



FREEZE-DRYING OF MILK PRODUCTS

Pfeiffer Vacuum DuoLine™ used for the production of mare's milk granulate

The demands placed on preserving and extending the shelf life of food are becoming ever greater: the process should be gentle, should not alter or eliminate the ingredients of the food and should not require artificial additives. Freeze-drying under vacuum has evolved into an excellent preservation method that meets these requirements.

This method makes use of the physical property of water to pass from a solid straight into a gaseous state under vacuum. This process is called sublimation. During the freeze-drying process, deep-frozen foodstuffs are placed under vacuum and are dried there by supplying heat. This procedure induces that the frozen water in the food does not melt but is released as water vapor. This process is carried out at temperatures

extending to far below -50°C and is one of the gentlest methods for drying food, as the changes to the product are minimal.

One of the most well-known products resulting from the freeze-drying method is granulated milk. Milk lasts longer in granular form and all its valuable nutrients are retained. Beckers Mare's Milk Farm in Leutkirch in the Allgäu region of Germany has been taking advantage of the freeze-drying benefits for 30 years for selling its mare's milk.

Mare's milk is becoming increasingly popular due to its positive properties and valuable nutrients. It is particularly easy to digest, low in fat and rich in minerals and enzymes.



Figure 1: Mare's milk granulate manufactured by using the freeze-drying method

In particular, its high content of the enzymes Isozyme and lactoferrin also makes it attractive for medical treatments. These enzymes are germ-inhibiting and antibacterial, so they are referred to as natural antibiotics. For example, mare's milk is recommended in the case of allergies, eczema, Crohn's disease, metabolic disorders and to improve the immune system to support medical treatment. But it is not just consumed as food; it is also applied in cosmetic products. Mare's milk is regarded as a veritable fountain of youth: the unique combination of various proteins, amino acids, lipids and minerals is ideal for dry, dehydrated and stressed skin.

Mare's milk from Beckers Mare's Milk Farm is processed into granules using a freeze dryer. These granules can then be shipped to order even over long distances without losing the milk's valuable properties.

To produce the necessary vacuum for freeze-drying, the manufacturer opted for a solution from Pfeiffer Vacuum.

Freeze-drying mare's milk with a vacuum solution by Pfeiffer Vacuum.

The freeze-drying plant on Becker's Mare's Milk Farm consists of circular, stacked shelves which are hermetically sealed with a bell jar. The mare's milk is placed on these shelves straight from the freezer at temperatures of about -34°C. Then a low vacuum is created inside the hermetically sealed bell jar. This is done with the Duo 10 M magnetically coupled, two-stage rotary vane pump. It is particularly sturdy and low-maintenance, which makes it highly reliable.

Once the final pressure of about 1 hPa required for freeze-drying is reached, the system heats up the shelves and the moisture contained in the milk sublimates - i.e. it is converted into gas. A large capacitor between the bell jar and the vacuum pump allows this water vapor to condense at up to 60° C. The entire freeze-drying process takes about a day.

Beckers Mare's Milk Farm has relied on its cooperation with Pfeiffer Vacuum for more than 20 years and uses solutions from the vacuum experts for all its freeze-drying facilities.

In addition, service is handled directly by Pfeiffer Vacuum – vacuum solutions from a single source. Production manager Ilka Becker is completely satisfied:
„We appreciate the excellent support offered by Pfeiffer Vacuum and the smooth service.“

The system processes about eight liters of mare’s milk to dry granules every day. In contrast to cows, mares are milked only in the presence of their foals and only when the foal has already been fed. For this reason, the quantities of milk obtained are rather low compared to cow fattening farms, but the method of obtaining the milk is natural and biologically sound.

Benefits of the vacuum solution at a glance:

- High operational safety
- High reliability thanks to sturdy construction
- Virtually maintenance-free
- Compact design for easy, space-saving system integration

This vacuum system guarantees the excellent quality and careful preservation of the mare’s milk. The vacuum solution adopted exactly meets the customer’s demands for reliability, durability and a long service life for the vacuum pump used.



Figure 2: Freeze-drying facilities on Becker’s Mare’s Milk Farm

Figure 3: Pfeiffer Vacuum Duo 10 M rotary vane pump in the freeze-drying facility

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