

# Heat Recovery by Heat Pumps in Supermarkets Refrigeration Systems



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# Contents



**1.- Introduction.**

**2.- Heat Recovery, Floating Condensing and Heat Pump.**

**3.- Supermarket COOP Forum Birsta**

**4.- Comparison between Floating Condensing  
Floating Condensing with Heat Pump.**

**5.- Conclusions.**

## 1.- Introduction.



**Energy-saving technologies as heat recovery and floating condensing temperature, have been implemented in several supermarkets in Sweden to save energy.**

**Heat Recovery from the condensers is a good possibility to decrease the heating costs in supermarkets .**

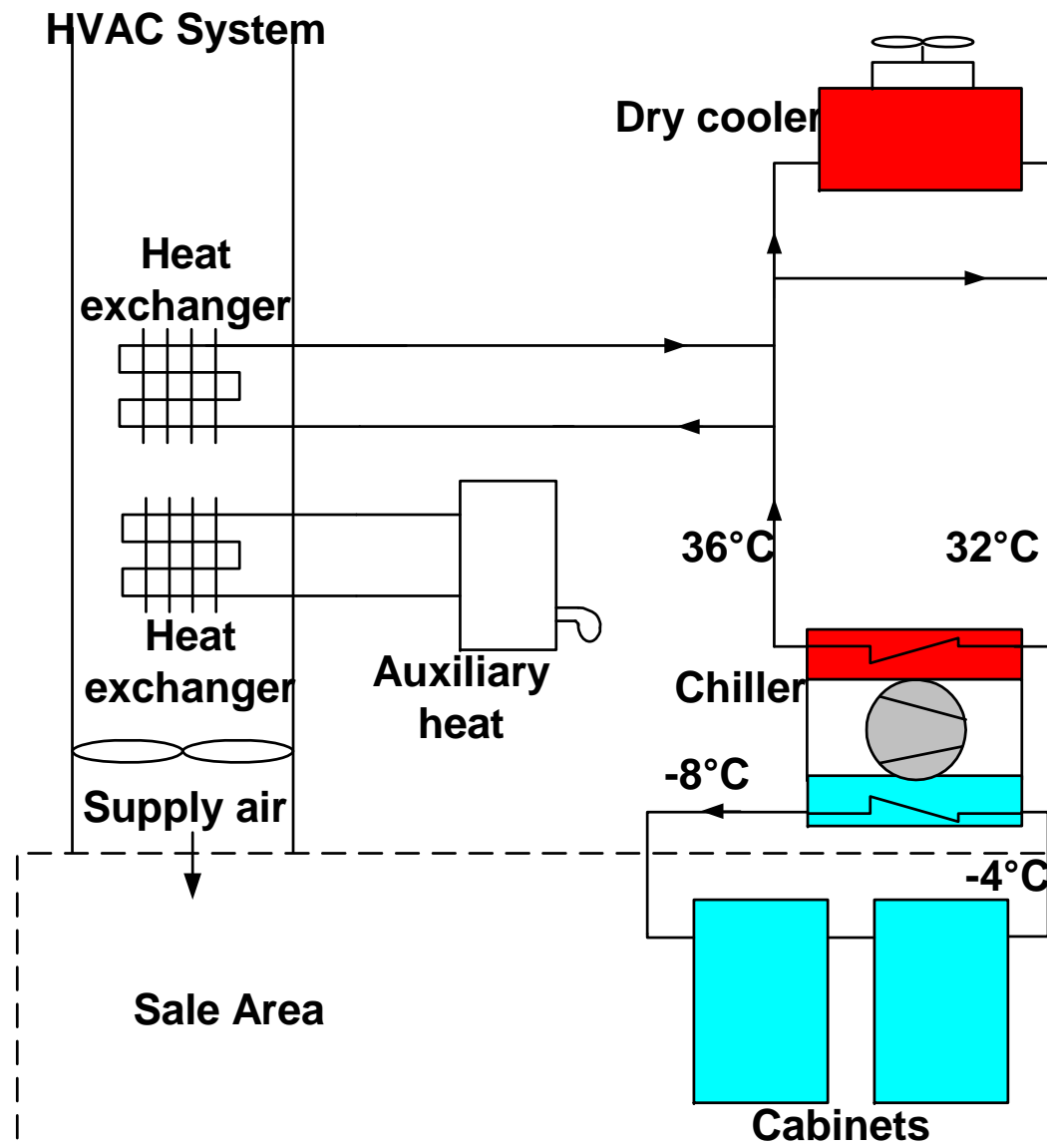
## 1.- Introduction.



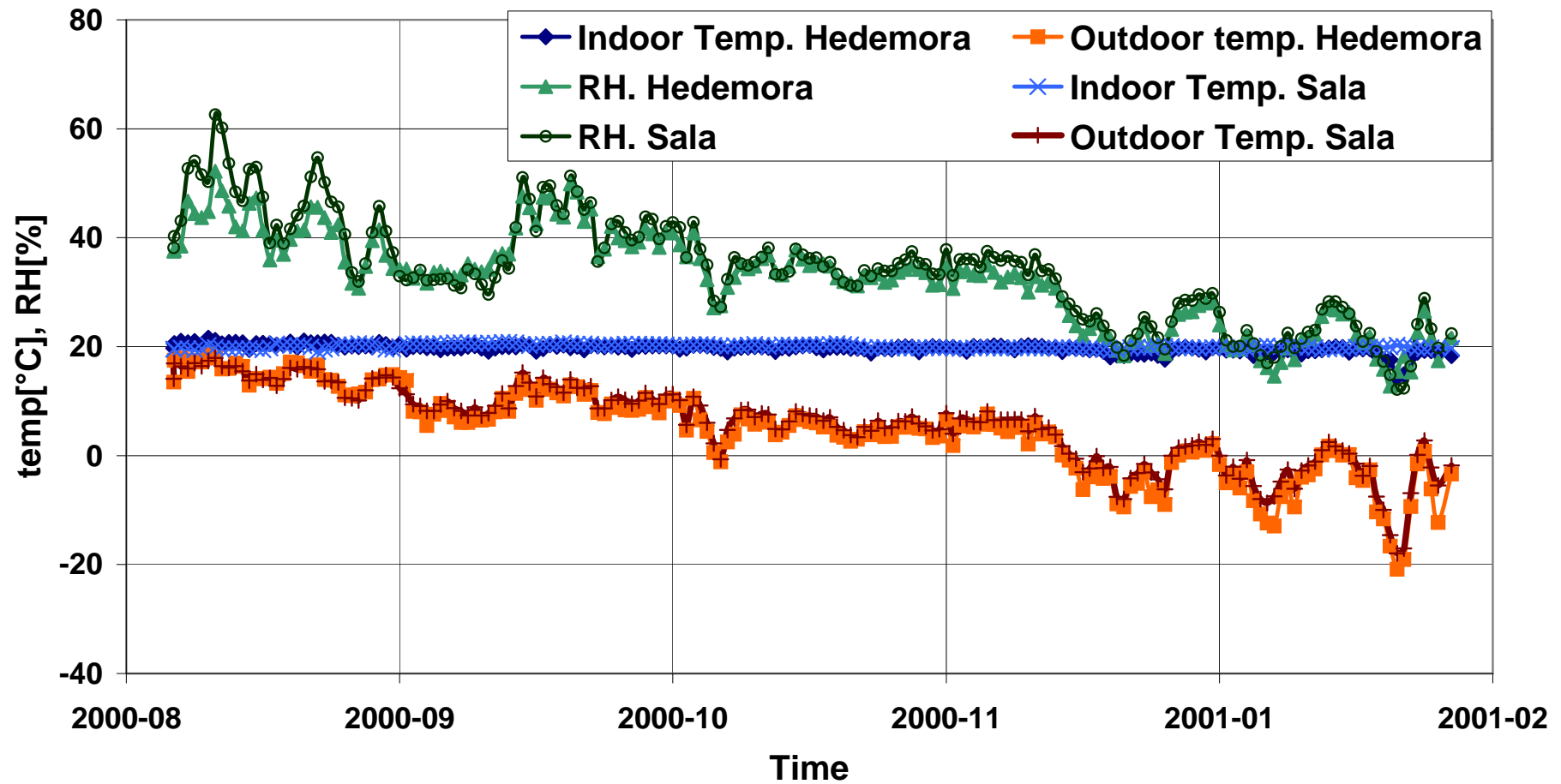
**An option to heat recovery is floating condensing pressure that decrease the energy consumption of the refrigeration temperature at lower outdoor temperatures.**

**Another option to heat recovery is floating condensing pressure and a Heat Pump connected to the coolant fluid loop.**

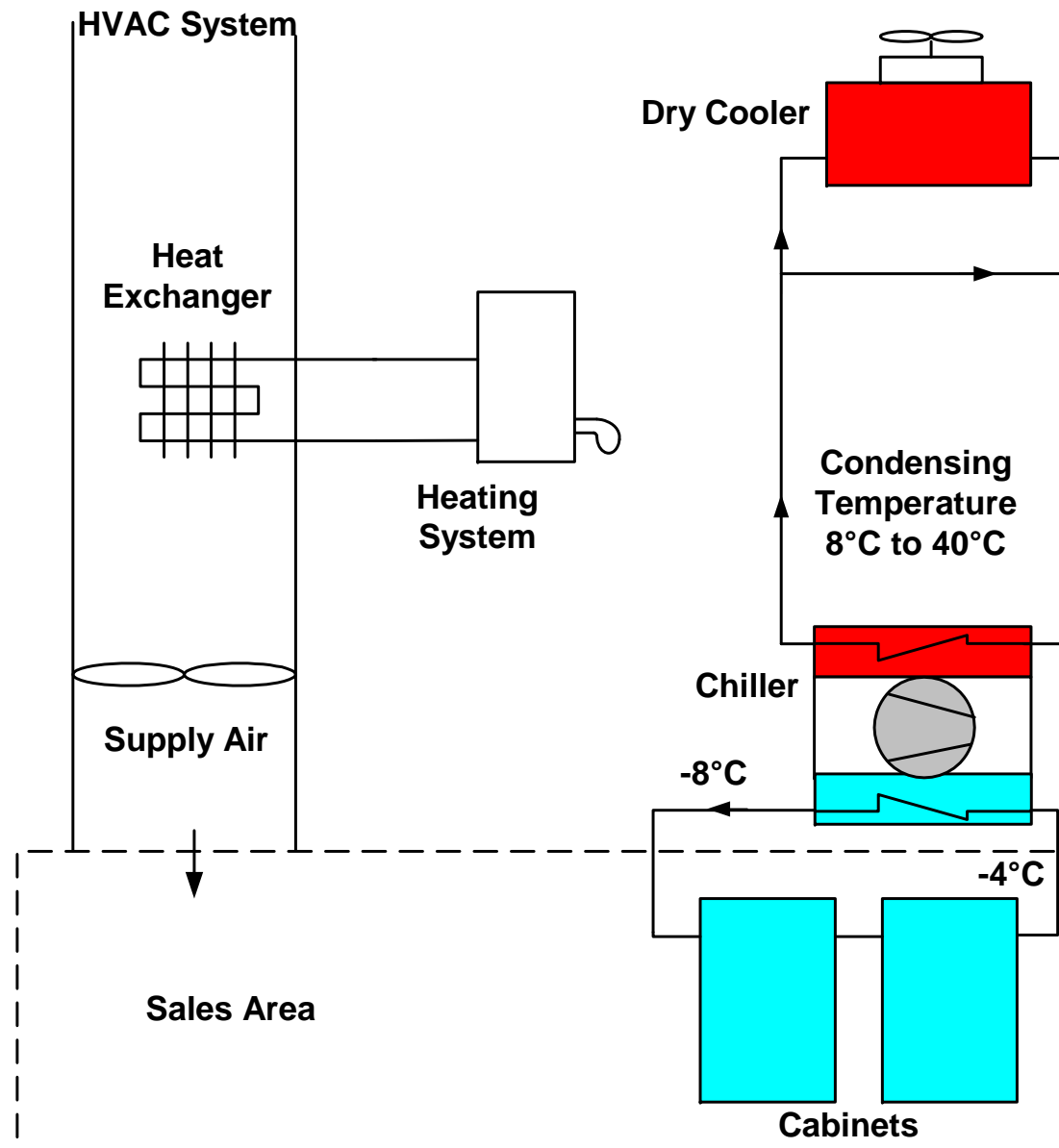
## Heat recovery System 3



Sala - Hedemora  
Aug 2000 - Feb 2001

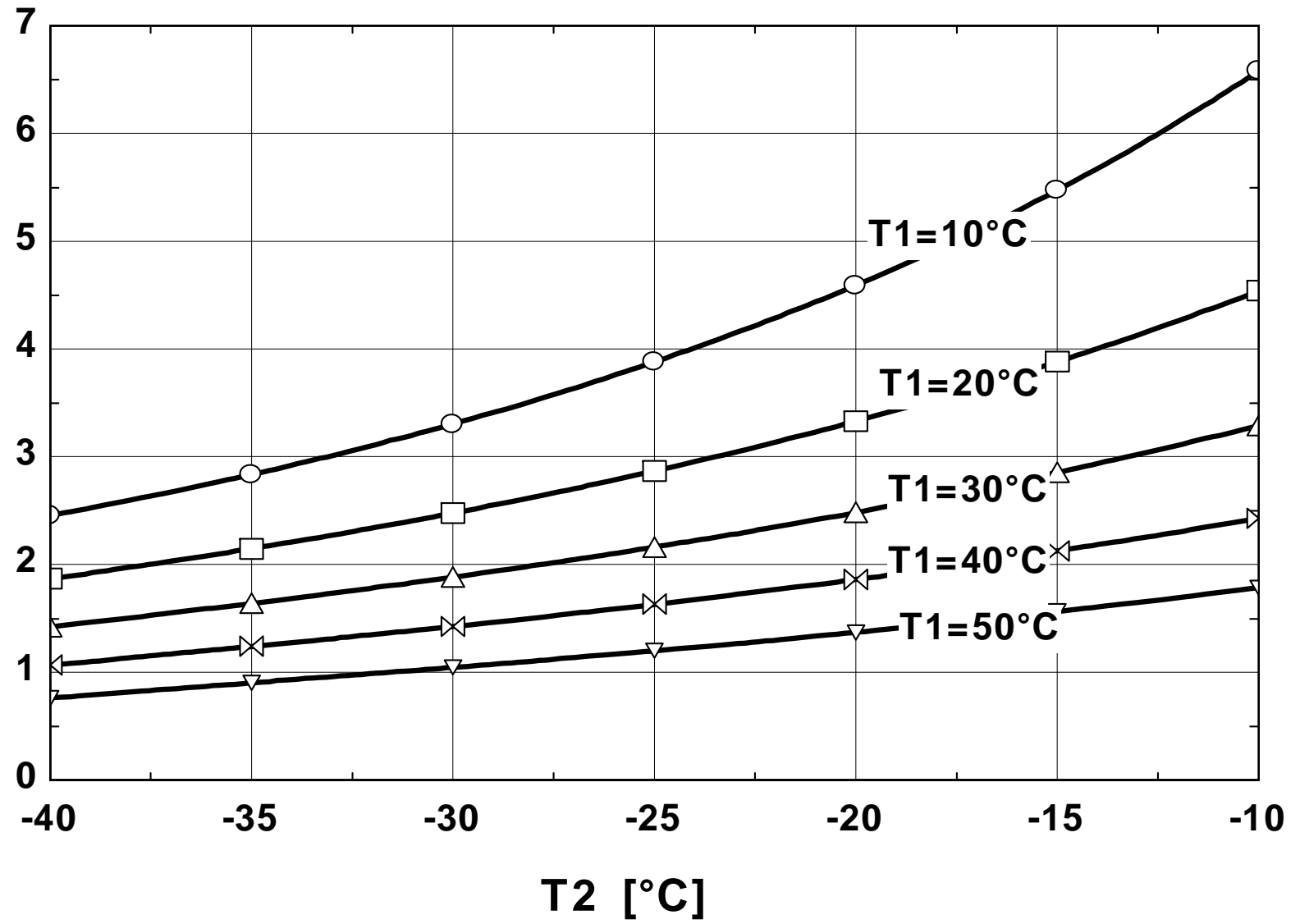


# Floating Condensing System



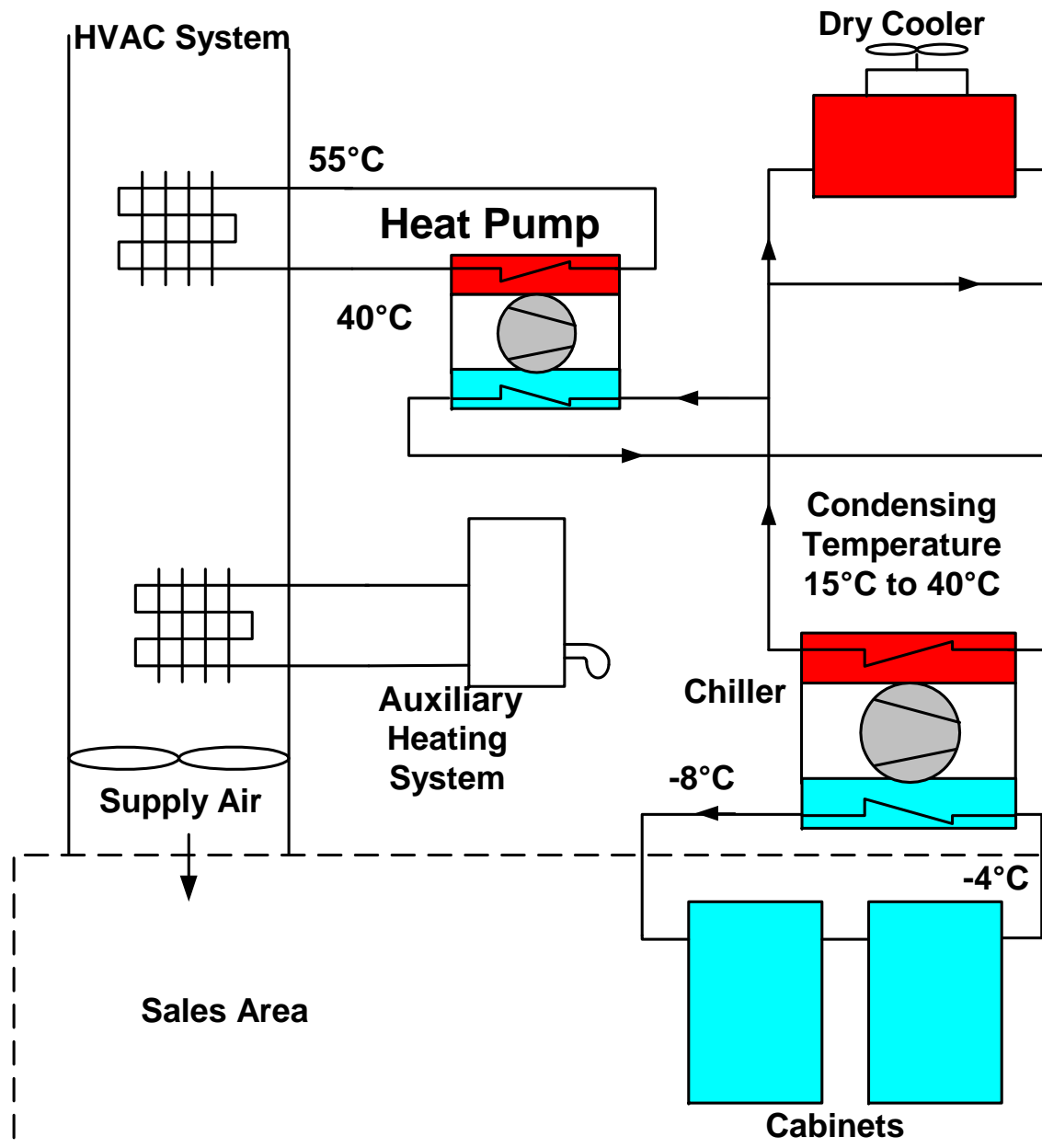


COP<sub>2</sub>





# Floating Condensing System and Heat Pump



# COOP Forum Birsta in Sundsvall



# **COOP Forum Birsta in Sundsvall**

## **Area**

**Total Area : 8000 m<sup>2</sup>**

## **Refrigeration capacity**

**Medium Temp. Level : 260 kW**

**Low Temp. Level : 60 kW**





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COOP Forum Birsta in Sundsvall				
Energy	No Heat Recovery or Floating Condensing	Heat Recovery	Floating Condensing	Floating Condensing and Heat Pump
	MWh/year	MWh/year	MWh/year	MWh/year
Total Electricity	2900	2800	2400	2400
Total Heat	850	200	850	330 (210 +120)
Total Energy (el+heat)	3750	3000	3250	2830




COOP Forum Birsta in Sundsvall				
Cost	No Heat Recovery or Floating Condensing	Heat Recovery	Floating Condensing	Floating Condensing and Heat Pump
Electricity: 0.1 EUR/kWh				
Dist. Heating: 0.06 EUR/kWh				
	EUR/year	EUR/year	EUR/year	EUR/year
Total Electricity	290000	280000	240000	240000
Total Heat	51000	12000	51000	28000
Total Energy (el+heat)	341000	292000	291000	268000
Savings		49000	50000	73000

# COOP Forum Birsta in Sundsvall



**COOP Birsta**



# Birsta

KB 10

KB20 & VS1 & KM10 & KM20

KB 30

KB 40

KMK10

KMK30

VKA 1 & VKA 1 & KA 1 & KA 2

VKA 3 & VKA 5

VKA 4

KA 3

Frys & Kyl

PLC Larmstatus

Energimätare ME1 - Maskinrum

Energimätare ME2 - VP-AC

Energimätare ME3 Kylobjekt

Energimätare ME1 Systemb.

Energimätare ME1 Apotek

Lösenordändring

Användarlista

Datum/Tid

16.05.08

11:01:23

Ute temp.

8.4 °C

Gäst

Inloggning


Antal larm

0

Okvitt.

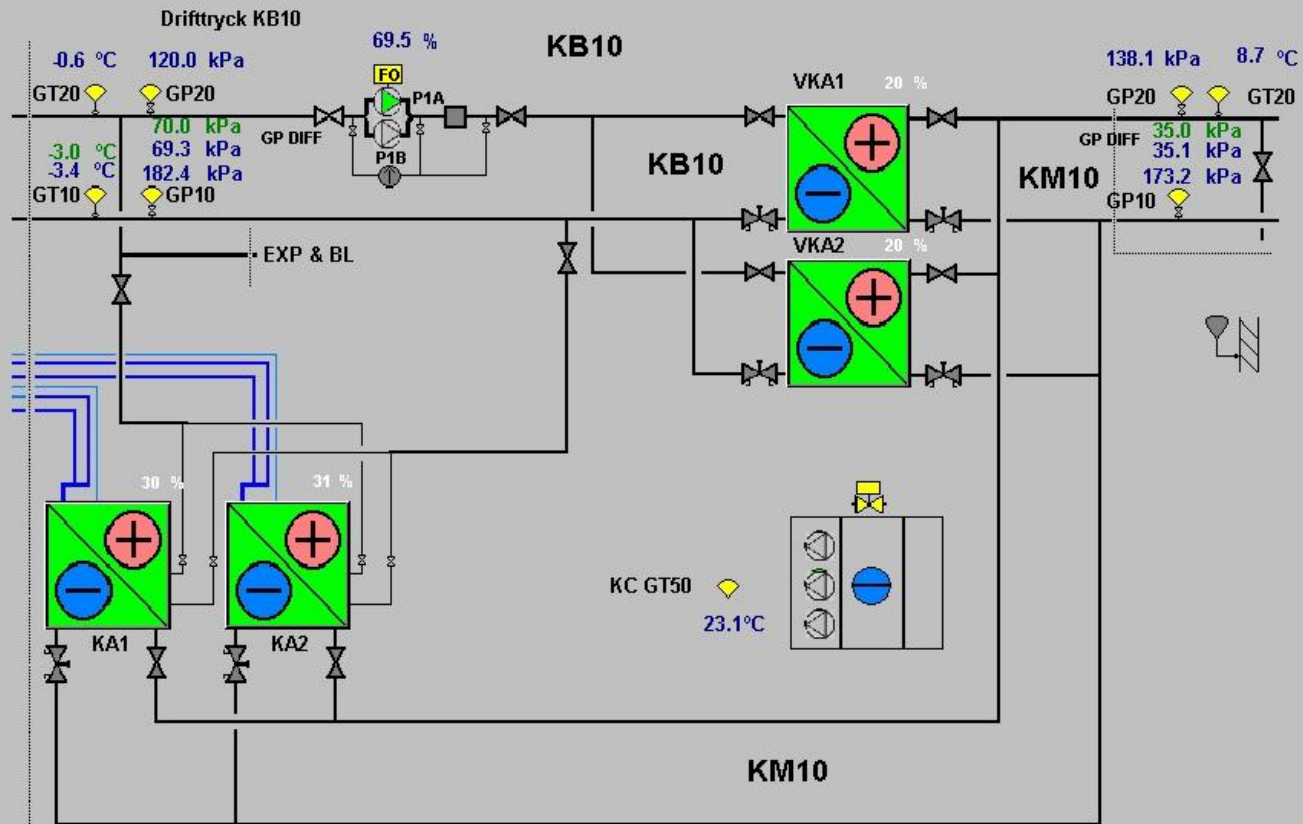
3

Larmlista



3 15.05.2008 10:01:28 / AS1\_2:FR135\_RK1:RK1:GT50:Larm:HögTempLarm:Value / / På

# KB 10

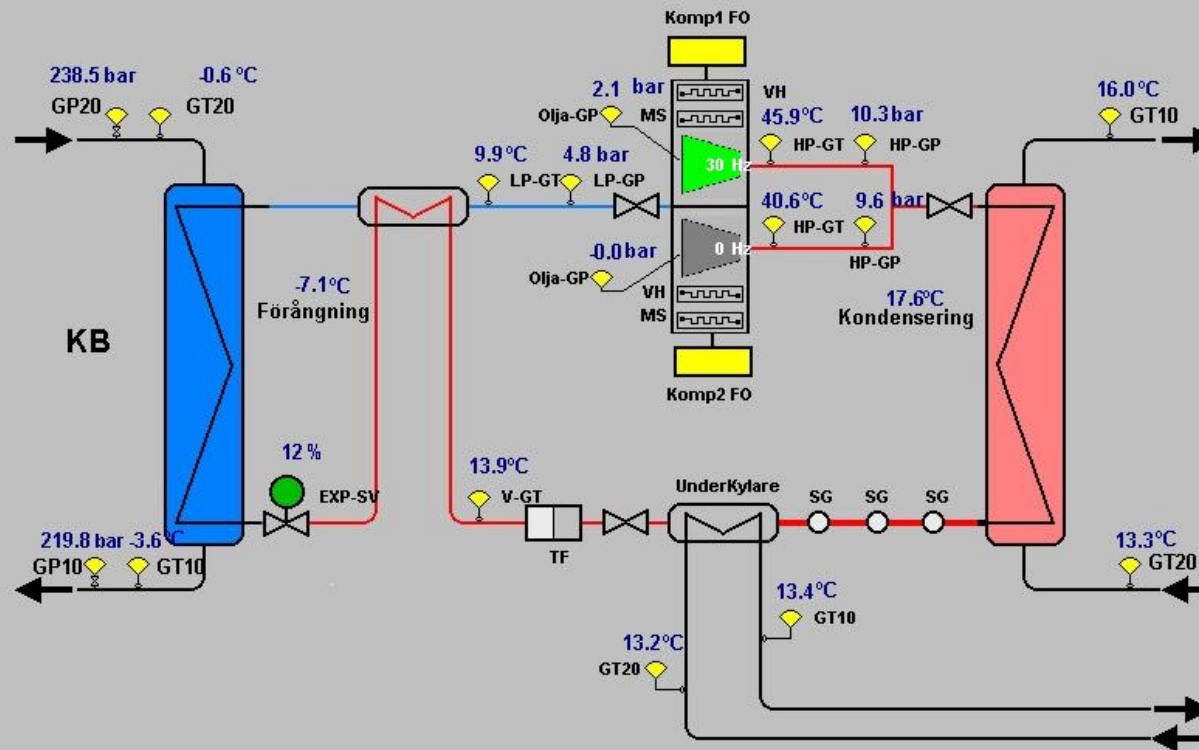


3 15.05.2008 10:01:28 / AS1 2:FR135\_RK1:RK1:GT50:Larm:HögTempLarm:Value / / På



# VKA 1

Köldfaktor 6.2



KB Trend

Kompr. 1 Trend

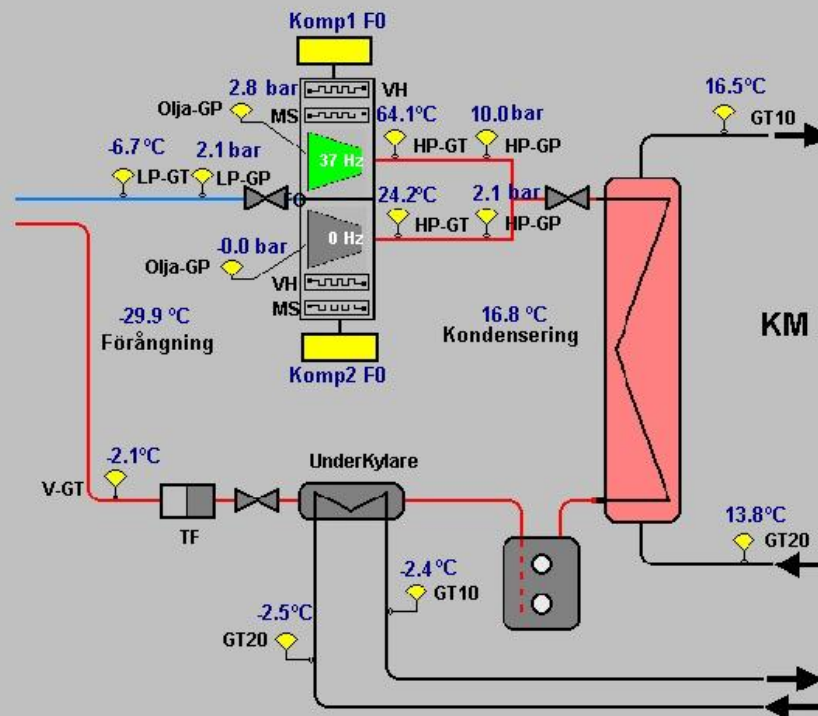
Kompr. 2 Trend

KM Trend

3 15.05.2008 10:01:28 / AS1 2:FR135 RK1:RK1:GT50:Larm:HögTempLarm:Value / / På

KA 2

Köldfaktor 3.2



Kompr. 1 Trend

Kompr. 2 Trend

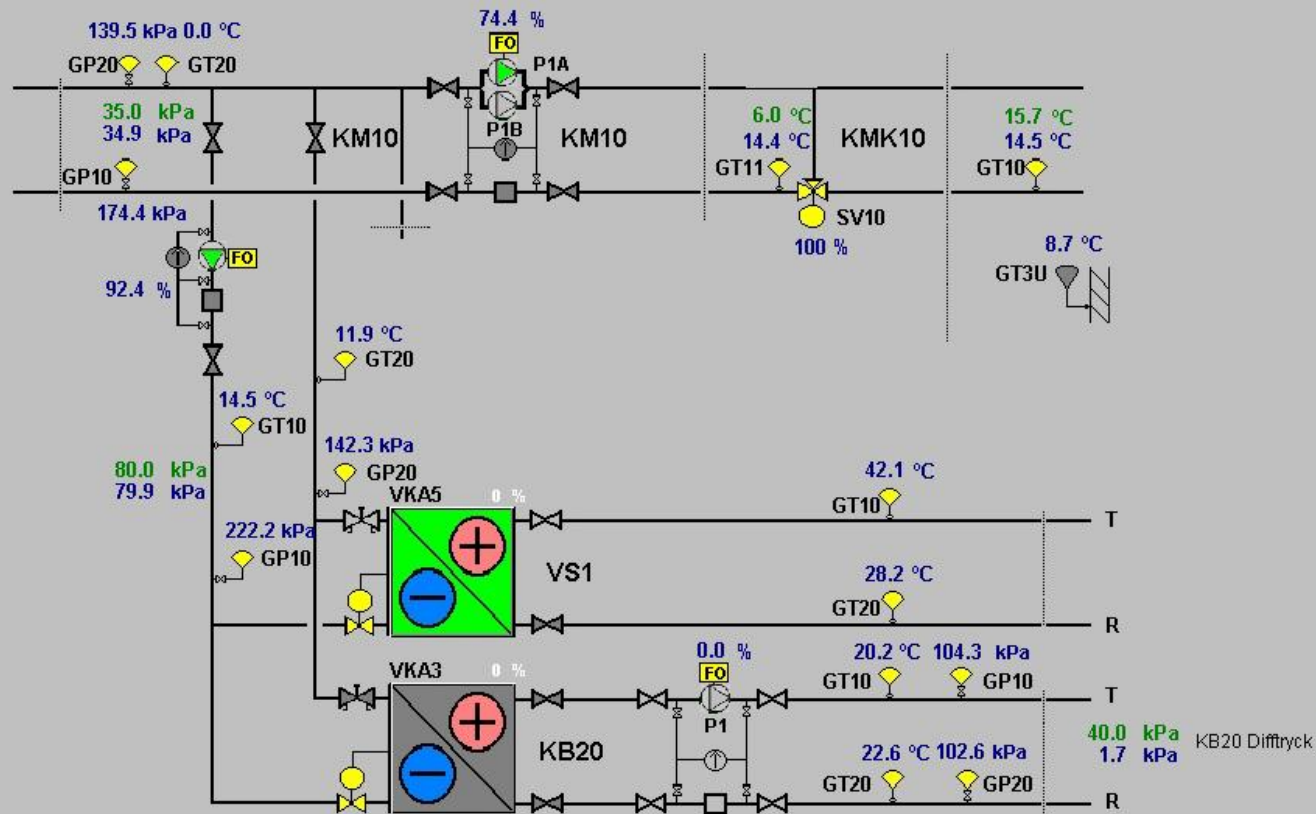
KM Trend

3 15.05.2008 10:01:28 / AS1\_2:FR135\_RK1:RK1:GT50:Larm:HögTempLarm:Value / / På



## KM 10 & KM 20

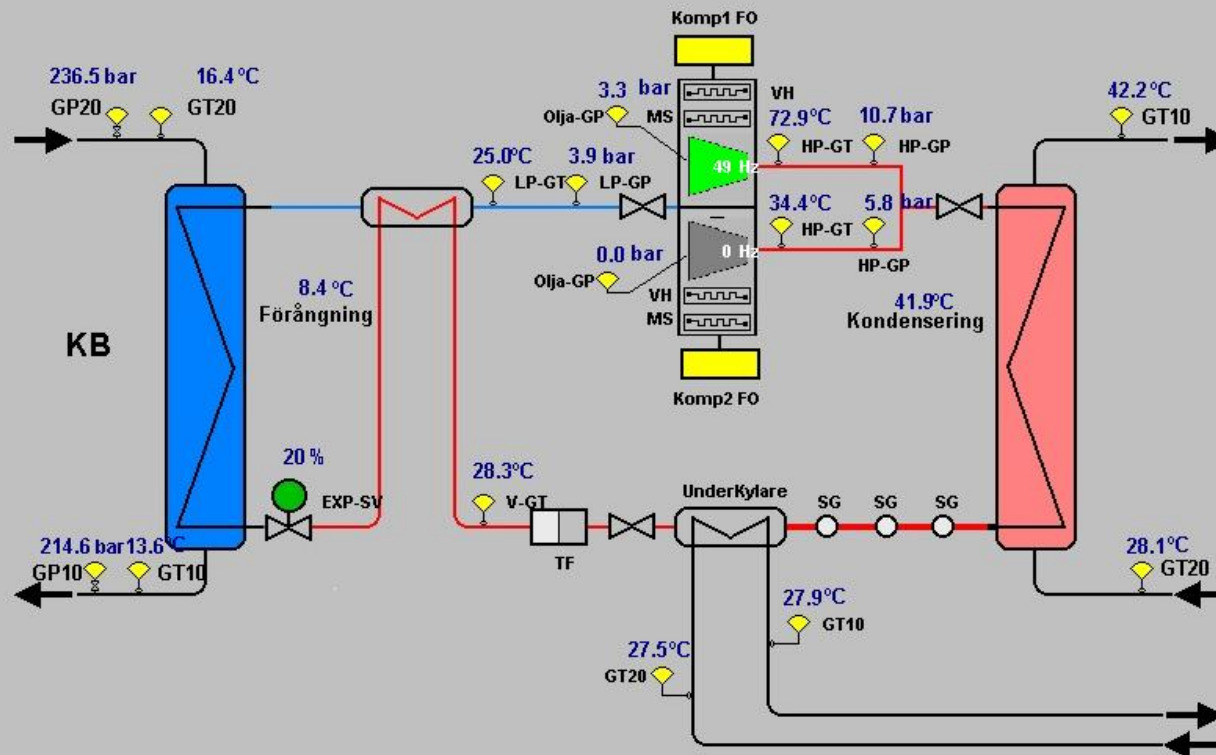
## KB 10 & VS 1



3 15.05.2008 10:01:28 / AS1\_2:FR135\_RK1:RK1:GT50:Larm:HögTempLarm:Value / / På

VKA 5

Köldfaktor 5.1



KB Trend

Kompr. 1 Trend

Kompr. 2 Trend

KM Trend

3 15.05.2008 10:01:28 / AS1\_2:FR135 RK1:RK1:GT50:Larm:HögTempLarm:Value / / På

Beskrivning	Maxtemp°C	Mintemp°C	Larm	Avfr.
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### Frysdisk

FD 02 S1-S4	-20.1	-23.8	<input type="radio"/>	<input type="radio"/>
FD 03 S1-S8	-17.6	-23.2	<input type="radio"/>	<input type="radio"/>
FD 04 S1-S8	-19.1	-21.7	<input type="radio"/>	<input type="radio"/>
FD 05 S1-S8	-19.4	-22.5	<input type="radio"/>	<input type="radio"/>
FD 07 S1-S5	-20.1	-22.2	<input type="radio"/>	<input type="radio"/>
FD 08 S1-S5	-19.5	-23.7	<input type="radio"/>	<input type="radio"/>
FD 10 S1-S2	-19.0	-19.1	<input type="radio"/>	<input type="radio"/>
FD 11 S1-S3	-16.3	-18.7	<input type="radio"/>	<input type="radio"/>

### Kyldisk

KD 01 S1-S5	4.6	0.4	<input type="radio"/>
KD 02 S1-S8	1.8	-0.5	<input type="radio"/>
KD 03 S1-S8	7.2	-2.8	<input type="radio"/>
KD 04 S1-S3	2.2	1.3	<input type="radio"/>
KD 05 S1-S4	4.1	2.8	<input type="radio"/>
KD 06 S1-S5	4.5	1.8	<input type="radio"/>
KD 08 S1-S2	1.5	0.3	<input type="radio"/>
KD 09 S1-S3	5.6	4.1	<input type="radio"/>
KD 10 S1-S2	6.2	5.9	<input type="radio"/>
KD 11 S1	3.6	3.6	<input type="radio"/>
KD 12 S1-S2	7.1	4.5	<input type="radio"/>
KD 13 S1-S2	2.9	0.0	<input type="radio"/>
KD 14 S1-S2	3.5	2.9	<input type="radio"/>
KD 15 S1-S4	4.1	2.2	<input type="radio"/>
KD 16 S1-S4	4.7	4.2	<input type="radio"/>
KD 17 S1-S3	9.1	4.9	<input type="radio"/>
KD 20 S1	2.4	2.4	<input type="radio"/>

Beskrivning	Maxtemp°C	Mintemp°C	Larm	Avfr.
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### Frysrum

FR 115B	-21.7	-21.7	<input type="radio"/>	<input type="radio"/>
FR 135 RK1	-19.7	-19.7	<input type="radio"/>	<input type="radio"/>
FR 135 RK2	-19.5	-19.5	<input type="radio"/>	<input type="radio"/>

### Kylrum

KR 115	2.4	2.4	<input type="radio"/>
KR 117A	4.7	4.7	<input type="radio"/>
KR 117B	6.7	6.7	<input type="radio"/>
KR 118	13.1	13.1	<input type="radio"/>
KR 130	12.1	12.1	<input type="radio"/>
KR 137	7.3	7.3	<input type="radio"/>
KR 138	4.1	4.1	<input type="radio"/>
KR 141_1	3.4	3.4	<input type="radio"/>
KR 141_2	2.7	2.7	<input type="radio"/>
KR 144	14.1	14.1	<input type="radio"/>
KR 145	8.7	8.7	<input type="radio"/>
KR 146	3.3	3.3	<input type="radio"/>

Beskrivning	Rumstemp °C	Köldb.°C	Larm
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LK 116A	-54.6	-54.6	<input type="radio"/>
LK 120A	19.7	19.7	<input type="radio"/>
LK 121	21.6	20.0	<input type="radio"/>
LK 223	18.7	-3.4	<input type="radio"/>

3 15.05.2008 10:01:28 / AS1 2:FR135 RK1:RK1:GT50:Larm:HögTempLarm:Value / / På

## 5.- Conclusions



**According with CyberMart the highest potential of energy saving is achieved from using a system with Floating Condensing Temperature and a Heat Pump.**

**The influence of the outdoor temperature on the indoor relative humidity of air is an important factor to take into consideration for design of Heat Recovery or Heat Pump in Supermarkets.**



# Thank for your attention!