ECO MESH PRE COOLING SYSTEM

EXCLUSIVELY REPRESENTED BY MAKAM AGENCIES LTD.

+972 – 3- 9384313

WWW.MAKAMAGE.COM

INFO@MAKAMAGE.COM

PRELIMINARY GENERAL CONCEPT

Air Cooled Systems	VS	Water Cooled Systems
 		
Higher general cost	Advantages / Disadvantages	Lower general cost
High efficiency thanks to the coefficient of high heat transfer of water		Lower efficiency due to low heat transfer coefficient of air
High operating and maintenance costs - water / water treatment / blowers and pumps		Low operating costs, coils wash twice a year
Large area required for cooling unit Cooling Tower Pumps / Power Board ...		Space is required only for the cooling unit

We all know the differences between WATER COOLED chillers and AIR COOLED chillers

THE ECO MESH SYSTEM COMBINES THE BEST OF THE TWO WORLDS

- Pre Cooling System, Based on fully controlled water chilled meshes Complexity on the cooling unit Without intervention in the gas and water circuit of the unit or in the control of the unit.

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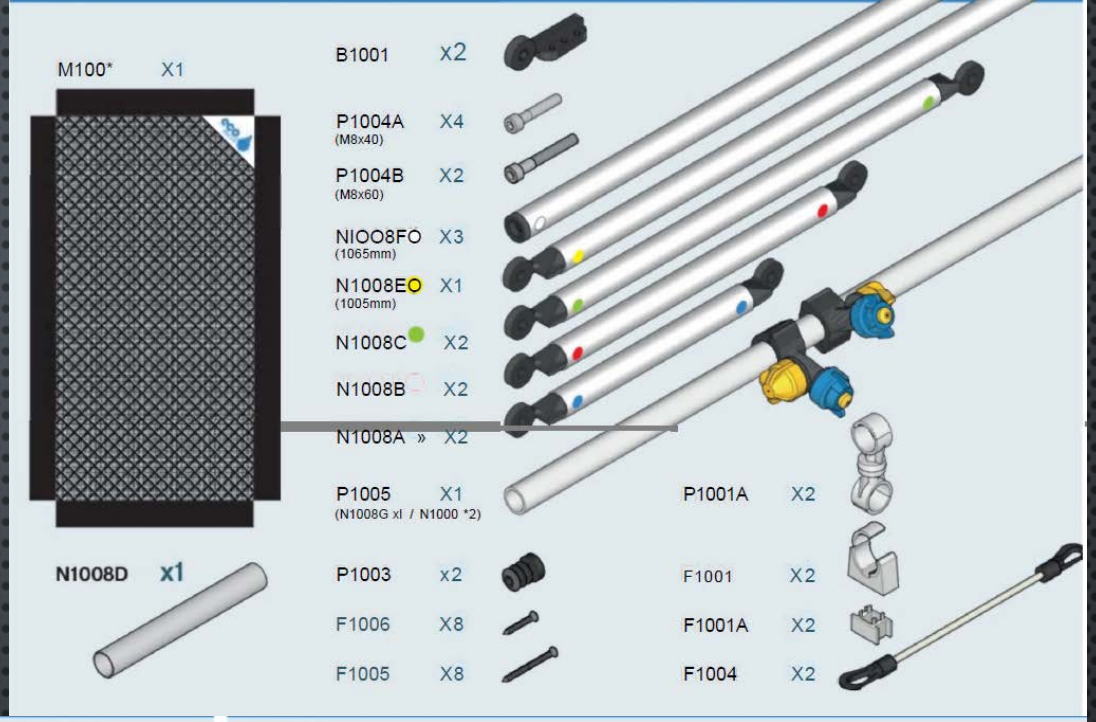
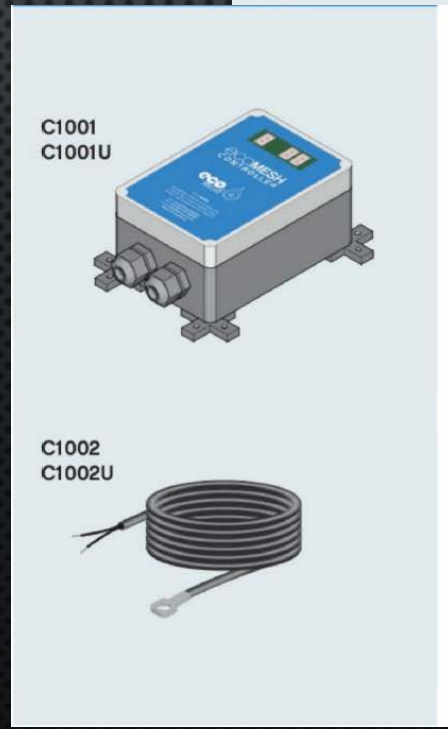
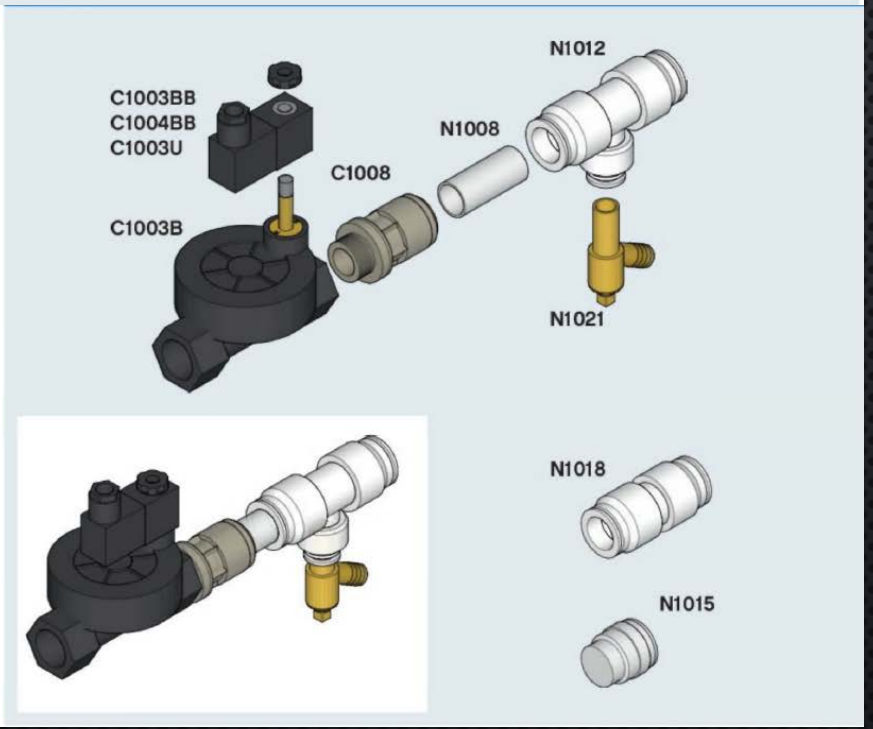
SYSTEM COMPONENTS

- A UNIQUE SYSTEM OF NETWORKS THAT ABSORB AND EVAPORATE THE WATER
- A UNIQUE SYSTEM OF HEADERS AND SPRINKLERS TO DISPERSE THE WATER ON THE NETS
- A CONTROL SYSTEM & SENSORS







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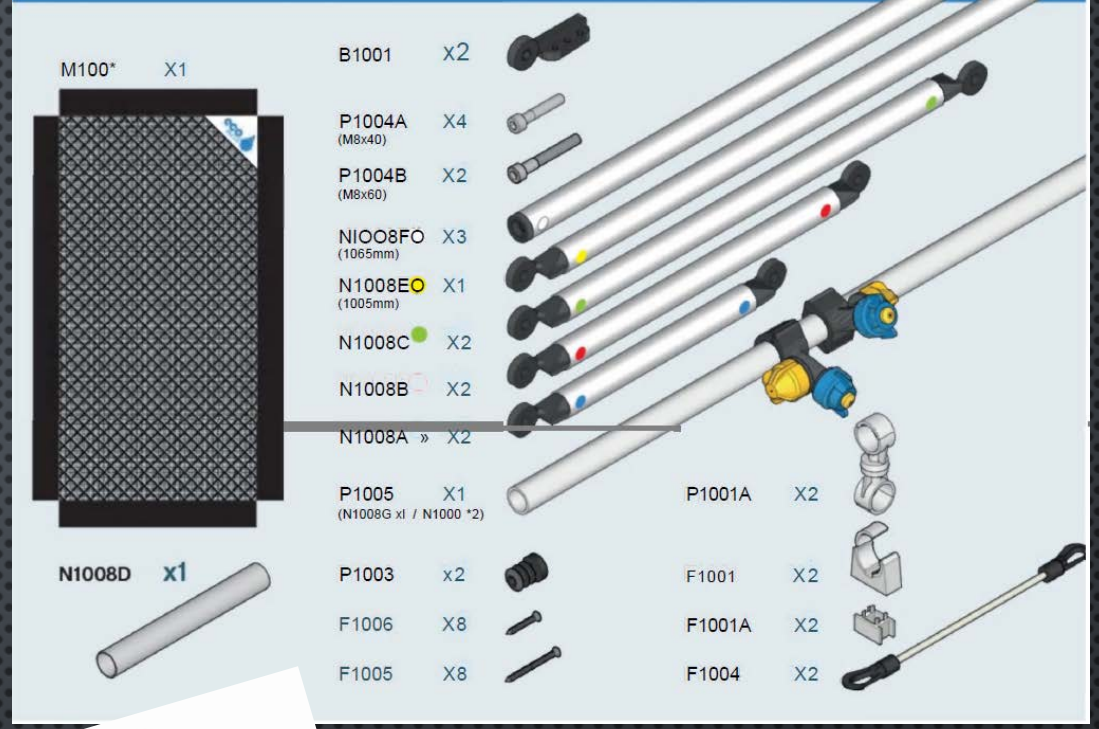
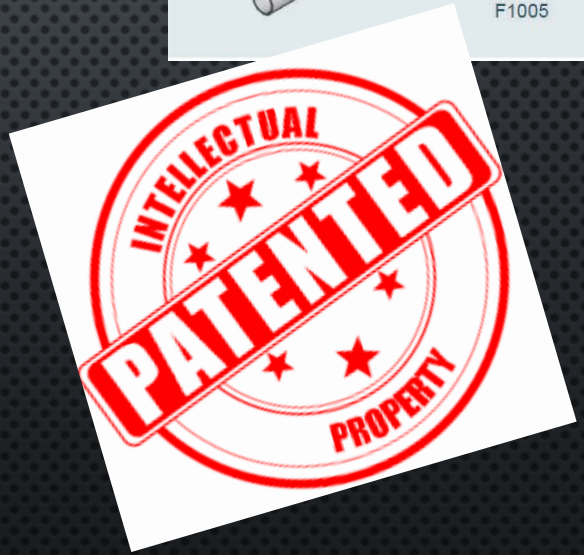
SYSTEM COMPONENTS



UNIQUE PATENTED NETWORKS, RESISTANCE TO WEATHER DAMAGE AND ULTRAVIOLET RADIATION.

LIFE EXPECTANCY IS 18 YEARS

ALL CONNECTIONS ARE ALUMINUM



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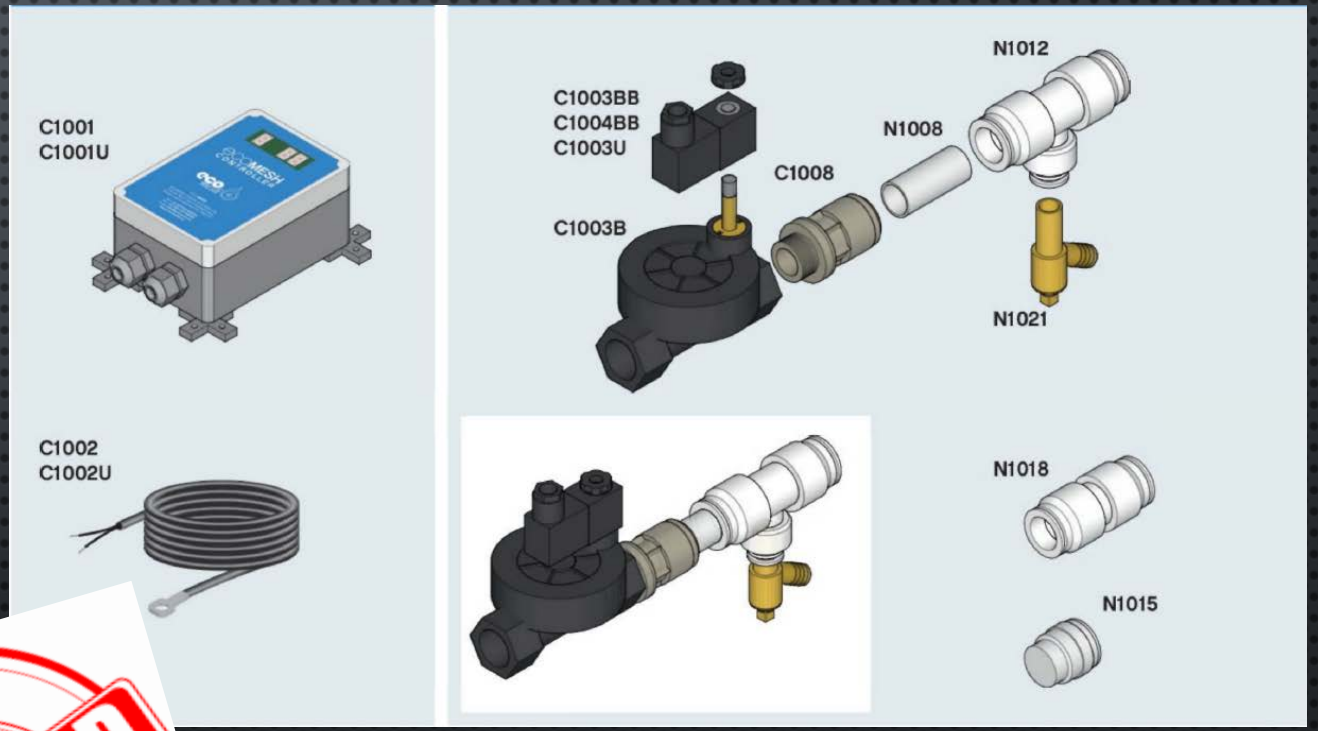
SYSTEM COMPONENTS

- ALL VALVES ARE HEAVY DUTY (INDUSTRIAL)
- IP65 CONTROLLER



HOW THE SYSTEM IS INSTALLED ON THE COOLING UNIT

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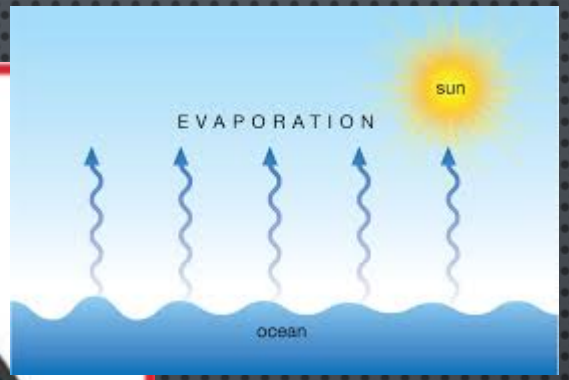
HOW THE SYSTEM WORKS

Water is spayed in the OPOSITE direction of the coils at the mesh



The water spay is controlled by the system controller, and spayed for **only a few seconds** with an interval of **few minutes**

The temperature reduction is carried out mainly during the evaporation of water from the networks.

The result - lowering the external temperature that the cooling unit "feels" using a Minimal amount of water

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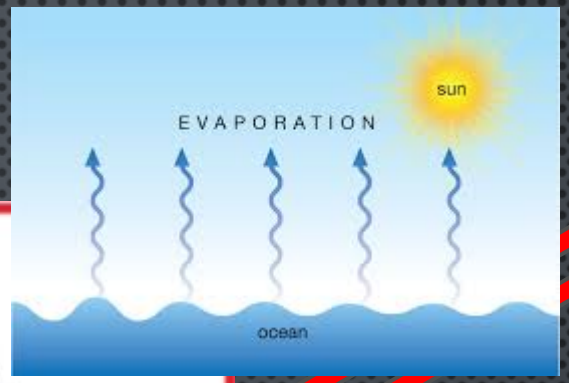
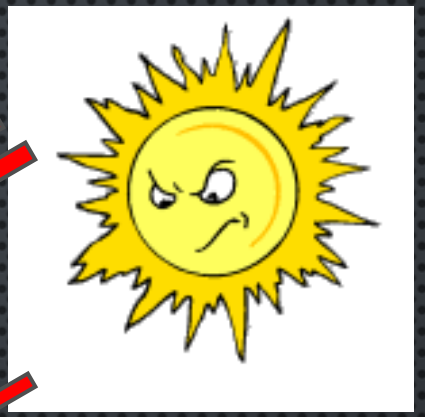
SOLAR PROTECTION

In ADDTION to cooling by evaporation of the water

Shading provides optimal protection from solar radiation

<u>Additional temperature reduction - 2 to 5 degrees</u>





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INSTALLATION STEPS

Step 1: Unpack and mesh Kits assemblley

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Step 2: Mesh installation on Chiller

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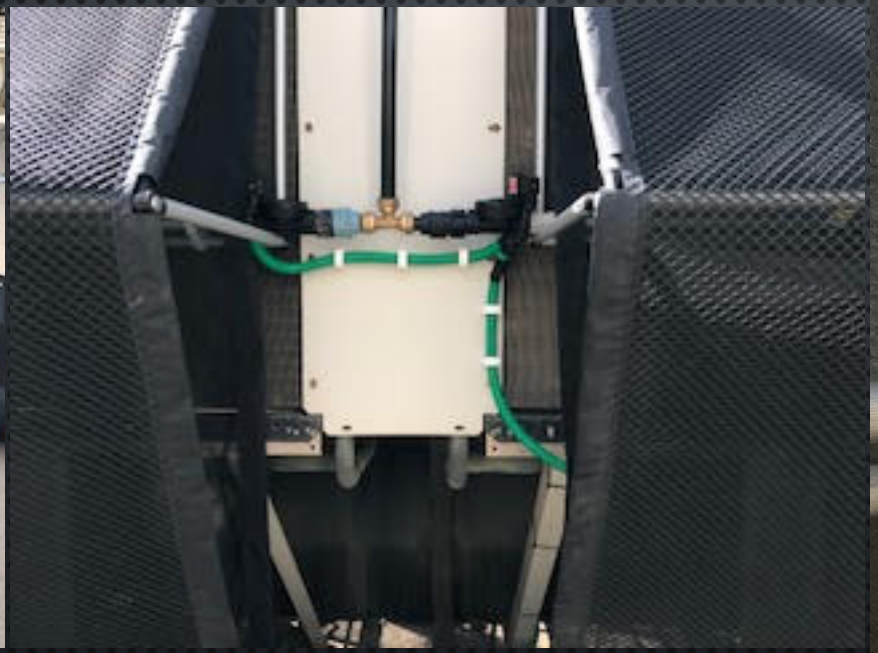
STEP 3: WATER SYSTEM – TAP WATER, 3 BAR MIN



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STEP 4: FINISHING AND STRETCHING THE SHEETS

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THE FOLLOWING IS THE PROCESS ON THE PSYCHOMETRIC SCALE

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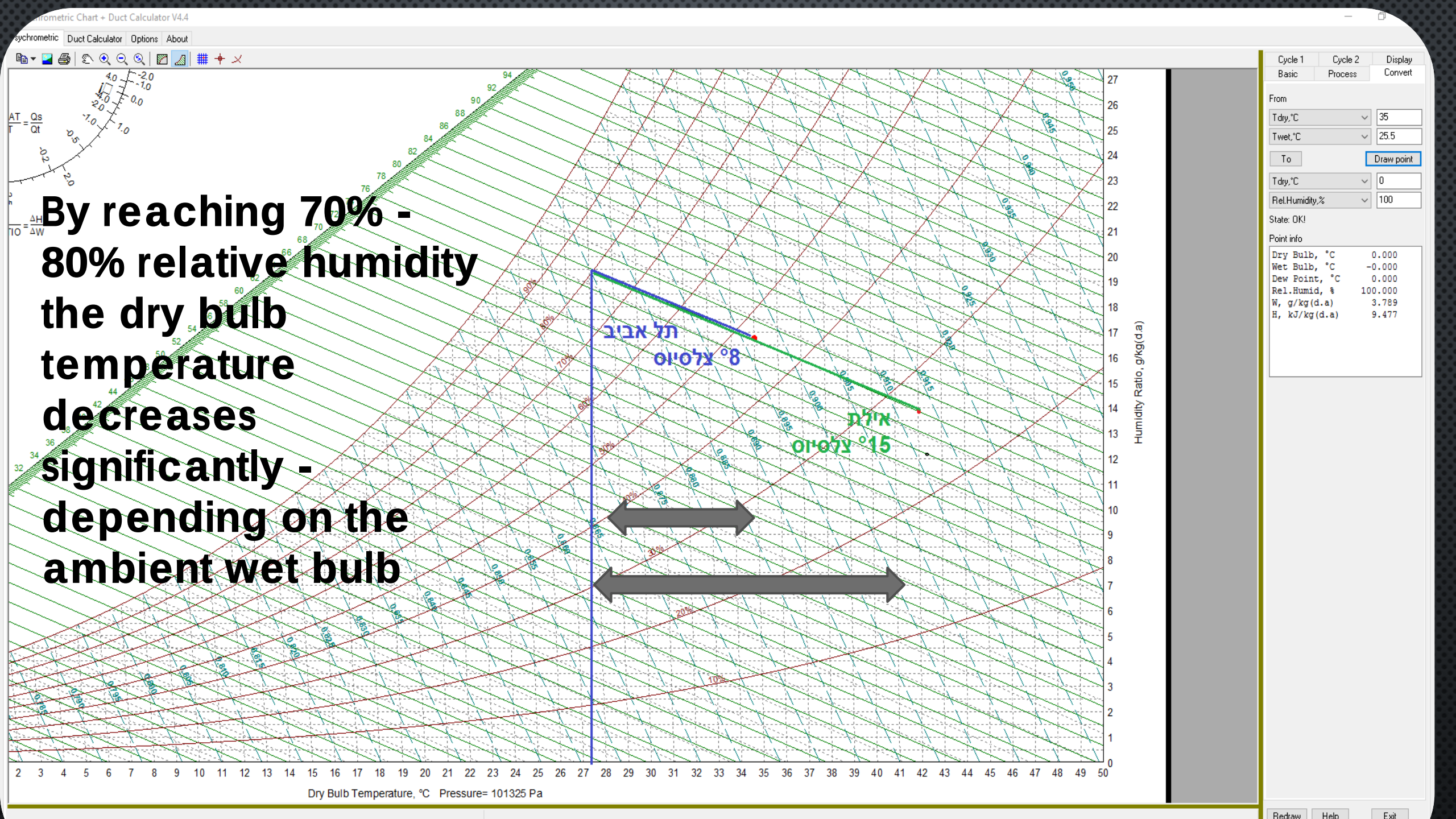
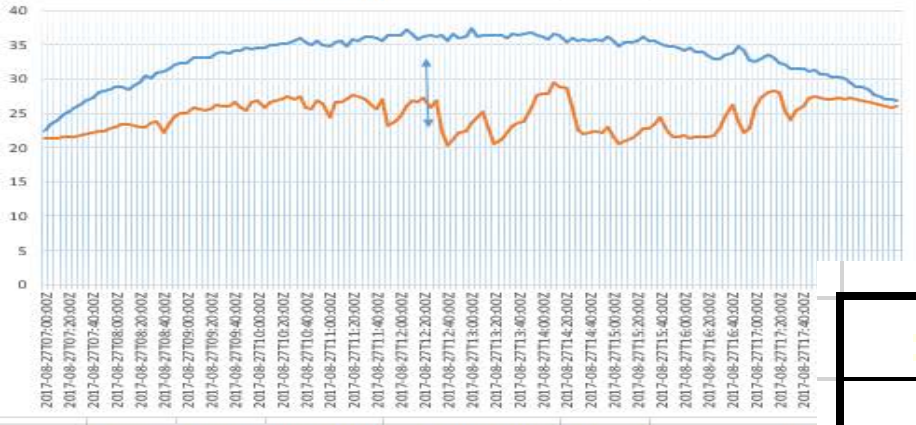

By reaching 70% -
80% relative humidity
the dry bulb
temperature
decreases
significantly -
depending on the
ambient wet bulb
תל אביב
8° צלסיוס
אילת
15° צלסיוס
Dry Bulb Temperature, °C Pressure= 101325 Pa
Humidity Ratio, g/kg(d.a)
Psychrometric Chart + Duct Calculator V4.4
Psychrometric
Duct Calculator
Options
About
Cycle 1
Cycle 2
Display
Basic
Process
Convert
From
Tdry,°C
35
Twet,°C
25.5
To
Draw point
Tdry,°C
0
Rel.Humidity,%
100
State: OK!
Point info
Dry Bulb, °C 0.000
Wet Bulb, °C -0.000
Dew Point, °C 0.000
Rel.Humid, % 100.000
W, g/kg(d.a) 3.789
H, kJ/kg(d.a) 9.477
Redraw
Help
Exit

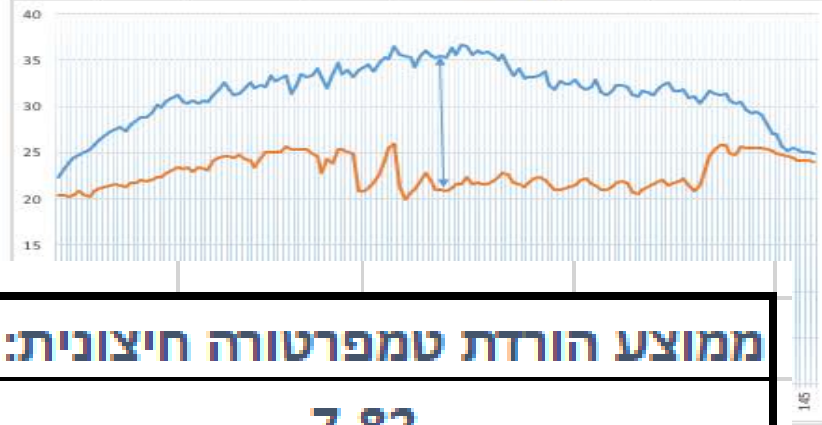
EXTERNAL TEMPERATURE REDUCTION (JERUSALEM) 8/2017

27/08/2017



Average Temperature rec 0.291666667 to 19:00 -8.6

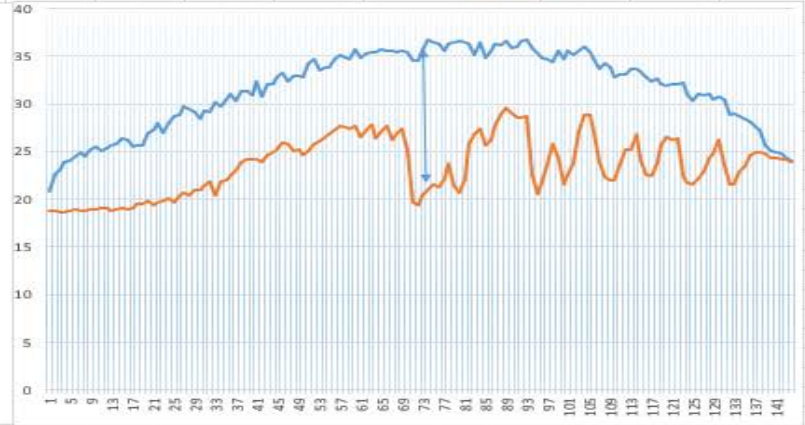
28/08/2017



ממוצע הורדת טמפרטורה חיצונית:

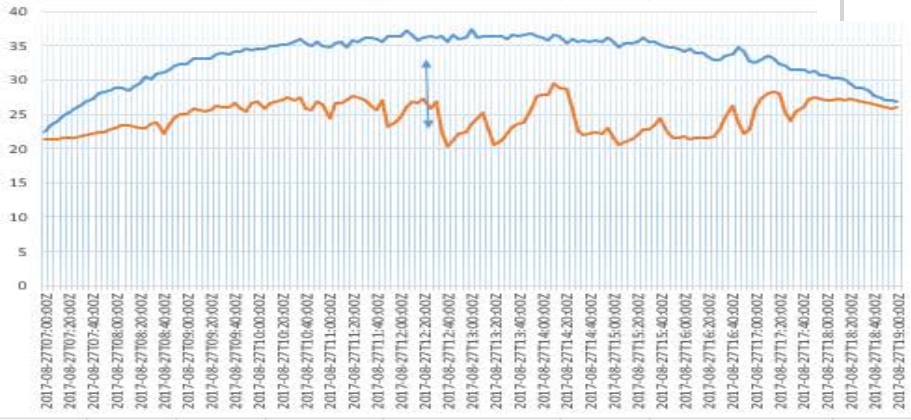
-7.82

29/08/2017

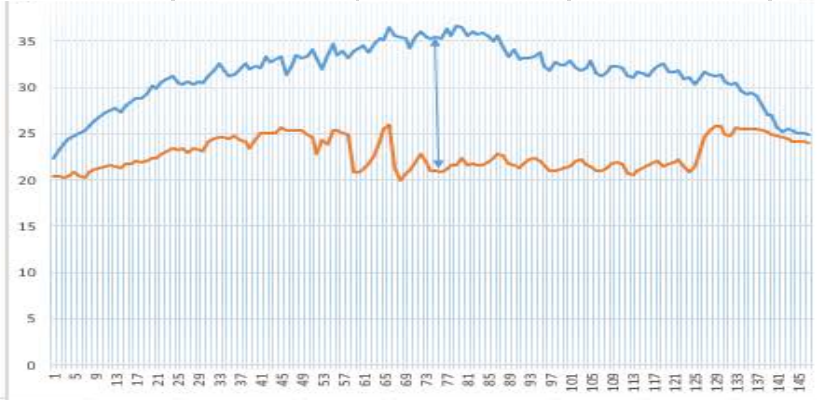


Average Temperature r 0.291666667 to 19:00 -8.06

27/08/2017

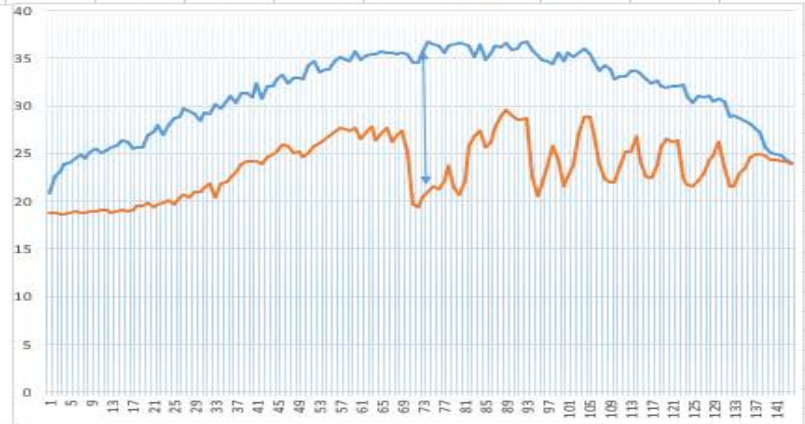


Average Temperature rec 0.291666667 to 19:00 -8.60



Average Temperature re 0.291666667 to 19:00 -8.67

29/08/2017

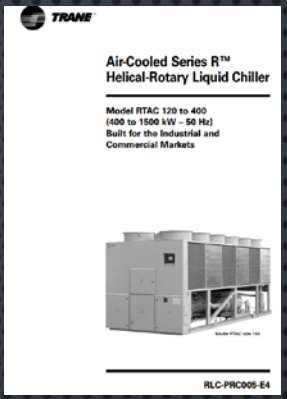


Average Temperature r 0.291666667 to 19:00 -8.06

What is the effect on the cooling unit?

- Each manufacturer declares in the data sheets of the relevant unit:
  What the impact and significance of environmental temperature varies on the performance of the cooling unit
- Especially with regard to the output (thermal output) and the power consumption consumed
- Cop or EER – Thermal Power OUT / Electricity power IN

EXAMPLE – TRANE UNIT


TRANE

Air-Cooled Series R™
Helical-Rotary Liquid Chiller

Model RTAC 120 to 400
(400 to 1500 kW – 50 Hz)
Built for the Industrial and
Commercial Markets

RLC-PRC005-E4

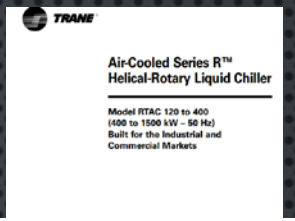
Performance Data

Table P-1 - Standard Efficiency Units (SI Units)

Evaporator Leaving Water Temperature (°C)	Model and Size	Entering Condenser Air Temperature (°C) 30 Cooling Capacity (kW)	Power Input (kW)	COP	35 Cooling Capacity (kW)	Power Input (kW)	COP	40 Cooling Capacity (kW)	Power Input (kW)	COP	45 Cooling Capacity (kW)	Power Input (kW)	COP
	140 STD	492.9	142.0	3.17	461.3	153.8	2.76	429.0	166.8	2.38	395.9	181.0	2.04
	155 STD	539.4	157.0	3.13	504.9	169.5	2.74	469.7	183.3	2.37	433.9	198.6	2.03
	170 STD	586.8	172.2	3.10	550.3	185.5	2.72	512.6	200.3	2.36	474.0	216.7	2.03
	185 STD	649.8	188.0	3.15	610.0	202.4	2.76	569.2	218.5	2.41	527.8	236.2	2.08
5	200 STD	713.8	204.0	3.18	671.2	219.5	2.80	627.3	236.8	2.45	581.9	255.9	2.11
	250 STD	854.7	243.7	3.20	804.1	263.5	2.80	751.4	285.3	2.44	697.2	309.2	2.10
	275 STD	957.1	275.4	3.16	900.1	296.5	2.79	841.0	320.0	2.43	780.2	345.9	2.10
	300 STD	1083.3	307.7	3.21	1020.0	330.8	2.83	954.6	356.6	2.47	887.1	385.0	2.14
	350 STD	1187.7	346.3	3.12	1115.3	373.0	2.74	1040.4	402.6	2.39	963.7	435.3	2.06
	375 STD	1306.2	377.2	3.15	1229.2	406.0	2.78	1149.4	438.0	2.42	1066.8	473.4	2.10
	400 STD	1434.5	409.9	3.19	1350.8	440.7	2.81	1264.0	474.9	2.46	1174.3	512.7	2.13
	140 STD	526.4	147.4	3.27	492.9	159.3	2.85	458.8	172.5	2.47	424.0	186.9	2.12
	155 STD	575.2	163.2	3.22	539.0	175.8	2.82	502.1	189.9	2.45	464.1	205.3	2.11
	170 STD	625.1	179.2	3.19	586.5	192.6	2.80	546.7	207.6	2.44	506.0	224.1	2.11
	185 STD	692.0	195.6	3.23	650.1	210.2	2.84	606.9	226.5	2.48	562.9	244.5	2.15
7	200 STD	760.2	212.4	3.27	715.2	228.2	2.88	668.4	245.7	2.52	620.6	265.2	2.18
	250 STD	908.5	252.9	3.29	855.4	272.9	2.89	800.2	295.1	2.52	743.3	319.5	2.17
	275 STD	1017.2	286.3	3.25	957.1	307.7	2.86	894.8	331.6	2.50	830.8	357.8	2.17
	300 STD	1151.1	320.0	3.29	1084.7	343.7	2.90	1015.8	369.9	2.54	944.4	398.9	2.21
	350 STD	1262.6	360.0	3.21	1186.6	387.0	2.82	1107.9	417.0	2.46	1027.0	450.1	2.13
	375 STD	1387.8	392.1	3.23	1306.9	421.4	2.85	1222.9	454.0	2.50	1136.0	489.9	2.16
	400 STD	1524.9	426.4	3.27	1436.6	457.8	2.89	1345.6	492.7	2.53	1251.0	531.2	2.20
	140 STD	560.5	153.1	3.36	525.3	165.1	2.94	489.4	178.5	2.55	452.9	193.1	2.20
	155 STD	612.1	169.7	3.31	573.8	182.4	2.91	534.8	196.6	2.53	495.1	212.2	2.18
	170 STD	664.5	186.4	3.27	623.4	199.9	2.88	581.6	215.0	2.51	538.7	231.7	2.17
	185 STD	735.2	203.5	3.31	690.9	218.4	2.92	645.5	234.9	2.55	598.8	253.1	2.21
9	200 STD	807.6	221.1	3.35	760.2	237.1	2.96	710.9	255.0	2.59	660.3	274.8	2.25
	250 STD	963.4	262.3	3.37	907.8	282.7	2.97	849.8	305.3	2.59	790.4	330.0	2.24
	275 STD	1078.0	297.5	3.32	1015.1	319.3	2.94	950.0	343.5	2.57	882.5	370.0	2.23
	300 STD	1220.4	332.9	3.36	1150.8	357.0	2.98	1078.4	383.8	2.61	1003.5	413.3	2.27
	350 STD	1338.9	374.1	3.28	1259.1	401.5	2.90	1176.5	431.8	2.53	1091.7	465.2	2.19
	375 STD	1470.7	407.5	3.31	1386.0	437.4	2.93	1298.1	470.5	2.56	1207.0	506.9	2.23
	400 STD	1617.0	443.6	3.34	1524.5	475.6	2.96	1428.6	511.2	2.60	1329.4	550.5	2.26

Notes :
1. Ratings based on sea level altitude and evaporatot fouling factor of 0.0176 m²°K/kW
2. Consult Trane representative for performance at temperatures outside of the ranges shown
3. kW input = compressor power input only

EXAMPLE – TRANE UNIT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	140 STD	526.4	147.4	3.27	492.9	159.3	2.85	458.8	172.5	2.47	424.0	186.9	2.12
	155 STD	575.2	163.2	3.22	539.0	175.8	2.82	502.1	189.9	2.45	464.1	205.3	2.11
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	185 STD	692.0	195.6	3.23	650.1	210.2	2.84	606.9	226.5	2.48	562.9	244.5	2.15
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	275 STD	1017.2	286.3	3.25	957.1	307.7	2.86	894.8	331.6	2.50	830.8	357.8	2.17
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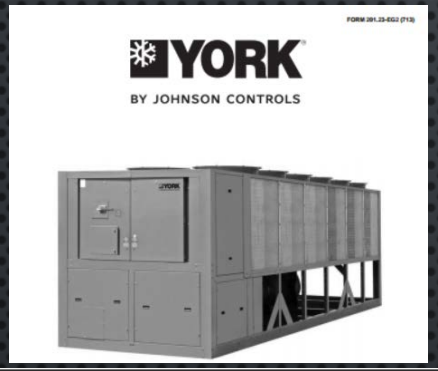
	350 STD	1262.6	360.0	3.21	1186.6	387.0	2.82	1107.9	417.0	2.46	1027.0	450.1	2.13
	375 STD	1387.8	392.1	3.23	1306.9	421.4	2.85	1222.9	454.0	2.50	1136.0	489.9	2.16
	400 STD	1524.9	426.4	3.27	1436.6	457.8	2.89	1345.6	492.7	2.53	1251.0	531.2	2.20

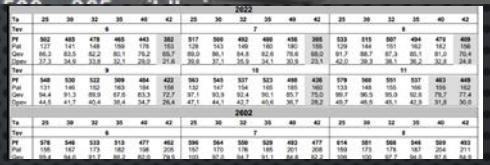
A Change of 5 ° C changes the unit's **output** by about 7%

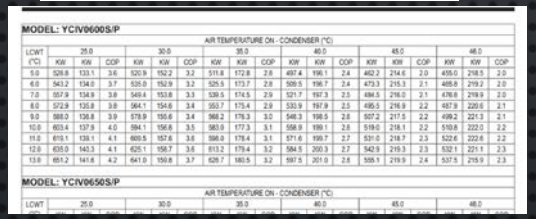
A Change of 5 ° C changes the unit's **Power consumption** by about 7%

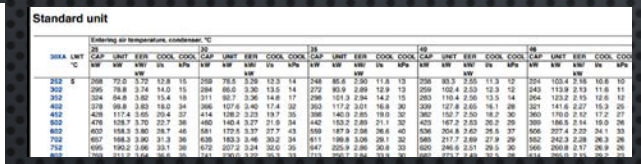
A Change of 5 ° C changes the unit's **COP** by about 15%

YOU CAN CHOOSE ANY CHILLER MANUFACTURE IN THE WORLD – ITS ALL THE SAME

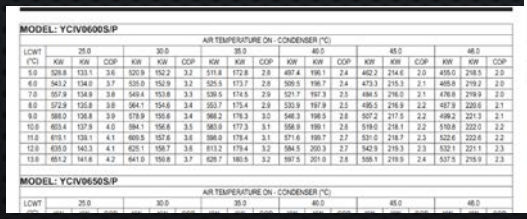








Lowering the external temperature = increase the unit's output and increase its efficiency significantly !!!



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IF SO, WHAT IS THE DIFFERENCE BETWEEN THE PROPOSED SYSTEM AND THE BATTERY BEING WASHED DIRECTLY IN THE WATER?

Use of Eco System	VS	Wash the battery in water
The battery remains dry, all the tartar if formed crumbles on the outer net (where the water evaporates	**fur**	The water is drying on the battery, the limescale is formed on the battery and quickly seals it
Very small amount (about 500 liters per day for a unit of 200 TR. Splashing water for several seconds every few minutes	**amount of water**	Large amount of water
Because the amount of water is small - all the water passes through a dedicated water softener	**Water quality**	Most of the water is hard. Treatment of a water conditioner will require frequent replacement due to water quantities
Most of the dust is trapped in the net - to visit an automatic washing cycle for cleaning	**dust**	All dust is "absorbed" in the battery. Dust + water = mud
The net can also be used as a shield against hail	**Additional defenses**	NONE

SUMMERY

- The use of the Eco system of makam improves and increases the cooling unit's working environment. In the hot summer days, the unit improves the efficiency of the unit and provides additional capacity, and extends the life span of the components of the cooling unit.
- This includes an external installation that does not interfere with the cooling unit systems.

- Enjoy all worlds

LINK TO MOVIEW

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THANK YOU

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  - 972-(0)3-9384313

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MKM VRF SYSTEMS

SHUANGLIANG ECO-ENERGY

Absorption cooling units

G.I. INDUSTRIAL HOLDING

CLINT KTK NOVAIR

Refrigeration units

DB DUNHAM-BUSH

Refrigeration units