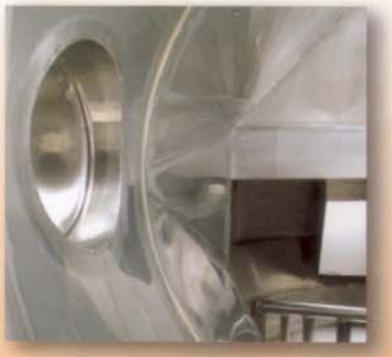
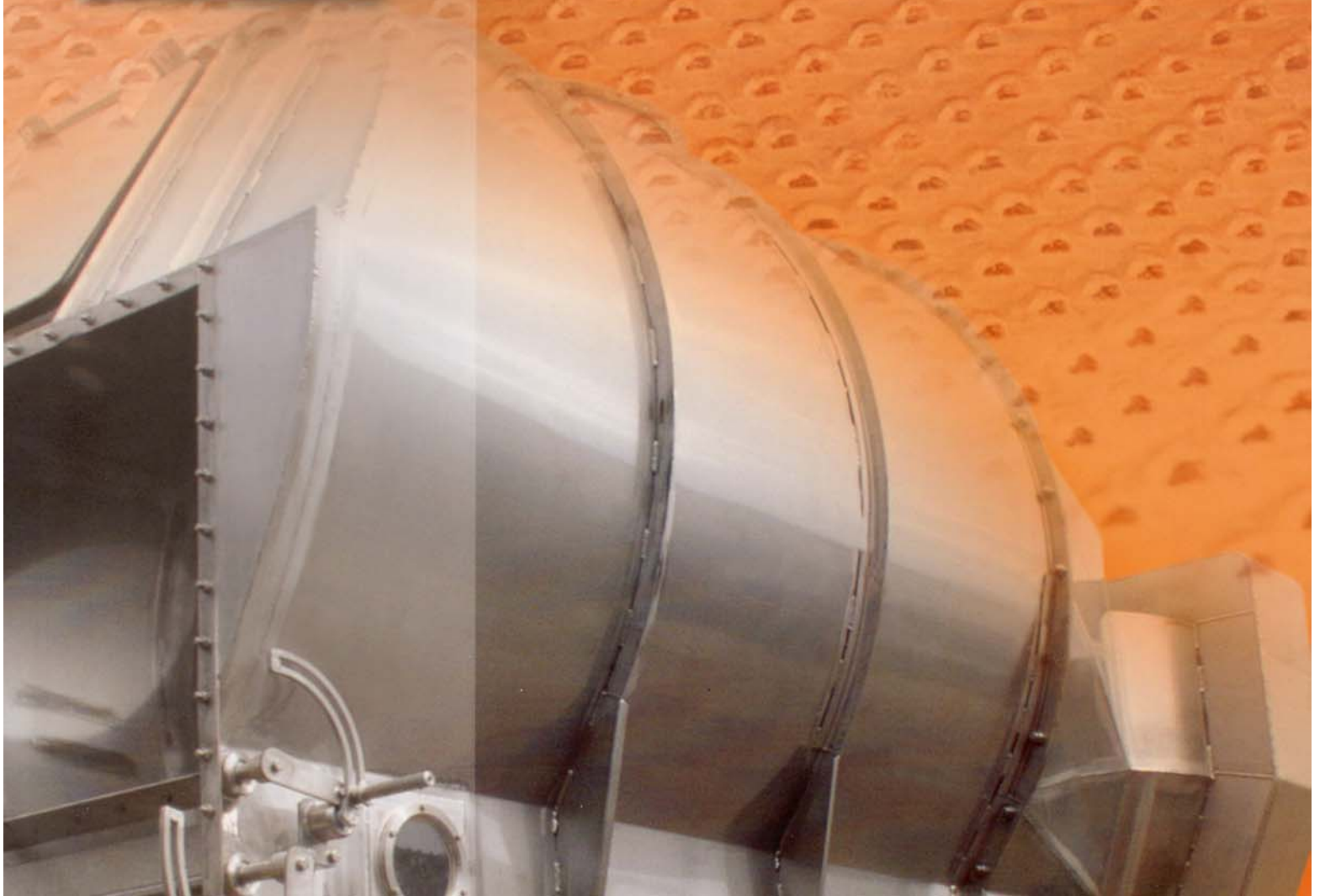


Industrial Dryers

OMNIKON



The phenomenon of fluidization

Fluidizing sugar in a fluid bed cooler, depth of the bed: 300mm.

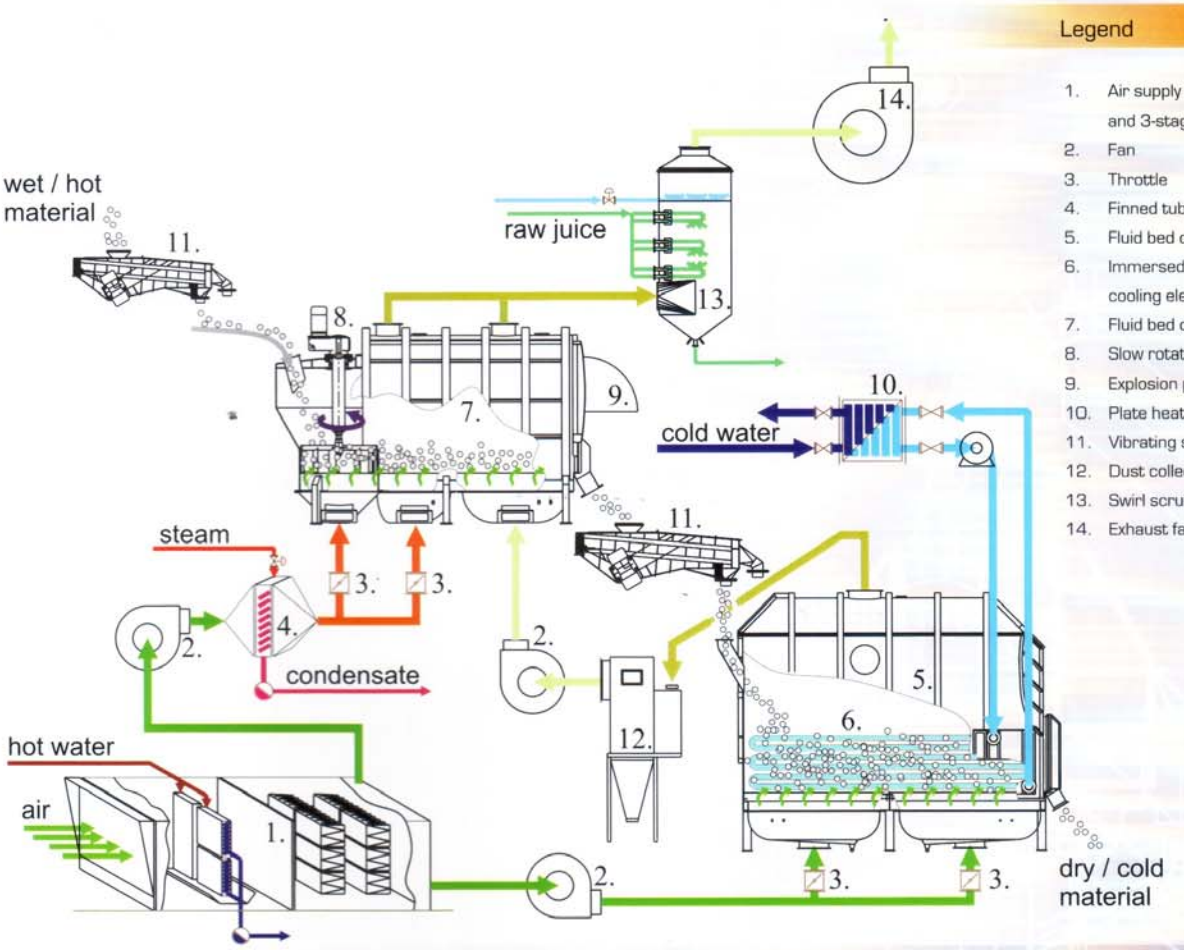
If a stream of air or other gas is blown through a layer of granular material placed on a perforated deck a pressure drop results due to flow resistance attributed to granular solid layer. This pressure drop increases with air superficial velocity. At certain velocity the pressure drop will be large enough to balance the weight of the bed - at that moment the bed will be raised upwards and then depending on the extent of cohesion forces it will disintegrate into smaller or larger particles, even single grains, which will start to rapidly move stirred by the flow of gas in the form of bubbles. The bed will resemble boiling liquid. The process is called fluidization.

Transportation of granular solids

Assembling of the installation for drying and cooling of sugar in the sugar Factory Kruszwica S.A. (KSC Polski Cukier). The installation was started up in 2006, capacity 50 t/hr.

Fluidized bed (fluid bed) flows like a liquid from higher to lower bed level thus transporting the solid along. The granular solid can also be transported by vibrating the trough containing the solid. It does not need to be fluidized then. However, one can combine fluidization and vibration making the material to flow faster towards the exit. Similar effect can be achieved by using the so called "gill plate" gas distributors, in which the air stream is inclined towards the exit thus additionally pushing the solids downwards. In both cases an efficient way of horizontal transport of solids is obtained.

Typical installation with a fluid bed dryer/cooler



Legend

1. Air supply chamber (preheating and 3-stage filtration)
2. Fan
3. Throttle
4. Finned tube exchanger
5. Fluid bed cooler
6. Immersed contact cooling element
7. Fluid bed dryer
8. Slow rotating impeller
9. Explosion protection (option)
10. Plate heat exchanger
11. Vibrating screen
12. Dust collector
13. Swirl scrubber
14. Exhaust fan

OMNIKON designs and supplies multichamber fluid bed dryers and coolers with individually air supplied chambers. The solid is supplied directly into the bed or passed through a feed lock or a screw feeder in the case of units working with underpressure. The entering solid may also be screened through avibrating screen in order to remove lumps.

The incoming air pretreatment consists of preheating to remove a possible fog and up to three-stage filtration (preliminary filtration on a non-woven flat filter, main filtration in structural filters and, if needed, sanitary filtration in HEPA filters). The air is then heated or cooled to the required process temperature in steam or water supplied finned tube exchangers. It is then compressed by a centrifugal fan and pumped into the blow chambers of the dryer-cooler. In units operating with underpressure there are no blowers at air entry but one suction fan at the exit. This spares 5 to 8°C of the incoming air temperature caused usually by blowers. The air flow-rates in each chamber are set by butterfly valves and controlled by r.p.m. of the blowers.

The upper chamber of the dryer-cooler is connected to the venting system in such a way that it maintains a slight underpressure to eliminate dust emission. The first chamber of the SCFM series contains a slow rotating impeller which improves fluidization of wet products and breaks possible lumps.

The exiting air is cleaned from dust in dry or wet systems. The exit fan is usually low-pressure or medium-pressure suction fan that throws out the exit air into the atmosphere.

The installation is equipped with measuring and control equipment and can be hooked up to the main control system of the plant and/or operated locally from a local control cabinet.

SCHEMA OF INSTALLATION

Drying

Fluid bed dryer for sugar with two rotating impellers, capacity 50 t/hr.

Fluid bed provides an excellent environment for the process of drying of granular solids. Vapors resulting in the process are instantly drawn from the bed thus the solids contact fresh, hot air supplied from below all the time. To provide uniformity of the end product the solids during the process should not possibly contact nor fresh, wet particles nor the already dry particles. Such conditions exist in a continuously operated elongated trough with an aspect ratio 6:1 or more. If, however, the solid is sticky when wet it would be better to dry it in a bed when it is mixed with already dry product down to moisture content allowing for fluidization. Such conditions exist in a tank shaped, deep fluid bed. By combining these two principles in fluid bed dryers of the SFM series it is possible to fluidize wet, sticky materials and achieve uniformity of moisture content of the final product at the same time.

Heating - cooling

Fluid bed cooler with immersed heat exchanger.

Owing to an excellent contact of gas and solid particles heating and cooling in the bed is extremely intensive. The exiting air temperature is close to the bed temperature which means that almost all theoretically possible heat was exchanged. If necessary the amount of heat exchanged may be additionally increased by immersing heating or cooling elements in the bed. OMNIKON offers a fluid bed cooler with additional contact cooling inserts. Special heat exchangers are immersed within the fluid bed layer. The material coming into contact with the cool surface of the exchanger releases its heat to the water circulating in the cooling element. Simultaneously, the material is mixed and releases its heat to the stream of fluidising air (cooling by convection).

Dust separation

Before exhausting the process air to the atmosphere, fine fractions of the dried material entrained in the flow must be removed in dry or wet dust collector systems. OMNIKON supplies wet dust removing systems composed of a swirl scrubber (OMNIKON type) which guaranties both high cleaning effectiveness and low pressure drop. As a dry system OMNIKON offers compact filters based on viledon® filter cartridges.

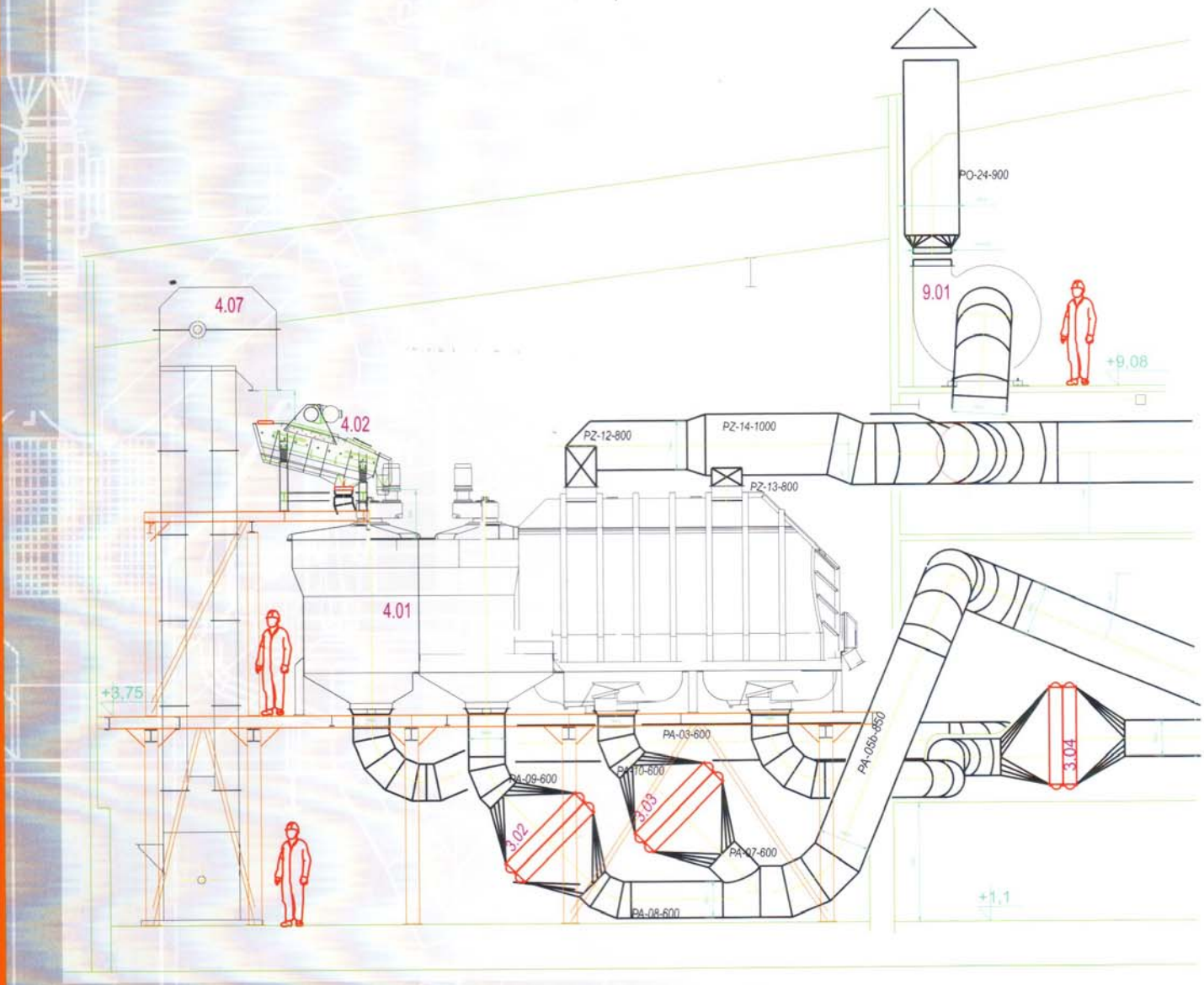
Wet swirl scrubber installed in the sugar Factory Kruszwica S.A., capacity 18m^3/s, made of stainless steal.

Other processes

Fluid bed allows for mixing several granular materials together in order to produce homogeneous mixtures. At the same time very fine particles are carried away by fluidizing gas and the resulting product is less prone to lumping. Fine granular materials can be agglomerated in a fluid bed by spraying agglomerating liquid onto the bed. In a similar way particles can be coated. One can also carry out chemical reactions including calcining. These processes can be combined in one fluid bed apparatus.

Vibro-fluidized bed dryer for calcium phosphate installed in Janikosoda S.A. (CIECH S.A.).

Designing



Part of the factory layout design of the fluid bed drying and cooling installation for white sugar in Factory "Nakło" S.A. (KSC Polski Cukier).

Our offer includes complete designing of installations for chemical or food industry. The project includes planning of all necessary branches starting from mechanical details through the layout of the factory, building structure, details of pipes and piping to the electrical as well as automation branch.

We cooperate with a network of experts offering technical consulting in process engineering, logistic planning or optimizing existing industrial processes.

Our products

Fluid bed dryer for PET and ammonium sulfate manufactured for EKO-PET Ltd. in Kędzierzyn-Koźle.

Fluid bed cooler installed in 2004 in the sugar Factory Maloszyn S.A., capacity 800 t/day. In 2006 the cooler was reallocated to the sugar Factory Strzelin S.A. (Südzucker).

Fluid bed dryer and cooler ready for shipping to the sugar Factory Liepaja in Latvia. Project made in cooperation with **WIEDEMANN POLSKA**.

SF2M-1200 dryer for the sugar Factory Werbkowice S.A. (KSC Polski Cukier). Installation started up in 2005, capacity 50t/hr.

"Underpressure" fluid bed cooler for the sugar Factory Gorodieja in Belorussia, capacity 35 t/hr. Project made in cooperation with **WIEDEMANN POLSKA**.

OMNIKON Ltd.

was founded in 1988. With the expertise in the operation of fluid-bed dryers constructed in Łódź Technical University, our engineers built new fluid-bed equipment for drying and cooling of sugar.
Since 1994, we have introduced to production vibro-fluidised drying and cooling systems, combined dryers and coolers with agitators, fluidised coolers, and recently, vertical plate fluidised units and horizontal plug flow coolers with contact cooling.

The OMNIKON team of specialists incorporates researchers of Łódź Technical University with which OMNIKON signed a "know-how" agreement allowing our company to use results of academic research and pilot-plant systems. The specialists are employed as needed in subsequent projects.

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