other two cooling troughs with a series of robust, separately exchangeable tray elements with cooling plates for cooling water at 4 bar. The side walls of the tray elements are also cooled. The individual tray elements are flanged together and largely identical, so that the requirement for spare parts is restricted to a minimum. The cooling plates feature a special distribution system that ensures a uniform flow of cooling water across the complete tray width.

Figures 14 and 16 are partial views of this plant.
Figure 15 shows the cooling water supply to the heat exchangers.

Fig. 14

Fig. 15

Fig. 16

Natural-frequency spiral conveyor with motor vibrator unit

Fig. 17

Difficult-to-convey products such as rubber crumbs can be efficiently handled by special spiral conveyors designed as a natural-frequency system that operates with a large vibration amplitude and a low vibration frequency. The spiral conveyors have two frequency-controlled motor vibrators and manage without any driving elements like gearing, a slider crank, a coupling, or a belt drive. Their main advantage compared to classic systems is the simplified design of the motor vibrator. Since they are operated near the natural frequency, they are also distinguished by a very low driving force in relation to the excited mass. A comparatively small motor vibrator size is therefore sufficient.

The spiral conveyor shown in Figure 17 has a diameter of 1500 m and a height of 6.5 m.

Detailed solutions

These successful innovations, which are the outcome of close collaboration with our customers, are not confined to fundamental new developments in the process technology and design. They also encompass detailed, highly advanced solutions that boost the performance of the vibrators and machines while simultaneously facilitating operation and cleaning.

The electromagnetic vibrator units in our ER series have been completely reworked, for instance, and aligned with the latest state of the art by integrating a series of improvements (Figure 18). The enhancement of our RS round screening machines with quick-release spring tensioners and pneumatic lifting units for the machine cover (Figure 19) is another striking example.

Fig. 18

Fig. 19

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