

Case story

The best hay for **happy, healthy** and **more productive** cattle

Reindl Kältetechnik, Austria

Reindl Kältetechnik uses Danfoss products for hay drying with dehumidifiers.

Many natural products require dry storage. This applies to hops, grain, wood or herbs, as well as hay. When dried, hay acquires superior quality as the staple diet for cattle. To ensure proper drying, the machine builder needs a great deal of experience and expert knowledge.

Reindl Kältetechnik GmbH in Hallwang is one of the largest companies of its kind in Austria. In recent years the company has developed hay drying expertise together with specialists from the agricultural sector. Now the company is a supplier of the core element of drying equipment: the dehumidifier. To ensure customer satisfaction Reindl Kältetechnik looks for maximum reliability in the components used – such as Danfoss refrigeration and VLT® drive technology.

For over 45 years, Reindl Kältetechnik has been making its mark as an innovative and quality machine builder. Besides hay farmers, the clientele includes private customers, catering and industrial sectors and almost all of Austria's supermarket chains. All these different sectors require state-of-the-art refrigeration, cooling and air conditioning technology.



85%

reduction in startup energy consumption is won by using VLT® Refrigeration Drive FC 103 to control the hay dehumidifier.

In the development of hay drying systems for high-quality hay, Reindl Kältetechnik focused on system development and drew upon the help of specialists from other fields in order to acquire the required niche expertise.

“We learned so much about grass and hay,” admits Wolfgang Reindl, refrigeration industrial engineer and managing director of Reindl Kältetechnik, “before getting a grip on the dehumidification process.

There were also a few surprises concerning the raw materials, and they had to be taken into account during the processes.” Indeed, now the installations are working with maximum reliability, are user-friendly, extremely energy-efficient, and can be optimally adjusted to the size of the company.

The dehumidifiers are available in a total of seven performance ranges.



Centrepiece of the installation: optimal dehumidifying and reliable service

In the dehumidifier, which in theory works like a big heat pump, the first heat exchanger removes the moisture

by cooling the air, and collects the water on the ground. A pump then removes the water from the system. In the second heat exchanger, the dehumidifier heats the air again to increase its absorption capacity for water va-

Hay drying machinery – advantages for farmers and cattle

But why a hay drying machine? Hay is the foundation of cattle feed in the colder seasons. The more carefully the farmer can dry the hay, the better its quality will be. The quality also depends on the exact time of the harvest. If the hay harvest is not timed exactly, the yield of the dairy cattle can decrease from 15 l/day to 5 l/day.

Machine hay drying provides a range of advantages:

- The harvesting process is less dependent on the weather, and therefore easier to plan.
- More of the nutrients remain preserved in the hay whereas additional feeding with concentrated feed significantly reduces them. This is a considerable cost advantage of machine-dried hay.
- The animals are also healthier, the vet bills lower and the milk production the same as for the winter feeding.
- The quality of the hay is clear to be seen: even after drying, it preserves a colour and smell that makes it seem freshly mown. This

also attests to the hay’s nutritional value: The hay dried with the Reindl product reaches 7.2 NEL - an absolute peak value.

Also on the technological front, there are definite advantages to be reaped from hay drying with the Reindl Kältetechnik dehumidifier:

- On many farms, only limited power is available. Using the VLT® frequency converter, Reindl is able to limit the inrush current efficiently despite full torque at power up.
- The overall control, which is optimally adjusted to the size of the operations, ensures higher energy efficiency, for example by controlling the ventilation flaps at the intermediate floors.
- Via ventilation flaps, installations can use or offset the various temperatures depending on the outside temperature and the amount of sunshine, in order to achieve the best possible process.
- Using the lost heat and process heating to warm the dry air increases the efficiency of the system further.

Structure of a hay drying system

After mowing, once the grass has been lying for a short while in the fields, the farmers bring it into the barn. A distinction can then be made between the hay that remains directly in the dryer, which then serves as storage at the same time, and that which is subsequently relocated for contracted drying. In the hay dryer, the hay lies on an air-permeable intermediate floor, through which the dry, warmed air travels and then rises up throughout the hay. The air absorbs the moisture released by the gas. Via ventilation flaps, the now moist air reaches a further intermediate floor under the roof, which takes it to the dehumidifier.

Due to the sophisticated airflow system, high drying rates and high process efficiency are achievable. The centrepiece of the entire system is the dehumidifier, the design of which has a definite effect on the function and efficiency of the system. Here, Reindl primarily calls on his invaluable knowledge of the processes which occur during drying, to guarantee a seamless and lastingly effective service.

pour, and blows it back into the cycle. Heating of the facilities is performed using heat lost from the scroll compressors of the heat exchanger with its refrigerant, in addition to a further heating device, depending on the size of the facilities, season and outside conditions. The process starts at temperatures around 22°C, and quickly reaches 42°C. The temperature should not rise any higher, since otherwise the useful substances in the hay are destroyed and the quality and nutrient quantity drops significantly.

Reindl Kältetechnik trusts Danfoss products

The Danfoss scroll compressor is ideally suited for dehumidifying hay. "We have looked closely at a number of compressors, but only the Danfoss unit fulfilled the requirements that we set," Reindl says. A VLT® Refrigeration Drive FC 103 frequency converter provides the motor control. This frequency converter is especially adapted to cooling applications and speaks the language of the refrigeration engineers. The other components, such as the oil separator, expansion valve and display unit also come from the Danfoss range

of refrigeration products. "The frequency converter is extremely robust and protects itself even under adverse conditions. We have therefore had no breakdowns until now, even in bad weather, overvoltage or with a weak local network," Reindl says, explaining why he opted for the VLT® drive. "It switches off in time and then starts up again and resumes its functions." Reindl Kältetechnik put its trust in the Danfoss products from the outset, both for the refrigeration components and now also for the torque control drive.

Extensive knowledge and the best components for reliable systems

Wolfgang Reindl has invested long experience and technical ability into developing and testing a dehumidifier for hay drying, which is now perfected and of high quality. "Reliable machines make satisfied customers. On top of that there is an advisory service, and – of particular importance to us – first-class service, even after sales and installation," said Reindl, explaining the company's philosophy. "High-value components, such as those from Danfoss, are therefore also of benefit to us."



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In the dehumidifier, the first heat exchanger extracts moisture by cooling air, and the water collects at the bottom. The second heat exchanger reheats the air and increases its capacity to absorb water vapor.



The frequency converter reduces the starting current, so there is no need for the supply utilities to scale up.





VLT® Refrigeration Drive FC 103 – the frequency converter for chiller systems

In an optimised cooling system, smart regulation of the speed of the many compressor and condenser fans is crucial. The VLT® Refrigeration Drive FC 103 has special properties for this field. It is optimised to adjust the performance of the refrigeration pumps, compressors and other equipment, to ensure a continuous supply of temperature-regulated process air.

When the dehumidifier is controlled by the VLT® Refrigeration Drive FC 103, the hay dryer achieves a 85% energy saving advantage during start-up, over a dehumidifier running direct-on-line (DOL).

The drive is available in the protection classes IP20 to IP66. It provides a standardised user interface and covers all the power ratings between 1.1 and 630 kW. For hay drying, it is sufficient to use a power range of 2.2 to 55 kW in the IP66 enclosure type, for partial protection against adverse conditions on the farm.

Although the drive can regulate the speed to the demands of the installation for continuous power tuning, the speed input is restricted here to three levels, to ensure simple system operation. Farmers can however, if they are so inclined, also adjust the preset speed for their specific system themselves. The desired speed can be specified through preselection and the control then outputs this in the form of a 0 - 10 V voltage level on one of the analog inputs of the frequency converter.

To ensure simple commissioning during the building and testing phase, Reindl Kältetechnik tests all systems prior to delivery in the company-specific test facilities. A graphic, alphanumeric VLT® Local Control Panel LCP 102 operating device is used for programming. In addition to the displays in clear text, with typical sizes for refrigeration engineers in the display, it offers simple parametrisation and extensive diagnosis functions.

Right from start up, the frequency converter reduces the starting current. Via optimal adjustment of the voltage, it ensures a start from zero speed for maximum torque, and limits the starting current.

For farmers, this means that their energy provider need not oversize the power supply so that it has to take current from one of the multiple current ratings. In many regions hay drying is therefore not permitted, without starting current limitation by the electricity utility. This also saves the farmer costs that would otherwise be due for the higher power supply.

Reindl Kältetechnik GmbH – Reliable solutions and innovative technology

Reindl Kältetechnik is a family business steeped in tradition. It is now in its second generation and has been providing private customers, caterers and industry with state-of-the-art refrigeration, cooling and air conditioning technology for 40 years. The core geographic markets are in particular Salzburg, upper Austria and neighbouring Bavaria. However, customers from eastern and southern Austria also turn to Reindl Kältetechnik for its expertise.

In addition to the quality of the products, the company also guarantees first-class service. This includes fast customer service available around the clock, a well-arranged spare parts depot, competent partners in all sectors, and the swift transmission of new and efficient technologies to the customers. The workshop also provides courses and further training. This is how the specialist company has trained apprentices since it was founded. With Reindl Kältetechnik, users can always be sure that they are putting their trust in the most efficient cooling and air conditioning solution.

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