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natural refrigerants

19 & 20 April, 2016 – Barcelona

OUH 1912  
2012  
2021  
ODENSE UNIVERSITETSHOSPITAL





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## A cold room for sample tissues

A -80°C freezer at Odense University Hospital, Denmark

## In the past

Each department had their own low temperature chest freezers.

Disadvantages:

- Take up space which is an issue in an hospital environment.
- Create heat loads
- Have low efficiency
- Are expensive
- Have high repair/maintenance costs
- Lost of samples as no monitoring of working environment



## Need for an extra low temperature cold room

A new low temperature storage build for Odense University Hospital

- Floor area 352 m<sup>2</sup>
- Room height 2,5 m
- Room temperature -80°C
- Storage: Sample tissue
- Energy cost saving: ca. 2 mill. DKK/268.300,00€/year



The refrigeration system used is a cascade system using R170 (Ethane) and R717.

It runs on a fluid similar to what is used in the arctic regions for cooling radar systems.

## Our proposed solution

- Refrigeration system
- Backup system
- Electrical installation including controls
- Insulation panels, light, doors and floors
- Clothing suggestion
- Specified working conditions for employees

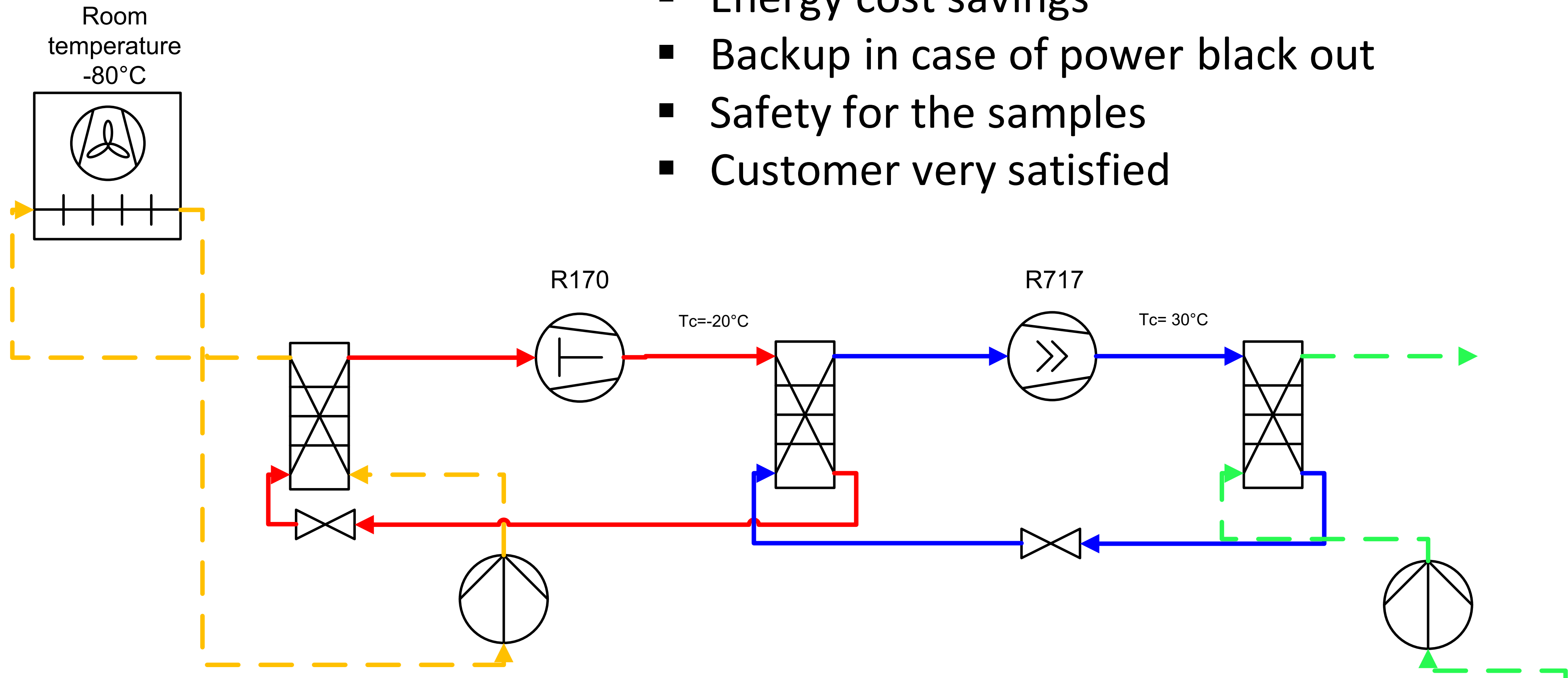
The low temperatures were a challenge

Normally the samples are frozen in small freezers in the departments



## Cost Analysis & result

- Space is sufficient for many years
- Energy cost savings
- Backup in case of power black out
- Safety for the samples
- Customer very satisfied



## Challenges faced and solutions proposed

The use of HFC systems with charge over 10kg is not allowed

The option is to use ultra low temperatures which all have high GWP

The systems used before were small chest freezers

- The efficiency was not good
- The units had a limited life expectancy
- The cost of the units was very high
- The refrigerants used are very expensive

	GWP
Refrigerant	100 years
R23	14800
R508A	11384
R508B	11776
R170	5.5
R1150	3.7

## Lessons learnt

Going in to such low temperatures requires new solutions all the way:

- Heavy clothing for the people working there
- Lights have to be chosen for the low temperatures
- Floor material, panels and doors must be selected for the temperatures
- Front room kept at about 2°C
- In the front room there are chest freezers for incoming and outgoing samples
- The back-up system is N<sub>2</sub> that activates if the power supply fails





# Some impressions

## Clothing:



## Back up: old chest freezers



## Future plans

- There is a growing interest for these low temperature room with special requirements
- This application will not become a big market
- The installation shows that it is possible to build systems for low temperatures using natural refrigerants
- The plant was visited by Crown Prince Frederik in August 2012.



Kompressor		
Suge TT104	Status	Høj TT105
-83,8°C	Trin 3	100,4°C
Brine TT101	PID	Suge TT103
-85,4°C	Setpunkt	-40,7°C
Væske	0,0°C	Høj tryk
-36,0°C	Kapacitet	7,99bar
Olie	100%	Suge tryk
3,18bar	Ingen alarmer	-0,04bar
Tid	Køretid	3654T
Regulering	Antal starter	5922
		Sikkerhed

## Take aways

- The presented product is for a niche market
- The project shows that there are no limits to what can be achieved with natural refrigerants
  
- There are other bigger markets with higher potentials



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Thank you very much!