

VIBRA SCHULTHEIS



Vibrating conveyors for indirect heat exchange

Cooling
Heating
Drying
Calcining



Vibrating conveyors

for indirect heat exchange

Cooling, heating, drying and calcining

General

Vibrating conveyors are ideally suited for a variety of processing tasks that extend beyond simple conveying.

In addition to the fluid-bed dryers/coolers for direct heat exchange described in our P 121 brochure, where the bulk material is fluidized by the gaseous heat transfer medium, an important role is played here by our vibrating conveyors for indirect heat exchange:

Trough, tube and spiral conveyors are equipped for this purpose either with heat exchangers for cooling water, steam or thermal oil or with other heat transfer devices.

The heat exchange principle is as follows: heat is transferred from the product bed via the contact surface of the heat exchanger to the heat transfer medium.

Vibrating conveyors facilitate gentle, dust-free, hygienic and gas-tight handling of the bulk material. The contact time, which is crucial to the heat transfer, can be tailored to individual operating requirements through careful selection of the angle of throw, frequency, vibration amplitude and inclination.

Front cover

Vibrating spiral conveyor and vibrating trough conveyor with heat exchangers for drying and cooling chemical products



Figs. 3 and 4 Water-cooled vibrating trough conveyor with additional heat exchanger inserts



The heat transfer is further optimized by mixing stages, such as built-in internals and cascades.

Fan-shaped heat exchanger inserts can be installed in the conveying troughs to improve the heat transfer properties.

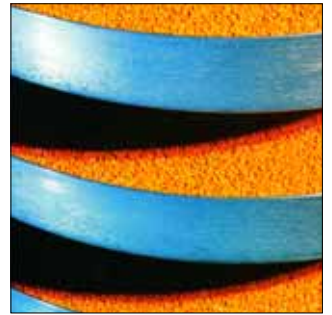


Fig. 7
Cooling plastics granules is one important application for cooling spiral conveyors

Successful applications:

Cooling

plastics granules, instant products, pasta, rubber pellets, welding powder, filter dust, activated carbon, molecular sieve, iron oxide

Heating

plastics granules

Drying

milk powder, citric acid, metal salts

Calcining

catalysts



Fig. 5 Cooling spiral conveyor with a screening machine in a plastics factory



Fig. 6 Three cooling trough conveyors arranged in a cascade

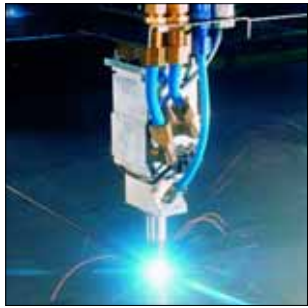


Fig. 8
Welding head of the carbon dioxide laser in action

Conveyor versions

Trough conveyors

Trough conveyors are equipped with laser or spot welded heat exchangers and are designed to endure continuous duty.

The complete exchange surface can be subdivided into a series of cascaded units for optimum heat transfer efficiency. The stages arranged between these units serve to circulate the product.

In high-temperature applications, e.g. 600°C for calcining troughs, the trough bottoms are heated by means of electric tubular heaters or ceramic infrared lamps.

Defined temperature profiles, optimally tuned to the respective process, can be obtained with the help of electronic instrumentation and control equipment.

The design of these vibrating conveyors – with an electromagnetic vibrator or a motor vibrator unit or according to the natural-frequency principle – is based on the same criteria as in applications without heat transfer. The insulation devices can be either vibrating or stationary.

Tube conveyors

Tube conveyors for heat exchange are designed with double walls for steam, cooling water, or another heat transfer medium, and are especially suitable if an insulating jacket needs to be fitted. The variable bed thickness of the product in the tube conveyor has to be considered.

Spiral conveyors

In many respects, spiral conveyors are similar to horizontal trough conveyors. The great advantage of spiral conveyors, however, is that they permit a large exchange surface to be achieved over a small floor space, with a long path and a correspondingly long residence time. With standard external diameters up to 1400 mm and conveying heights up to 6 m, exchange surfaces as big as 40 m² are easy to carry out.



Fig. 9
Cooling trough conveyor for dusting powder – food grade design with integrated product buffer for batchwise feeding and continuous further processing



Water-cooled spiral conveyors have established a reputation for themselves as superlative plant components, particularly when used for plastics granules, that cool the hot granules fast while simultaneously conveying them to the required height. Spiral conveyors with an external diameter of 450 to 1400 mm and a conveying height of between 1 and 8 m cover a wide spectrum of industrial applications with conveying capacities of up to 5000 kg/h and inlet temperatures of up to 180 °C.

Spiral conveyors facilitate gentle conveying and efficient cooling. They are easy to clean and practically maintenance-free. They can also be used to heat and dry bulk material.

Design

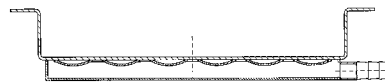
The design merges basic theoretical principles with specific, empirical heat transfer values.

A number of experimental units are available at our pilot plant or for testing at our customers' works to verify the design parameters of as yet untested products.

Heat exchangers

The pressure-resistant and vibration-proof heat exchangers are manufactured with a smooth face and a corrugated underside. The liquid or gaseous stream of heat transfer medium in the conduits between the top and bottom plates is uniformly distributed through specially designed nozzles.

Fig. 10 Block diagram of a heat exchanger plate



When the heat exchangers are built, the top and bottom plates are joined together by a large number of circular laser welds and the gap between them then inflated at high pressure. By optimizing the plate thicknesses, it is possible to achieve a smooth top side facing the product, while the underside is swollen like a pillow.

Pre-cut plates, joined by resistance WIG or MIG/MAG-welding, are used for heat exchangers destined for non-standard applications, e.g. with a high coolant flow.

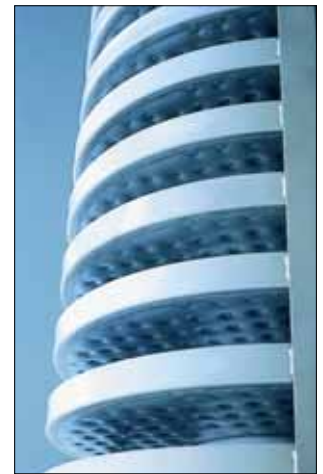
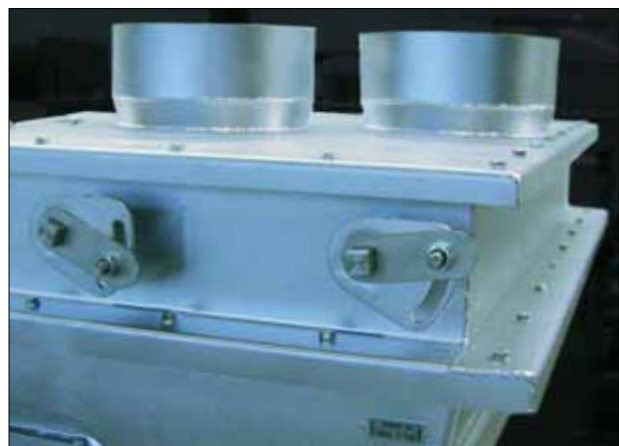


Fig. 13 Cooling spiral conveyor - underside of the heat exchangers

Fig. 11 (bottom left) Cooling trough conveyor with two vertically stacked heat exchanger decks. Each deck is fed with half the product stream

Fig. 12 (bottom right) The two inlets with distribution flaps





Typical applications

Fig. 14
The temperatures and temperature profiles of the decks can be electronically monitored and controlled



Fig. 15
Natural-frequency trough conveyor, 800 mm wide and 8 m long, with cascaded heat exchangers



Fig. 16 Vibrating tube conveyor with water-cooled outlet and water-cooled downpipe



Fig. 17 Screen case with heated walls and screen supports to prevent caking

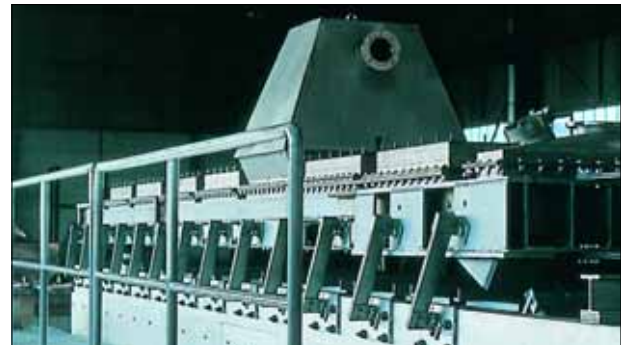


Fig. 18 Calcining vibrating trough conveyor, 900 mm wide and 8 m long, with covibrating infrared heater for operating temperatures up to 600°C



Fig. 19 (top) and Fig. 20 (left) Cooling spiral conveyor and screening machines for cooling and screening plastics granules



Fig. 21 Spiral conveyor with transparent dust cover and cooling air connections



Fig. 22 Spiral conveyor with natural rubber dust cover



Fig. 23 Spiral conveyor with transparent dust cover / noise reducing enclosure. The enclosure consists of two moving halves suspended on rails which can be separated for cleaning

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