Mee Industries Inc.

Data Center Uses MeeFog™ System to Keep Operating Through a Heat Wave

THE BENEFITS OF MEEFOG™ TECHNOLOGY

- Able to put more computing equipment in same building without upgrading cooling equipment
- Able to keep operating on days that exceed design specifications of cooling system
- Lower energy bills for cooling

CHALLENGE

To boost the capacity of the existing rooftop condenser units for an 80,000 square foot urban data center so the company could add more computing equipment without having to shut down the data center during summer heatwaves.

THE SOLUTION

Install MeeFog fogging units on the eight existing rooftop dry cooler condenser units. Operate the MeeFog units when glycol temperatures exceed 100˚F.

Major Financial Institution, New York City Metropolitan Area

A major financial institution operates two mirrored data centers to service its New York City operations. One of these occupies the second floor in a 14-story brick building, originally built in 1912 to house a department store, but now a multitenant structure hosting computing and telecom equipment. The 87,000 square foot data center contains about 30,000 square feet of white space for the computing and storage equipment and a small amount of office space. The rest of the space is used for battery rooms and other ancillary equipment.

LEFT: Nozzles produce billions of tiny fog droplets that evaporatively cool the inlet air close to the wet bulb temperature.

RIGHT: Cooling the inlet air stream to the Air Cooled Condenser (ACC) increases heat rejection and efficiency.

The Physical Site

Unlike like rural data centers which can pull in enough outside air to keep the data center cool, in this case the data center is in the middle of a dense urban area where the streets and brick buildings absorb the heat day after day and don't fully cool down at night, gradually raising the temperature inside the building. To make things worse, while the urban ambient temperatures themselves are higher than the surrounding countryside, the rooftop temperatures can exceed the ambient temperatures by another ten degrees.

The data center uses an indirect cooling system with CRAC units in the white space. Glycol runs through heat exchangers in the CRAC units and is then pumped to rooftop units where the glycol is recondensed and the heat dissipated into the outside air. When the data center went through a major upgrade which added to the heat load, there was enough room on the roof to install five additional condensers to supplement the eight already in use. This arrangement works for most of the year, but for a week or two each summer it does not. The cooling system operates properly as long as the glycol temperature can stay below 100˚F. When it exceeds that temperature, the cooling system can trip off line.

"We have dry coolers on the roof, so we don't have the benefits of evaporation," says the data center's assistant chief engineer. *"If we have 1000 tons of refrigeration at 100˚F, when it goes to 110˚F capacity drops and we are just shy of what we need. On very hot days when it gets above 110˚F on the roof — which we reached about ten days last year — the units would have tripped offline on high head pressure."*

"As outside temperatures hit 100°F and climb higher, we fire up our MeeFog unit. Glycol temperatures don't rise. MeeFog's cooling effect is substantial."

Installation Challenges/ Specifications

To keep the data center operating, since there was no room for additional rooftop condensers, the financial institution needed to find a way to get more cooling out of the condensers it did have by bringing down the inlet air temperature. After experimenting with using lawn water sprinklers to spray water into the inlet air on the bottom of the condensers, IT decided to put in a more efficient and controllable MeeFog system to keep the glycol temperature and pressure within limits.

"They found that using a Rainbird sprinkler underneath the units gave them a bit more capacity out of the dry coolers, but it wasted a lot of water," says Gennaro Lombardi, president of Metro Air Products in Hillsborough, NJ. *"That's where we came in, designing a fogging system for them with a series of manifolds and valves that performs quite well."*

The removal of minerals from the water supply reduces maintenance and prevents fouling of the heat exchanger.

The MeeFog system for this application consisted of a single 10 HP, 480vGrundfos CRI-5 pump with Allen Bradley controllers to pressurize the water for all use by the eight original condensers. ¾" stainless steel feedlines bring the water from the pump to the 90-nozzle fogging arrays placed in the bottom inlet of each of the condensers. A Marlo, Inc. water softening system keeps minerals from clogging the nozzles or building up on the condenser fins.

"The MeeFog system pressurizes the water to just under 300 psi and it comes out of an orifice in such a fine fog that it cools the outside air and drops the temperature of our glycol by about six to eight degrees," says the engineer.

Putting it to the Test

Once it was installed, the MeeFog system was quickly put to the test in a heat wave last summer.

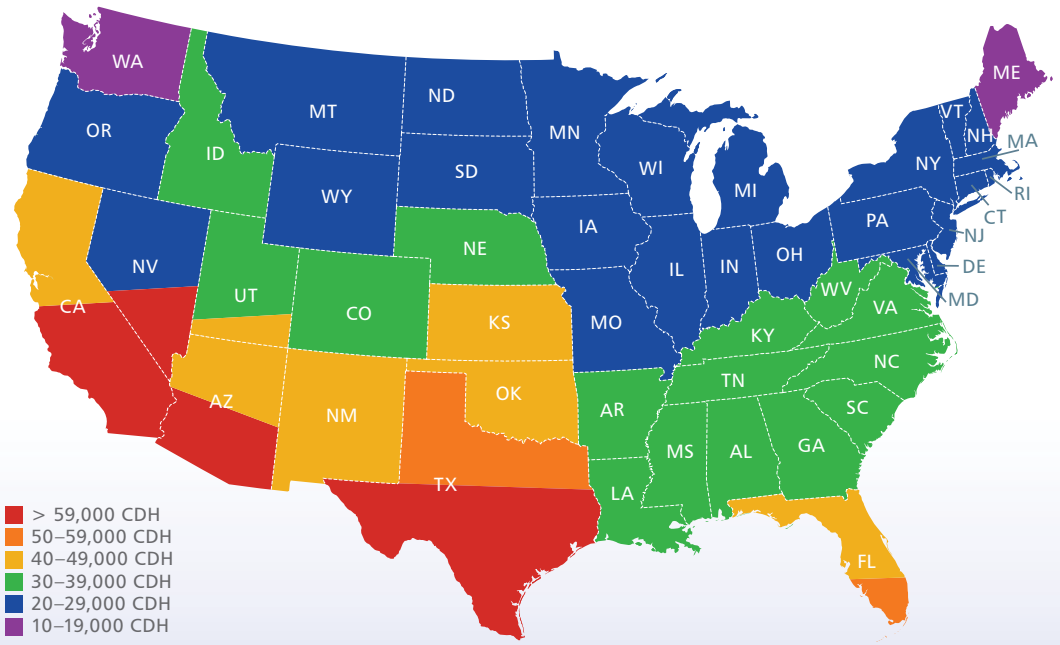
"There is a cumulative effect because all day long the heat cooks the bricks and each day the bricks heat up deeper and deeper and don't return to the ambient temperatures at night," says the engineer.

By the third day of the heat wave, the rooftop temperature was hitting 115˚F, even though the air temperature was just 103˚F.

"Since we were above our 100 degree max, our cooling capacity was below what we needed," says the engineer. *"We didn't wait until we had units failing, but fired up the MeeFog unit as soon as the temperature hit 100 and the glycol temperature dropped about six degrees. Then, as the day progressed and the outside temperatures climbed, our glycol temperature didn't get any higher, so the MeeFog cooling effect was pretty substantial."*

Currently the MeeFog system is only cooling the bottom inlet air, which is enough to meet the original intention of keeping the data center on line during heat waves, but an engineering firm has been to the site and is looking at fogging the condensers on three sides in order to provide additional cooling and reduce the amount of energy required to cool the data center.

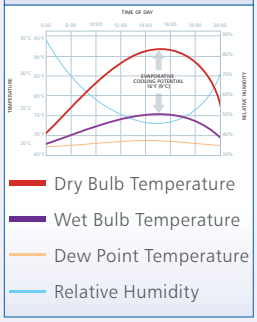
EVAPORATIVE COOLING DEGREE HOURS (CDH) IN THE USA, ˚F



Fog systems are suitable for use even in very humid climates. It is almost always possible to get at least 15°F of evaporative cooling on a hot day, even in a tropical climate. Mee Industries has developed a climate database tool to help our clients understand how much cooling is available at their particular site. The data is obtained from published climatic databases.

The analysis can be used to determine the Evaporative Cooling Degree Hours (ECDH) for a variety of locations worldwide. The annual ECDH number defines how many degree-hours of cooling can be done at a particular location in a typical year. Hot dry climates can have as much as 50,000 annual ECDH, while even moist climates might have as much as 30,000 ECDH.

TYPICAL DAILY WEATHER TRENDS



On a typical day the relative humidity decreases as the temperature increases. This means that the maximum cooling potential usually coincides with the hottest part of the afternoon.

About Mee Industries Inc.

Mee Industries Inc. is the innovative, high technology corporation that provides highly customized, cost-effective fog solutions for a wide range of applications including gas turbine inlet air cooling. Founded in 1969 by former Cornell University Research Scientist, Thomas Mee Jr., today the company also specializes in revolutionary fog solutions for industrial humidification, outdoor air conditioning, greenhouse climate control, wine barrel humidification and unique special effects applications.

Renowned MeeFog™ turnkey solutions include meticulously designed and engineered, premium quality, integrated systems that deliver an unequaled combination of price and performance. Mee Industries products are backed by our experienced staff of technical personnel including leading researchers, project managers and engineers along with production and installation specialists. An active research and development division ensures our position of technological leadership in the fog system market. Mee Industries is a proud ISO 9001 certified corporation and manufactures components to meet exacting UL or CE requirements.

Mee Industries is a privately held company with corporate headquarters in Irwindale, California.

Mee Industries Inc.

MeeFog™ System Applications

EVAPORATIVE COOLING
- Data Center Cooling
- Condenser Cooling
- Heat Exchanger Cooling

GAS TURBINE COOLING
- Power Generation
- Oil, Gas, Petrochemical
- Offshore Operations

HUMIDIFICATION
- Commercial HVAC
- Manufacturing

SPECIAL EFFECTS
- Amusement Parks
- Themed Entertainment
- Zoos, Aquariums, Gardens
- Fountain Art
- Private Residence

AGRICULTURE/OTHER
- Greenhouses
- Conservatory
- Wine Barrel Storage
- Cold Storage
- Dust Suppression
- Odor Control
- Cement Curing

HEADQUARTERS

Mee Industries Inc.
16021 Adelante Street
Irwindale, CA 91702
T: 626.359.4550
F: 626.359.4660
www.MeeFog.com

© 2012 Mee Industries, Inc.
All rights reserved. MeeFog is a trademark of Mee Industries, Inc. in the United States.

ISO 9001:2008 CERTIFICATION

MAJOR FINANCIAL INSTITUTION
NEW YORK CITY METROPOLITAN AREA
CASE STUDY 2012
Printed in USA 5/12