CO₂ Hydrate Slurries for Rapid Chilling of Fresh Food Product

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The idea
The idea arose in 2008
The system

- Fluidized bed heat exchanger
- Shell & plate heat exchanger
- Control cabinet
- CO₂ mixer
- Refrigeration
- Hydrate storage
- Hydrate tap
The system
The system

7 kg/h CO₂ gas
18 l/h wet slurry
The measurements

- Shock chilling cold air
- Immersion with CO$_2$ hydrate
- Immersion with ice water

Hypothesis

Quick chilling in CO$_2$ hydrate slurries will:
- Reduce number of pathogenic micro-organisms
- Reduce weight loss
- Slow down growth micro-organisms due to CO$_2$
The results

Quick chilling products
- Faster compared to air
- Equal to ice water
For pork an increase in
• 1 day shelf life measurements
• > 2 days by modelling
The results

For chicken:
- Equal to air
The results

- Energy saving compared to air cooling 42%
- Reducing weight loss 2% = € 0.04 / kg meat
- Extra costs CO$_2$ €0.01 / kg meat
- Increased shelf life
Further R&D

Research

- Description of flashing hydrates
- Break apart hydrates
- Mixing CO$_2$ in solution after standstill
- Prediction growing characteristics of hydrates on surface heat exchanger
Future research

Development

a) Reliable secondary system

b) Corrosion problems

c) Separation hydrates from water

d) Direct spraying hydrates on products
My question:

Do you believe in CO$_2$ Hydrate Slurries for Rapid Chilling of Fresh Food Products?

Your questions