The Energy Mist System
by
Miatech, Inc.

What is an Energy Mist System?

A simple, cost-effective method of dramatically improving the upper ambient performance of refrigeration and air-conditioning systems

How Does It Accomplish This?

By injecting a cool water mist into the condenser air. This lowers its temperature and allows the condenser to reject more heat.

What Are The Potential Benefits?

Increased Cooling Capacity

Because the temperature of the condenser air is reduced through the evaporation of water into the air, the condenser can reject more heat and cooling capacity is increased.

Decreased Peak Demand

Because the condenser can reject more heat, head pressures are reduced. As a result, the compressors require less power to run, which reduces peak demand.

Decreased Energy Use (kWh)

Since the compressors draw less power and produce more cooling when they run, energy usage (kWh) is reduced.

Extended Compressor Life

Since head pressures are lowered, the compressors are taxed less under peak ambient conditions, so compressor life is significantly extended.

Reduced Water and Sewerage Costs

When the Energy Mist System replaces water sprinklers that are already being applied to air-cooled condensers, water and sewerage costs are slashed.

Why Is the Energy Mist System Needed?

Power Draw vs Ambient Temp				
Ambient Temp (Deg F)	Power Draw (kW)	Capacity (Tons)	kW/Ton Cooling	Increase
85	118.3	104.6	1.13	-
95	129.5	98.0	1.32	16.8%
105	142.2	91.1	1.56	38.0%
115	156.2	83.6	1.87	65.2%

- The performance of air-cooled systems is negatively impacted at high ambient temperatures so demand and energy use increase while cooling capacity falls.
- As condensers age, the coils, fins and fans deteriorate and they become less capable of rejecting heat.
- Newer refrigerants often run under higher pressures and temperatures, so more condenser capacity is needed.

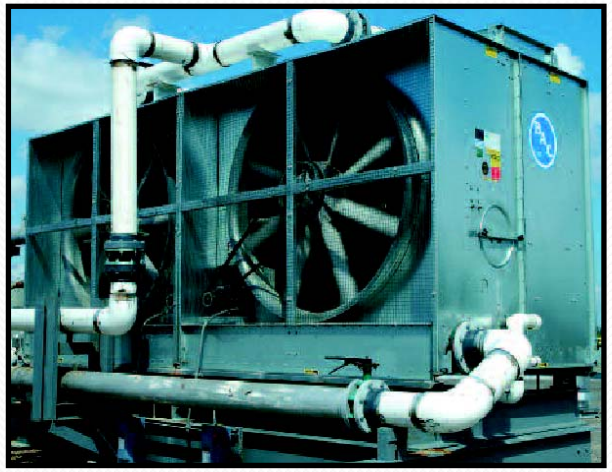
The Proof:
Manufacturer's Performance Data

48TF006 (5 TONS)										
Temp (F) Air Entering Condenser (Edb)		Air Entering Evaporator — Cfm/BF								
		1500/0.07			2000/0.09			2500/0.12		
		Air Entering Evaporator — Ewb (F)								
		72	67	62	72	67	62	72	67	62
75	TC	71.0	63.8	55.4	74.5	67.2	59.2	76.5	69.7	62.1
	SHC	33.9	41.5	47.9	37.4	47.4	55.8	40.6	52.8	61.8
	kW	5.04	4.82	4.62	5.20	4.97	4.76	5.29	5.06	4.87
85	TC	69.2	61.0	54.2	72.9	65.6	57.2	75.2	68.1	61.5
	SHC	33.4	40.5	47.3	37.0	46.9	54.9	40.1	52.3	61.3
	kW	5.50	5.27	5.02	5.66	5.41	5.18	5.75	5.50	5.29
95	TC	65.5	56.6	50.4	69.4	60.9	53.1	71.2	63.3	57.8
	SHC	32.1	38.8	45.6	35.8	45.3	52.6	39.1	50.9	57.8
	kW	5.88	5.62	5.37	6.01	5.76	5.53	6.12	5.87	5.67
105	TC	61.9	53.1	47.1	65.4	56.6	50.5	67.1	58.8	54.5
	SHC	30.8	37.5	44.1	34.5	43.7	50.2	37.9	49.3	54.5
	kW	6.25	5.99	5.72	6.38	6.13	5.91	6.50	6.23	6.06
115	TC	58.2	49.7	43.7	61.4	52.3	47.8	63.0	54.3	51.2
	SHC	29.5	36.1	42.5	33.2	42.1	47.8	36.7	47.6	51.2
	kW	6.63	6.35	6.08	6.75	6.49	6.29	6.88	6.59	6.46

Traditional High Ambient Solutions

Missing December

Evaporative Condensers and Cooling Towers



These work well but they are a difficult, expensive, invasive retrofit. They also require a great deal of maintenance as well as continuous chemical treatment.

Evaporative Pad Systems

These work to some extent, but on horizontal condensers they are difficult to install. Furthermore, water use is high and mold tends to grow on the pads.

Mechanical Subcoolers

Although peak ambient capacity is increased, peak demand and kWh usage may both rise.

Lawn Sprinklers

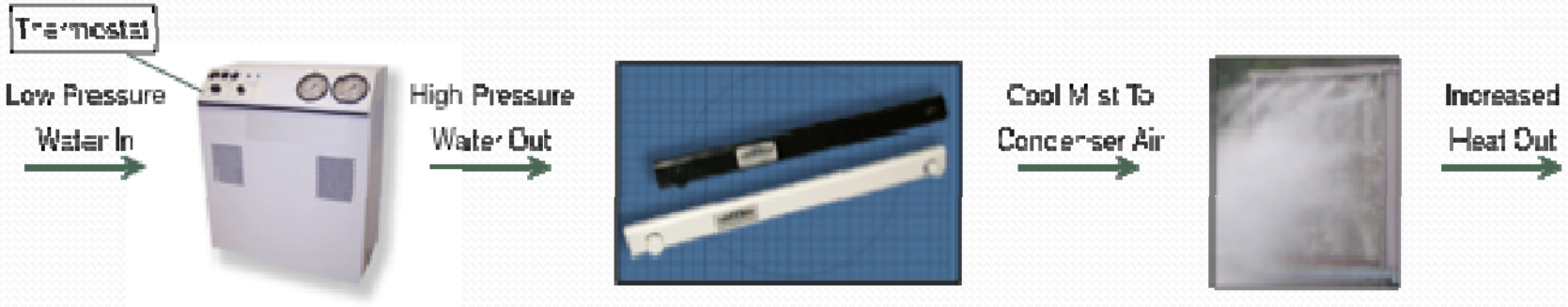
Sprinklers are often placed under condensers to increase peak ambient cooling capacity. Since water use is uncontrolled, water and sewerage costs tend to skyrocket.

Note:

Each of the traditional high ambient solutions previously listed, other than mechanical subcoolers, involves utilizing water to increase heat rejection. That is because it is a universally accepted solution. The trick, however, is to use the water judiciously.

The Energy Mist Solution

How The Energy Mist System Works



Water is fed to the inlet of a positive displacement pump. Upon a signal from a thermostat or energy management system, the pump raises the water pressure to the desired level. The pressurized water then flows through tubing to atomization nozzles located on mist bars placed around the perimeter of the condensing coil. The mist is directed into the incoming condenser air, lowering its temperature and reducing system head pressure. This increases cooling capacity while decreasing peak demand.

How Misting Cools Condenser Air

As the water evaporates, latent heat is extracted from the air, thereby lowering its temperature.

Components

Pump Module

The heart of the Energy Mist System is the pump module. Manufactured for Latent Energy Solutions by world-renowned Miatech, Inc. of Clackamas, Oregon, these pumping modules are extremely reliable and require very little maintenance.

Mist Bars

The patented mist bars deliver a super-fine micro mist. Atomization tips are spaced 9” apart, allowing for maximum coverage. A unique integrated ball check valve tip eliminates dripping and features on/off capability. With no spray nozzles to misdirect and/or break, they provide unparalleled reliability. Integral magnets on the back of the mist bars allow for rapid attachment to condensers, minimizing installation costs.

Adjustable Thermostatic Control

By sensing the outside air temperature, the thermostatic control cycles the system on and off as needed, thereby minimizing water and sewerage costs.

Integral Water Meter

This tracks water usage, allowing the user to eliminate sewerage charges for the water consumed in the misting process.

Mist Bar Placement

Horizontal Condenser Coil

Mist bars are placed under the condenser.

Vertical Condenser Coil

Mist bars are placed around the condenser coils.

Air-cooled Chiller

Mist bars are placed around the vertical coils and below the horizontal coils.

Predicting Performance

How Energy Savings Are Predicted

- Latent Energy Solutions has developed a spreadsheet based on ASHRAE bin data.
- When site-specific conditions are fed into the spreadsheet, it calculates the baseline kW and kWh, the revised kW and kWh, the energy savings and the water usage.

The Spreadsheet

Air Conditioning

Inputs	
Compressor Tons	100
Compressor kW	129
% Load at Peak	100%
Fogging Pump kW	0.8
Compressor Savings/Degree	1.0%
Effectiveness	0.75

Savings	
kWh Savings	18,619
Demand Reduction	44.58
Assumed kWh Cost	$ 0.14
Assumed Demand Cost	$ 18.00
Energy Cost Savings	$ 5,816

Cost & Payback	
Energy Mist System	$7,850.00
Installation	$2,500.00
Total	$10,350.00
Payback (yrs)	1.78

Energy Use Calculations

Weather Data					Existing System			Fogged System						Savings	
Mid-pts	DB (F)	Total Hrs	WB (F)	Diff.	Percent Load	Comp kW	Comp kWh	Comp kW	Comp kWh	Pump kW	Pump kWh	Total Fog kW	Total Fog kWh	kW Savings	kWh Savings
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
112.5	110 to 115	3	65.6	46.9	100%	129.00	387	83.62	251	0.8	2	84.42	253	44.58	134
107.5	105 to 110	90	65.6	41.9	95%	122.55	11,030	84.04	7,563	0.8	72	84.84	7,635	37.71	3,394
102.5	100 to 105	254	65.1	37.4	90%	116.10	29,489	83.53	21,218	0.8	203	84.33	21,421	31.77	8,069
97.5	95 to 100	392	63.8	33.7	85%	109.65	42,983	81.94	32,119	0.8	314	82.74	32,432	26.91	10,550
		646					72,472						53,853		18,619

Service

Service is available through Miatech’s international network of service dealers.