

# ❄️ Decarbonization and saving energy with special cooling solutions

Energy efficient E-room cooling and more

BM Green Cooling GmbH



# Agenda



Why energy efficiency is important in the control rooms?

Problems faced in the cooling in paper mills

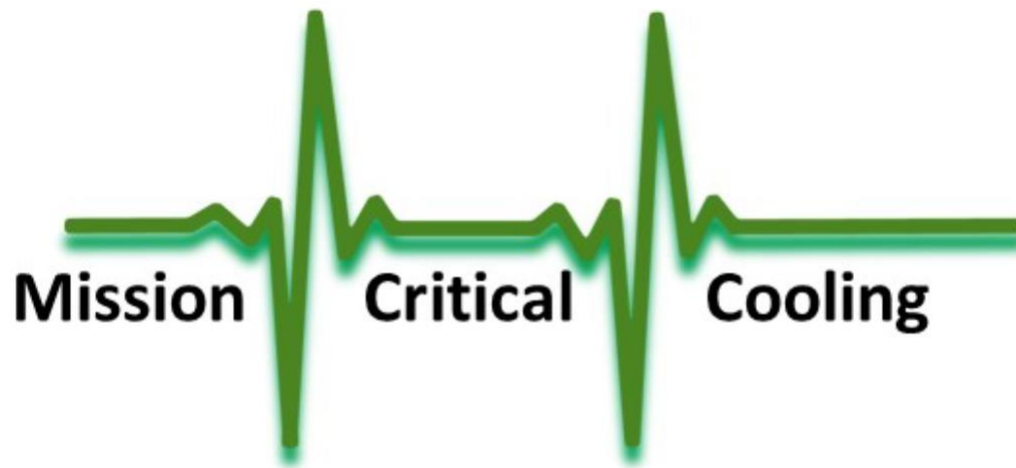
Why choose BM Green Cooling?

Turnkey solutions

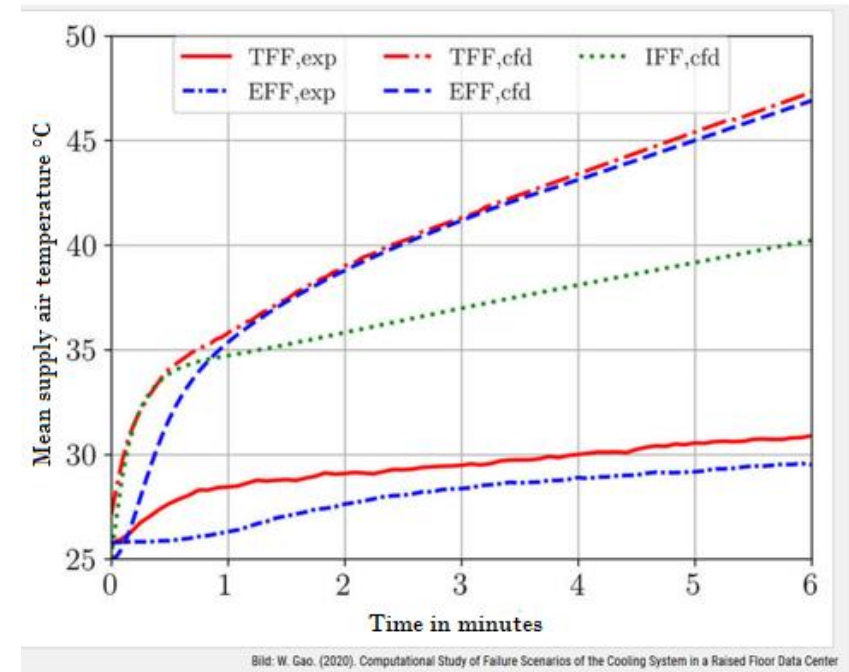
References and pictures

# Why reliable cooling is important in control rooms?

- If cooling in control rooms is compromised, costs can be high (production disruptions)
- Insufficient cooling or interruptions in cooling can raise temperature in a control room rapidly
- Running cost savings of modern cooling systems compared to old technics are significant
- BM Green cooling is focused on Mission Critical Cooling, and is also experienced in cleanrooms and IT-rooms



Mission Critical Cooling; BMGC is professional in cooling in demanding conditions, where the cooling cannot be compromised (clean rooms, server rooms, paper mills)



# Why energy efficiency is important in control rooms?

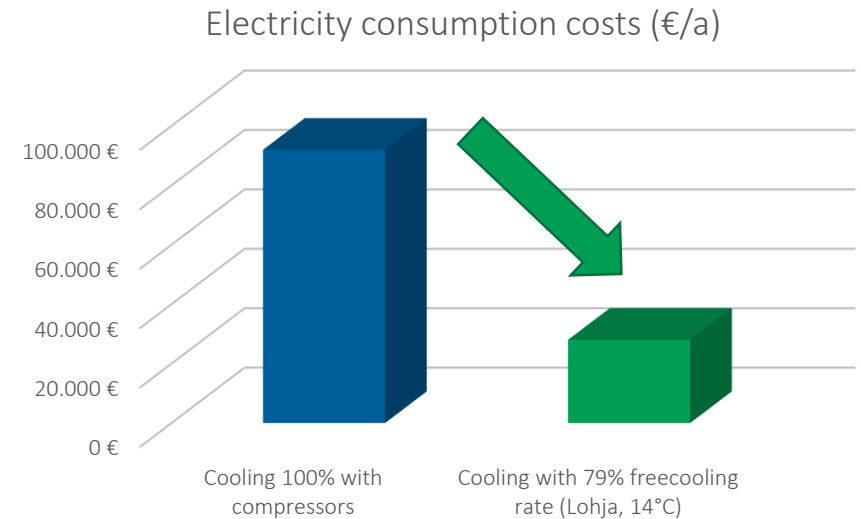
## Profitability calculation for 500kW cooling capacity Lohja / Finland

- Potential for big savings in energy consumption;

### Electricity consumption for 500kW cooling capacity

Assumed electricity price €/kWh: 0,07

	kW	h/a	Kwh	Costs
Cooling 100% with compressors	150	8.760	1.314.000	91.980 €
100% freecooling	18	8.760	157.680	11.038 €
Cooling with 79% freecooling rate (Lohja, 14°C)	45,72	8.760	400.507	28.036 €
<b>Savings with freecooling system</b>				<b>63.944 €</b>
<b>Savings with freecooling system</b>				<b>69,5%</b>



- Freecooling rate of 79% in Lohja, Finland

Average hourly temperatures annually for Lohja, Finland for 2015-2019:

Average hours per years 2015-2019; Lohja (Finland)						Freecooling up to																			
T [°C]	< 10	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
t [h]	5.350	273	289	304	333	357	350	322	271	216	189	146	118	78	56	38	23	21	16	9	4	3	0	0	
t kumm [h]	5.350	5.623	5.912	6.216	6.549	6.906	7.256	7.579	7.849	8.065	8.254	8.399	8.517	8.595	8.651	8.689	8.712	8.732	8.748	8.757	8.762	8.764	8.765	8.765	
t kumm [%]	61%	64%	67%	71%	75%	79%	83%	86%	90%	92%	94%	96%	97%	98%	99%	99%	99%	100%	100%	100%	100%	100%	100%	100%	

# Why energy efficiency is important in control rooms?

## Profitability calculation for 500kW cooling capacity Aalen / Germany

- Potential for big savings in energy consumption;

### Electricity consumption for 500kW cooling capacity

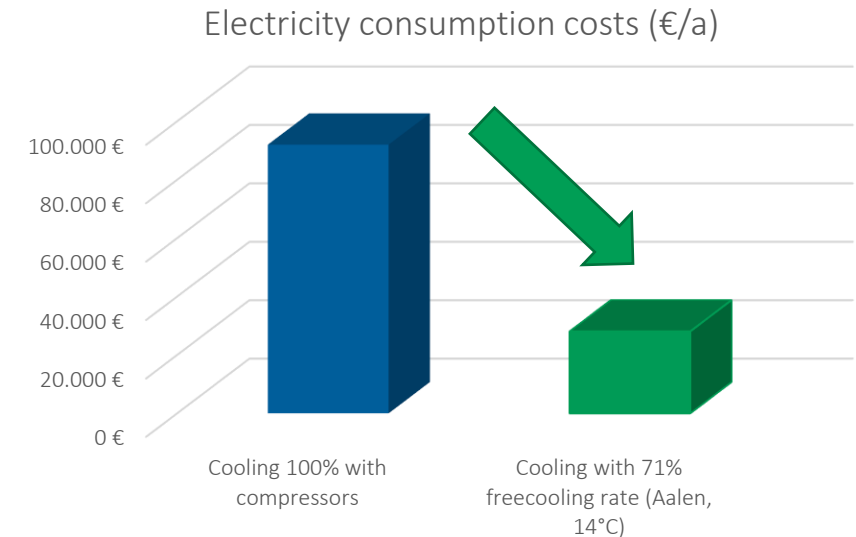
Assumed electricity price €/kWh: 0,07

	kW	h/a	Kwh	Costs
Cooling 100% with compressors	150	8.760	1.314.000	91.980 €
100% freecooling	18	8.760	157.680	11.038 €
Cooling with 71% freecooling rate (Aalen, 14°C)	56,28	8.760	493.013	34.511 €
Savings with freecooling system				57.469 €
Savings with freecooling system				62,5%

- Freecooling rate of 71% in Aalen, Germany

Average hourly temperatures annually for Aalen, Germany for 2014-2018:

Average hours per years 2014-2018; Aalen (Germany)			Freecooling up to																				
T in °C	<9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	>30
h/a	336	333	363	357	374	353	335	314	297	266	218	187	158	132	126	110	93	73	57	49	33	23	36
kum h/a	4.440	4.773	5.136	5.493	5.867	6.220	6.555	6.870	7.167	7.433	7.651	7.838	7.995	8.127	8.253	8.363	8.456	8.529	8.586	8.636	8.669	8.692	8.728
%kum a	51%	55%	59%	63%	67%	71%	75%	79%	82%	85%	88%	90%	92%	93%	95%	96%	97%	98%	98%	99%	99%	100%	100%



# Why energy efficiency is important in control rooms?

## Profitability calculation for 500kW cooling capacity Istanbul / Turkey

- Potential for big savings in energy consumption;

### Electricity consumption for 500kW cooling capacity

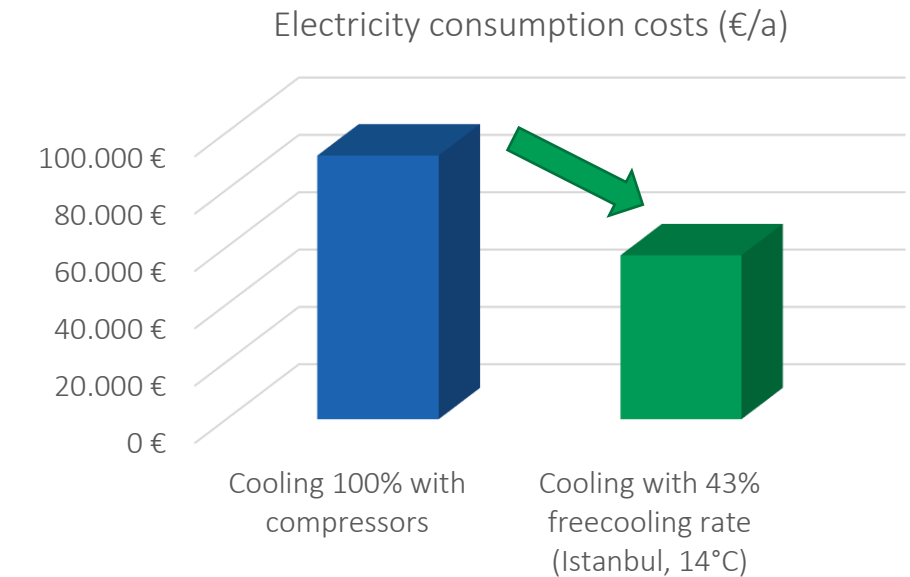
Assumed electricity price €/kWh: 0,07

	kW	h/a	Kwh	Costs
Cooling 100% with compressors	150	8.760	1.314.000	91.980 €
100% freecooling	18	8.760	157.680	11.038 €
Cooling with 43% freecooling rate (Istanbul, 14°C)	93,24	8.760	816.782	57.175 €
<b>Savings with freecooling system</b>				<b>34.805 €</b>
<b>Savings with freecooling system</b>				<b>37,8%</b>

- Freecooling rate of 43% in Istanbul, Turkey

Average hourly temperatures annually for istanbul, Turkey for 2015-2019:

Istanbul, Average of years 2015-2019						Freecooling up to																											
T [°C]	< 10	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
t [h]	2.011	149	330	343	414	422	165	365	349	405	361	177	377	381	457	406	165	288	241	251	177	63	111	67	32	13	4	3	2	1	0	0	
t kumm [h]	2.011	2.160	2.490	2.833	3.247	3.669	3.834	4.198	4.547	4.953	5.314	5.491	5.868	6.248	6.706	7.112	7.277	7.565	7.806	8.057	8.234	8.297	8.408	8.475	8.507	8.520	8.524	8.527	8.529	8.530	8.530		
t kumm [%]	24%	25%	29%	33%	38%	43%	45%	49%	53%	58%	62%	64%	69%	73%	79%	83%	85%	89%	92%	94%	97%	97%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	





# Case study: energy efficiency in control rooms

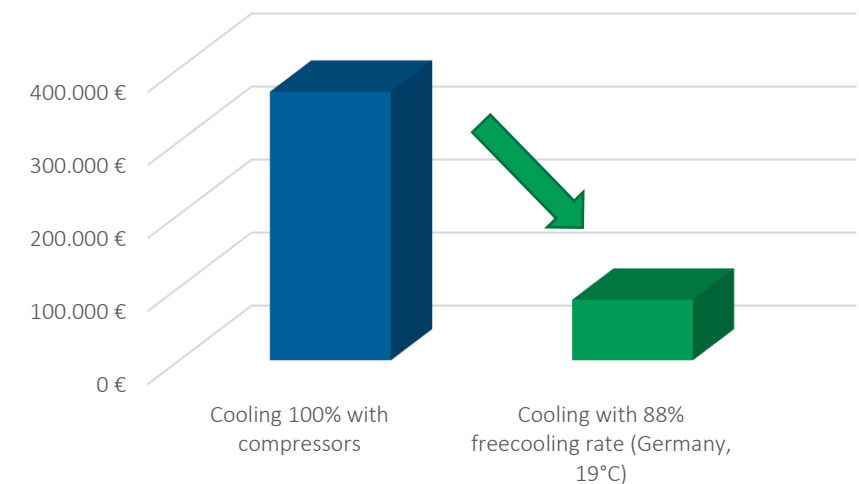
## Freecooling ratio of 88% achieved with direct water cooled cabinets in a delivered project

### Electricity consumption for 2.000kW cooling capacity

Assumed electricity price €/kWh: 0,07

	kW	h/a	Kwh	Costs
Cooling 100% with compressors	600	8.760	5.256.000	367.920 €
100% freecooling	72	8.760	630.720	44.150 €
Cooling with 88% freecooling rate (Germany, 19°C)	135,36	8.760	1.185.754	83.003 €
Savings with freecooling system				284.917 €
Savings with freecooling system				77,4%

Electricity consumption costs (€/a)



- By combining the newest technologies, we were able to raise the freecooling share to 88%
- In some conditions, even 100% natural cooling is possible. In these cases we do not need mechanical cooling except for redundancy.
- Theoretical CO<sub>2</sub> emissions were lowered **almost 2.000 tons per year** (German average 0,485kg CO<sub>2</sub>/kW for produced electricity in 2017)

# Problems faced with the cooling in paper mills

- High heatloads inside mills
- Control rooms must be online 8.760h/year for continuous operation
- Noise regulations of cooling system in certain locations can be challenging
- Aggressive air, sulphur acids and dust particles in the air

Non-corrosion resistant solutions



Our corrosion resistant drycooler





# Why choose BM Green Cooling?

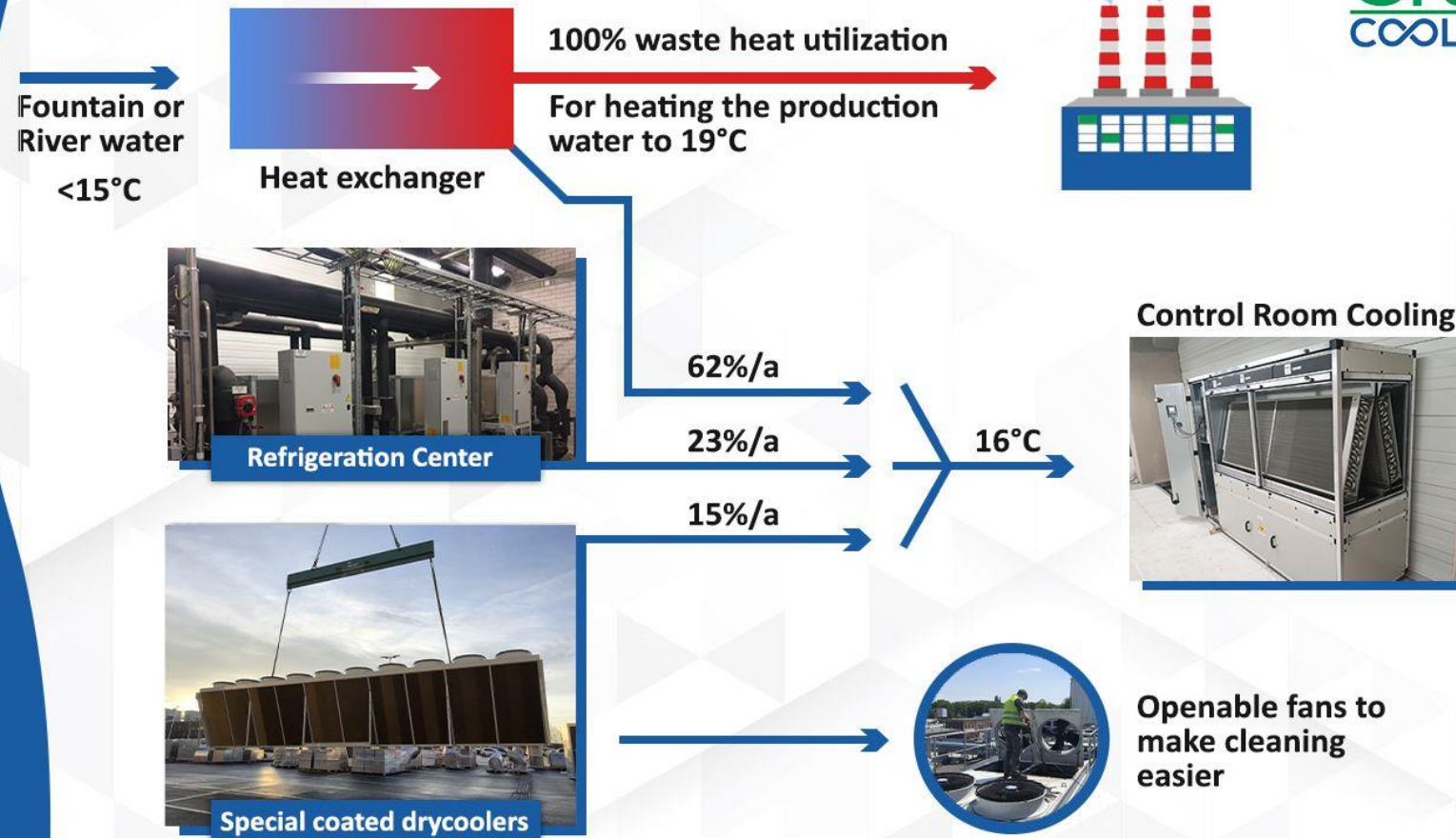


- Over 30 years of experience and hundreds of projects for energy efficient solutions in paper industry
- Leader in its field;
  - Innovative and award winning solutions
  - ISO 9001 and ISO 14001 certified
  - Always customized solution for each client
  - Local weather data used in engineering
  - Own production for cooling equipment
- Expert from the smallest to the biggest projects
- Optimizing the existing cooling systems of all sizes
- Pioneer in new technics for natural cooling



# Why choose BM Green Cooling?

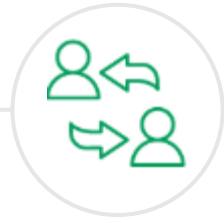
## ✓ Well- and riverwater used in cooling projects



As a solutionfinder we support you all the way to an energy-efficient and reliable cooling system!



First  
idea



Common  
conception



Professional plant  
engineering



Uninterrupted  
commissioning



Sustainable  
maintenance  
+ Support

An abstract of our customers in...

... IT-Cooling



... Paper-Cooling



FUJITSU



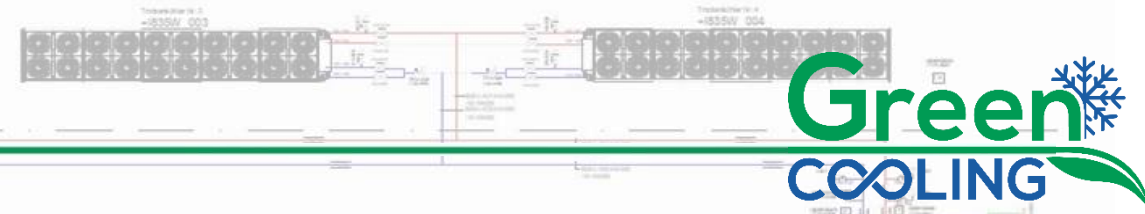
SCHOELLERSHAMMER



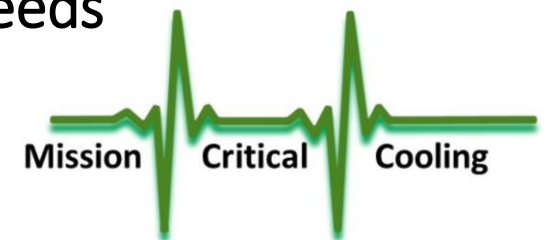
Palm



# Decarbonization – Our technical advantages



1. High freecooling ratio and natural cooling usage, high energy efficiency
2. Siemens S7 control units as a standard
3. Electrical planning in Eplan and Tia-portal
4. Corrosion resistant equipment
5. 400V or 690V power supply according to customer's wish
6. 100% redundant solutions
7. Specifically engineered solutions for low sound levels
8. Special cooling projects to provide the solution that the customer needs





# Why choose BM Green Cooling?



- ✓ Main technical advantages;
  - ✓ Leader in concept of high medium temperatures and therefore high freecooling ratio
  - ✓ Experienced in river and fountain water use and waste heat recovery
  - ✓ Experienced in working with aggressive air, corrosion resistant solutions
  - ✓ Fully compatible with most common Process Control Systems (PCSs), for example Siemens S7 and Valmet DNA
  - ✓ Possibility for either 400V or 690V electrical supply
  - ✓ Continuous operation 8760h/a, redundancy system for failures and maintenance during operation
  - ✓ Easy-to-clean and -maintenance equipment
  - ✓ Simple technology for high reliability





# Why choose BM Green Cooling?



- ✓ Our technology is based on cooling systems that are corrosion resistant

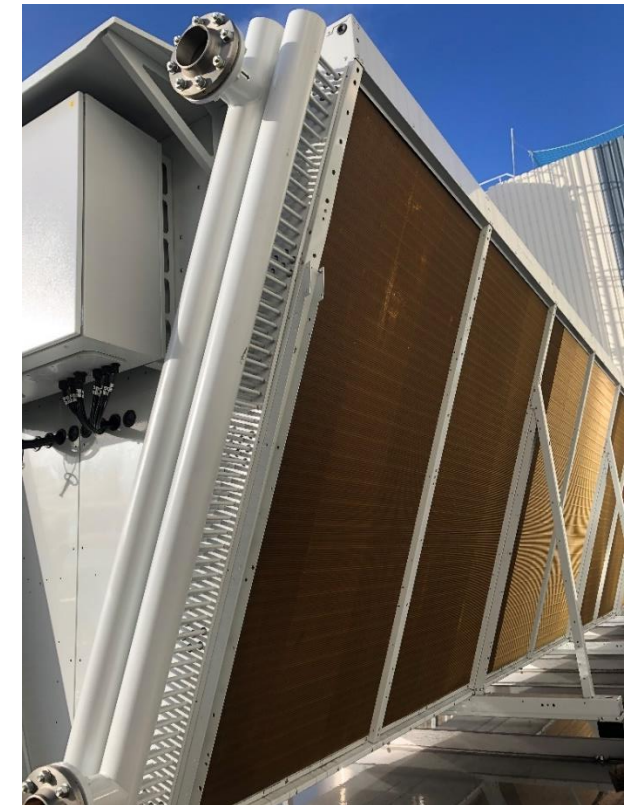


*Active filters to remove acids and pollutant from the air before control room*



*Climate cabinet for paper industry  
Special coated and easy to service*

*Heat exchangers and coils coated for corrosion resistance*



# From ideas to working cooling system

✓ Turnkey solutions





# From ideas to working cooling system

✓ **Turnkey solutions**



## Energy saving projects EN 50001

ZELL  CHEMING

Energie saving **EnEV**



**BAFA**

Bundesamt für Wirtschaft  
und Ausfuhrkontrolle



Energy audits **DIN EN 16247**