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Minimizing Thawing Loss in Food Production

The controlled thawing process developed by Kometos ensures product quality and an energy-efficient process.

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How to minimize the thawing loss in food production?

The most critical phase of the freezing process is thawing, during which a significant transition occurs from ice crystals to liquid water, along with the reactivation of microbes.

To ensure product quality while minimizing microbial growth and yield loss, the thawing process for meat, seafood, vegetables and berried, and various bakery products must be carefully controlled to preserve the product's structure.

Kometos' controlled thawing technology ensures high product quality and energy-efficient operation.

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What does controlled thawing mean?

Kometos' controlled air circulation-based thawing system prevents the surface temperature of the thawing product from rising too high, maintaining quality while minimizing the loss due to cell structure degradation.

Controlled thawing means precise regulation and monitoring of the thawing temperature according to the product's characteristics, without damaging its surface structure. The thawing process relies on controlled air flow, heat, cold technology, humidity, and the product's 'ice bank.'

Energy is used to heat the processing area and to change or maintain the temperature, not to heat the product itself. If the facility has a heat recovery system, we take advantage of waste heat.

The system using an intermediate fluid reduces energy consumption and optimizes process cost-effectiveness by utilizing condensation heat through a heat exchanger or air.

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Why is it necessary to control thawing?

Breaking the cellular structure of food during the freezing or thawing process reduces the quality of the product and increases losses. Controlled thawing keeps the surface cells intact, minimizes the loss of trace elements and water-soluble proteins, and reduces microbial growth.

The quality of the food remains at the level of fresh products, and waste is reduced. For example, the cellular structure of meat remains intact, microbial growth is kept to a minimum, and the product retains its natural moisture.

Thawing loss reduction has a positive impact on the system's payback period, and an efficient thawing system supports production planning.

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The difference between thawing and tempering

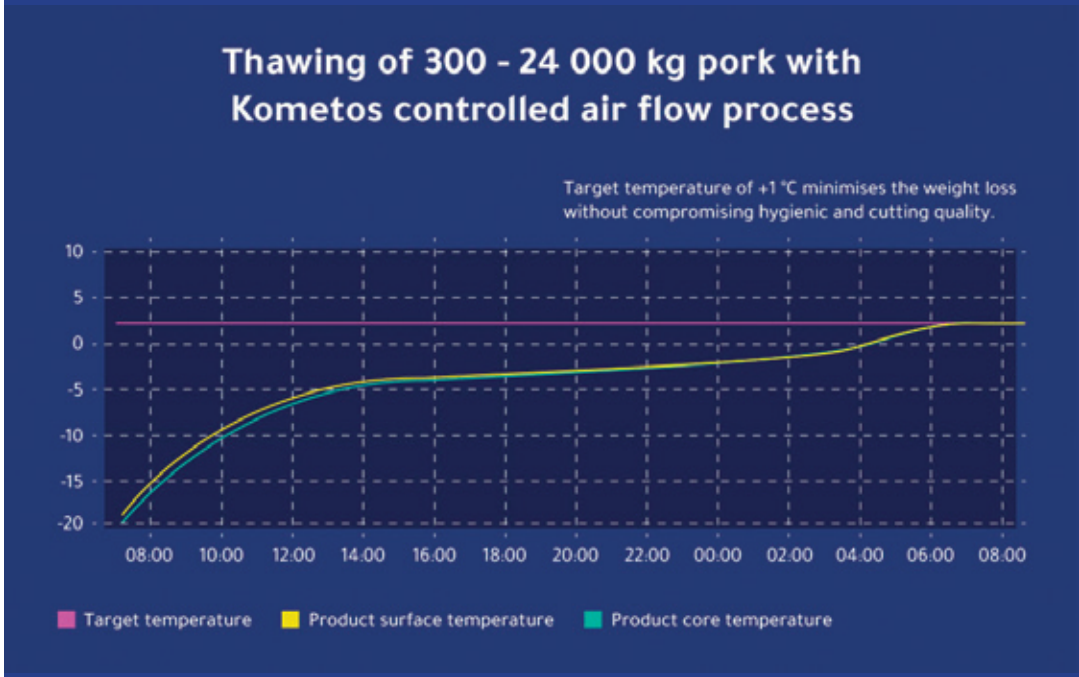
With Kometos' system, food can be both thawed and tempered. Both processes are important to ensure food quality and safety.

Thawing to zero degrees Celsius or above restores the food to its original form.

Tempering ensures the food reaches the optimal temperature for further processing without damaging its structure. For example, when tempering meat, the product's temperature is raised from -20 degrees Celsius to -5 degrees Celsius after freezing.

Well-tempered products achieve a more consistent result during further processing, such as slicing and cutting.

In Kometos' thawing process, the batch size is not a limiting factor - whether processing 300 – 24 000 kg of raw material, the process remains consistent, highly efficient, and ensures equally high-quality results.



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Energy efficiency and energy savings of thawing

Kometos' heat exchanger system is a long-lasting and eco-friendly option, with significantly lower operating costs compared to traditional electric thawing systems. The payback period can be as short as a year.

Our developed double-blowing system allows simultaneous thawing of different products. Adjusting the airflow direction and speed ensures an even temperature result throughout the thawing room.

The energy efficiency of the thawing process is particularly emphasized when compared to microwave, radio wave thawing, or cold water thawing, which result in 4–6% weight loss in addition to energy consumption.

Our customers' goals for the investment have included more efficient process control, minimizing drip loss, production growth, and simultaneous thawing of various products with different compositions. The system's ease of use has also been praised.

> "Within just a couple of months, we managed to improve thawing time and reduce drip losses to less than 1.5% using Kometos' thawing solution."
>
> **– Production Manager, Lerøy**

Example of Energy Savings with Kometos Heat Exchanger

- **Capacity: 60 kW**
- **Processing time: 12 hours per thaw**
- **Operating days per year: 250 days**
- **Electricity price: 0.35 €/kWh**

Annual Energy Consumption:

- **60 kW x 12 hours = 720 kWh per day**
- **With efficiency of 50%: 360 kWh per day**
- **360 kWh x 250 days = 90,000 kWh per year**
- **90,000 kWh x 0.40 € (including transfer tax) = 36,000 €/year**

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Defrosting Equipment Payback Calculation

Based on Kometos Thawing System for 15 pallets (MTC-15)

Capacity per Shift	9 000 [1]	kg / 8 hours
Number of Shifts per Day	1	3 shifts, 8 hours per shift
Weekly Capacity	45 000	5 days per week
Annual Capacity	2 250 000	50 work weeks per year
Process Electricity Consumption	890	kWh per shift
Price per kWh [2]	0,30	EUR / kWh
Process Cost	267,00	EUR / process
Annual Process Cost	66 750,00	EUR / process per year
Loss with Traditional Method	5,0 %	Typically 4-6% when thawing from -20°C to -2°C
Loss kg/year	112 500	kg
Loss with Kometos Method	1,5 %	Typically 1.5-2% when thawing from -20°C to -2°C
Loss kg/year	33 750	kg
Price per kg [3]	8,0	EUR / kg
Savings per kg	78 750	kg
Savings EUR/year	630 000	EUR
Total Savings per Year	563 250	Savings - process costs (electricity)
Investment Cost MTC-15	170 100	EUR
Payback Period	0,3	year
Note		Products in E2 boxes or cardboard boxes + separator grids between layers

[1] Variables marked in yellow.
[2] The price per kWh depends on the region. In this example, the electricity price in Finland has been used.
[3] The price per kg depends on the product and region. In this example, the producer price of beef (sausage material) in Finland has been used.

Additionally, there are cost savings in labor expenses (automatic process control) and product quality after the thawing process.

Want to learn more? Contact us

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Kometos Oy
P.O.BOX 97
FI-61801 KAUHAJOKI
FINLAND