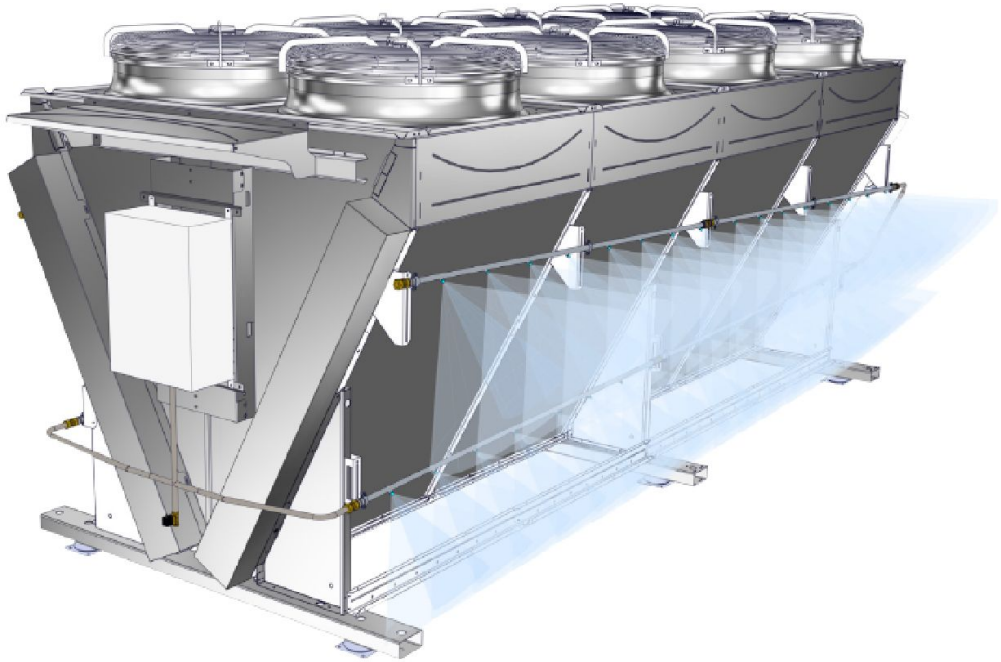
Spray Water System SWS



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Spray water system

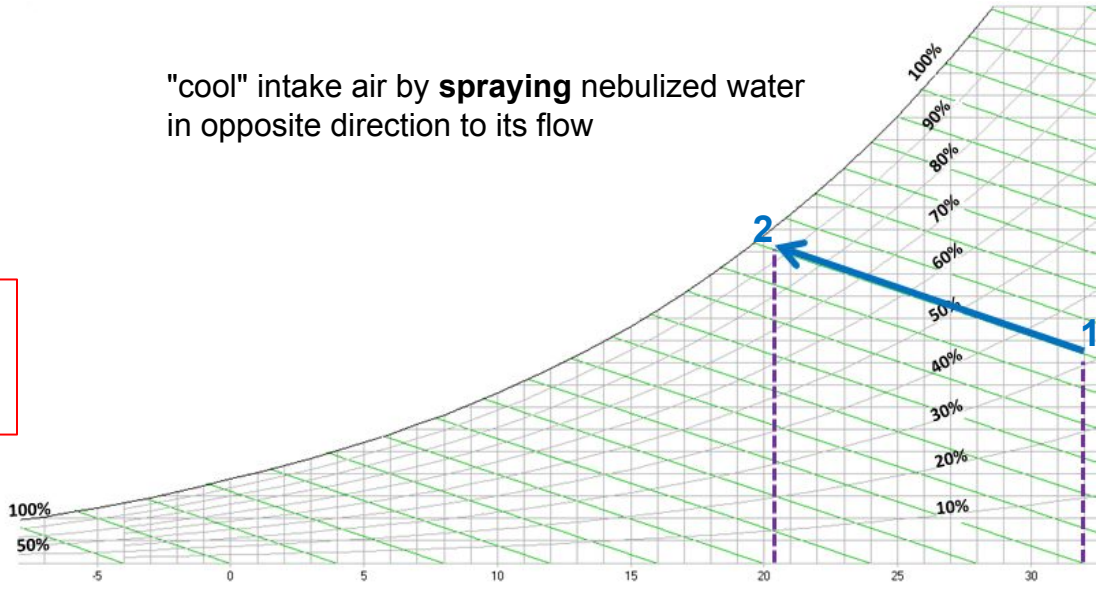
Alfa Laval drycoolers&condensers are normally selected to perform according to highest ambient conditions

Often, such conditions persist for very short period of the year/hot season peaks

Consequently, the selected product is oversized (...thus more expensive!)

=> a water spray system can help a lot in such cases!!

"cool" intake air by **spraying** nebulized water in opposite direction to its flow



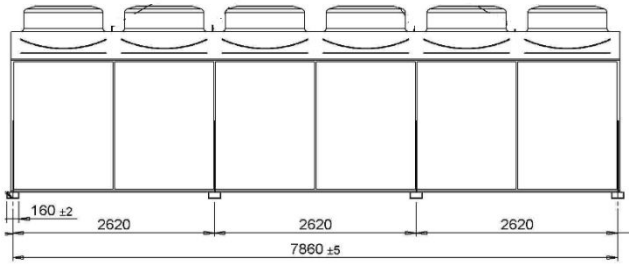
mandatory ambient data to know:
- temperature
- relative humidity (RH%)

Spray water system: calculation example

Vshape drycooler design

Design data:
Duty=800kW at $T_{amb\_max} = 30°C$ $T_{w-IN} = 45°C, T_{w-out} = 40°C$
Location: Malmö
average max ambient Temp July/August: 22°C, Tpeak=30/31°C (2-3 hours/day)

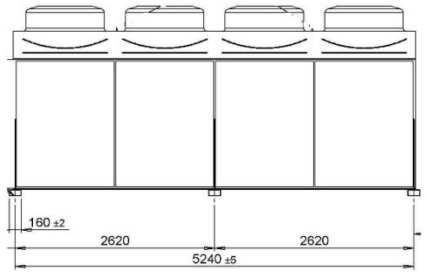
Selected unit: VDDSE806C_ICM
customer price: 27070€ (transportation included)



installed el.power: 18kW
Noise level: 60dB(A)

with spray water

Selected unit: VDDSE804C_ICM and spray water system (new duty 840kW!!)
customer price: 22750€ (transportation included)

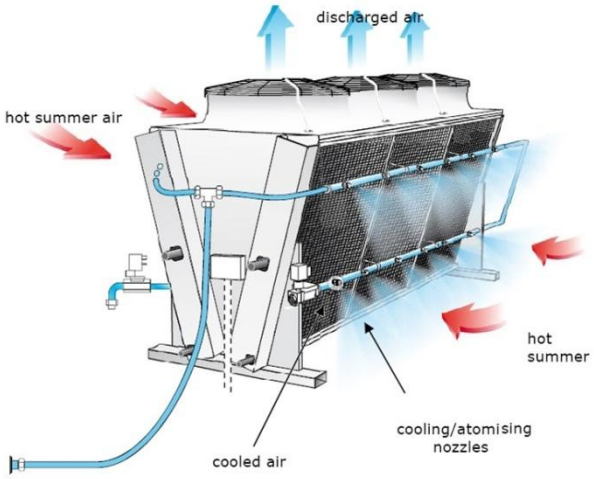


installed el.power: 12kW (0,55kW pump)
Noise level: 58dB(A)

Spray water system: advantages & limits

- ✔ More acurate unit design (no oversize) increased fans efficiency in middle season
- ✔ Compact&cheaper unit
- ✔ Less transportations cost
- ✔ Energy saving
- ✔ Lower Noise

Advantages



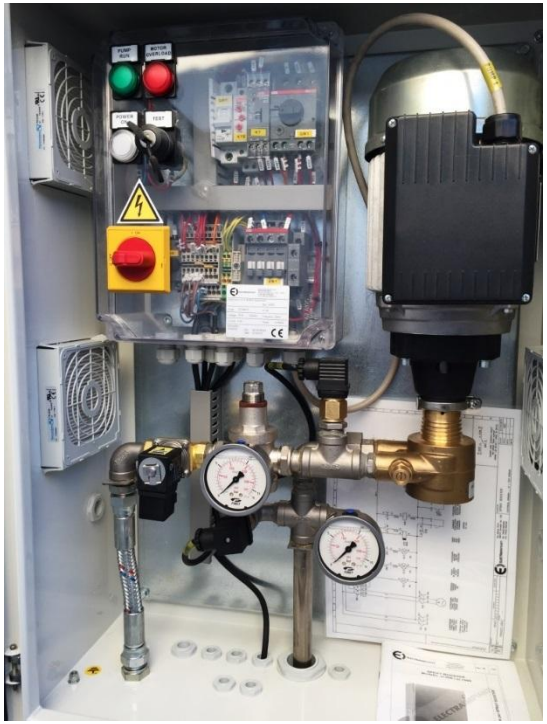
- ❑ Availability of water and its quality
- ❑ Limited working period
- ❑ ON/OFF activation (no modulation available!)
- ❑ Ambient relative humidity limitation

Limits

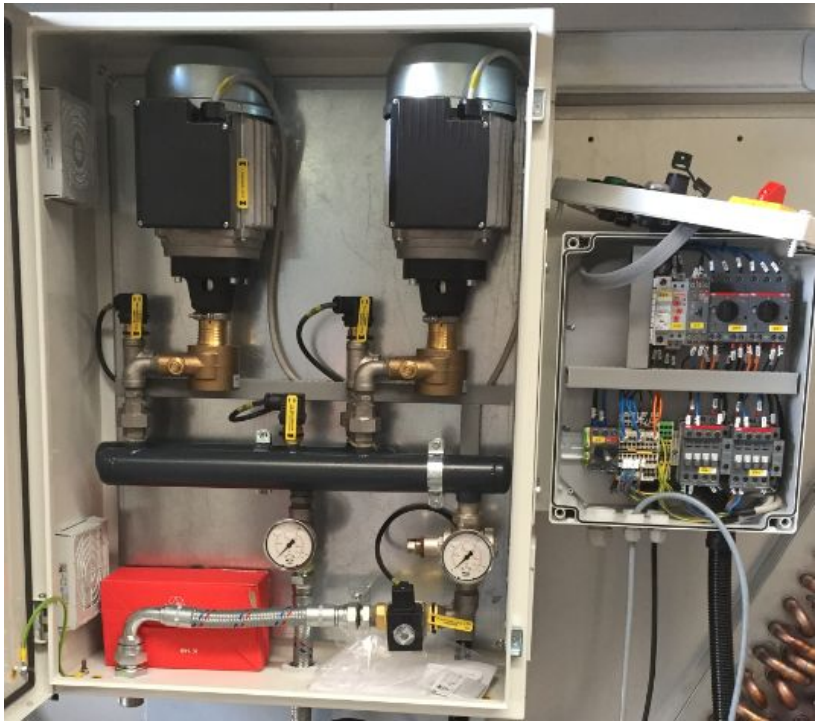
Remember: unit equipped with spray water ≠ adiabatic !!
real spray water efficiency ~70%

Spray water system: range sizes

500/1000l/h



2000l/h



Spray water system: components

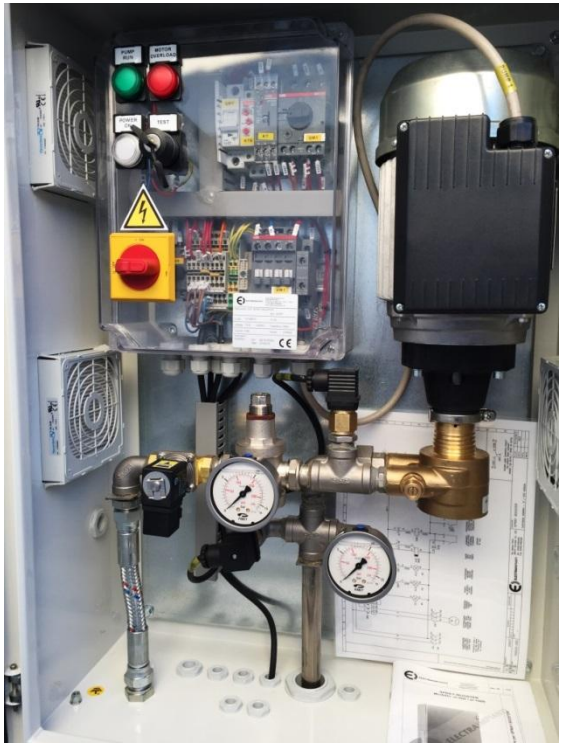
Pumping station

Stainless steel piping with spray nozzles

Spray water system: pumping station

Switchboard with pump protection and signals (remote ON/OFF and fault alarm)

6 bars pump



Safety draining pipe

T joint and draining valve

Spray water system

VDDSE1009C_2000l/h

Spray water system

Spray water system: activation mode

The spray water system can be activated by:
1- ICM control switchboard **(EC fans)**
2- Master controller/Ptec **(EC fans)**
3- digital input provided by the customer

Spray water system: conclusions

- Optimal cooling effect is given with RH% below at least 60% (Ambient Temp and relative humidity are mandatory input data)
- Spray System is perfect for temperature peaks -> limited usage
- Longer usage period is recommended only with a proper fins coating
- Less installation and transportation costs
- Water quality important
- Spray system cannot have the same efficiency level as an adiabatic system

Spray water system: HOW TO DESIGN

Microsoft Excel Worksheet

From the adiabatic calculation sheet, insert:

- ***ambient Temp***
- ***relative humidity***
- ***airflow (from CAS)***

and calculate the effect of the saturation by taking the assumption of 70% effect efficiency

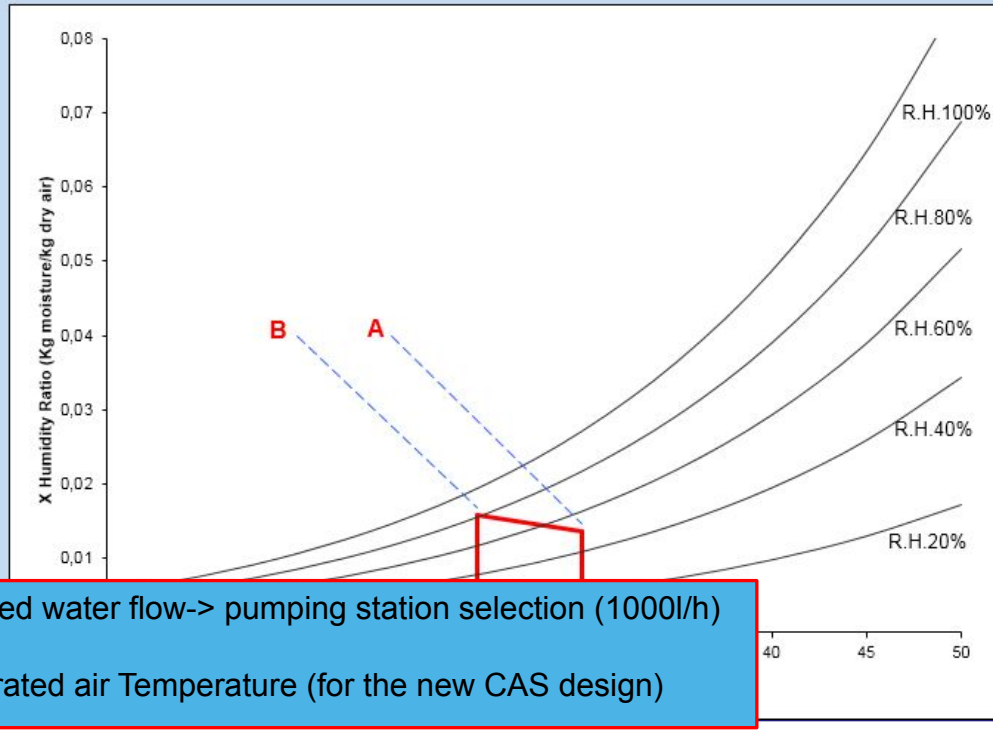
Spray Water System - Calculation of Adiabatic Saturation

Input	Temperature Dry Bulb	[°C]	30
	Relative Humidity	[%]	50
	Airflow	[m^3/h]	262000
Setting	System Efficiency	[%]	○ 100 ◉ 70
Details Point A	Air Density	[Kg/m^3]	46
	Saturation Vapour Pressure	[Pa]	,5
	Absolute Saturation Humidity	[g/Kg]	27,124
	Humidity Ratio	[g/Kg]	13,562
	Enthalpy	[KJ/Kg]	65,111
Details Point B	Saturation Vapour Pressure	[Pa]	2673,1
	Absolute Saturation Humidity	[g/Kg]	16,827
	Humidity Ratio	[g/Kg]	15,847
	Enthalpy	[KJ/Kg]	65,11
Output	Water Flow	[l/h]	996,04
	Temperature Saturated Air	[°C]	24,51

Theoretical Result

Default Value

Calculate



- needed water flow-> pumping station selection (1000l/h)
- Saturated air Temperature (for the new CAS design)

Spray water system: HOW TO DESIGN

with **Water Flow** and **Temperature Saturated Air**

→ select the correct equipment in CAS and the SWS