Chillventa Specialist Forums 2022
Chillventa Fachforen 2022

CONNECTING EXPERTS.

Why Evapco is an active member of eurammon?

Michael Rabenstein

eurammon lecture event at Chillventa, 12 October 2022

eurammon

refrigerants delivered by mother nature

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Source: Google/Picture

Who is Evapco? – Short Introduction

evap = Evaporative

evapco for LIFE

co = Condenser

Founded: 1976 in Baltimore, Maryland USA

- Employee-Owned
- 33 manufacturing facilities in 14 countries around the world
- Supplied through a sales network of more than 200 offices

Markets:

- Commercial HVAC
- Industrial Process
- Power
- Industrial Refrigeration

Who is Evapco? – Short Introduction

About Eurammon

https://www.eurammon.com/about-us

Whether in the food and beverage industry, in air-conditioning, in sport and recreation facilities, hospitals, the chemical, pharmaceuticals or the automotive industry
– cooling and refrigeration technologies are essential to our civilization and impact every one of us. That is why we have set our minds to using natural refrigerants – to substantially contribute to an eco-friendly and sustainable refrigeration technology. Welcome to eurammon. Refrigeration technologies are essential to our civilization and affect every one of us.

We are an association of companies, institutions and individuals with one goal: to encourage a sustainable approach in refrigeration engineering.
eurammon has therefore been advocating the use of natural refrigerants since its foundation in 1996. The initiative sees its mission in providing a platform for information and knowledge sharing – be it for scientists and researchers, politicians, as well as the public at large. By providing extensive information materials, offering our services and maintaining a globally connected network, we see it as our mission to help spread awareness and acceptance of natural refrigerants. Join eurammon today –for the sake of a healthy and sustainable environment.

>> Refrigeration technologies are essential to our civilization and affect every one of us.

>> We see it as our mission to help spread awareness and acceptance of natural refrigerants.

Different Refrigerants

Refrigerant	Boiling Point	Critical Pressure	Critical Temperature	GWP (AR4)
R22	-40,7 °C	49,9 bar	96,18 °C	1810
R134a	-26,1 °C	40,67 bar	101,10 °C	1430
R404A	-46,2 °C	37,35 bar	72,12 °C	3922
R407C	-43,8 °C	46,15 bar	86,12 °C	1774
…				
R290	-42,1 °C	42,51 bar	96,74 °C	3
R717	-33,4 °C	112,98 bar	132,40 °C	0
R718	100 °C	220,64 bar	373,95 °C	0
R744	-78,3 °C	73,77 bar	30,98 °C	1
…				

Natural refrigerants

Source: Bitzer REF Ruler

Why Evapco is an active member of eurammon?

Global warming potential (GWP)
is the heat absorbed by any greenhouse gas in the atmosphere, as a multiple of the heat that would be absorbed by the same mass of carbon dioxide (CO_2). GWP is 1 for CO_2. For other gases it depends on the gas and the time frame.
Carbon dioxide equivalent (CO_2e or CO_2eq or CO_2-e) is calculated from GWP. For any gas, it is the mass of CO_2 that would warm the earth as much as the mass of that gas. Thus it provides a common scale for measuring the climate effects of different gases. It is calculated as GWP times mass of the other gas.

Important factor
- Lifetime (years)
- GWP

Source: Wikipedia

Why Evapco is an active member of eurammon?

Answer:

Evapco forces the use of natural refrigerants. The combination with sustainable, effective and eco-friendly refrigeration technology follows our mission and vision!

„What if“ compilation and what are the consequences?

GWP = Influence on Global Warming

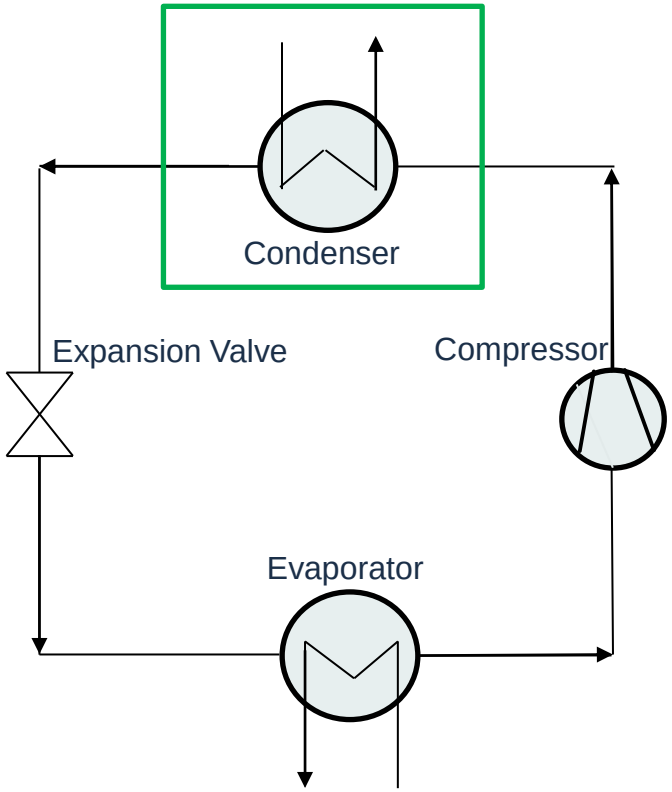
+ Energy Crises

Fact: The impact of Global Warming will turn in a circle with higher power consumption.

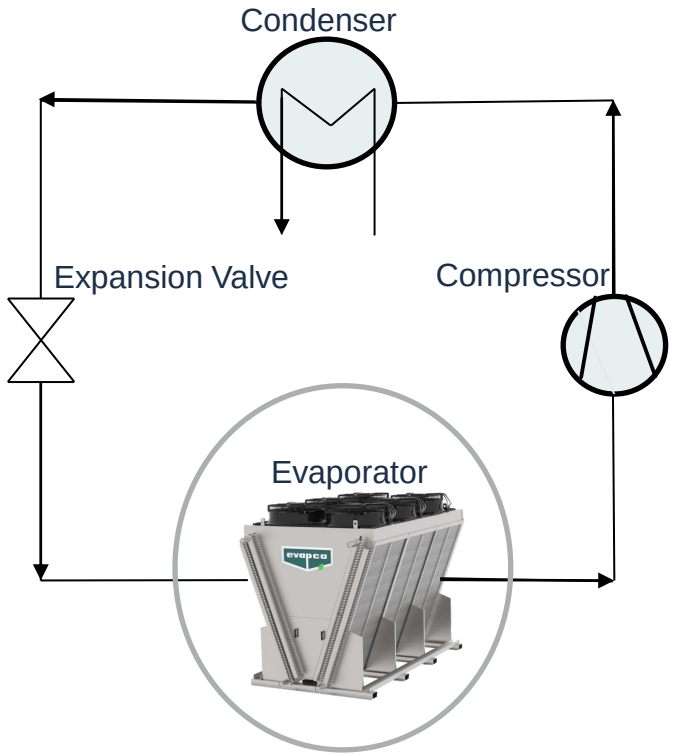
Example: In following explained at a R-717 Plant, focused on the cooling limit: ambient temperature

Different systems:

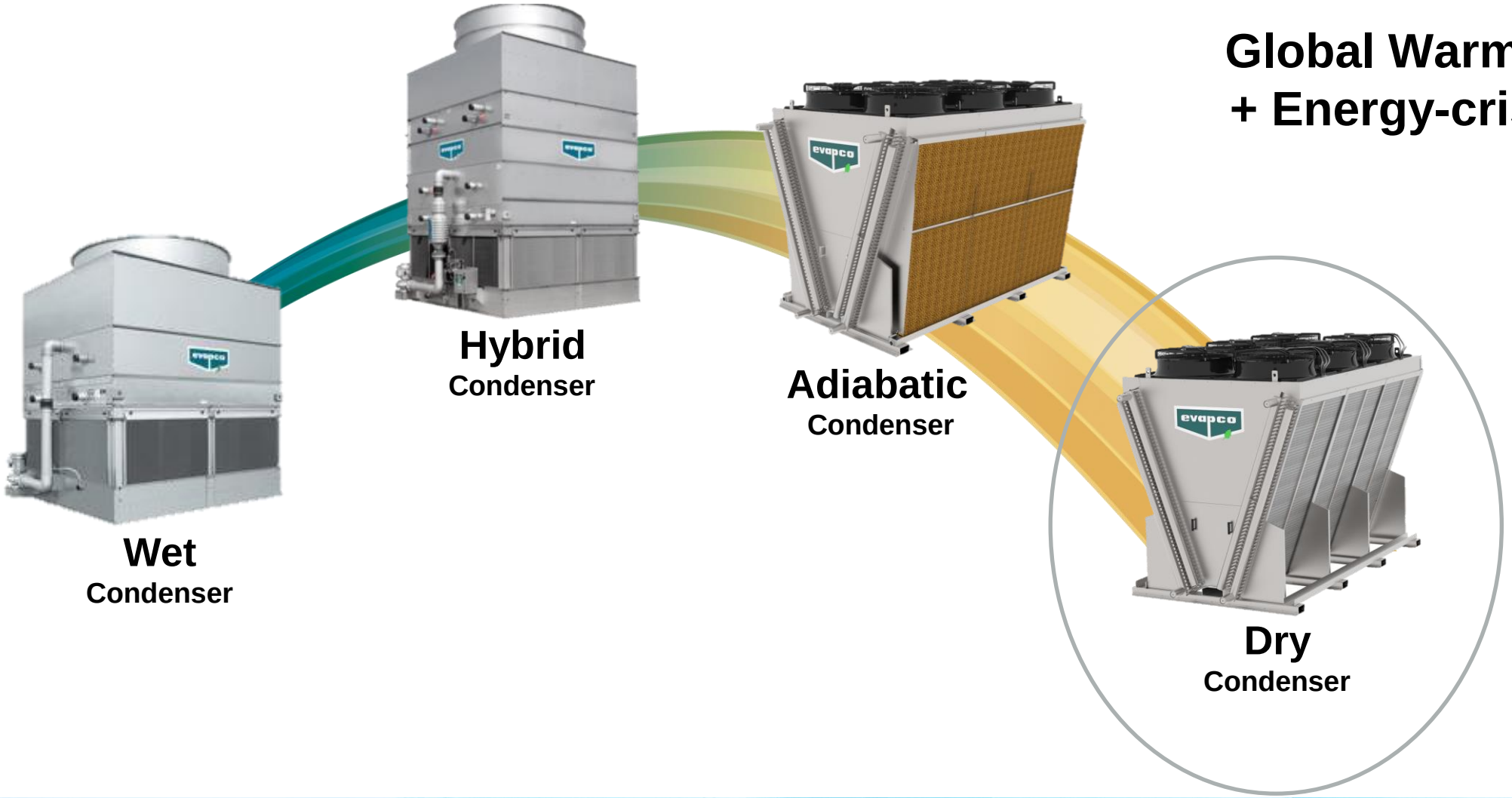
Refrigeration



Heat-pumps

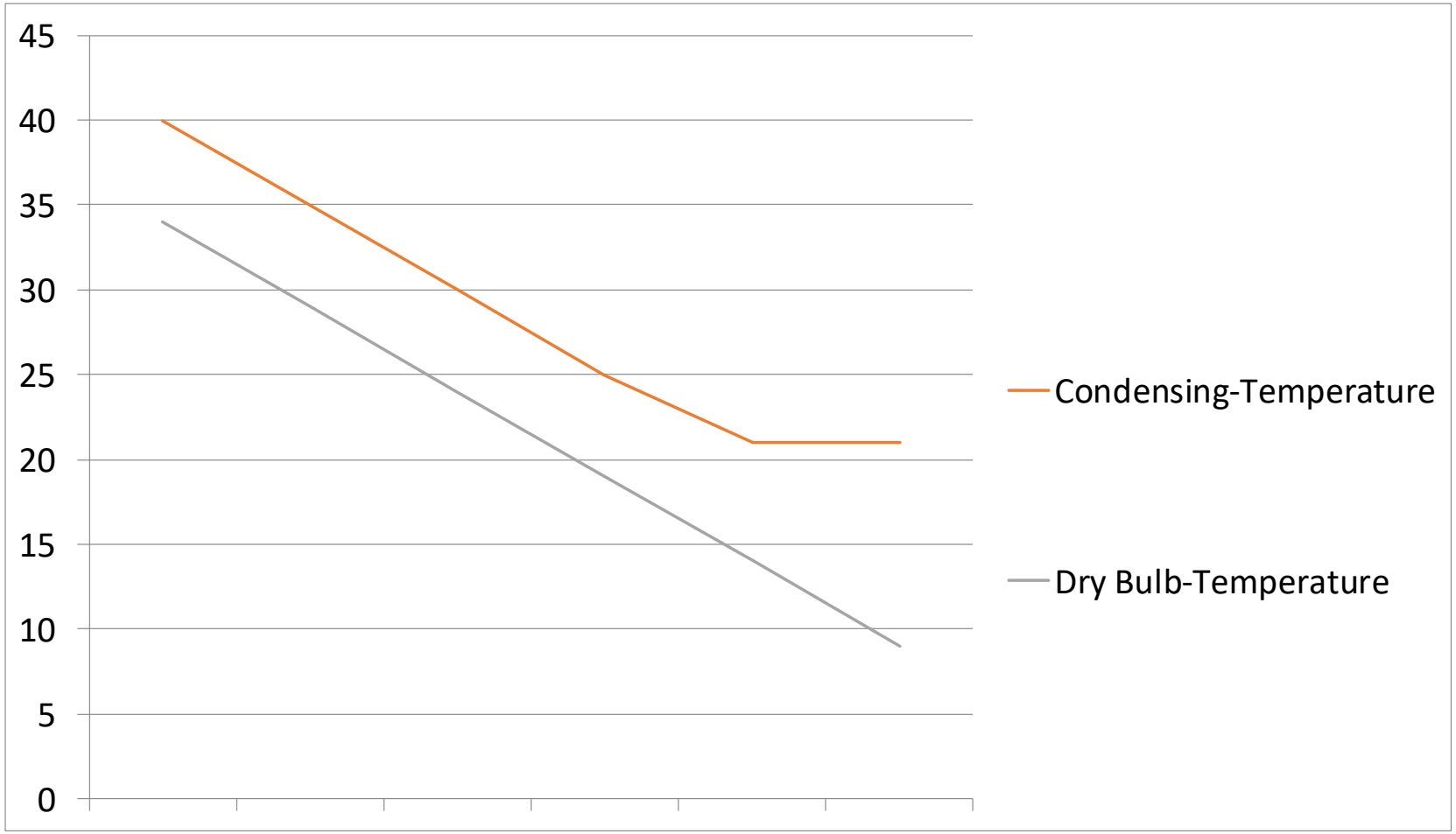


Different systems:



„What if“ compilation and what are the consequences?

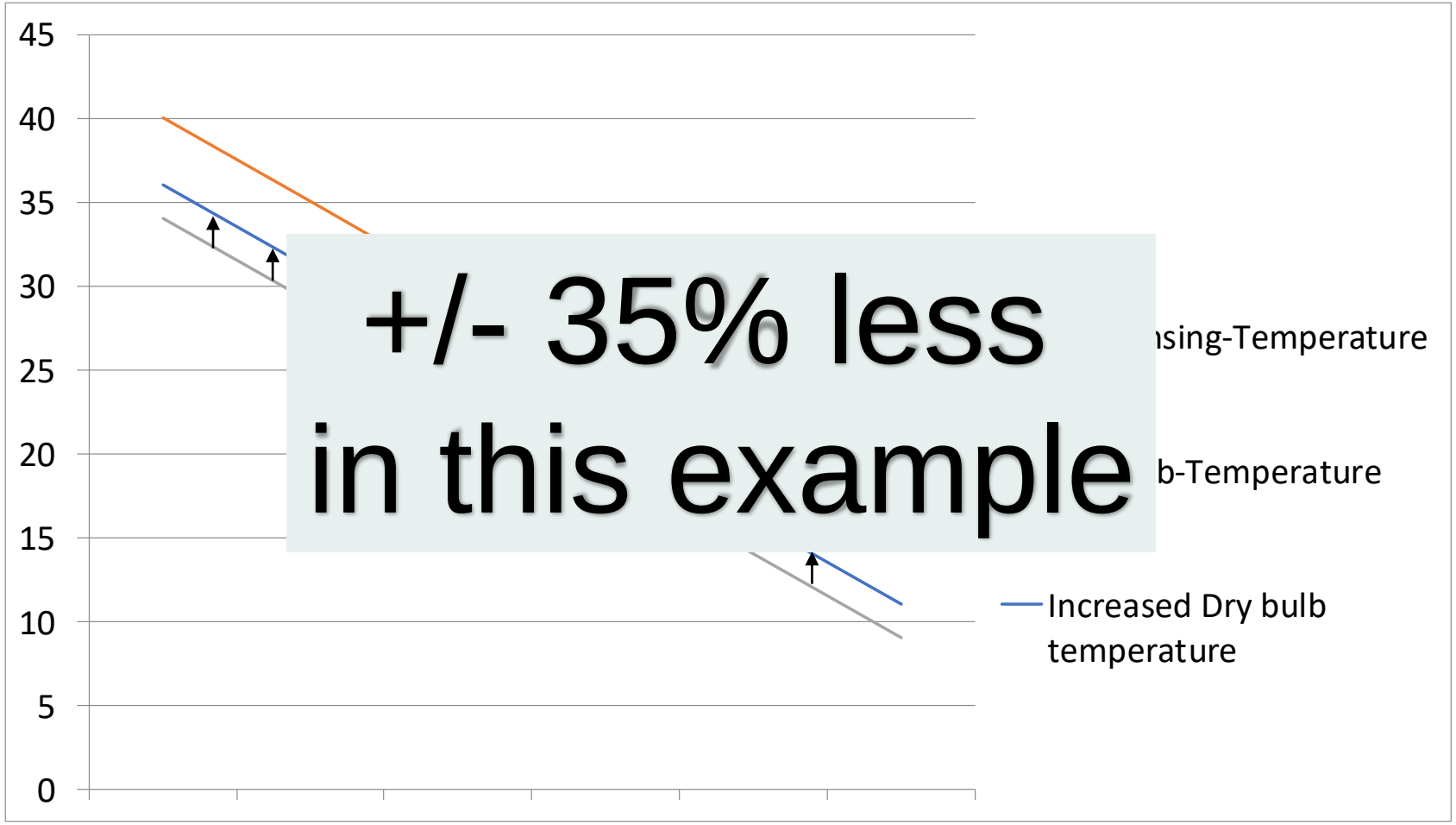
Global Warming: + 2 Kelvin!



Remark:
Constant load

„What if“ compilation and what are the consequences?

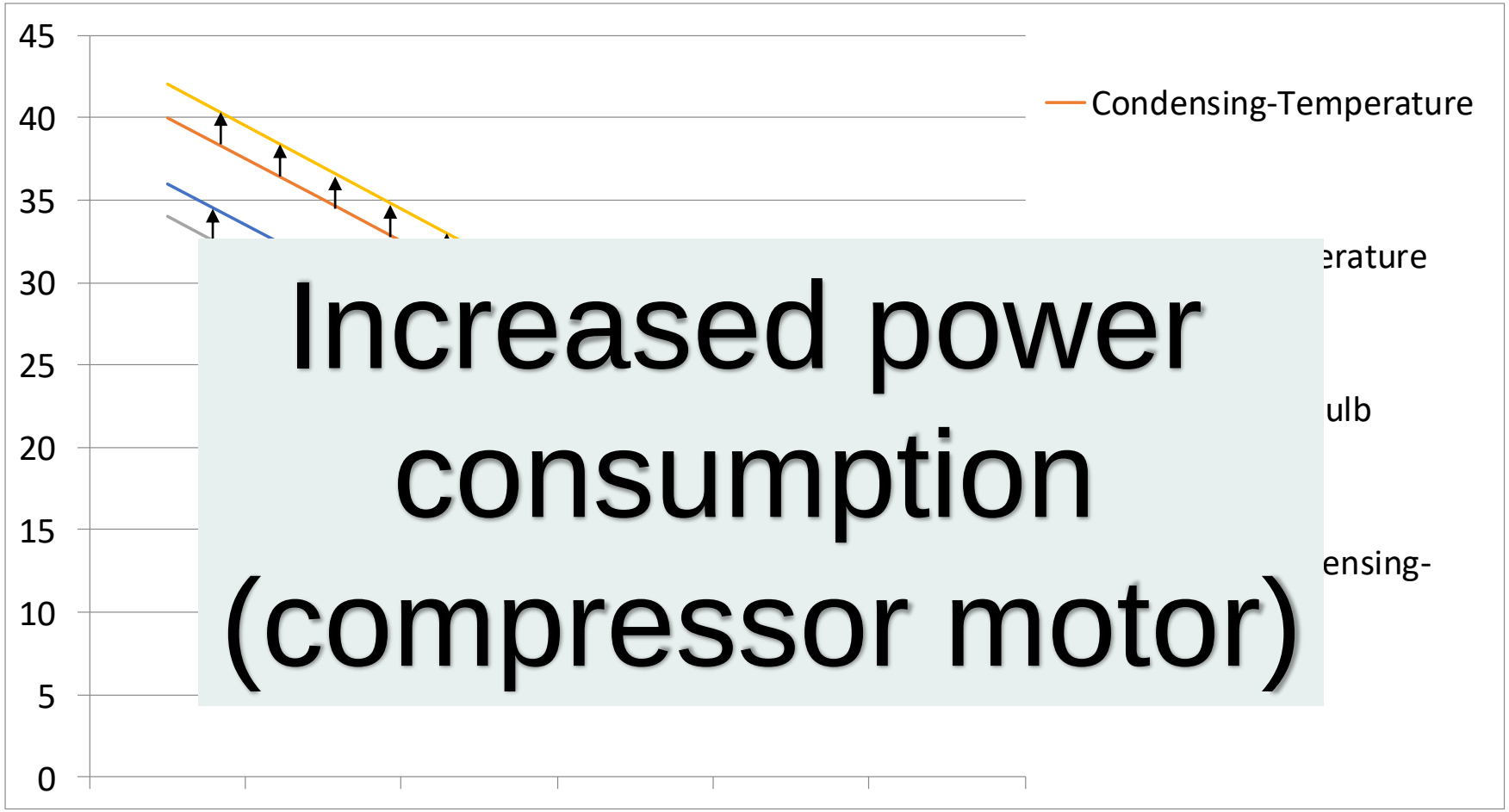
A: Reduction of the refrigeration capacity!?!



Remark:
Constant load

„What if“ compilation and what are the consequences?

B: Modification at the chiller!?!

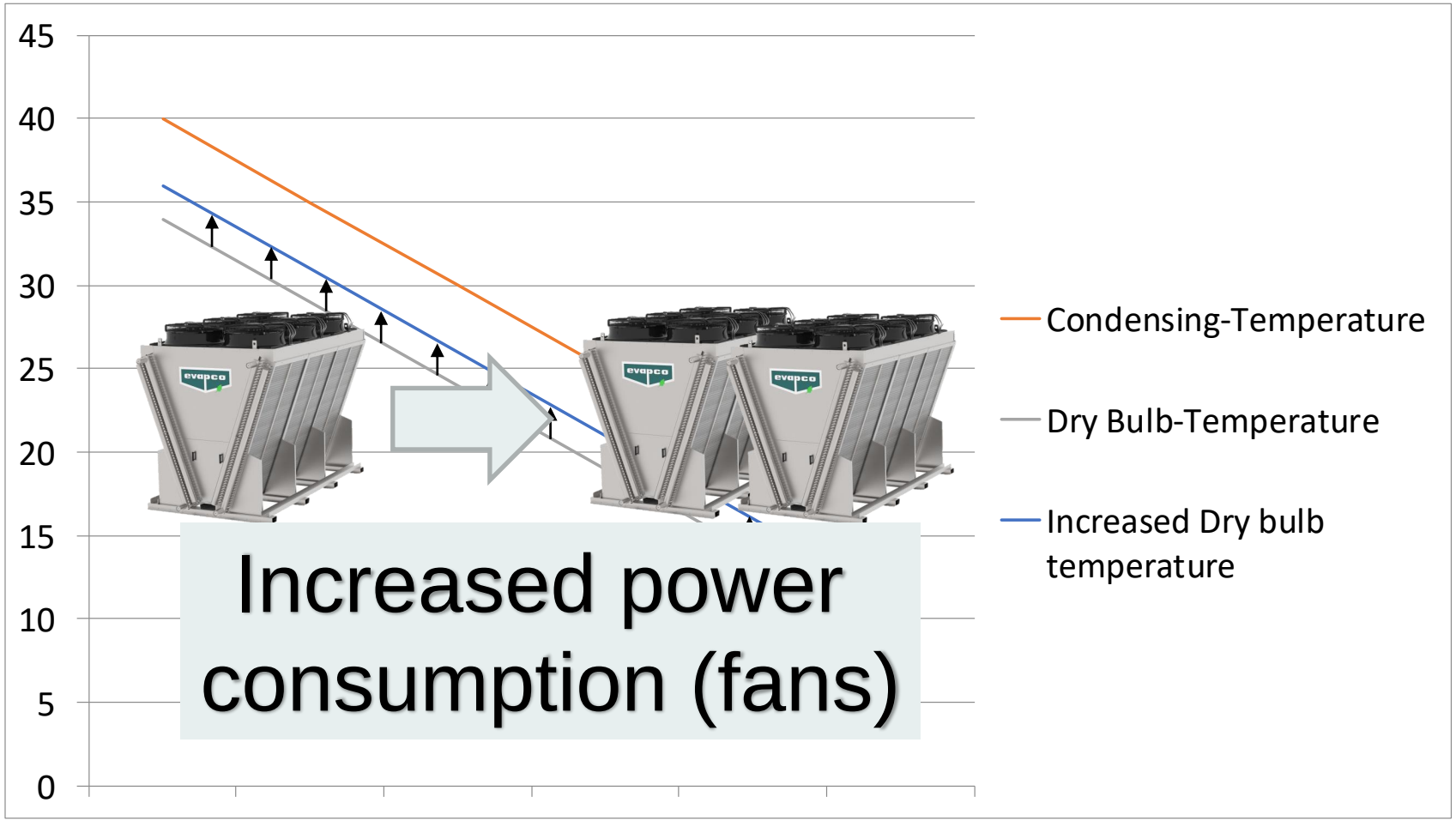


Increased power consumption (compressor motor)

Remark:
Constant load

„What if“ compilation and what are the consequences?

C: Oversizing of the air cooled condenser by > 50% ?



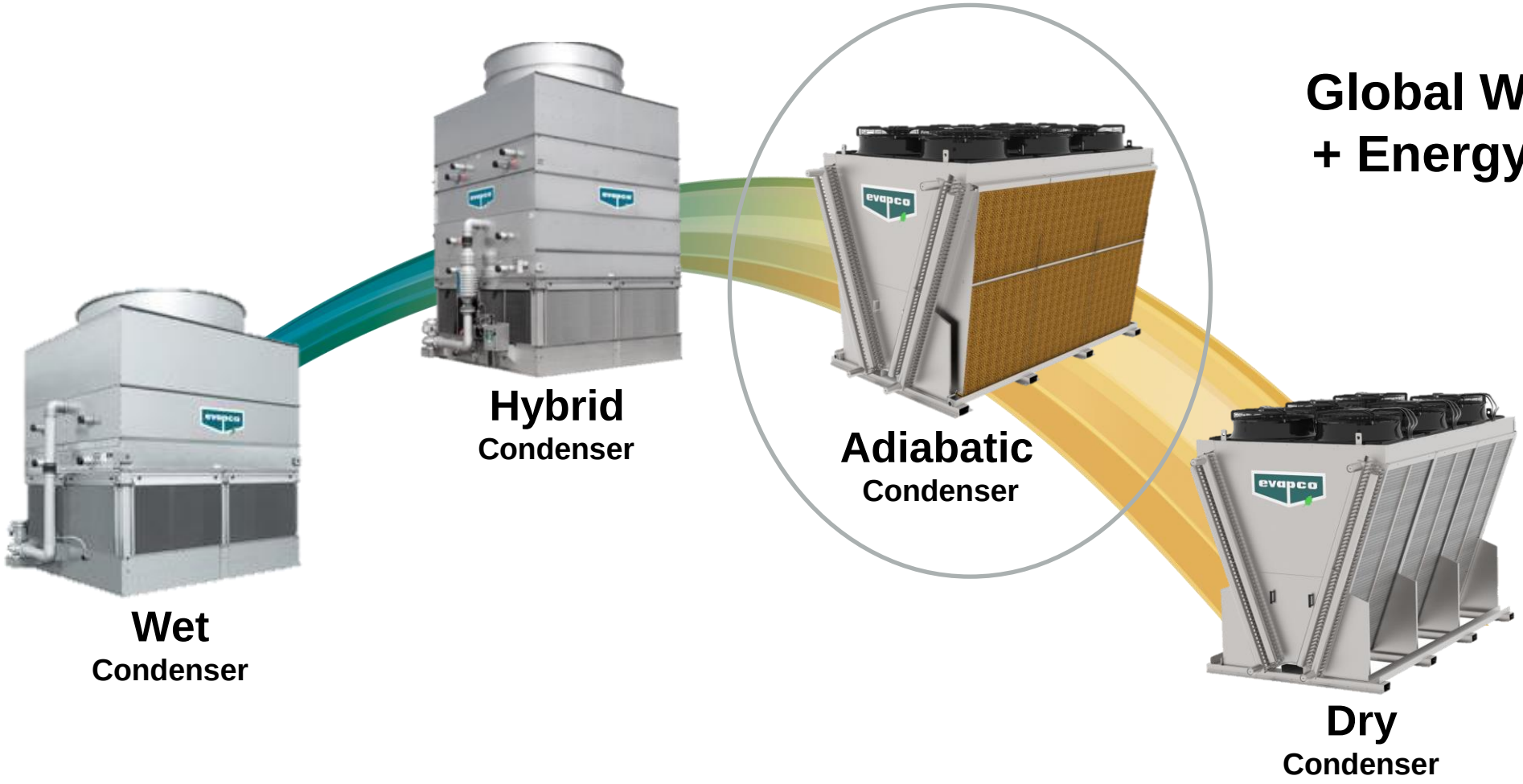
Remark:
Constant load

„What if“ compilation and what are the consequences?

	Ambient in °C	Working / wet bulb Temperature in °C	Difference in K
Dry	34,0	34,0	2,0
Dry	36,0	36,0	

Possible Alternatives

Different systems:



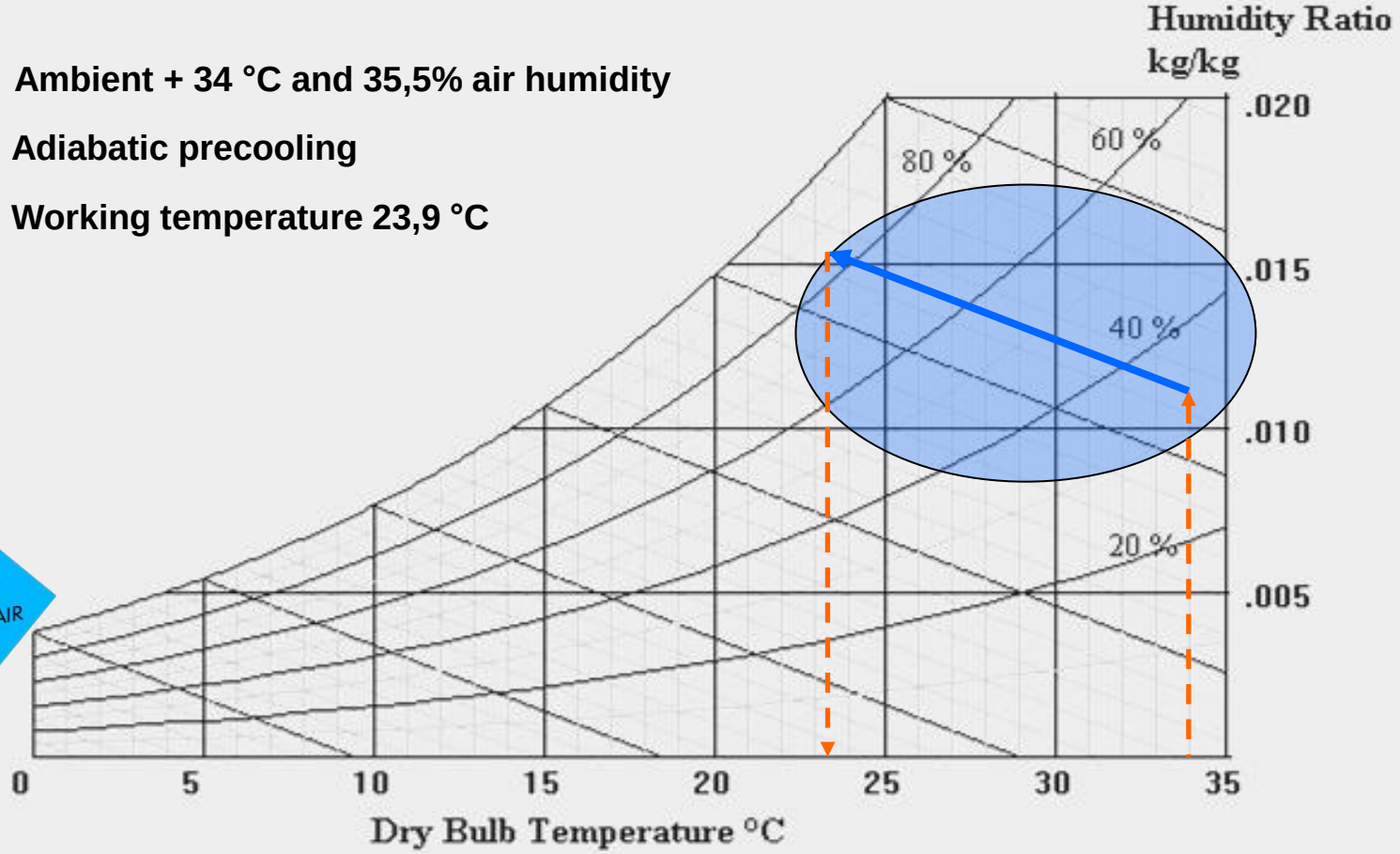
Global Warming
+ Energy crises

„What if“ compilation and what are the consequences?

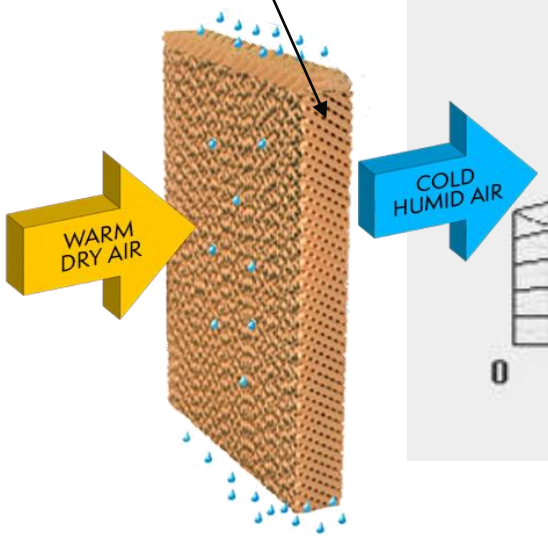
Ambient + 34 °C and 35,5% air humidity

Adiabatic precooling

Working temperature 23,9 °C



<< 100% air humidity, because of the limited thickness

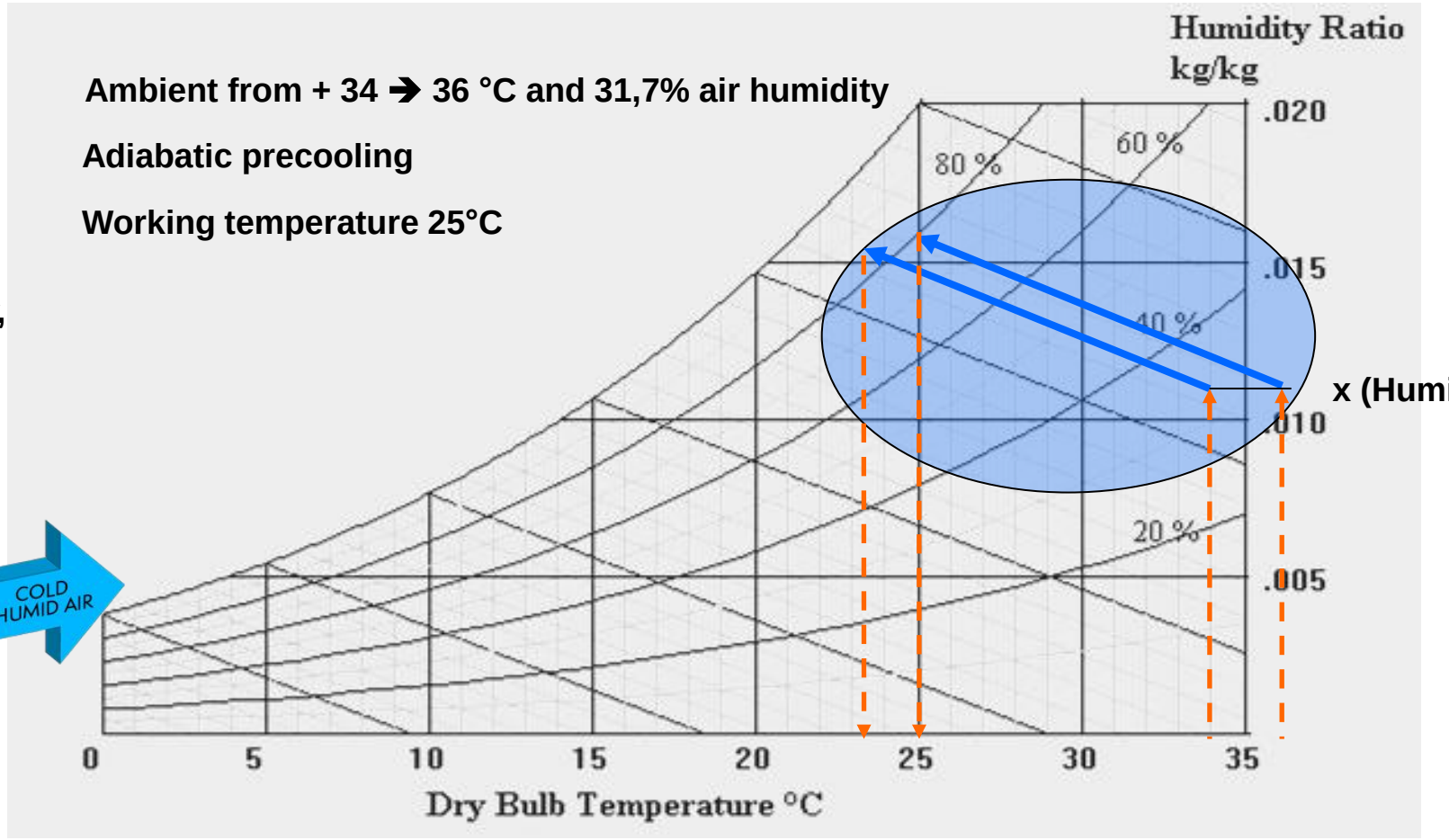


„What if“ compilation and what are the consequences?

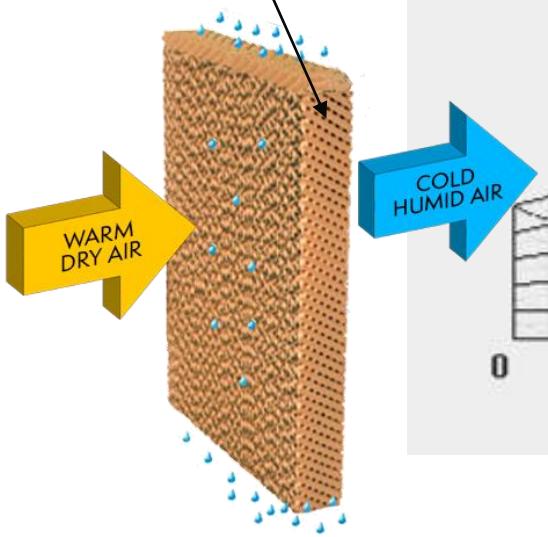
Ambient from + 34 ➔ 36 °C and 31,7% air humidity

Adiabatic precooling

Working temperature 25°C



<< 100% air humidity, because of the limited thickness



x (Humidity ratio) = constant

„What if“ compilation and what are the consequences?

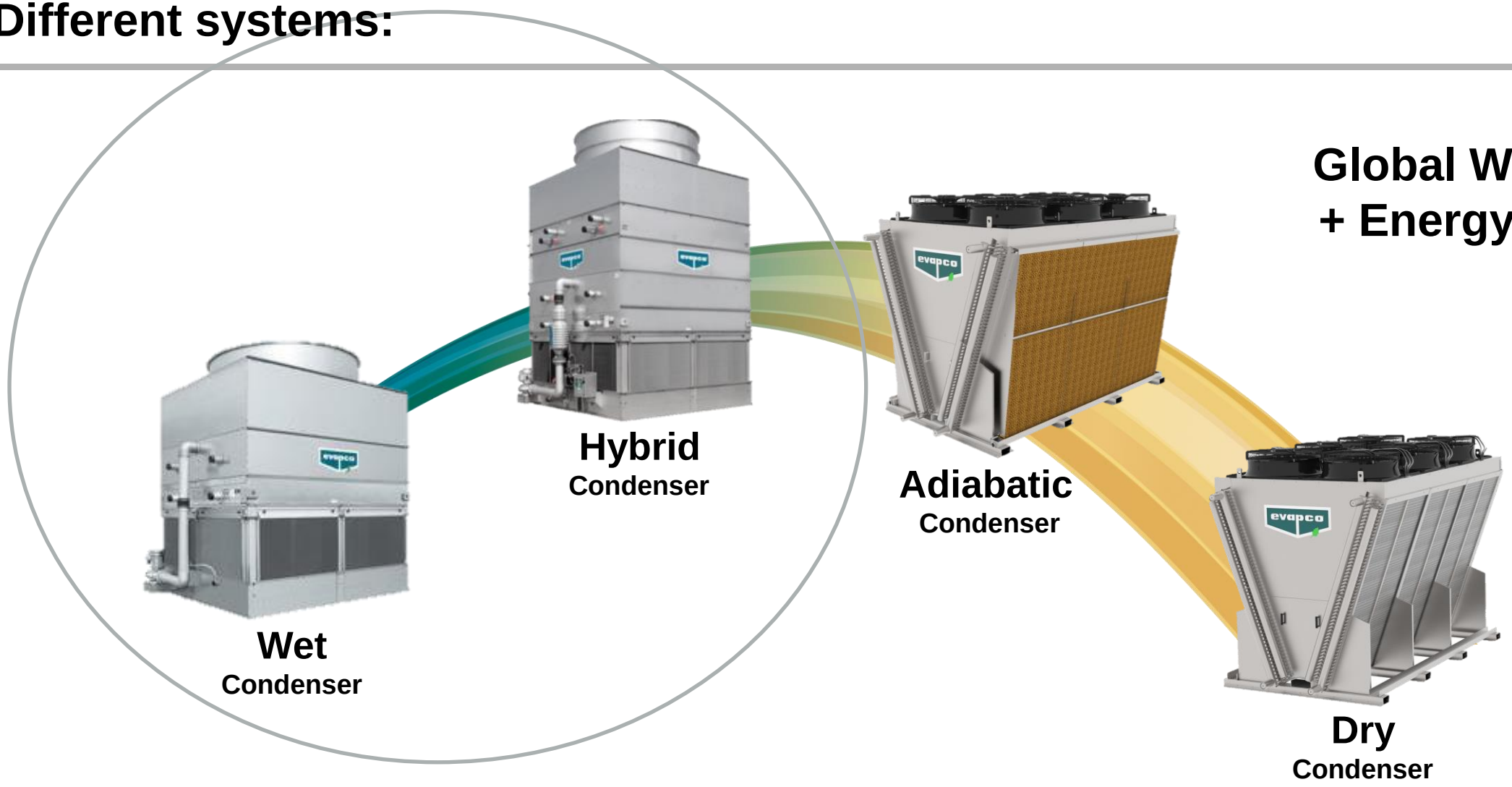
Air pressure 101.325 [Pa]	Temperature	Humidity ratio	Air humidity	Wet bulb Temperature	Enthalpie	Dense
	°C	g/kg	%	°C	kJ/kg	kg/m³
Ambient A	34,0	11,8	35,5	22,0	64,6	1,14
Adiabatic Cooling	23,9	15,9	85,0	22,0	64,6	1,29
Ambient A +2 K	36,0	11,8	31,7	22,5	66,6	1,13
Adiabatic Cooling	25,0	16,2	81,2	22,5	66,6	1,29

„What if“ compilation and what are the consequences?

	Ambient in °C	Working / wet bulb Temperature in °C	Difference in K
Dry	34,0	34,0	2,0
Dry	36,0	36,0	
Adiabatic	34,0	23,9	1,1
Adiabatic	36,0	25,0	

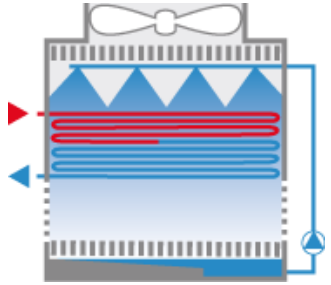
Possible Alternatives

Different systems:



Global Warming
+ Energy crises

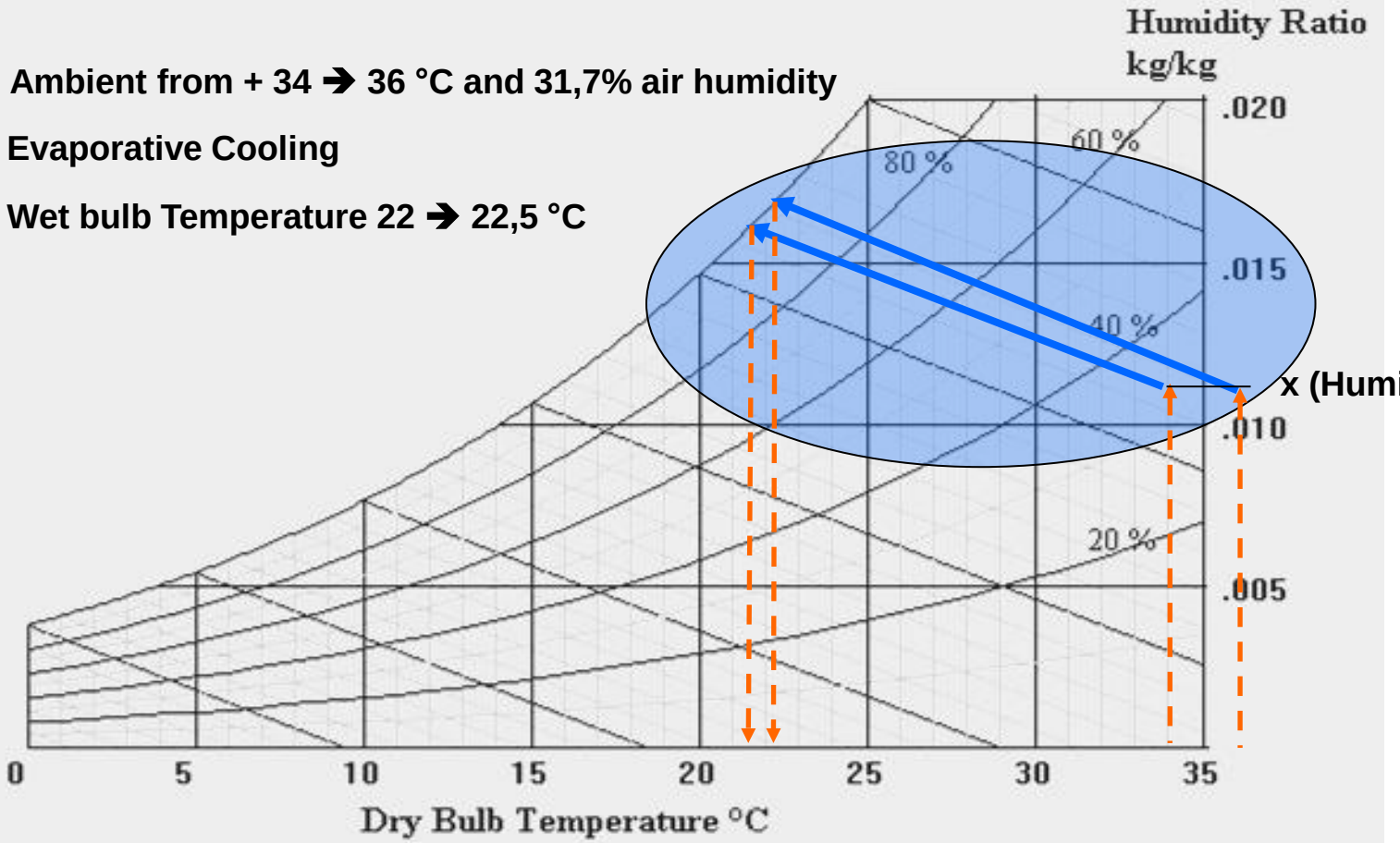
„What if“ compilation and what are the consequences?



Ambient from + 34 ➔ 36 °C and 31,7% air humidity

Evaporative Cooling

Wet bulb Temperature 22 ➔ 22,5 °C



x (Humidity ratio) = constant

„What if“ compilation and what are the consequences?

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Ambient A+2 K	36,0	11,8	31,7	22,5	66,6	1,13
Evap. Cooling	22,5	17,2	100,0	22,5	66,6	1,29

„What if“ compilation and what are the consequences?

	Ambient in °C	Working / Wet Bulb Temperature in °C	Difference in K
Dry	34,0	34,0	2
Dry	36,0	36,0	
Adiabatic	34,0	23,9	1,1
Adiabatic	36,0	25,0	
Wet	34,0	22,0	0,5
Wet	36,0	22,5	

x (Humidity ratio) = constant

Summary:

The use of refrigerants with a high GWP has an influence on the future global warming/cooling limit temperature. The use of natural refrigerants in effective, sustainable and eco-friendly refrigeration systems must therefore be the future!

The additional influence via the energy crisis - availability, price, avoiding of electricity peaks - require a sensible use of water as a resource.

>> We see it as our mission to help spread awareness and acceptance of natural refrigerants

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eurammon e. V. is always available as a sparring partner for questions on refrigeration with natural refrigerants.

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