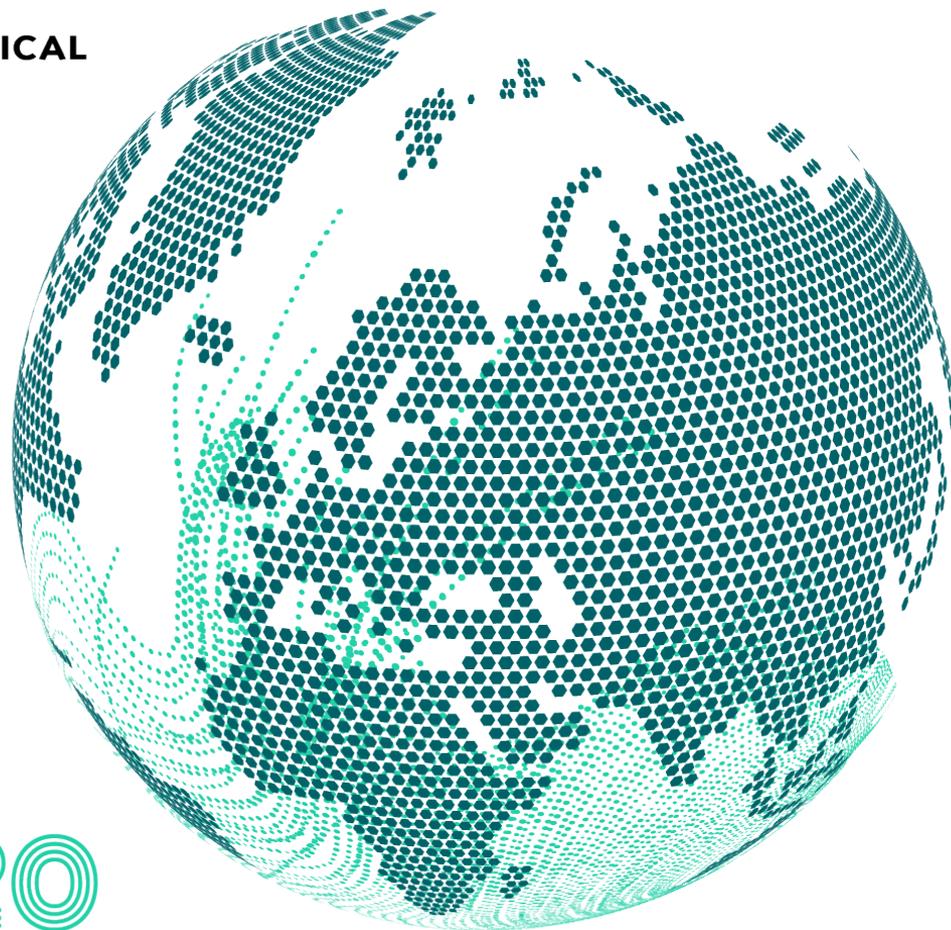




DANISH
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ONLINE

23-24/06/2020



Policy measures on F-gasses How did we respond?

Danish Technological Institute

Response on taxation (2001)

Contractors

- Chock
- Bewilderment
- Workaround?
- Possibilities?
- Hmm, there might be business potential here...

Supermarkets

- Chock
- One major leak and I am done!
- Chains: We are all in same boat
- How do we comply and minimise cost?

Today: We work on green solutions together!

Combined brine and cascade CO₂/ propane 1999



Propane compressor

Brine pumps

CO2 compressor

Ventilation duct

Receiver

Oil separator + IHX

Top: IHX

Left: Brine cooler with ex. valve

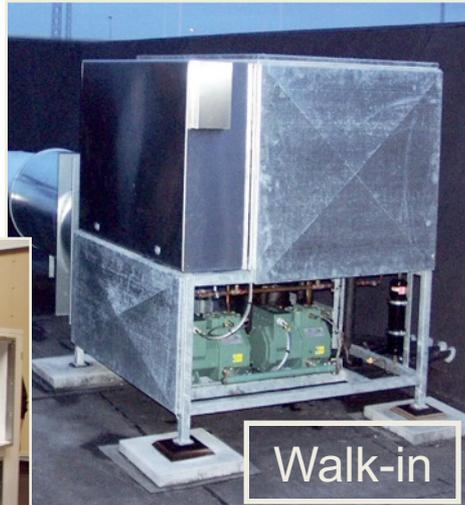
Right: Cascade HX with ex. valve
and 4 pcs. stop valves

The first: "Lokal Brugsen"





"Natural case" 2003, PR stunt?





We did not do it alone! - local initiatives, but:

International knowledge transfer / global supply chain

- Sweden
- Norway
- Italy
- Germany
- Japan
- China
- etc



Out on a limb! 1

Environmental Impact	[Color scale: Green to Orange]							
System type / Refrigerant	H ₂ O	NH ₃	CO ₂	HC	HFO	R32	HFO/HFC	
Plug in/ Monoblock/ Water loop								
Heatpumps Domestic								
Heatpumps Industrial								
Chillers small HT, MT, LT								
Chillers big HT, MT, LT					?			
Split units and Air to air Heatpumps								
Condensing Units					?			
Packs Commercial								
Packs Industrial								
Air Handling Units Integral AC								

Natural >< Synthetic

Low < Environmental Impact > High

Out on a limb! 2

First cost (relative per type)		Green	Yellow	Orange	White	White	White	White
System type	Refrigerant	H ₂ O	NH ₃	CO ₂	HC	HFO	R32	HFO/HFC
Plug in/ Monoblock/ Water loop				Red	Green			Yellow
Heatpumps Domestic				Orange	Yellow		Green	Green
Heatpumps Industrial		Orange	Yellow	Orange	Green			
Chillers small HT, MT, LT		Orange	Red	Red	Yellow		Green	Green
Chillers big HT, MT, LT		Orange	Orange	Red	Yellow	Green		
Split units and Air to air Heatpumps					Green		Green	
Condensing Units				Orange	Red	Yellow		Green
Packs Commercial				Green				
Packs Industrial			Yellow	Green				
Air Handling Units Integral AC				Yellow	Yellow		Green	Green

Natural <> Synthetic

Low < Environmental Impact > High

Out on a limb! 3

Cost of ownership (relative per type)		Green	Yellow	Orange	White	White	White	White
System type	Refrigerant	H ₂ O	NH ₃	CO ₂	HC	HFO	R32	HFO/HFC
Plug in/ Monoblock/ Water loop				?	Green			Yellow
Heatpumps Domestic				?	Green		Yellow	Yellow
Heatpumps Industrial		?	Green	?	Yellow			
Chillers small HT, MT, LT		?	?		Green		Yellow	Orange
Chillers big HT, MT, LT		?	Green	?	Yellow	?		
Split units and Air to air Heatpumps					Green		Yellow	
Condensing Units				?	Green	?		Yellow
Packs Commercial					Green			
Packs Industrial			Green	?				
Air Handling Units Integral AC					Green	Green	Yellow	Yellow

Natural >< Synthetic

Low < Environmental Impact > High



Together we can do better!

Now we have:

- revised standards
- a common goal
- better vocational training
- a network for refrigeration professionals

We can make Green Solutions even better!



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Thank you
for listening!

