Slashing Chiller Costs With Inlet Fog

Las Vegas Cogen
Las Vegas, Nevada

Las Vegas Cogen is a GE LM 6000-based peaking plant, which starts up hundreds of times per year. The electricity output from this facility is sold to Nevada Power. In addition, thermal energy is used to heat a 12-acre hydroponic greenhouse owned by the company.

The climate in Nevada is warm and dry. The plant is subjected to very hot temperatures during the long summer months. As a result, this facility employs a chiller system to maximize output. However, plant operators found that they couldn’t cool inlet air to dew point during periods of high ambient temperature. A fog system, therefore, was positioned upstream of the chiller coil to act as a pre-cooler.

THE BENEFITS OF MEEFOG™ TECHNOLOGY

- 5 MW of additional power
- Lower energy bills by limiting the use of the chiller system to only high temperature days
- Chiller is enhanced by using fog during the hottest weather
- Install MeeFog in this configuration without downtime

CHALLENGE

To limit the usage of the existing chiller in order to control overall cooling costs while achieving maximum turbine output during peaking operation.

SOLUTION

Installed MeeFog™ fogging units upstream of the chiller coil and air filters.

Operate the fog units for power augmentation when temperatures are below 70°F and also use them as pre-cooling for the chiller when temperatures exceed 100°F.
Each MeeFog™ system is designed using a series of high pressure pumps to pressurize demineralized water, which enters an array of nozzles to produce billions of ultra-fine droplets per second.

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

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.

<table>
<thead>
<tr>
<th>TIME OF DAY</th>
<th>TYPICAL DAILY WEATHER TRENDS</th>
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</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td>Temperatures: 65°F, 90% RH</td>
</tr>
<tr>
<td>10:00 AM</td>
<td>Temperatures: 68°F, 80% RH</td>
</tr>
<tr>
<td>12:00 PM</td>
<td>Temperatures: 72°F, 75% RH</td>
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<tr>
<td>2:00 PM</td>
<td>Temperatures: 75°F, 70% RH</td>
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<tr>
<td>4:00 PM</td>
<td>Temperatures: 78°F, 65% RH</td>
</tr>
<tr>
<td>6:00 PM</td>
<td>Temperatures: 80°F, 60% RH</td>
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</tbody>
</table>

Putting it to the Test

Las Vegas Cogen found it far more economical to exclusively use fog under certain conditions. When the outside temperature is below 70°F fog alone is used for cooling. If temperatures rise above 70°F, the steam absorption chiller is used exclusively. But because it takes time for the chillers to come on-line, the cogen facility uses high-pressure inlet fogging to provide maximum power instantly. And again as a pre-cooler to augment the chiller when ambient temperatures exceed 100°F.

Although the fog system was installed upstream of the air filters, the final barrier filters remain dry and these filters stay cleaner due to the scrubbing effects of the mist.

At Las Vegas Cogen, the first cooling stage achieves 7°F of cooling, two stages deliver 12°F and all three provide 15°F. The overall result of fogging is an additional 5 MW of power output.

“Due to its low cost, my advice would be to use fog as much as possible. It is simple, reliable and relatively maintenance free. In fact, the fog system has resulted in less operation of our chillers.”

— RD Dawkins, Operations Supervisor, Las Vegas Cogen
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.

About Mee Industries Inc.

For over 45 years Mee Industries has led the world with innovative water fog technology. MeeFog systems are used to humidify and cool many industrial, commercial and agricultural processes and to create interesting and dynamic special effects. Today there are over ten thousand MeeFog systems in use around the world. The MeeFog team looks forward to helping you with your fogging project.

The Mee Advantage: Experience, Innovation, Performance

In 1969, Thomas Mee Jr. a former Cornell University research scientist, founded Mee Industries. The company originally manufactured high-tech electro-optical, meteorological instrumentation, but by the early 1980’s, high-pressure water fogging had become the main focus of the company. Today, Mee Industries provides innovative, highly effective, economical fog solutions for many industrial applications including gas turbine inlet-air fogging, commercial and industrial building humidification and cooling, data center humidification, outdoor air conditioning, greenhouse climate control, wine barrel storage humidification, as well as dynamic special effects for the entertainment industry and theme parks.

Industry Leaders — Focused on Fog Technology

Mee specializes in providing custom-engineered, turn-key high-pressure fog solutions. We are committed to researching, developing, marketing and supporting the most innovative and reliable fog systems available anywhere in the world.