How European supermarkets have slashed heating energy costs through the innovative use of the latest heat pump technology

Karl Mittermayr

RSA, London, 27.10.2005

Introduction M-TEC

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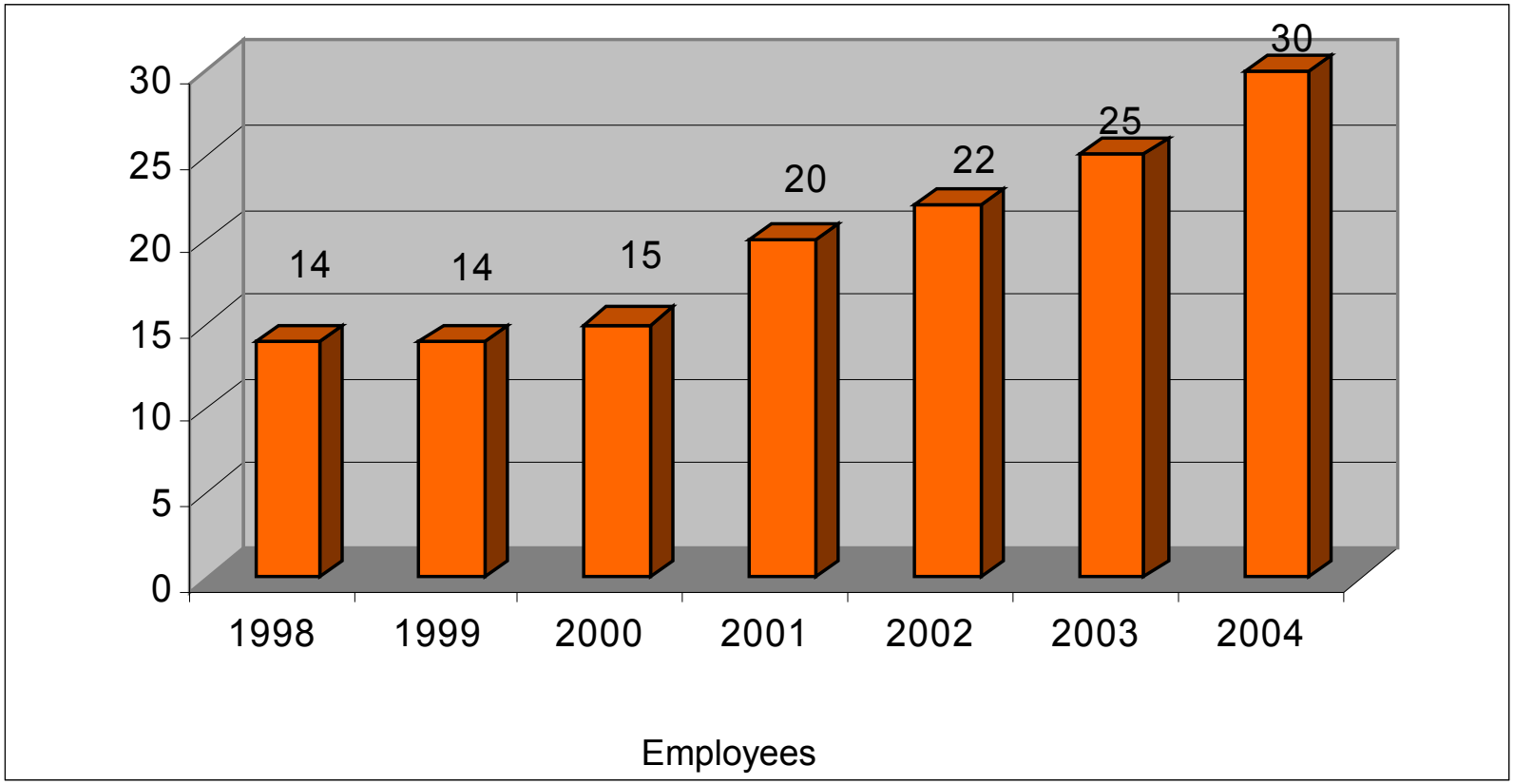
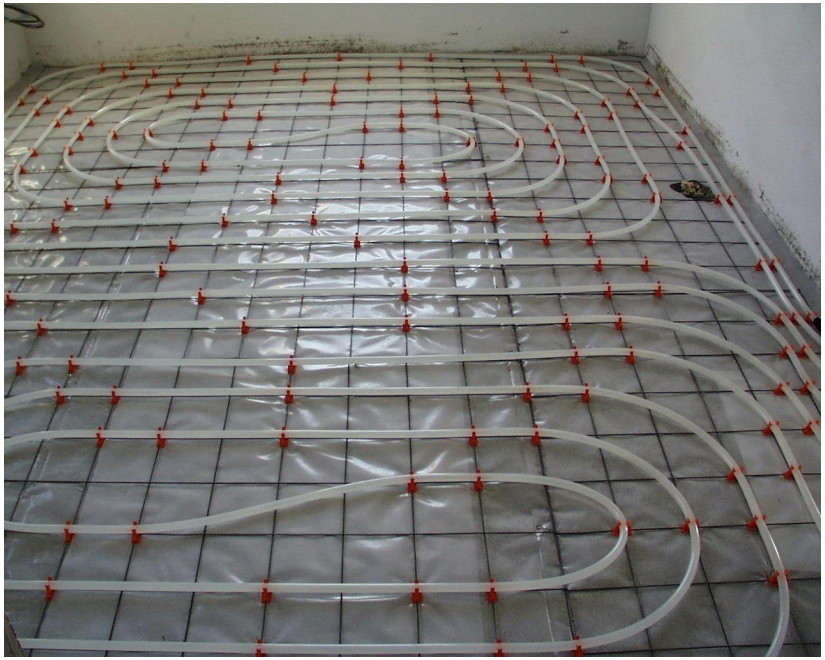


Introduction M-TEC

1972	M-TEC founded by Karl Mittermayr in Arnreit, Austria
1980	Began specialising in heat pump systems
1999	Patented 1st vertical collector with free circulation and CO2 as transfer medium
2001	M-TEC became limited company. Moved into new facilities
2002	Implemented heat recovering in a ADEG-store with zero heating costs
2003	Applied for patent for cooling-heating. Started cooperation with Hauser

Low temperature heating systems



Floor and wall heating systems under construction

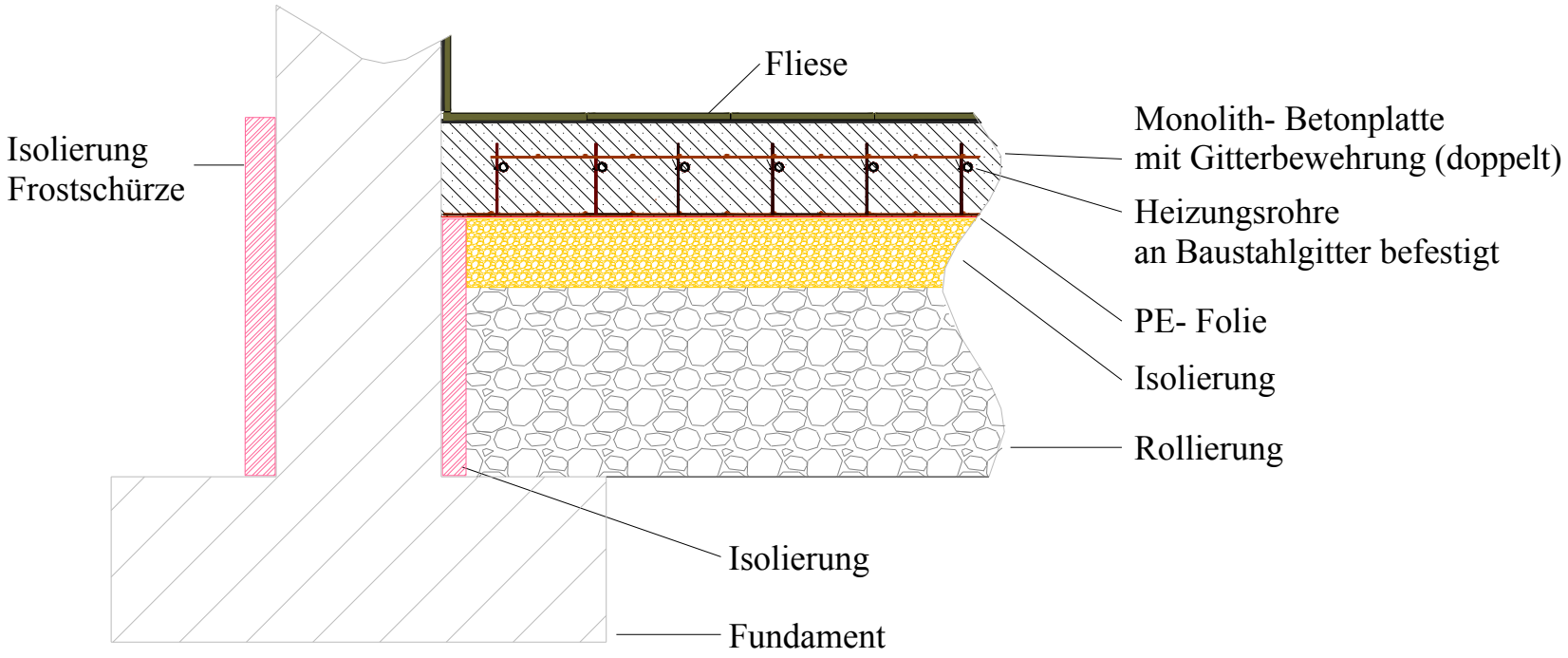
Low temperature heating systems

Advantages of floor heating systems

- Low running costs for heating and cooling
- Better room conditions (no air circulation, no raised dust)
- Lower energy costs resulting from lower condensing temperatures
- Self-controlled in case of low temperature heating system
- Concrete is a good storage medium for the heat

Low temperature heating systems

Lay out of industrial floor heating systems



Reinforcement and fixing with construction steel grid

Low temperature heating systems

Lay out of industrial floor heating systems

Fibre Reinforcement – Fixing with rails

Low temperature heating systems

Lay out of industrial floor heating systems

Fibre Reinforcement – Fixing with construction steel grid

Heat recovery in supermarkets

Refrigerated display units in SPAR store

Heat recovery in supermarkets

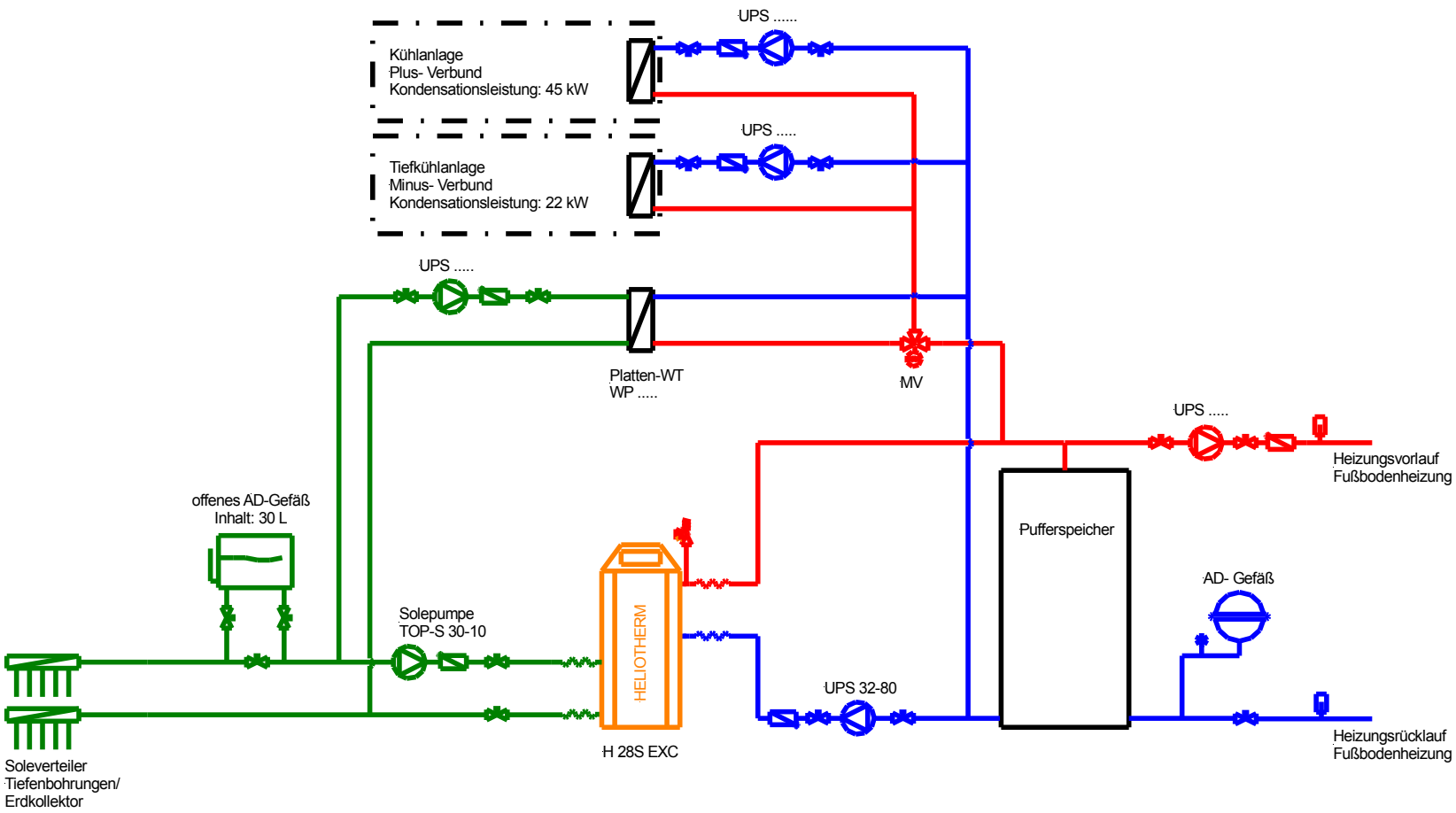


Diagram of heat recovery system

M-TEC MITTERMAYR	Anlage	Wärmerückgewinnungsanlage Hartl _ St.Veit	
	Sachbearb.	Karl Stelzer	Dieses Schema ist geistiges Eigentum der Fa. M-TEC Mittermayr GmbH und darf nicht weiterverwendet werden!
	Datum	5.7.2002	

Heat recovery in supermarkets

Installation with Bock compressors

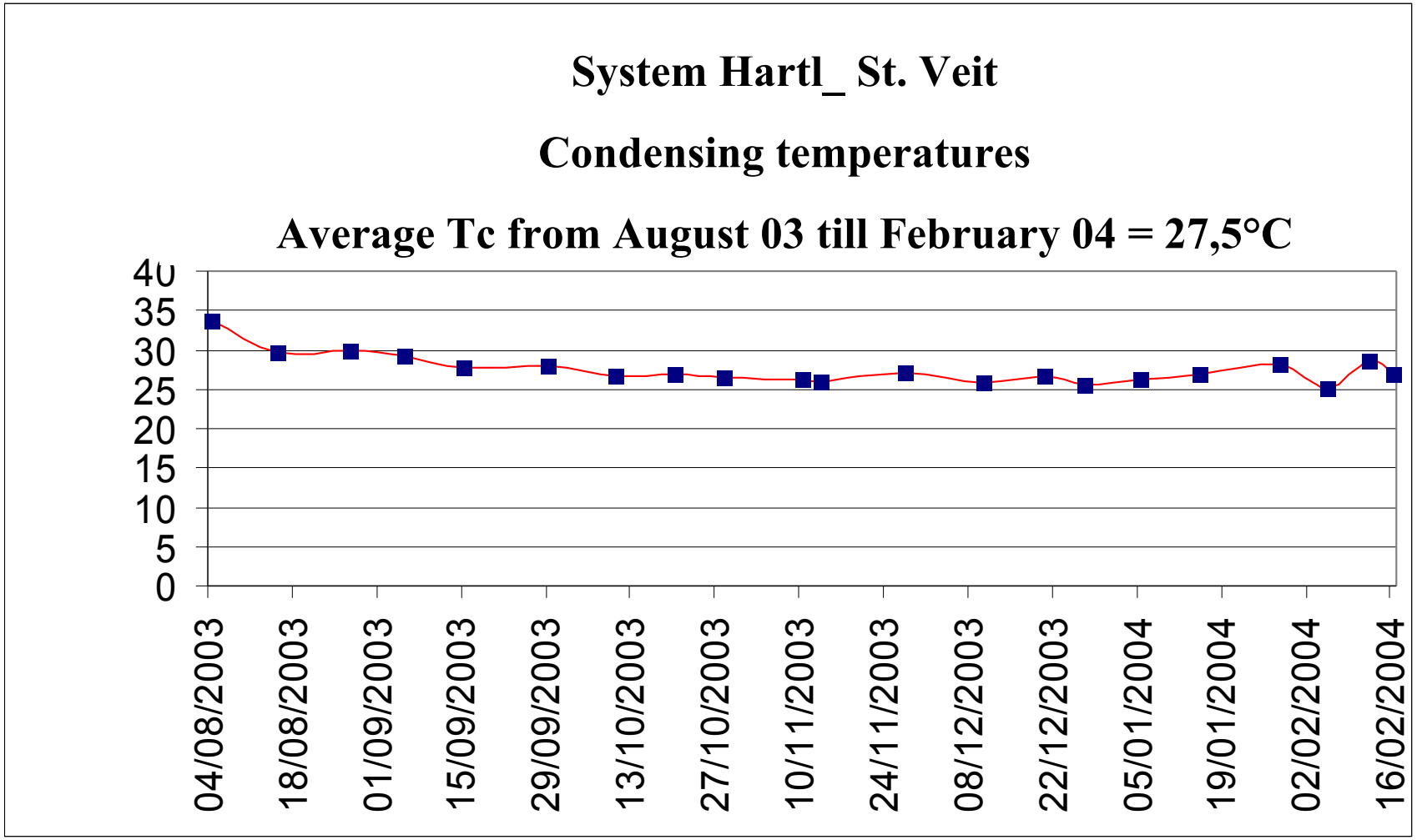
Heat recovery in supermarkets

Bock compressors showing variable speed controls

Heat recovery in supermarkets

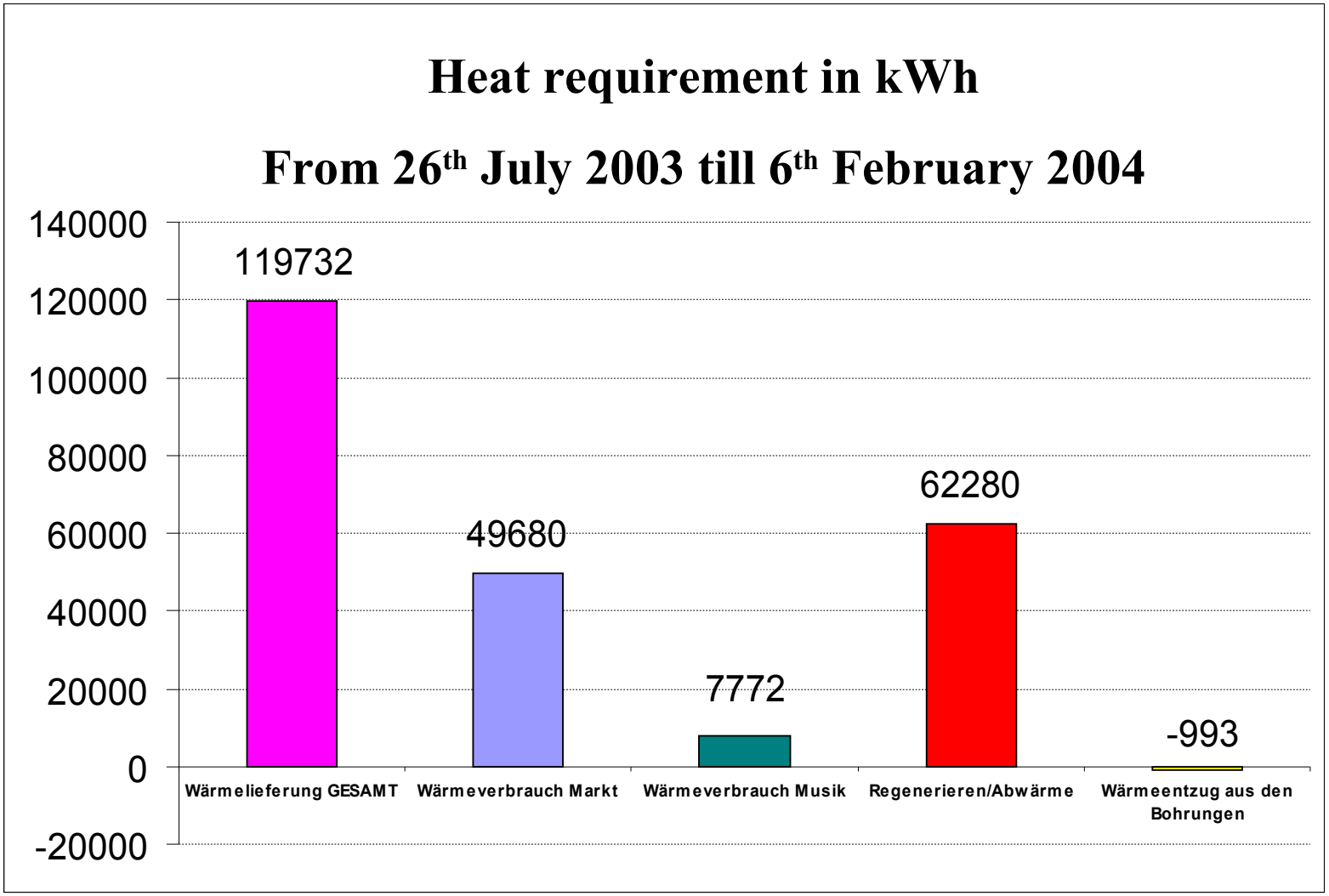
Control unit with heat pump, process cooling and heat recovery

Heat recovery in supermarkets



Actual data for Hartl store in St. Veit, Austria

Heat recovery in supermarkets

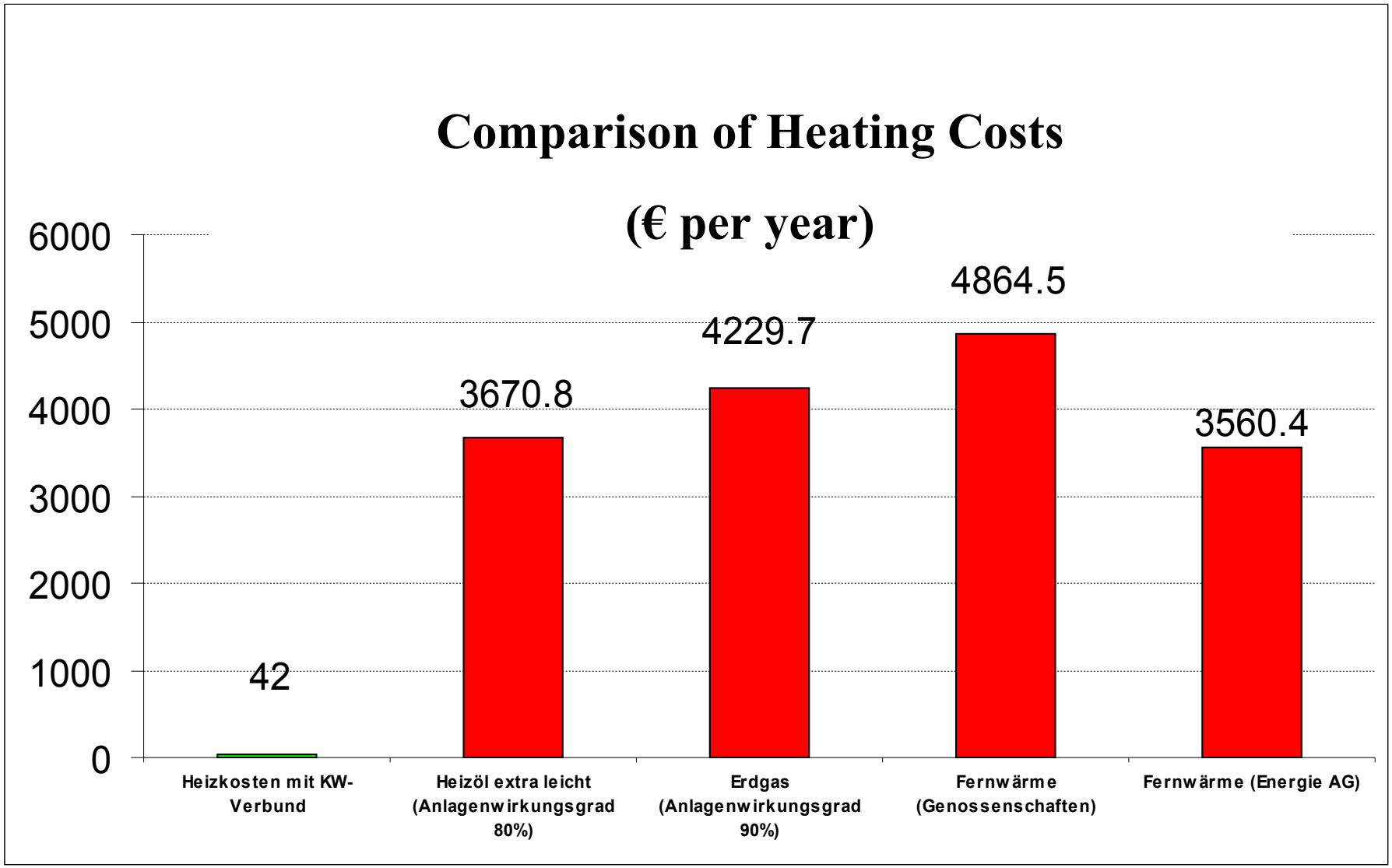


Heat distribution within supermarket

Heat recovery in supermarkets

Heat recovery installation

Heat recovery in supermarkets



Heat recovery in supermarkets

in Ū	Heating + Refrigeration			Refrigeration - Heat Recovery	
	Oil	Gas	Remote Heat Supply	System St. Veit Floor - Heating	Fan Comfort
Refrig - Heat recovery	37.150			48.980	51.960
Hot gas defrost	-			0	0
Heat producer	8.600	7.100	3.900	-	-
Source of heat	-	-	-	37.087	37.087
heat distribution	18.600			24.103	22.008
Air Conditioning	16.900			9.230 2)	16.262 2)
Condensing Sub Cooling	8.460			-	-
Installation cost Tank-Heating room Chimney	18.500	-	-	-	-
Installation cost heat	-	-	3.000	-	-
Installation cost Electricity	-	-	-	-1.200	-1.000
Sub Total	108.210	88.210	88.010	118.200	126.317
Subsidy Heat supplier a. Source 30 % Communalcredit	-			-14.800	-15.023
Subsidy County O… 10%	-			-3.709	-3.709
Summe	**108.210**	**88.210**	**88.010**	**99.691**	**107.585**

Investment comparison

Heat recovery in supermarkets

in €	Refrigeration + Heat recovery			Refrigeration-Heat Recovery	
	Oil	Gas	Remote Heat supply	System St. Veit Floor Heating	Fan Comfort
Heating cost at 49000 kW/h	2,075	2,592	3,454	213	251
Electricity cost at 139.000 kW/h niedrigeres TC durch KWV HLO Regelsystem	tc=35°C			tc=27°C	tc=31°C
	8,131			5,985	6,708
	90350 kW/h			66503 kW/h -27,5%	74538 kW/h -17,5%
Total Operating Cost	**10,206**	**10,723**	**11,585**	**6,198**	**6,959**
Savings when using floor heating	**4,008**				
		4,525			
			5,387		
Pay back time floor heating (Years)	0.0	1.7	1.5	with air conditioning	
	0.0	3.3	2.9	without air conditioning	
Savings when using Fans	3,247				
		3,764			
				4,626	
Pay back time Fans (Years)	0.0	2.7	2.2	with air conditioning	
	0.0	5.3	4.4	without air conditioning	

Operating costs comparison

Heat recovery in supermarkets

Reduction of the running costs Hartl, St. Veit

Reduction in running costs:

€3,629- compared with oil

Reduction of electricity costs:

10,969 kWh x 0,14 €/kWh = €1,536- (Tc = 29°C in comparison to 35°C)

Total reduction:

Heating costs €3,629- + Electricity costs €1,536- = €5,165 (£3,550)

(in comparison to an oil boiler)

Heat recovery in supermarkets

Heat recovery installation at SPAR store

Heat recovery in supermarkets

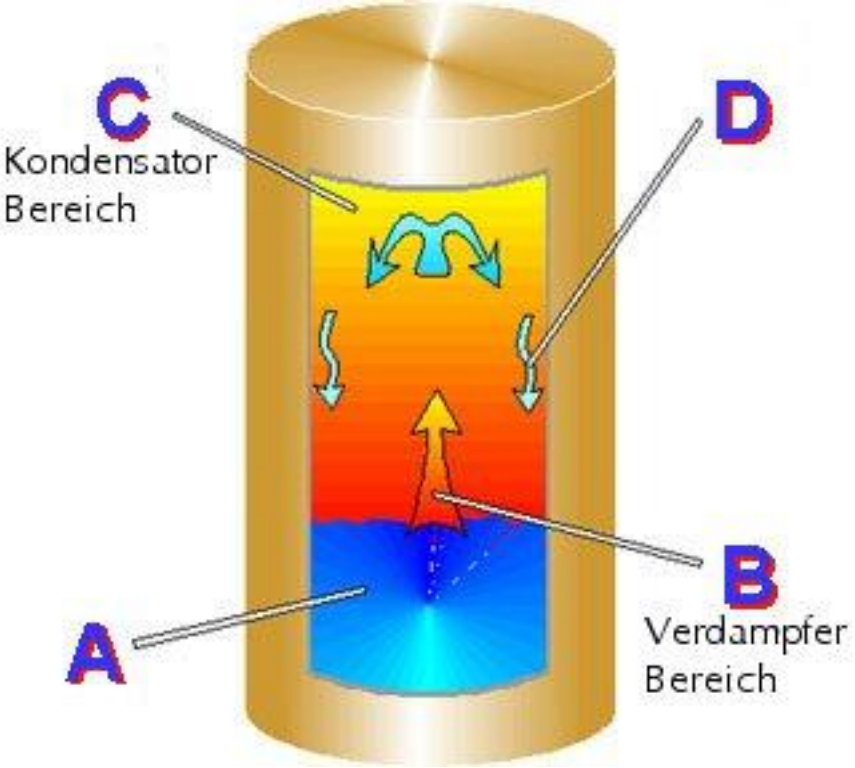
ALDI supermarket under construction

Heat recovery in supermarkets

Most ALDI stores in Austria have converted

New Developments:

Patented vertical collector with free circulation and CO_2 as heat transfer medium



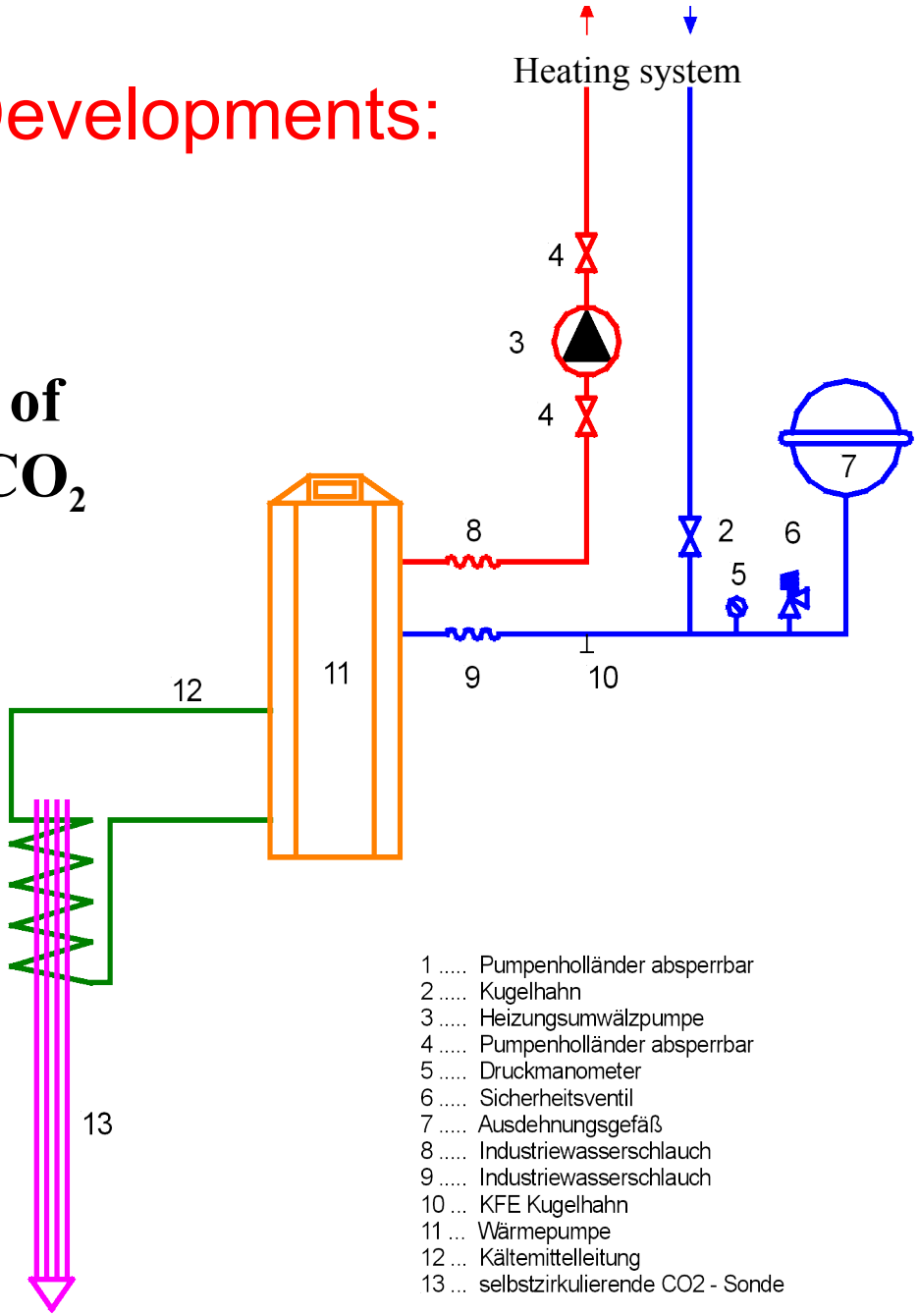
From development to series-production readiness

New Developments:

Testing the heat pipe - fixed in staircase

New Developments:

Diagram of vertical CO_2 collector



1….screw connection

2….ball valve

3….circulation pump

4…screw connection

5….manometer

6….safety valve

7….expansion vessel

8, 9….flexible tube

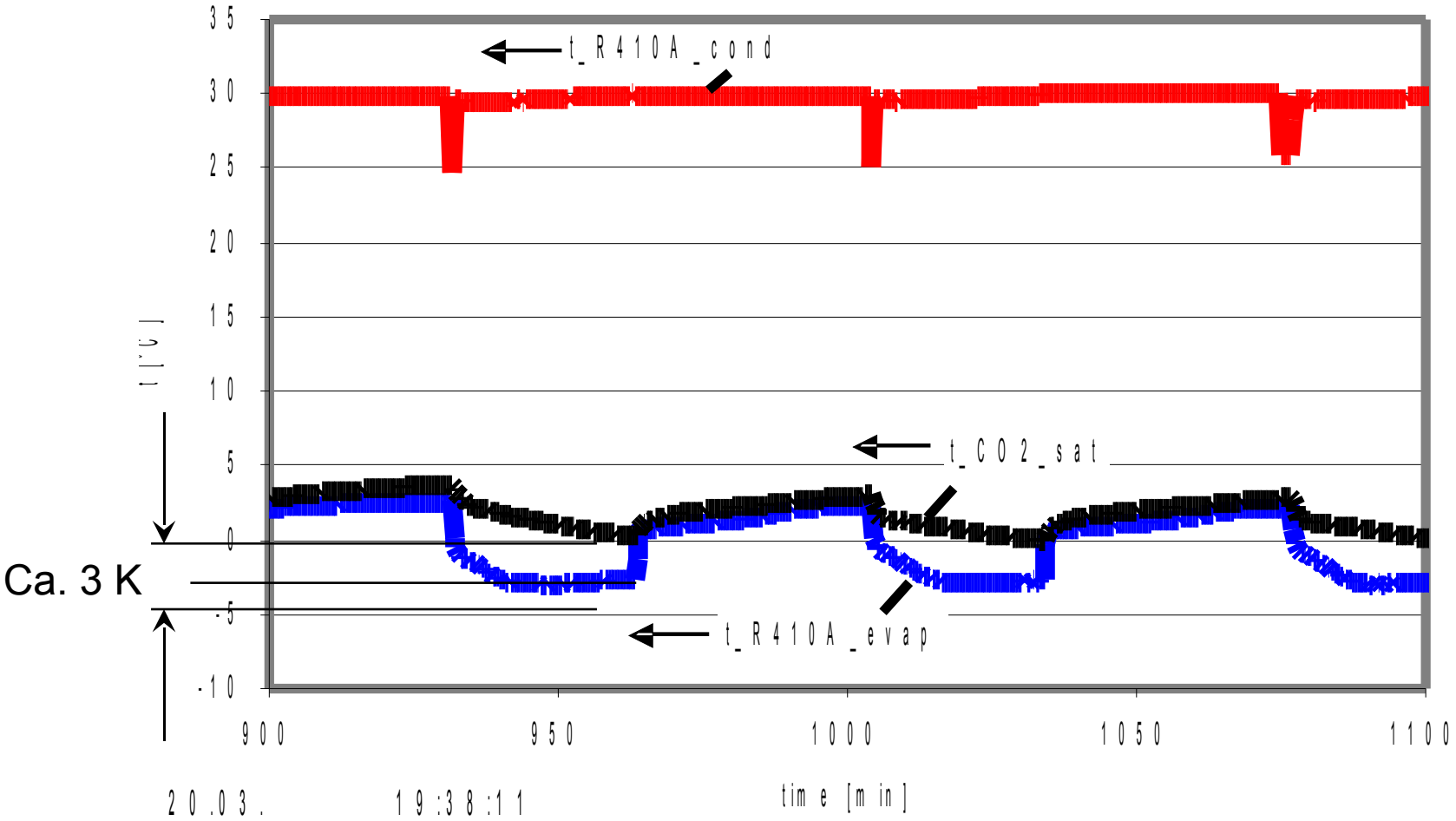
10... ball valve

11….heat pump

12…refrigeration pipe

13…self circulating vertical CO_2 collector

New Developments:



Measured temperatures

New Developments:

First system for customers: preparation of the pipe on site

New Developments:

Deep-well drilling in progress

New Developments:

Pot

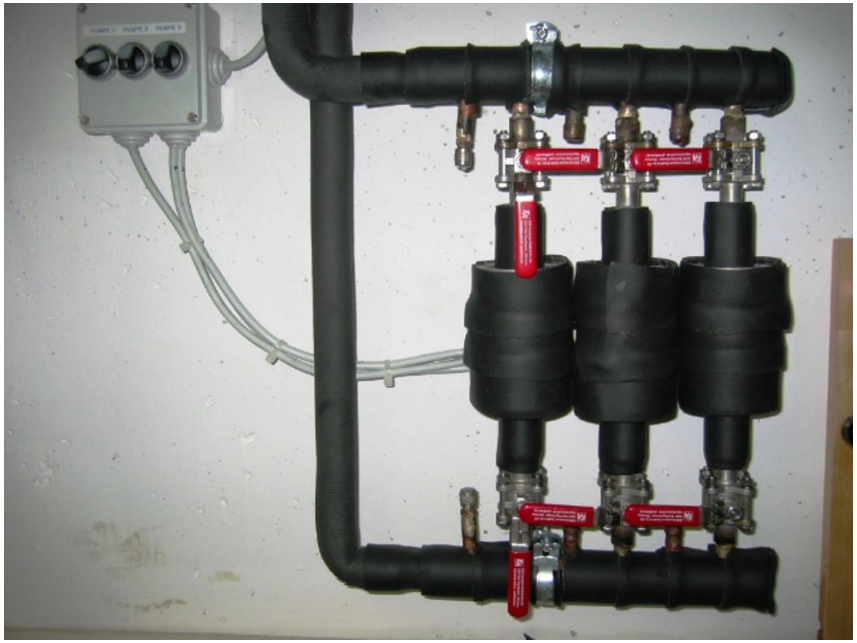
Serpentine

Spiral

Currently evaluating vertical type >>>>>

Different types of probes

New Developments:



CO_2 flat collectors distribution system

New Developments:

CO_2 - heat pipe ...after **150** installed systems

- The systems are running extremely well and customers are highly satisfied
- The Federal Environmental Agency is entirely sold on the system
- There are clear technical advantages: heat transfer, viscosity, no mechanical wear
- The investment in time and and financial effort are justified
- The potential for implementing heat pipes technology is immense and the cost/environmental benefits returns are substantial