

Bitzer - News on ECOStar Битцер - Новости о ECOStar



ECOStar a highly efficient solution for...

- ☛ Convenience stores
- ☛ Extensions in existing supermarkets
- ☛ Shops in petrol stations
- ☛ Food storage (Mc Donalds, Burger King, KFC)
- ☛ Cooling register for A/C systems
- ☛ Process cooling
- ☛ and many more applications



Typical Market Requests for Condensing Units:

- ☐ Reduced costs for electricity
- ☐ Reduced investments
 - Short amortization time
- ☐ High flexibility
 - Wide application range with minimized number of versions
- ☐ Quick installation and easy commissioning
- ☐ Maximum operational safety and reliability
- ☐ Minimum service effort



Market & Application Tendencies:

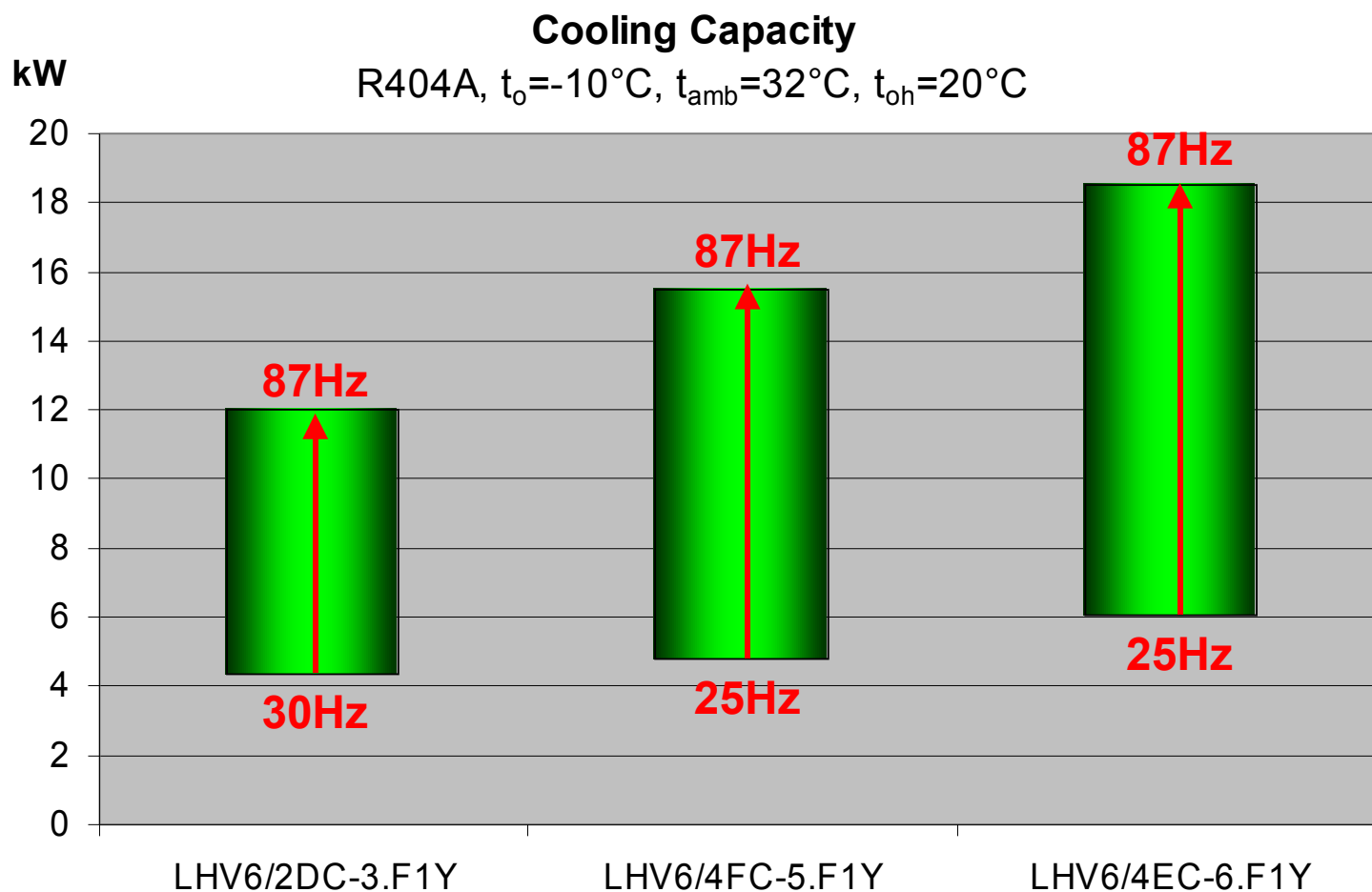
- ☐ Increasing energy prices
- ☐ Higher sensitivity regarding sound emissions
- ☐ More precise temperature of goods
- ☐ Reduced available installation place (machinery room)
- ☐ Power supply: starting current peaks considerations



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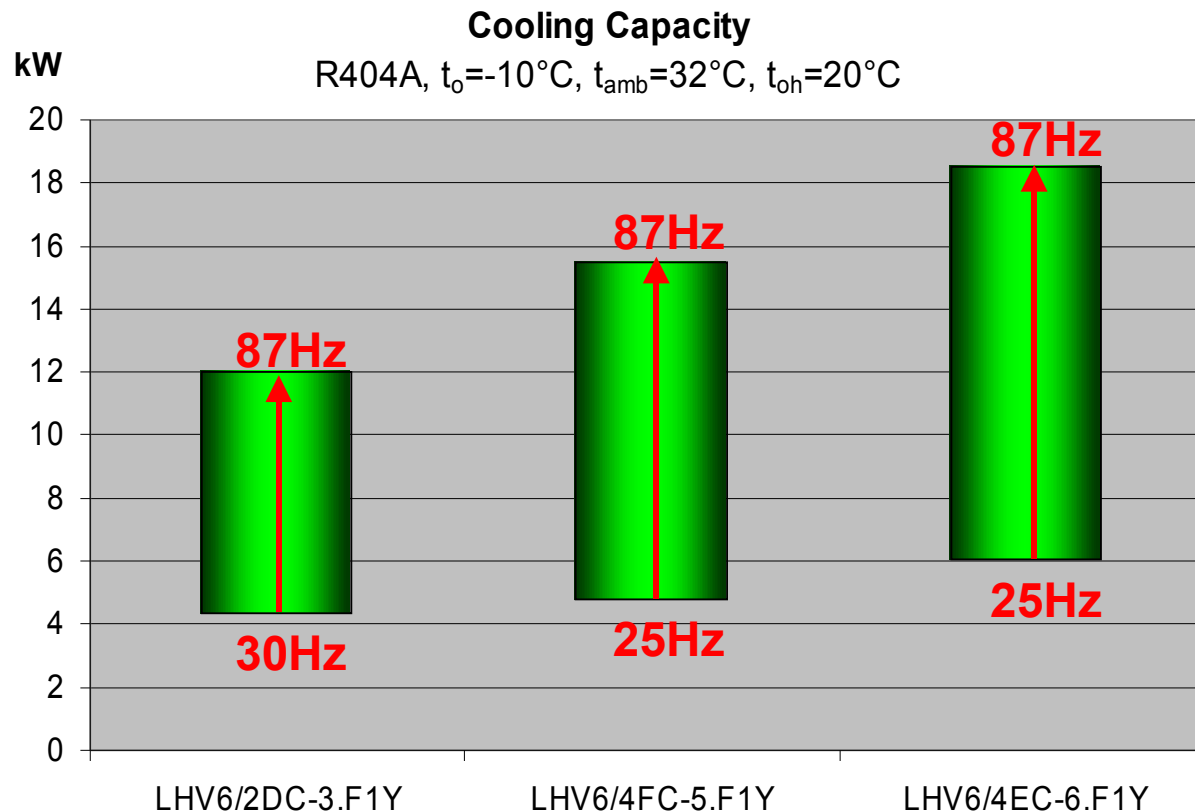
- Infinite capacity control by suction gas cooled frequency inverter
 - ➔ Capacity adaptation up to ratio 3 : 1



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Next step:

Feasibility study ... extension of capacity range ... bigger models... use of tandems



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- ❑ Selection based on max. ambient temperature

Condensing Units

Calculate Export Limits T. Data Tables Help Close

Input data

Series: Ecostar
Refrigerant: R404A
Reference temperature: Dew point temp.
Compressor type: Single Compressor
☐ Cooling capacity
☒ Unit type: LHV6/4FC-5.F1Y
Evaporating SST: -10 °C
Ambient temp.: 32 °C
Suction gas temperature: 20 °C
Useful superheat: 100%
Ecostar mode: Economy
Power supply: 50 Hz 400 V
Frequency compressor: 87 Hz

Output data

Unit type	LHV6/4FC-5.F1Y-40S
Cooling capacity	15.50 kW
Evaporator capacity	15.50 kW
Power input	7.92 kW
Frequency compressor	87.0 Hz
Current (400V)	12.43 A
Mass flow	440 kg/h
Condensing SDT	44.1 °C
Liquid subcooling	3.00 K
Fan power absorbed	0.43 kW
min. cooling capacity	4.81 kW
max. cooling capacity	15.50 kW

Messages
Tentative Data.

Compressor speed step less selectable

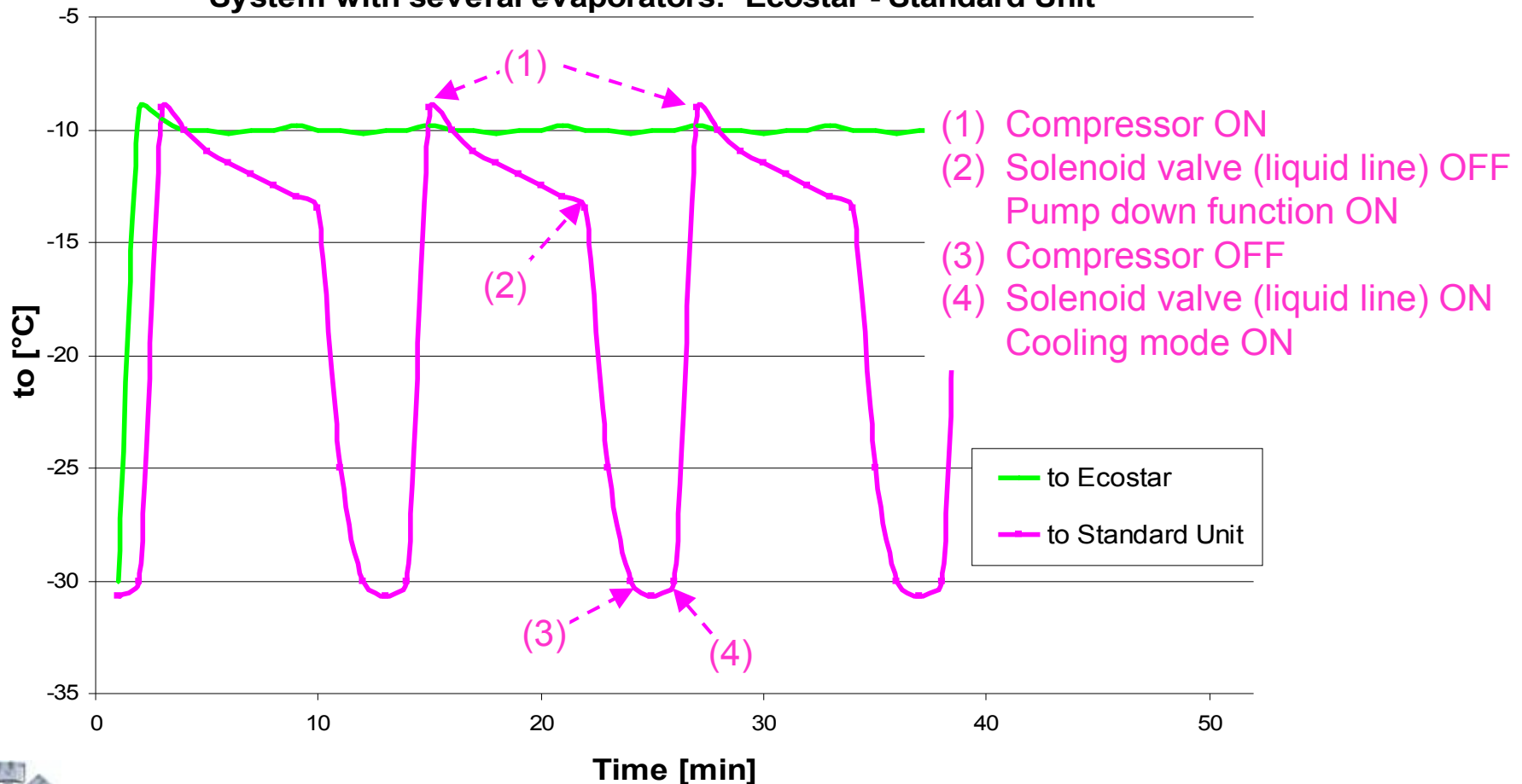


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Infinite speed control reduces start and stop behavior

➔ Intermediate evaporating pressure is visibly higher

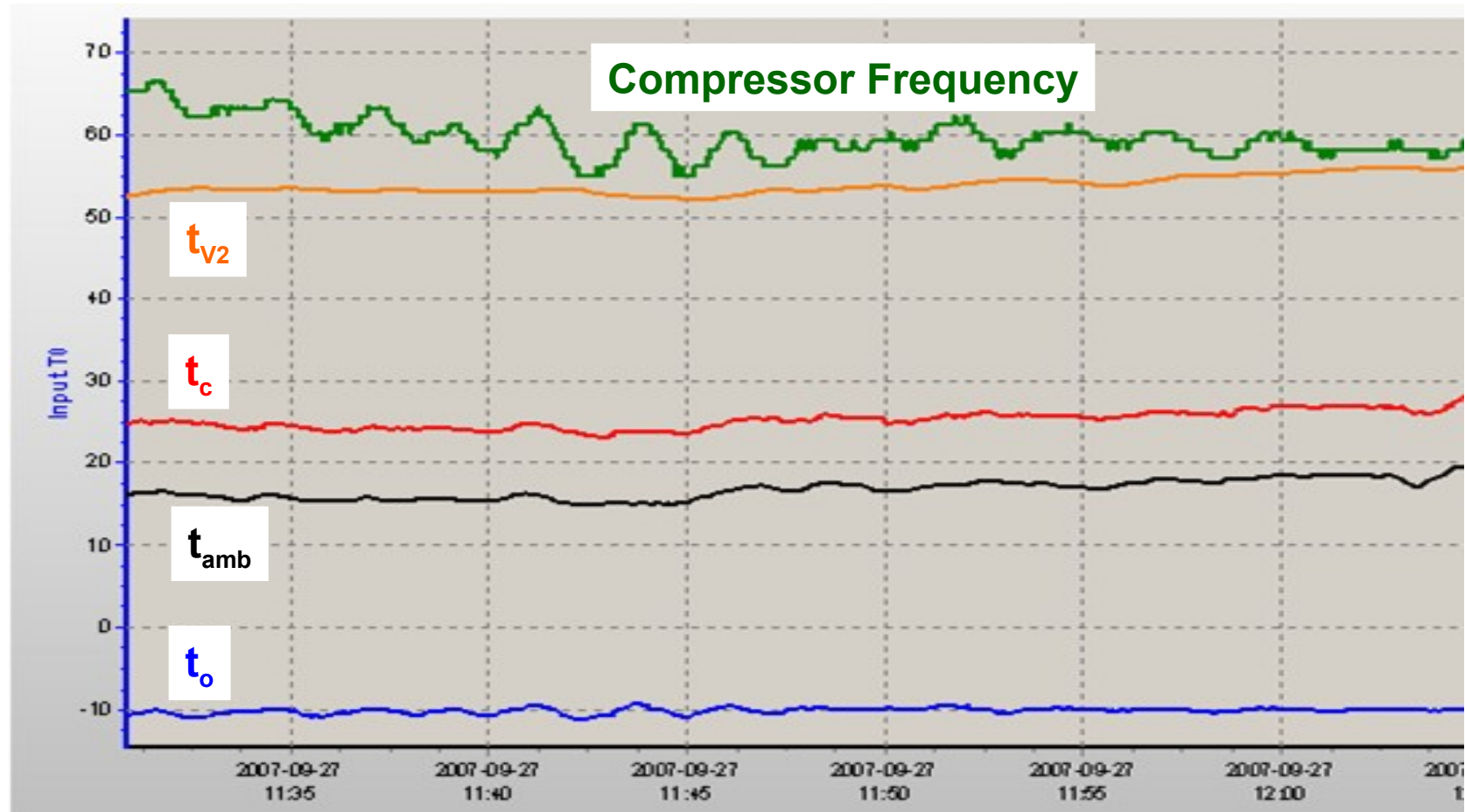
System with several evaporators: Ecostar - Standard Unit



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Field measurement results

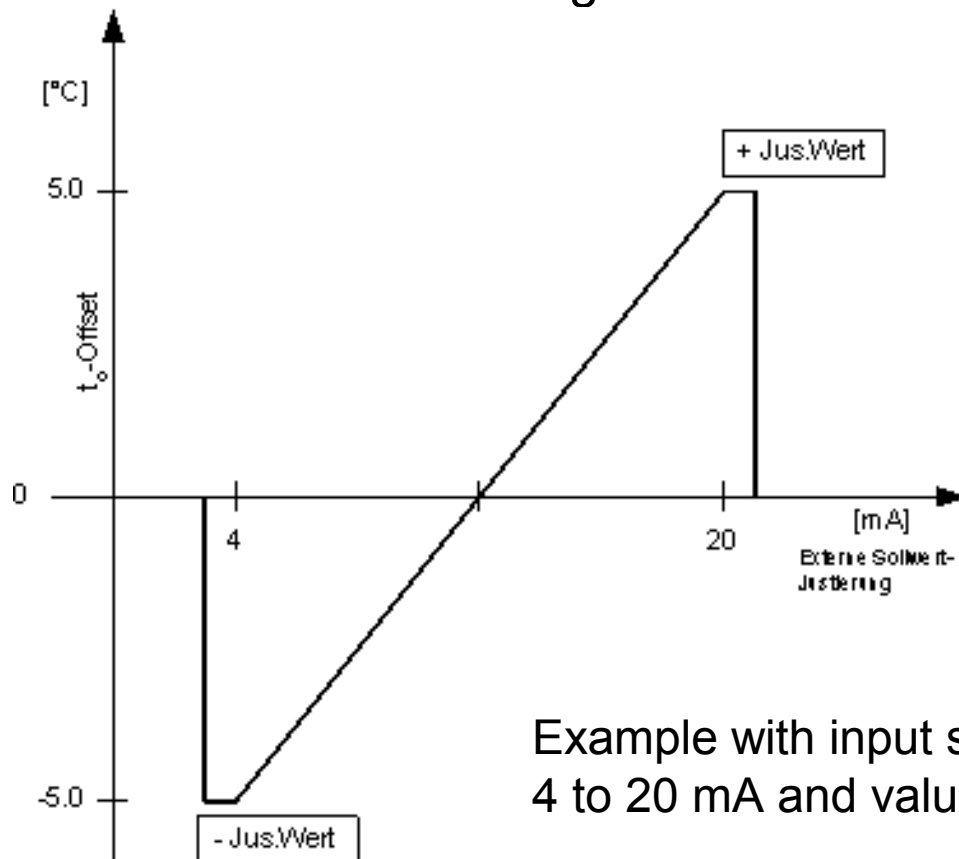
→ Evaporating pressure almost stable – neither fluctuations nor instability



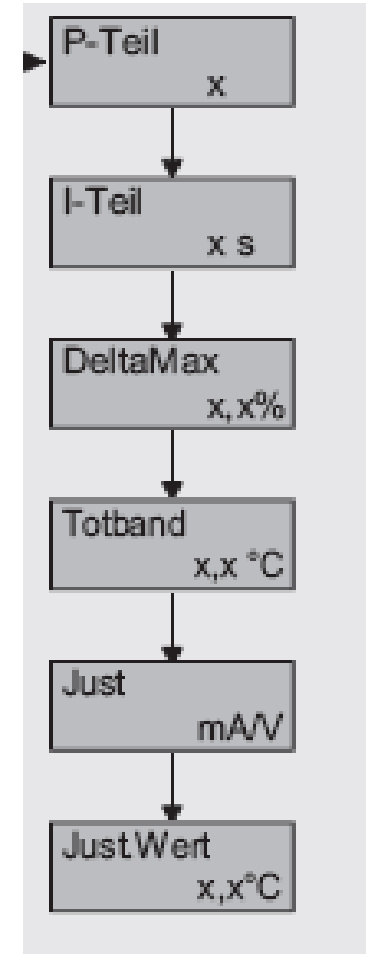
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Adjustment of higher evaporating pressure (e.g. for certain time frame)

- ➔ Programmable with integrated timer with weekly function
- ➔ Infinite via external signal



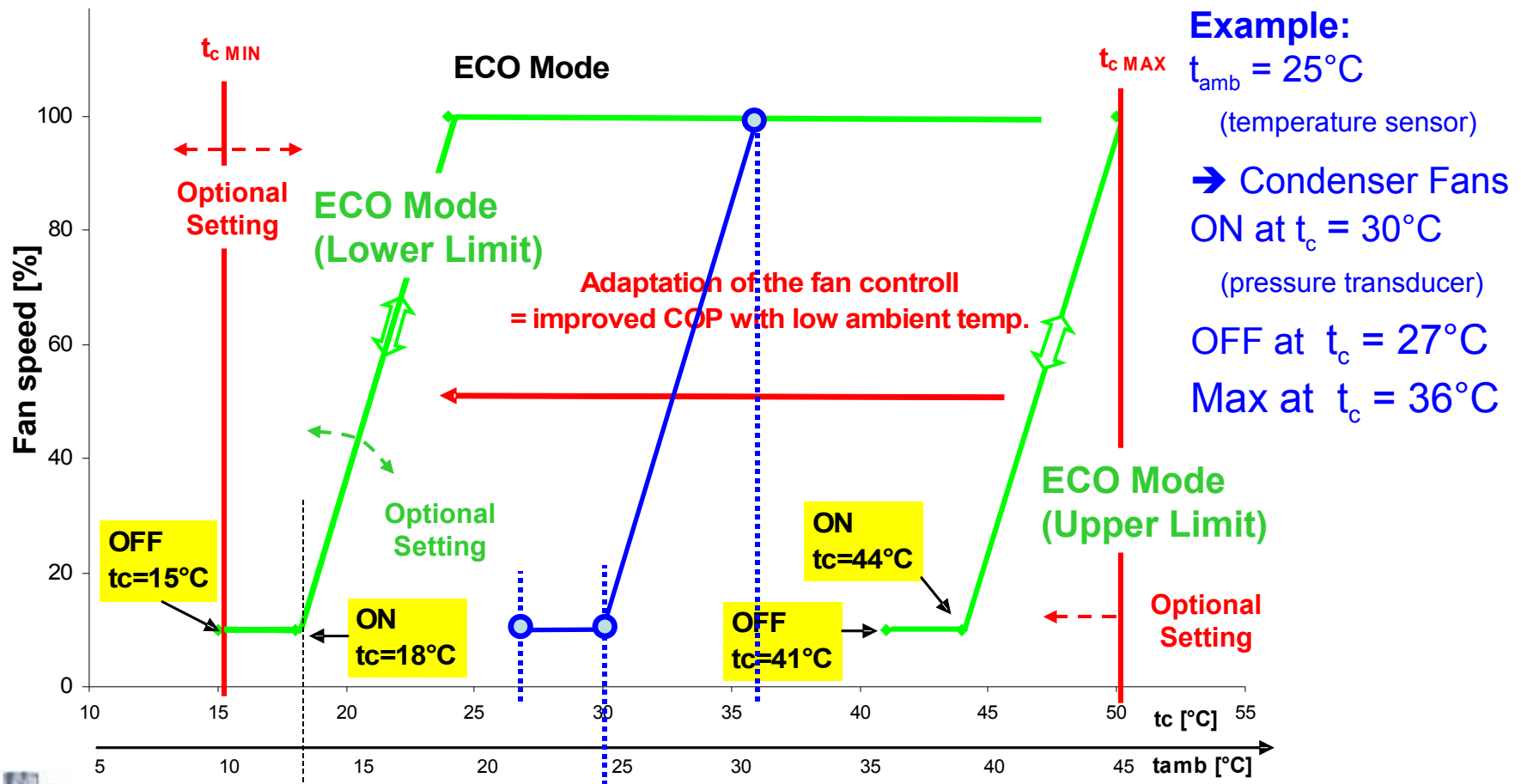
Example with input signal band of 4 to 20 mA and value setting of 5 K



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Infinite speed control of condenser fans

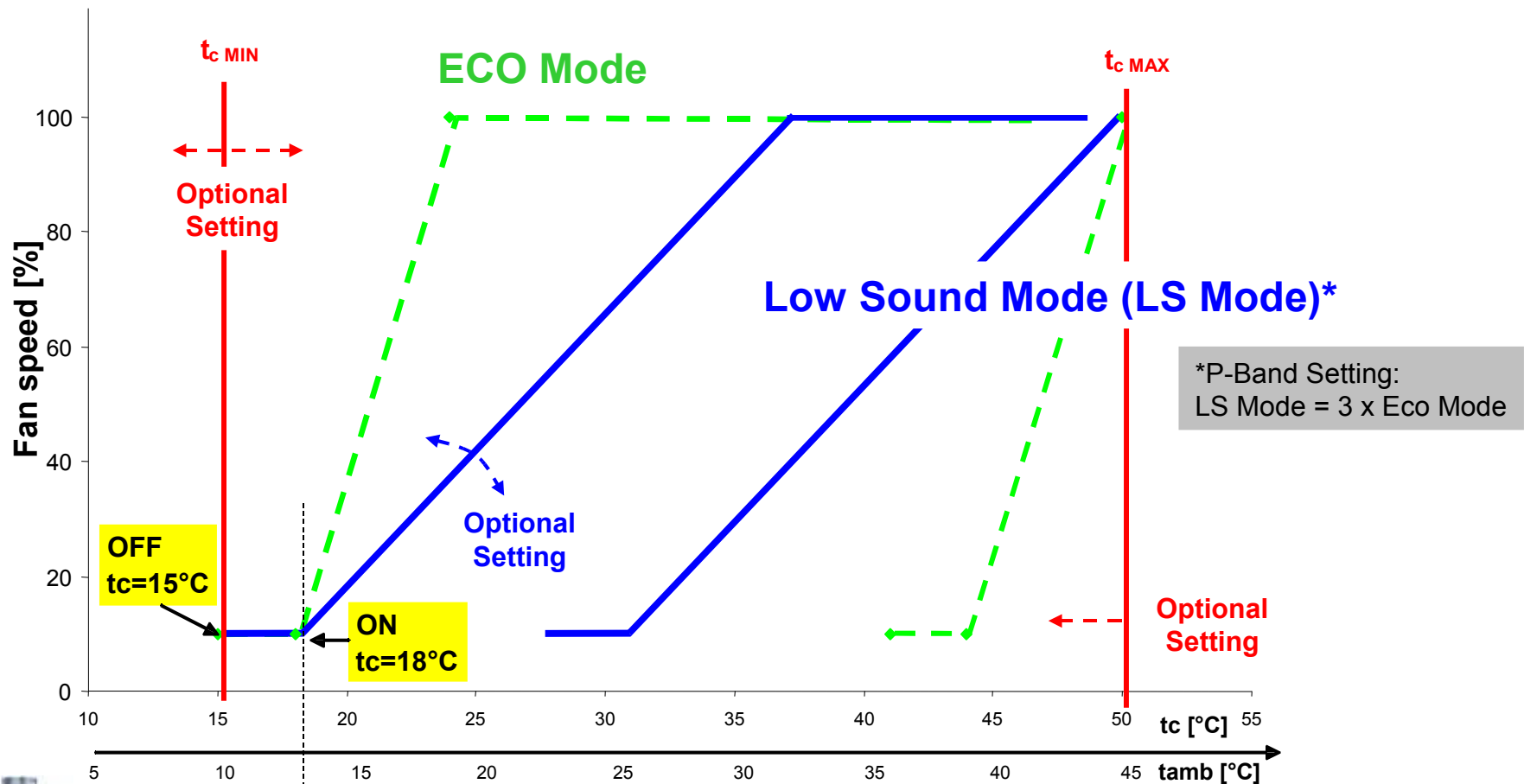
➔ Automatic reduction of condensing pressure – Example (R404A):



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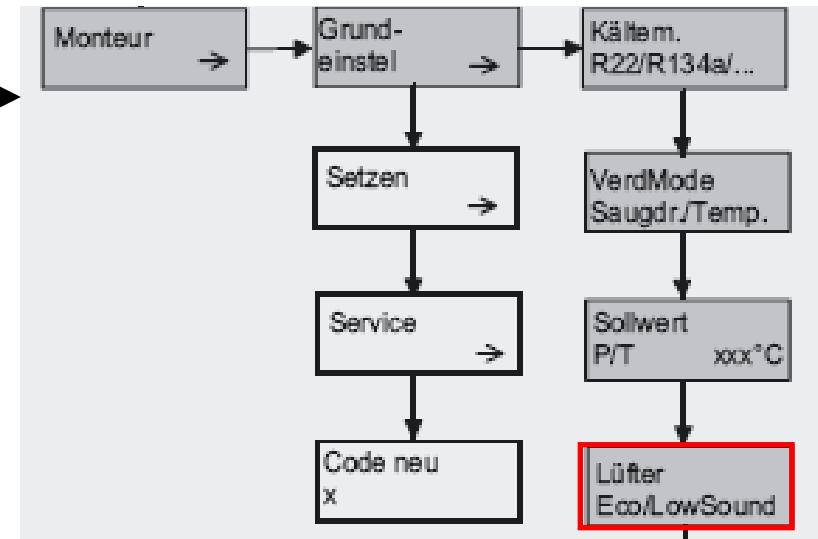
Infinite speed control of condenser fans

➔ Automatic reduction of condensing pressure – Example (R404A):



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Sound emissions reduction:



➔ Low Sound Mode (Condenser Fans)

As standard operation

or via

timer programmable



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Sound emissions reduction:

- ➔ Sound jacket for compressor (optional)
 - Sound emissions about 8 dB(A) lower (compressor)



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Active Application Limits Monitoring → Actions to prevent cut-outs

Examples:

Max. condensing pressure

→ FI reduces compressor speed

Min./max. evaporating pressure

→ FI reduces compressor speed

Max. discharge gas temperature

→ Fans increase speed

→ FI reduces compressor speed

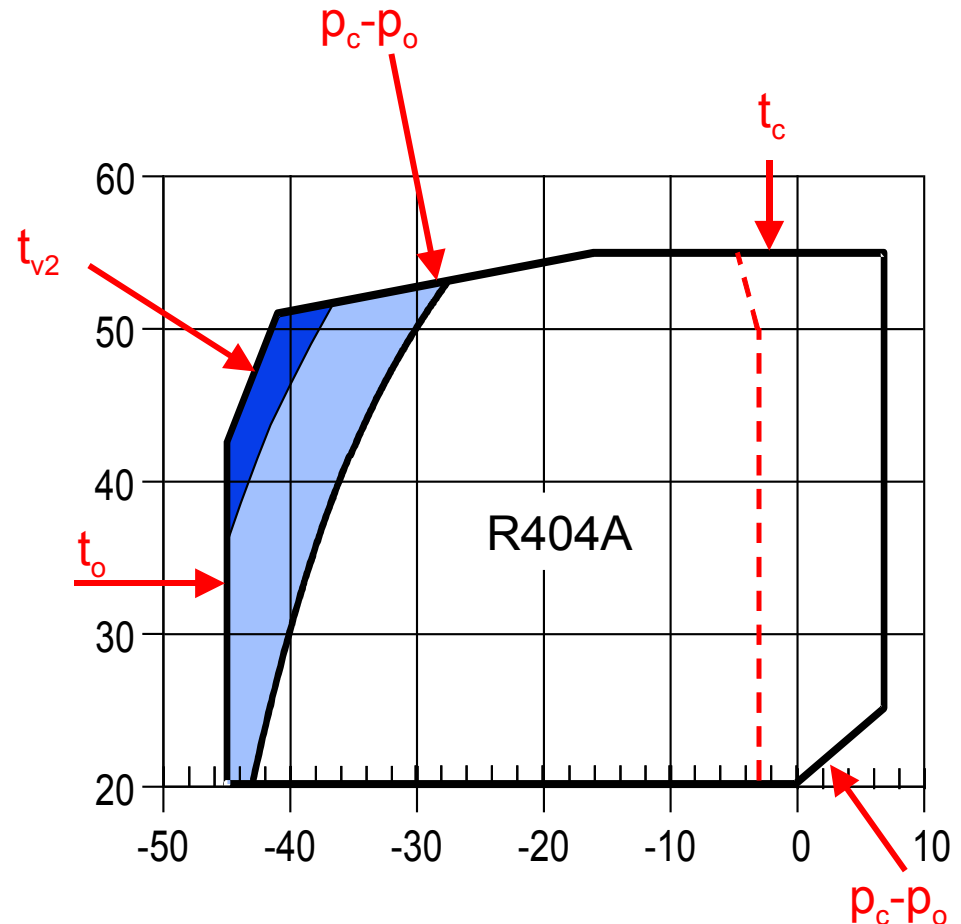
Max. pressure difference

→ Fans increase speed

→ FI reduces compressor speed

Min. pressure difference

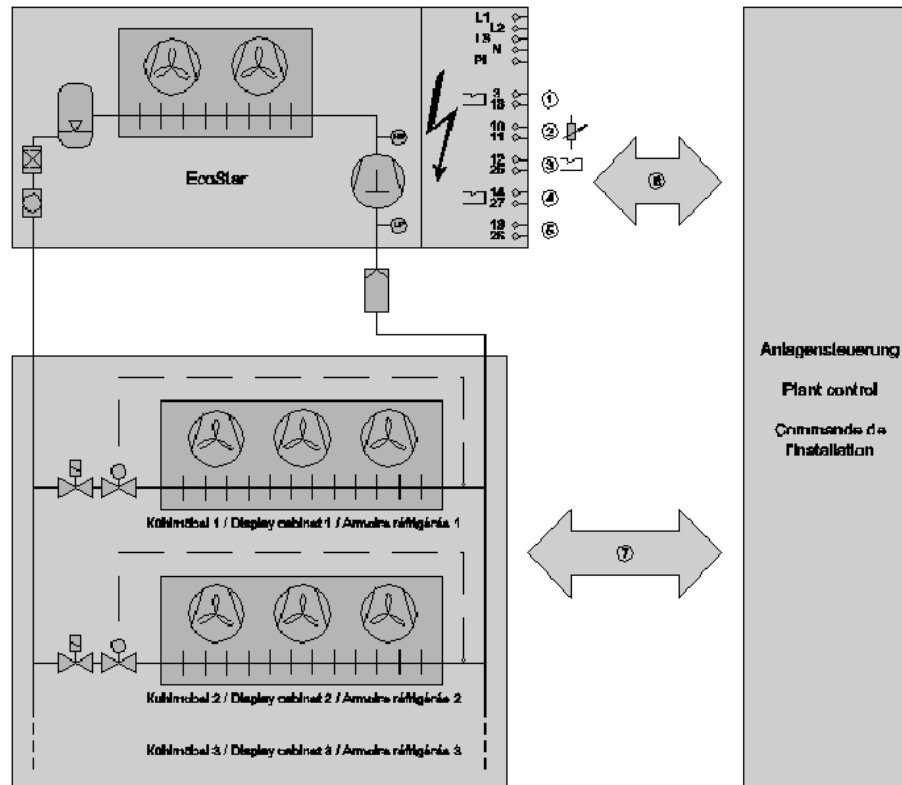
→ Fans decrease speed



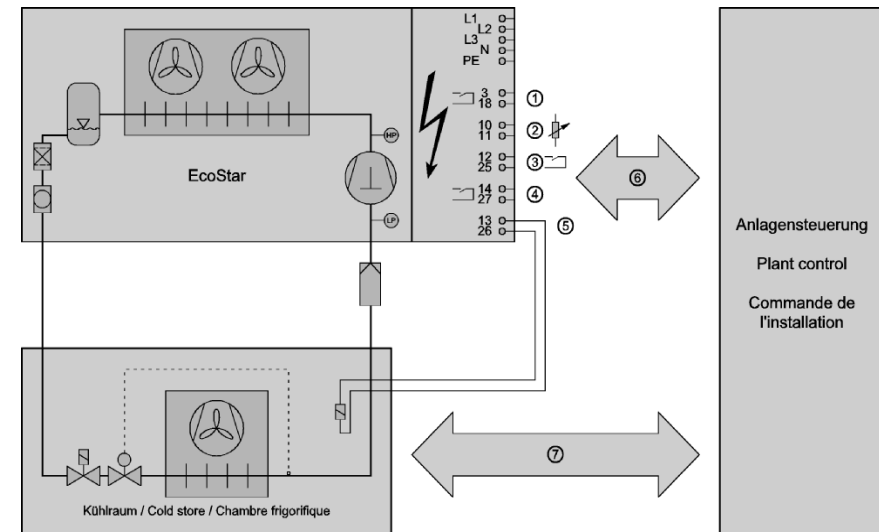
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The controller allows regulation either by evaporating pressure or temperature set point

Regulation by evaporating pressure set point



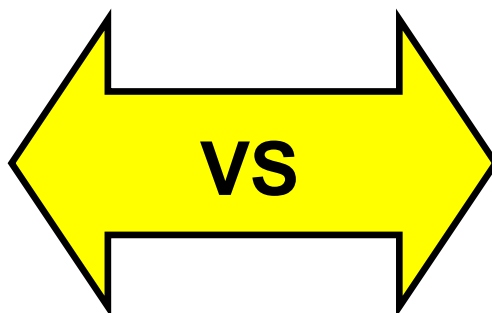
Regulation by temperature set point



FIELD STUDY COST SAVING POTENTIALS



Conventional Scroll Unit
2 x ZX500



ECOSTar LHV6/4EC-6.F1Y
with suction cooled inverter



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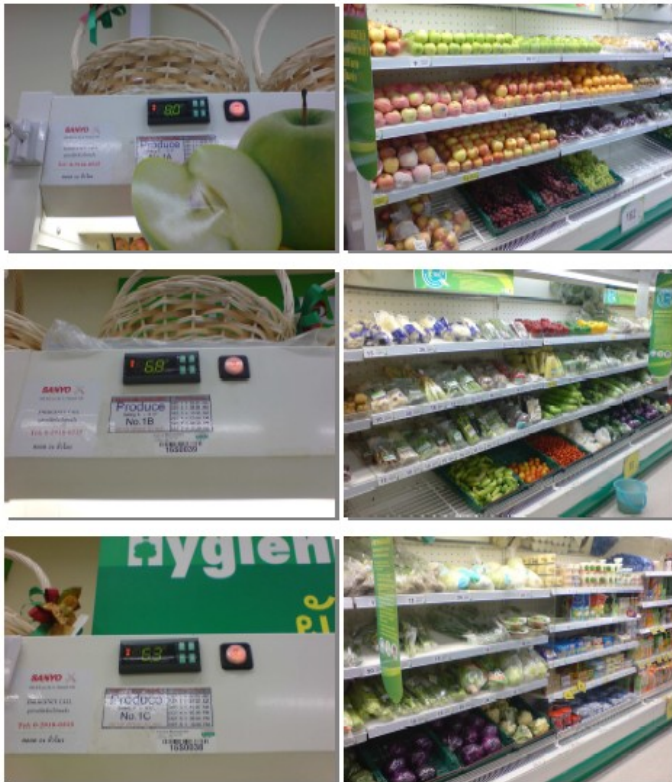
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- ❑ TESCO convenience store in Bangkok/ Thailand
 - existing running store with 2 Scroll CDU's ZX500
 - 3 x L2500 display case
- Operating conditions:
 - R404a, SST= -4°C, 6-8°C display case temperature
- ❑ Comparison on medium temperature application only!
- ❑ Measurement by DIGITAL POWER METER over 6 days each (monitor of power consumption)
- ❑ Existing CDU run first (6 days)
- ❑ Then ECOStar got installed ... run for 6 days as well



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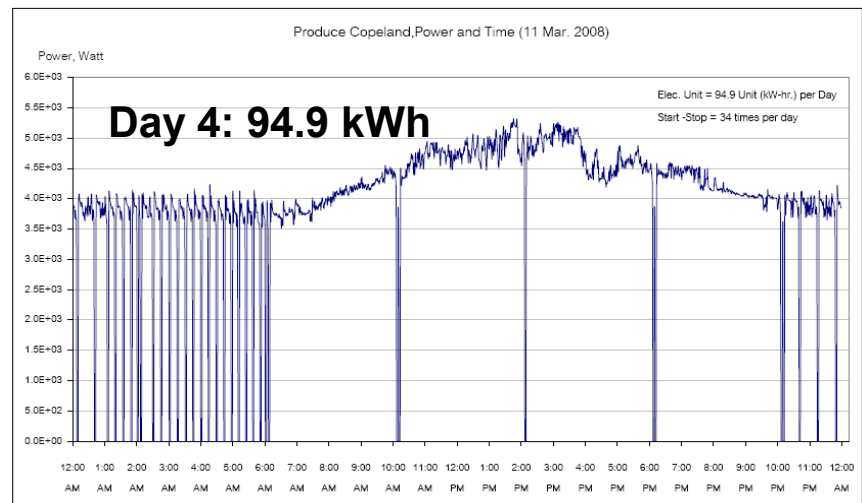
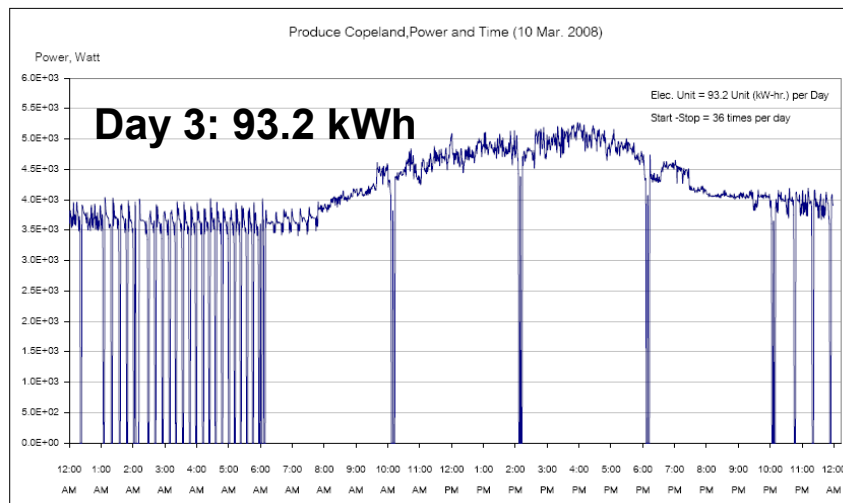
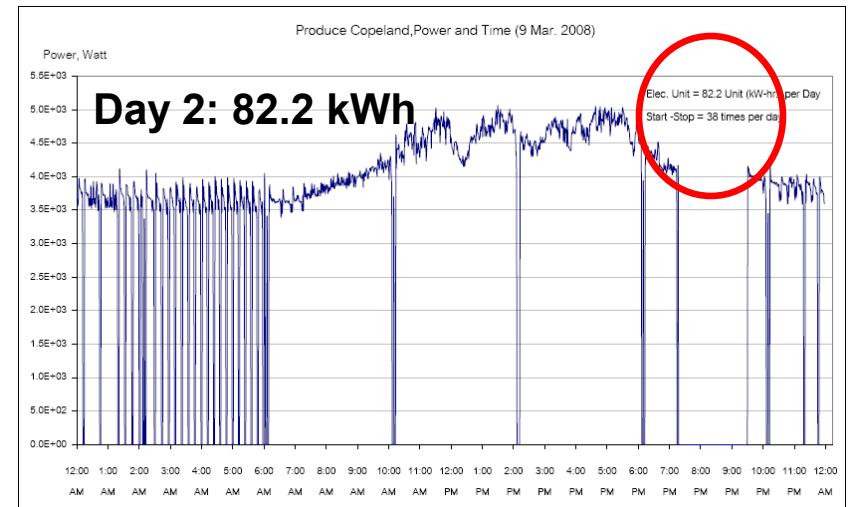
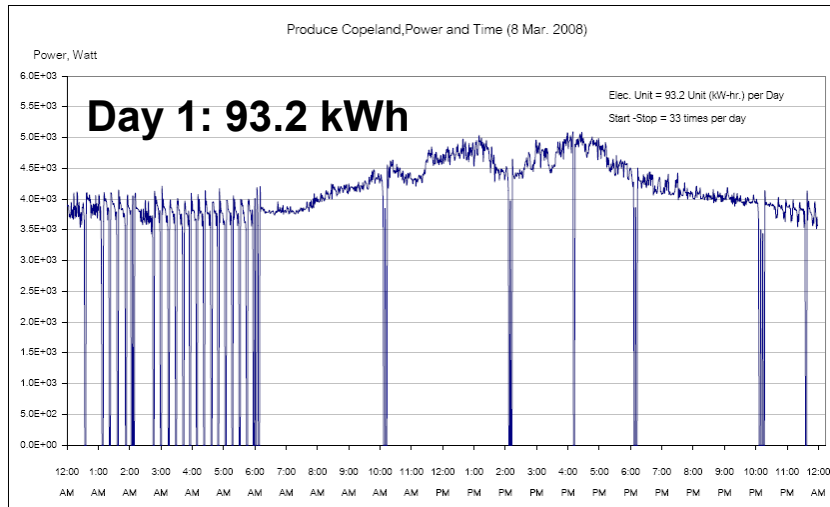
Copeland Scroll Unit vs. ECOSTar: pics of site



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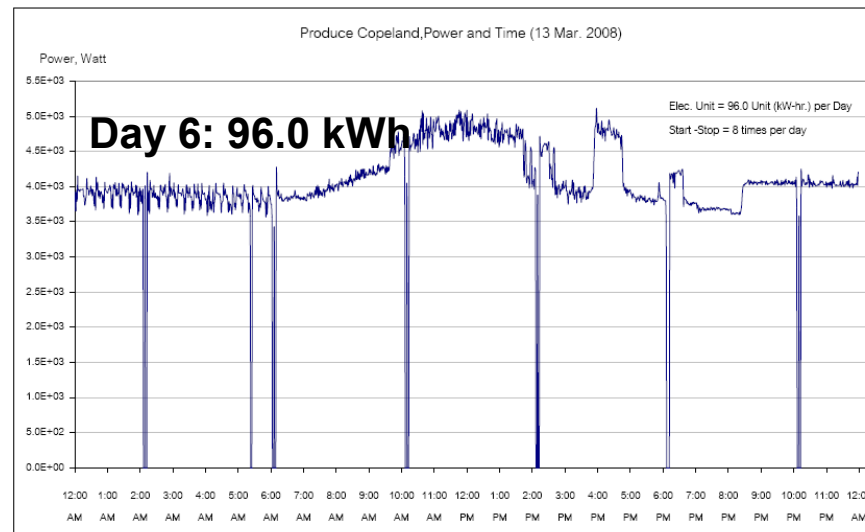
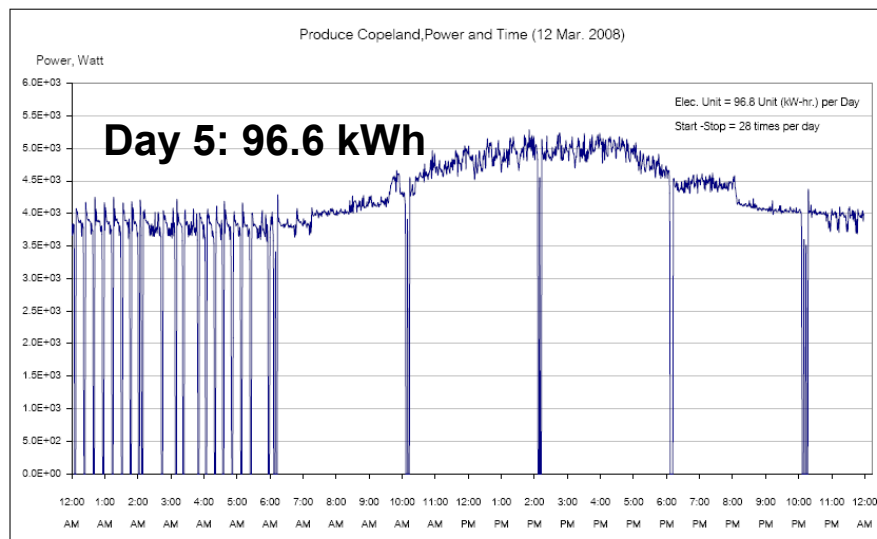
Test results: ZX 500



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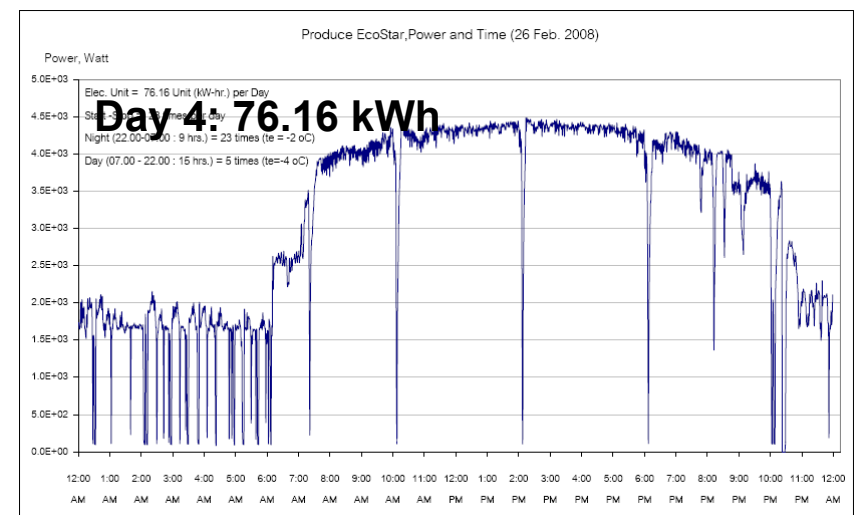
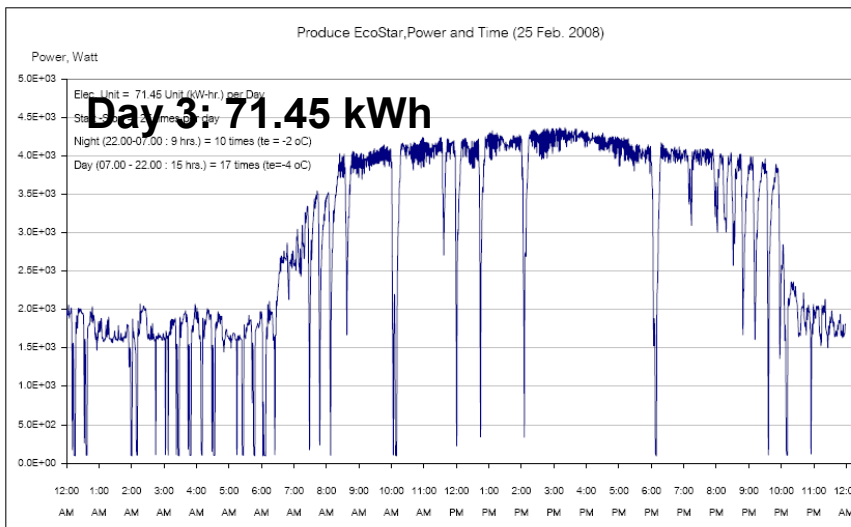
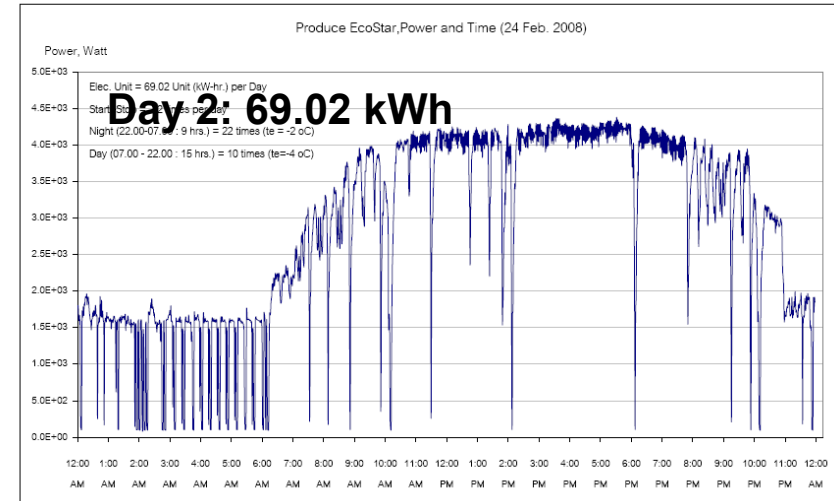
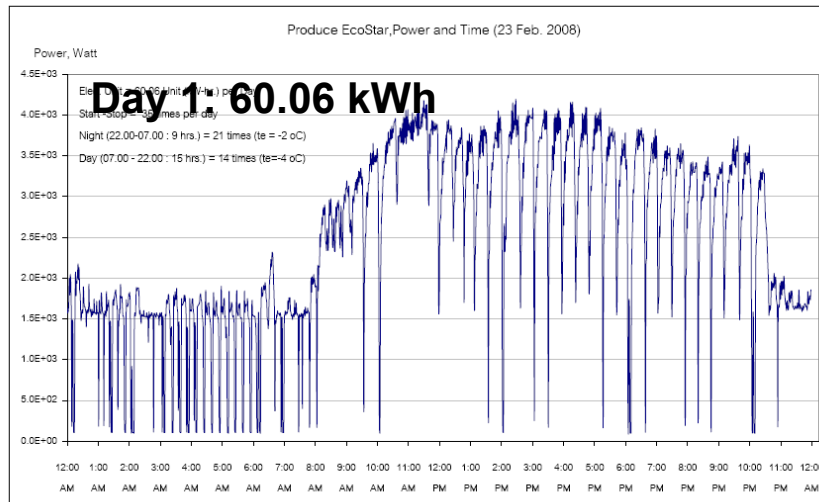
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Test results: ZX 500



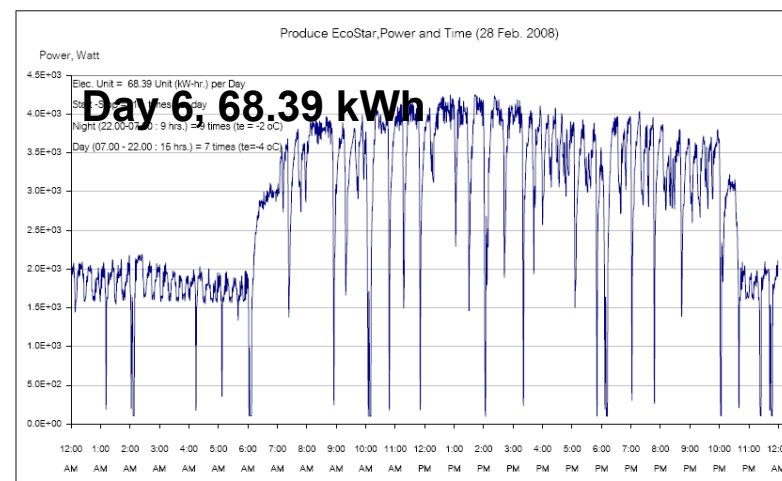
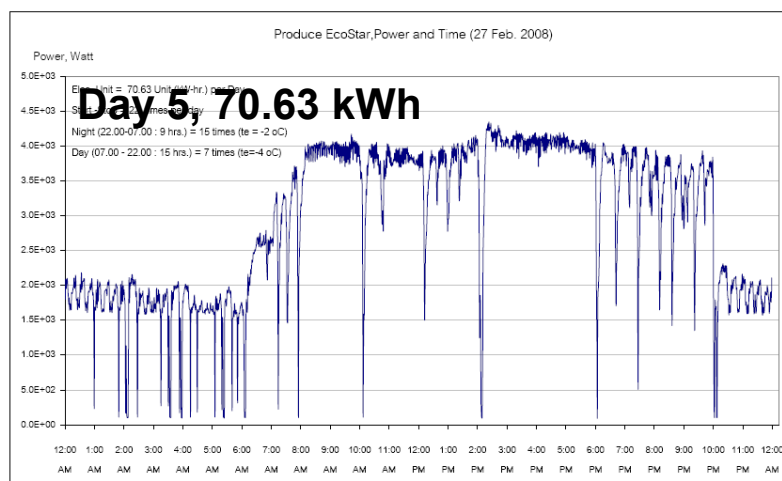
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Test results: ECOStar



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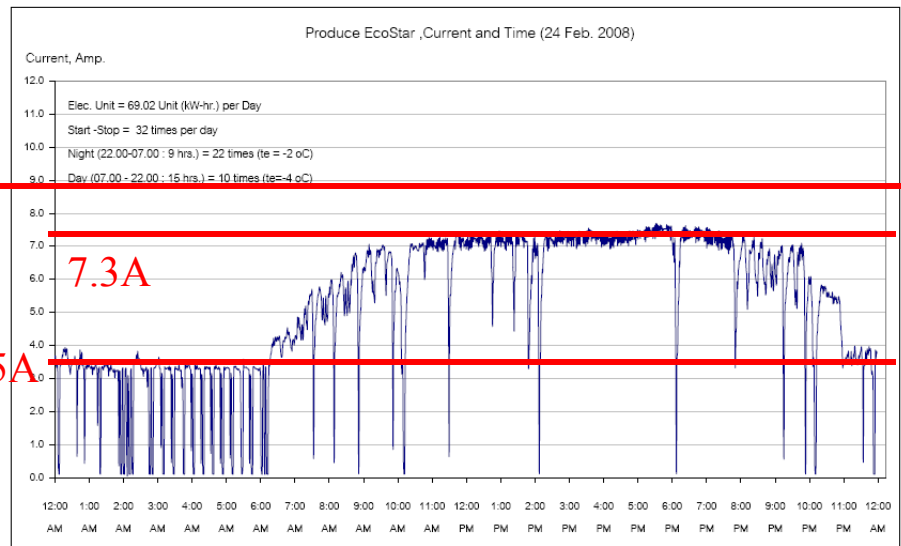
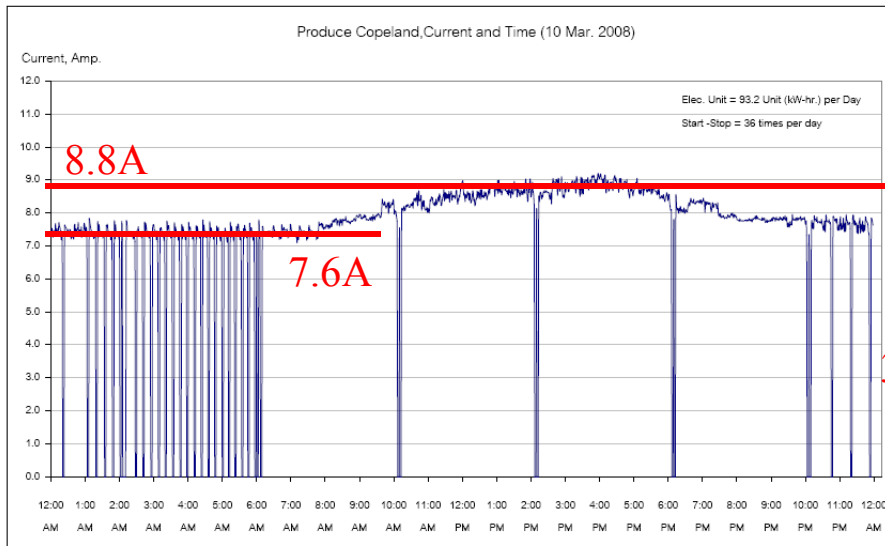
Current (Amps) comparison:

Scroll Unit

Day : 8.8 A average
Night : 7.6A average

Ecostar Unit

Day : 7.3 A average
Night : 3.5 A average



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Test results:

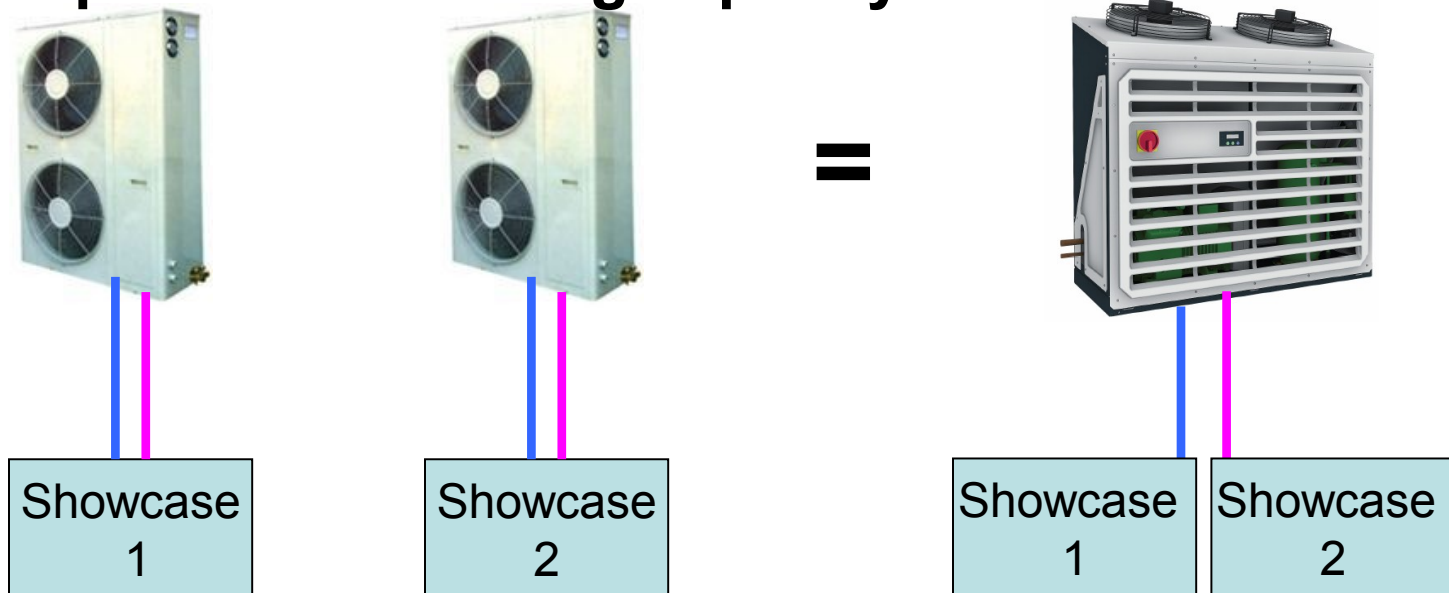
	Day 1 (kwh)	Day 2 (kwh)	Day 3 (kwh)	Day 4 (kwh)	Day 5 (kwh)	Day 6 (kwh)	Total (kwh)	Average (kwh)
Scroll on off unit Power consumption	93.20	82.20	93.20	94.90	96.80	96.00	556.30	92.7
Ecostar unit Power consumption	60.06	69.02	71.45	76.16	70.63	68.39	415.71	69.3

Ecostar Energy (%) = 25.2% less



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Comparison of cooling capacity:



	Unit with Recip & VFD LHV6/4EC-6.F1Y	Conventional unit with 2 x ZB38
Cooling capacity	5.36 - 16.42 kW	2 x 8.67 kW

Based on: R404A; $t_o = -10^{\circ}\text{C}$; $t_{\text{amb.}} = +38^{\circ}\text{C}$; return suction temp. = 18.3°C ; subcooling = 0 K



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Calculation investment return:

Based on the actual testing of a conventional scroll unit (-4°C/ 45°C)

1 x conventional scroll unit ~ 90 kWh/ day

2 x conventional scroll unit ~ 180 kWh/ day or 65,700 kWh/ year

65,700 x U\$ 0.1/ kWh = U\$ 6,570.00/ year

25% saving = U\$ 1,642.50/saving per year

$$\text{Investment Return} = \frac{\$ (\text{Ecostar} - \text{Conventional Units})}{\$ \text{ Saving Per Year}}$$

Example : Investment of U\$ 4,000 will have 2.43 years return of capital
Investment of U\$ 5,000 will have 3.04 years return of capital

Investment Risk = Minimum



Life cycle cost savings:

7 years ~ U\$ 11,500.00 life cycle cost savings

Assumptions:

- 7 years life cycle of standard CU
- No energy cost increase within 7 years
- Energy cost based on lowest rate of U\$ 0.1 /kwh
(Higher energy cost areas will have more savings)
- Based on $t_e = -4^{\circ}\text{C}$, low temperature application will have more savings
- Testing in tropical country, no full advantage on fan speed controller
(under low ambient conditions - more savings)

