German dairies choose ice water silos

By Pontus Holmström

The Scandinavian dairy industry has a tradition of using ice as cooling medium. In the 19th century ice was collected from frozen lakes during the winter and stored until summer in stacks insulated by layers of sawdust. Up to 10,000 tonnes of ice were stored annually at the biggest dairies, and the practice gained almost industrial dimensions: Sweden even exported ice blocks to the USA for the ice boxes of the New Yorkers.
As natural ice was gradually replaced by artificially frozen ice the Swedish dairy industry pioneered with the development of the so-called ice bank system. Straight pipes made of iron or galvanised tube material and joined together in a rib pattern lay submerged in water in basins, usually made of concrete. Even at that time the cooling medium was ammonia and the tube diameter was normally 50 mm. With an evaporation temperature of approx. -10°C an approx. 40 mm ice layer was built up overnight on the tubes. The advantage of this system was – and still is – that cheap electricity could be utilized during the night and thus the dairy's electricity requirement could be spread over a 24-hour period. By means of stirring, the water in the basin was cooled to approx. +1°C and then pumped during the day to various heat exchangers in the dairy. The tepid return water melted the ice in the basin so that the temperature of the ice water was lowered to +1°C.

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Ice water silos

In the late 70s Finnish Tankki OY introduced a new ice accumulation concept. Erkki Rantala – one of the founders of Tankki and a former cooling technician in the dairy industry – found it natural to draw in this new concept to complete the product range offered by his company, which had specialised in the manufacturing of stainless tanks for the dairy industry. Tankki OY's concept implied that one or several evaporator coil elements made of stainless 40 mm tubes were submerged in a stainless insulated silo tank with largely the same outer configuration as conventional milk silos. Otherwise, the principle is roughly identical to conventional ice water systems. However, Tankki OY's concept offers a multitude of advantages. For example, a more efficient ice melting process is obtained owing to the efficient stirrer built in at the centre. The result is a lower output temperature than in conventional basins, eg +0.5°C, which is very important for achieving the lowest possible temperatures in the cooling section of the pasteurizers. The electricity consumption to the stirrer function in Tankki OY's concept is lower than in conventional systems.

Appreciated by dairy designers

Small space requirement and flexibility are other advantages appreciated by dairy designers. Eg when Ingman Foods' new yoghurt and ice cream factory was built outside Helsinki a year ago no other solution than ice water silos was even considered. Elegant design solutions can be obtained, which not least Finnish dairy architects have shown, and space-consuming basins, which will gradually become difficult to clean, are eliminated. It is therefore natural that all dairies built in Finland in the 70s and 80s were designed as ice water silo dairies, and that worn-out coils have been replaced in conventional basins by the new concept.

Hygienic advantages

The demand for hygiene in the dairy industry is constantly increasing and, obviously, this also affects process media, such as ice water. New regulations have been adopted for the dairies to observe. The EC and the Scandinavian food administration agencies today demand that ice water meets the standard of drinking water, both chemically and bacteriologically. In practice this standard cannot be met using large surface concrete basins, often placed outside and with coils which in time are attacked by corrosion. Although the basins are cleaned now and then it is obvious that they are no longer up to the hygiene requirements of the dairy industry. Among others, the German dairy industry has reached that conclusion and consequently Germany has become Tankki's best market for ice water silos. So far 18 complete prefabricated ice water silos have been supplied from Tankki OY's factory in central Finland by truck and ferry to various parts of Germany, particularly Bavaria.

Why ice water silos in Germany?

To establish the reason for the sales success in Germany this author visited a number of dairies in Bavaria some time ago and found that the cooling plants were adequately dimensioned, and the installations were well-equipped and well-designed from a technical point of view. It is generally held by German dairymen that the dairy's cooling plant is too important for compromise. Germany is characterised by a free market with extremely tough competition, particularly when it comes to yoghurt and other specialty products. All over the country supplies are made to large retail chains ac-

cording to the JIT principle (Just-In-Time) and this calls for reliable supply: a breakdown of cooling capacity could be disastrous for the dairies' production planning. Therefore German dairy experts regard the cooling plant as part of the infrastructure where reliability comes first and where the period of amortization of the equipment is calculated according to different principles than those applying to ordinary processing equipment.
Hygienic aspects were another argument. The dairies are well aware of the authorities' requirements on water quality in ice water systems and will do their best to comply.
Energy consumption is also a significant factor; in Germany the dairy industry is very energy conscious and cooling plants are dimensioned to allow optimum utilization of cheap night electricity. The price of electricity is somewhat higher in Germany than in the surrounding European countries. Mention was also made of the small space requirement and the flexibility, or the fact that the entire ice water silo can easily be moved, should a rearrangement of the process facilities or removal to another site become necessary.
A prestigious order was recently won as the government research and development dairy Weihenstephan in Bavaria ordered two ice water silos with volumes of 130 m^3 per tank, a total tube length of 5,300 m per tank and with an accumulation capacity of 4 million kcal per tank, which is equivalent to 50 tonnes of ice. Tanki OY and their competent representatives in Germany, Anlagenbau Haas GmbH in Chieming, Bavaria, should be congratulated! ■

Delivery to Neuburger Milchwerke, Germany.

Delivery to Karwendelwerke Buchloe, Germany.