

FLUID BED SALT DRYING REDUCING ENERGY COST

Most of the salt production has its origins in the sea, being either harvested directly from sea water or derived from rock salt deposits (former seas which have evaporated many millions of years ago). There are three types of salt extraction: rock salt mining, solution mining (dissolving the salt in water, called brine) and solar evaporation.

Rock Salt Mining

There are many hundreds of horizontal and vertical salt layers across the world. Mines vary in depth from 100 metres or so, to 1 ½ kilometres. There are two main methods of extracting rock salt – ‘Cut and Blast’ mining and ‘Continuous’ mining.

Solution Mining

In the process of solution mining, water is forced under pressure into a bore-hole drilled into an underground salt layer. The salt dissolves, turning the water into brine and creating a cavern in the salt-layer. Controlling the amount of water introduced and the rate of extraction ensures that the size of this cavern is fully controlled, minimising the risk of subsidence.

Ventilex Salt dryer Benefits:

- High energy savings—up to 40%
- Eliminates corrosion
- Reduced wear-and-tear
- Rugged construction
- Long lifetime, reliable dryers
- Low maintenance
- Advanced control strategies
- Accurate product temperature control
- Abrasive materials without excessive wear



Construction of large corrosion resistant Saltdryer in workshop Heerde

The saturated raw brine is then withdrawn and pumped to the purification plant where calcium, magnesium and other impurities are removed prior to the evaporation process.

In the first step of the evaporation process, brine is pumped into the first of a series of vessels which also contain special steam chambers. The heat of the introduced steam causes the brine to boil and water evaporates. This in turn produces further steam and causes salt crystals to grow. These salt crystals and associated brine slurry are fed into a second vessel where the process is repeated (using exhaust steam from the first vessel). Pressures (and boiling temperatures) become successively lower through the evaporators.

The final ones operate under vacuum and enable the brine to boil at much lower temperatures, which is more fuel-efficient. The salt crystals and slurry from the final vessel is fed into a centrifuge to extract more moisture and the resulting undried vacuum salt is then stored in bulk, for supply to the chemical industry.

Salt for food and other uses which needs to be drier, the undried vacuum salt from the centrifuges is fed into the Ventilex fluidized-bed dryers. The salt is then sieved and graded – Iodine can also be added at this stage – before being transferred into large storage hoppers ready for distribution in bulk and bags.

Solar Evaporation

Probably the earliest method of production, producing salt from the sea, involves channelling sea water to flow into natural or man-made basins and allowing the water to evaporate using wind and solar energy. The water evaporates in successive ponds until the brine is fully concentrated and salt crystallizes on the floor of the crystallizing ponds. Solar salt plans must be located in areas of low rainfall and high evaporation rates.

Once the salt 'crop' reaches the appropriate density, the salt is harvested, washed and placed on a stockpile to drain. During this process, salt comes in contact with several impurities and is therefore washed afterwards with brine to get white and pure sea salt containing more than 97% NaCl.

By Product Salt

This is salt which is generated through other industrial processes. Some industries end up with sodium chloride as a waste product and go on to use it for other activities such as de-icing.

Salt industry dries with Ventilex

Salt is marketed in many forms; as a semi-finished product in artificial fertilizer for example but also as sea salt for the food industry. Ventilex supplies Fluid Bed Dryers for the production of salt.

Our installations are tailor-made from stainless steel. For high-grade use all product parts are continuous-welded and polished.

Choosing the correct materials is very important in the production of salt in order to prevent corrosion. The installation is easy to disassemble and clean due to the quick release design and 'Cleaning-in-Place' systems. Ventilex delivers directly to the salt factories but also via engineering companies.

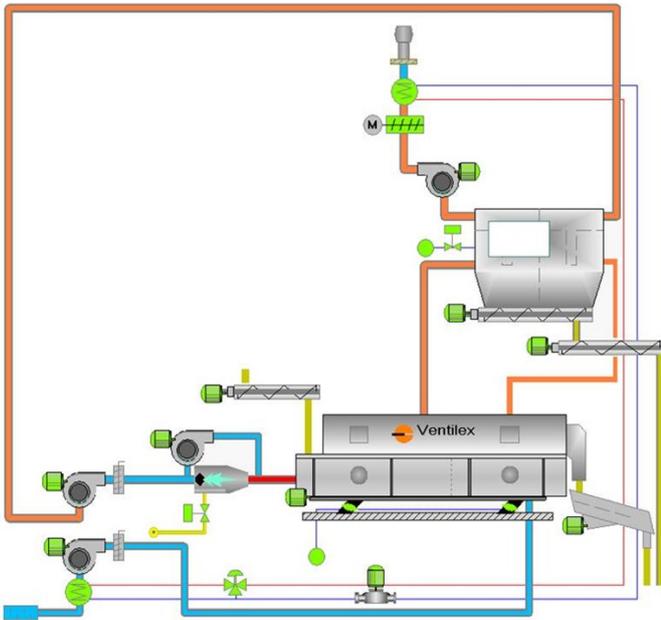
Ventilex has delivered many salt dryers for all types of salts, such as:

Ammonium Chloride NH_4Cl , Copper sulphate CuSO_4 , Hydrohalite $\text{NaCl} \cdot 2\text{H}_2\text{O}$, Hydroxylammonium sulfate $(\text{NH}_3\text{OH})_2\text{SO}_4$, Magnesium Sulphate MgSO_4 , Magnesium Sulphate Heptahydrate $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, Monocalcium phosphate $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$, Potash, Potassium chloride and sulphate $\text{KCl} / \text{K}_2\text{SO}_4$, Potassium chloride KCl , Potassium chloride KCl salts, Potassium nitrate KNO_3 , Sodium carbonate Na_2CO_3 , Sodium Chlorate (NaClO_3) , Sodium Chloride NaCl , Sodium formate HCOONa , Sodium Gluconate $\text{C}_6\text{H}_{11}\text{NaO}_7$, Sodium Sulphate Na_2SO_4 .



How does a Ventilex Fluidbed Saltdryer work

In a continuous fluidbed dryer/cooler a continuous flow of wet granular material is dried and subsequently cooled. Drying of the material occurs by direct contact between the material to be dried and the hot drying air that is blown through a layer of product.



Flow sheet Fluid bed salt dryer with re-circulation of exhaust air from the cooling section in combination with controlled evaporative cooling and heat recovery of the exhaust air .

This cross flow maximises heat transfer from the drying air to the product making this one of the most efficient drying processes. The air velocity of the drying air is adjusted in such a way that the layer of product is maintained in a fluidised state. The same principle applies for cooling, only the cooling is achieved with ambient air or with conditioned (cooled) air.

We know exactly what materials to use to provide equipment that will operate for years whilst handling the most abrasive products. Ventilex has delivered fluid bed dryers in several types of high quality stainless steel alloys.

Whether our customers have their own preference for specific materials being used or based on our own experience, we only deliver a fluid bed build from materials that are up for the job.

In food related salt production corrosion is not the only challenge to be overcome. Everything has to be designed keeping hygiene in mind.

Ventilex can supply fluid bed dryers with food-grade design and manufacturing and on top of that there several extra options are available. Cleaning in place is one of the options that is being used for all food processing Ventilex fluid bed dryers whether it is for salt or not.

Besides the selection of the right materials the shaking motion of the Ventilex fluid bed is unique. The shaking motion is a very gentle way of moving the fluid bed and the product inside. This generates the least amount of stress possible to the product, the equipment and its surrounding. This gentle motion results in low maintenance and low abrasion to the processed product.

Because of the different ways salt can be produced Ventilex is able to provide several options to fully integrate the dryer in to the production process.

In solution mining it can be preferred to clean the exhaust air coming from the dryer by means of wet scrubber. This will generate a saltwater solution which can be fed back into previous stages of the production. In other systems it can be preferred to make use of cloth filters which can feed the salt directly to end product.



Wet scrubber for dust collection

Why Ventilex

Drying systems for salt products can also consume a lot of energy leading to significantly higher operational costs and low margins. Greater wear-and-tear on account of the abrasive nature of the materials being processed also means frequent maintenance and repairs or replacement expenses.

Leading parties in the salt industry have already chosen for a Ventilex Fluid Bed system. It is space saving, energy-saving and there is no product loss. Customers also indicate that their installation and maintenance costs are significantly lower. The shaking forces of the Ventilex Fluid Bed Dryers prevents the product from producing lumps during the process. This is a big advantage in the case of salt installations!

Fluid bed dryers from Ventilex are the ideal solution for the aggregates and minerals industry.

- Our high-efficiency bed dryers typically provide you with 30-60% energy cost savings, the lowest energy consumption among dryer beds. The exhaust from the cooler area can be recycled to the dryer area so that excess heat energy in the product is reclaimed in the dryer.
- Sturdy stainless steel construction backed by European excellence in engineering and manufacturing requires less maintenance.

The state-of-the-art PLC control system offers advanced temperature and humidity controls to deliver optimal processing capacity and quality.



Fluid Bed drying line for sodium chloride

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Fluid Bed dryer for salt, fully automated

