QualiFish

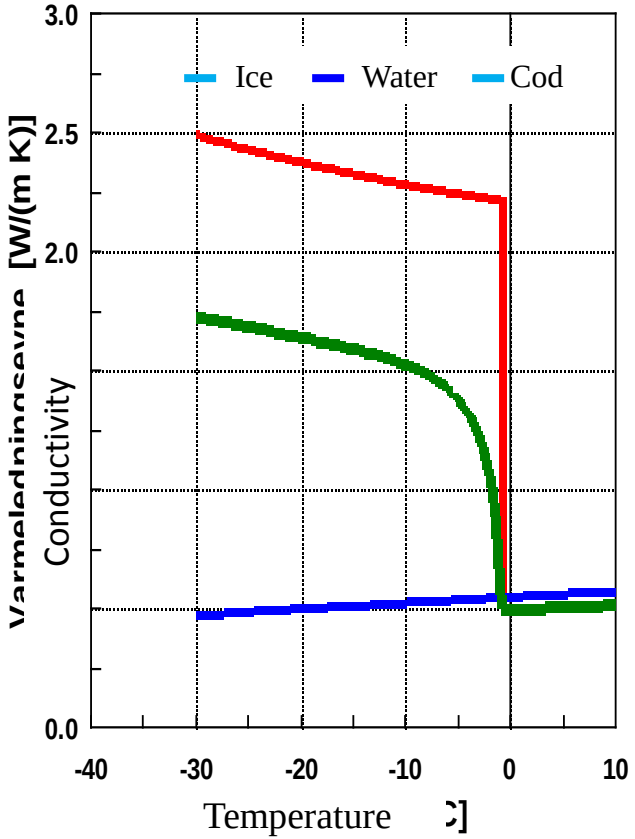
Thawing challenges in the industry

Tom Ståle Nordtvedt, SINTEF
Support from Ingmar Jensen, Melbu Systems

Why freeze and then thaw?

- Secure and steady supply of raw material
  - utilise process equipment better
  - improve production planning
- Profit margin
  - strongly dependent on price fluctuations of raw material
- Simplified production
- Improved quality
  - when transportation is time consuming
- Reduced transportation costs
  - 30% of the cargo load is ice, when fresh fish is transported

Thermal characteristics of fish



Conductivity

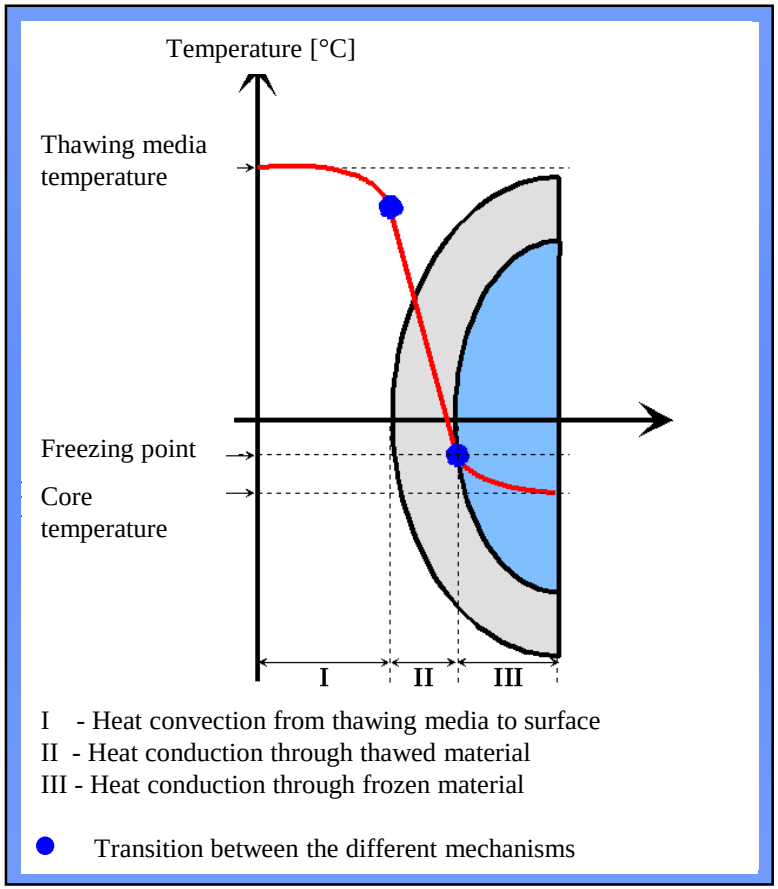
- Thawed fish meat has lower conductivity than frozen

⇒ During thawing an insulation layer is formed and total heat conductivity is reduced

Thawing - opposite of freezing

Transferring energy to the product

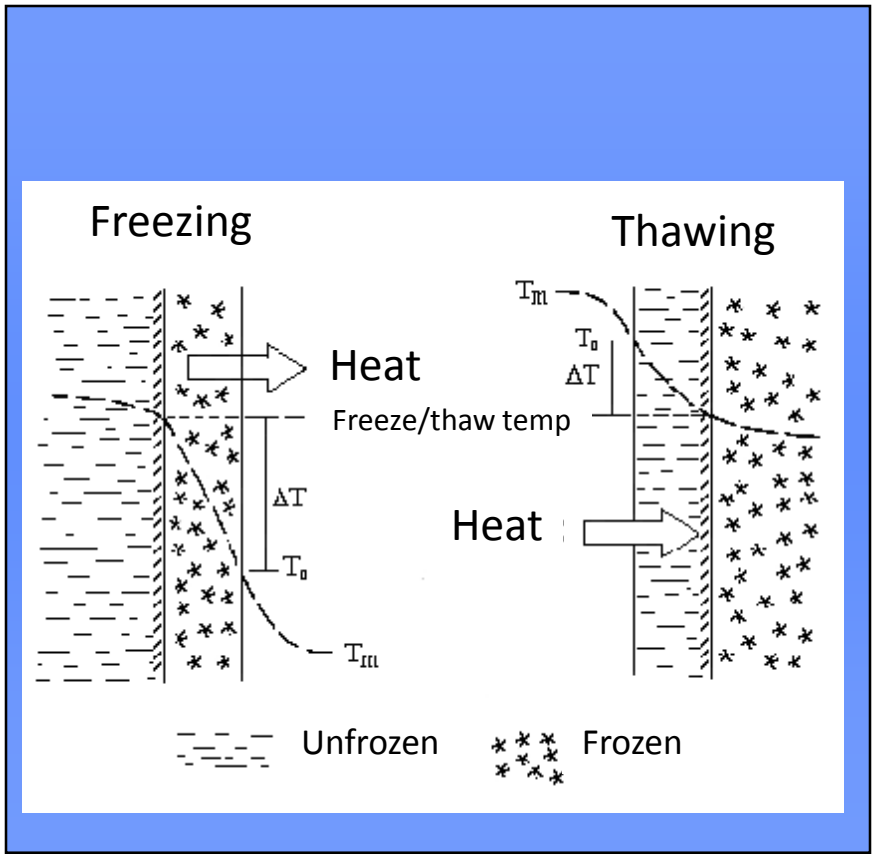
- **Due to a temperature difference:**
  - **Energy is transferred from the thawing media to the product surface**
    - Heat transfer coefficient, depending on: thawing media, temperature and velocity, and product surface conditions
  - **And led through to the core**
    - Conductivity, depending on product composition and temperature
- **Higher surface area pr. volume benefit the thawing process**



Thawing - opposite of freezing

But more difficult:

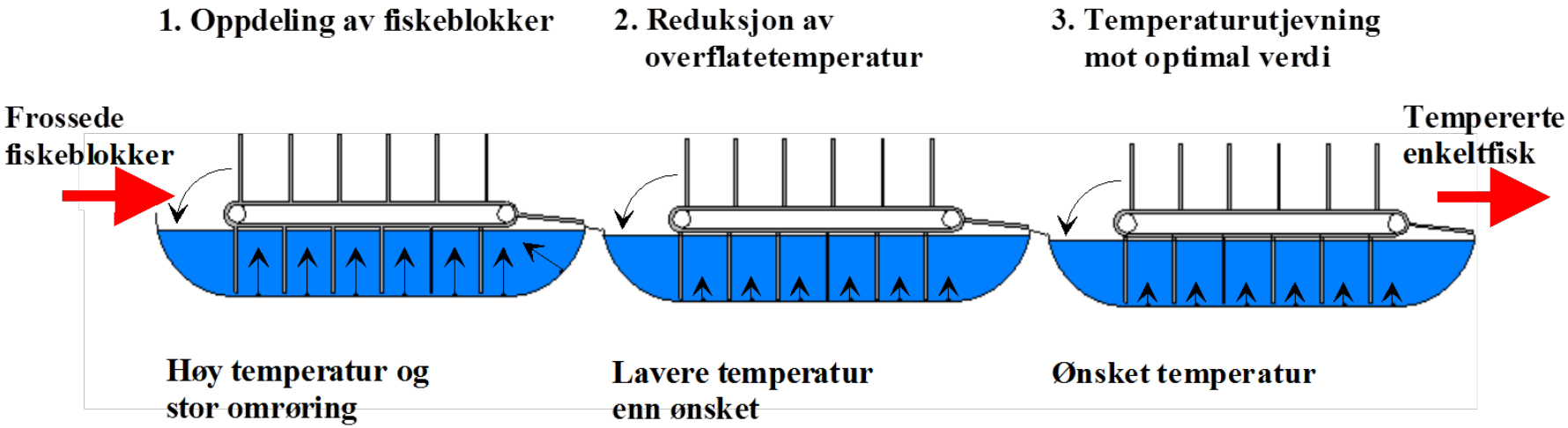
- Temperature difference product - thawing medium lower to ensure products quality.
- Thermal conductivity of product lower for the thawed material.
- When is the product thawed?
  - What mean temperature.
  - How long thawing period.



Thawing methods

- Water
- Forced air or still air
- Electric
  - Vacum
  - Microwave
  - Radio frequency

Industrial thawing of block frozen fish - Controlled process



- Increased yield
- Increased quality
- Less labor demanding
- Even and higher capacity
- Reduced water demand

Thawing methods used in Norwegian fish industry

- Immersion in tanks
- Tanks with controlled water-current an temperature (size 20 – 50 tons)
  - Rectangular tanks (Long with rectangular cross section, in and out at the end)
    - Challenges: Even watercurrent and temperature, transport of fish)
  - Cylindrical tanks: High, in at the top and out at the bottom,
    - Challenges: Splitting of the blocks, division between thawed and non thawed
  - Sector dived tanks (with rotating chambers): Dived batch, first in first out, near continues thawing
    - Challenges: Control of water-current and temperature in each chamber.

Thawing of fish

Melbu systems
www.melbusystems.no

Optimarstette AS
www.optimarstette.com