

Use of transcritical CO₂ in industrial applications



19 & 20 April, 2016 - Barcelona





Why CO₂ in industrial?



- Commercial needs customer needs it ...
 - Customers want natural solutions (NH3 not always wanted)
 - Customers want non-toxic solutions
 - Customers want lower first cost and lower running cost

Technical features

- New components with larger capacities (compressors, valves)
- Already industrial design (welded steel frames, steel pipes)
- CO_2 will substitute NH_3 below 1 MW and HFC is not relevant
- Solutions
 - DX, flooded, secondary and combinations hereof
 - Heat reclaim, AC, hot-gas defrost



Where we are coming from and going to ...

From ...

- Refrigeration in supermarkets
- Standard products
- Lower capacities
- 10% of turnover on industrial

То ...

- Customized systems
- Larger capacities
- 20% turnover from industrial in 2017









DX CO2

- DX evaporators
- Cold storage
- Logistic centers
- Food factories









Pumped CO2

- CO2 pumped to evaporators
- For high evaporation temperatures
- Food factories, storage, perishable food
- Plate freezer, spiral freezers (LT)





Pumped secondary fluid

- For indirect applications at factories •
- Plate freezer, Ice rink .
- Chillers for industrial applications •
- Brine module can be attached to a • standard Advansor booster CO2 system





solutions for europe

EUROPE Sphere natural refrigerants

Energy consumption (Barcelona)



Hot gas defrost – easy and fast







Ice rinks system

https://www.youtube.com/watch?v=Te7uye41qCY

Industrial presentation

• <u>https://www.youtube.com/watch?v=8zd2n5eXQjQ&sns=em</u>



Case story: Mussel factory DK

The Advansor CO2 solution was designed to provide:

- Freezing for storage of ready meals
- Cooling for storing of fresh mussels
- Chilled sea water (glycol loop) for cooling during processing
- Heating of office spaces and tap water



Stig Wittrup (co-owner):

"Our expanding business required new production facilities and larger storage rooms. An essential part of our production line requires process cooling and our focus was of cause also on energy consumption"











- Packs and processes fresh blue mussels for export and retail.
- The company yearly produces about 4000 tons of mussels and occupies about 30 employees.
- Wittrup Seafood A/S is mainly self-sufficient in mussels. The company commands a fleet of 4 ships and has fishing licenses for the Isefjord on Zealand and the East coast of Jutland.



- Qualified Danish Advansor partner providing industrial thermal systems including cooling systems and heat pumps.
- Purely offering systems with natural refrigerants
- Employs 40 refrigeration specialist



Advansor solution

- Advansor L4x3-2R
 4 Bitzer MT compressors, 120 kW @ -10°C
 3 Bitzer LT compressors, 58 kW @ -35°C
 2 x 130 litre receivers
- + Heat recovery for space heating
- + Separate chiller module (glycol/seawater +2/-2°C)



"We found it attractive to be able to utilize also the waste heat for heating purposes and were even granted with a subsidy from the local energy provider by choosing this solution" S. Wittrup





ADVA



Heat recovery space heating and tap water

Chiller module +2/-2°C

MT 120kW @-10°C LT 58kW @-35°C



Processing



Own ships





Storage tanks for fresh mussels before processing



Freezing room for storage of frozen ready meals

Cold storage for fresh mussels















Conclusions



- 6% lower energy consumption than HFC (expected)
- Lower running costs
- Typically HFC is no longer wanted
- Alternatives to NH3 for small medium sized needed
- Our industrial team working on (examples)
 - 3.2 MW vegetable factory
 - 200, 500, 950 kW warehouse
 - 200 kW ice rink
 - 600 kW professional kitchen
 - 1.2 MW food factory



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Thank you very much!