Entergy's Cool Solutions

A quarterly newsletter for customers and employees

Tulane Health Sciences Center - the newest chilled water customer to the New Orleans Thermal System

Tulane Health Sciences Center's J. Bennett Johnson Building in downtown New Orleans is one of the area's top medical research facilities containing several advanced research laboratories. As would be expected in such a facility, reliable environmental control is critical.

Tulane has been receiving steam service from Entergy Thermal in New Orleans for the past several years. As of early 2005, they have now added chilled water service as well -giving preference to Entergy Thermal over installing an additional in-house chiller.

The JBJ building demands a solid 1500-ton cooling capacity to meet the requirements of its medical research laboratories. To answer the call, Entergy Thermal recently completed the construction of 1,500 feet of distribution pipe as well as the installation of a roof-top heat exchanger to serve this very critical load. Piping challenges included various techniques of open-cut trenching and tunneling in order to navigate the numerous underground utilities and several huge cypress stumps that have been buried under this part of the City for many generations. Despite these obstructions, the project was completed in good fashion and began flowing water prior to the heavy air-conditioning season. Entergy Thermal and Tulane continue to work together on other existing and newly planned projects in this vital medical district.

Celebrating Cinco de Mayo at Houston's Entergy Solutions District Cooling Plant

To coincide with their 5th anniversary of doing business in downtown Houston, the folks at Entergy Solutions District Cooling threw a Cinco de Mayo fiesta for customers at their Union Station plant. Guests enjoyed Mexican food, guided tours of the district cooling plant, and great giveaways like Astros tickets, a baseball signed by Roger Clemens and other items donated by existing district cooling customers.

Part customer appreciation, part anniversary celebration (5 years with no plant outages), everyone in attendance reported having a great time at the event.

"After five years, our business has made a big impact on downtown Houston, and we wanted to emphasize and celebrate that. I think it was a huge success!" -

Doug Castleberry,
VP Entergy Resources.

What Does Your Liver Have in Common With Your Air-Handling Unit?

*Written by*Steve Tredinnick, *P.E.*

Unfortunately, an air-handling unit (AHU) can't turn its head and cough or let you know when it is sick. Just as your hands need washing to help prevent infection, an AHU coil requires cleaning too. Proper AHU air filtration provides a protective barrier to the internal components and ductwork system in a manner similar to how our livers and kidneys filter out the body's toxins to protect the heart and lungs. A sick AHU can also infect the occupants of the space it serves and use more energy. Filters, therefore, should be checked and replaced and the coil cleaned regularly to maintain good AHU health.

Cooling coils can get fouled more than heating coils, since they have closer fin spacing and deeper row configurations. I originally thought that dirt, debris and scale acted like insulators on the coil and would greatly affect its heat transfer capability. This is not entirely true, however. Don Eppelheimer of The Trane Co. informed me that airside fouling has minimal effect on the coil's capacity, explaining that "dirty fins do not impede the flow of heat; they impede the flow of air."

This is confirmed by a research project on the fouling of HVAC

continued on page 3

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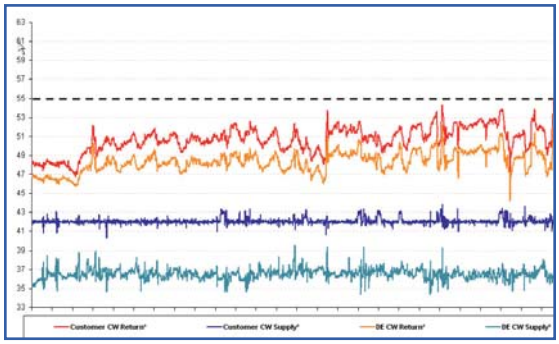
Delta T - What Does It Really Mean?

You may or may not know what a "Delta T" is or how it affects your business, but it has a significant impact on the way cooling plants run. The "Delta T" is the difference between temperatures of chilled water supplied to your building versus the chilled water temperature you return to the central plant after extracting the thermal energy from the water. Chilled water supplied from our cooling plants is typically set for 42° to your building. A good water temperature return from your building should be around 56°, or a 14 to 15 degree optimal spread.

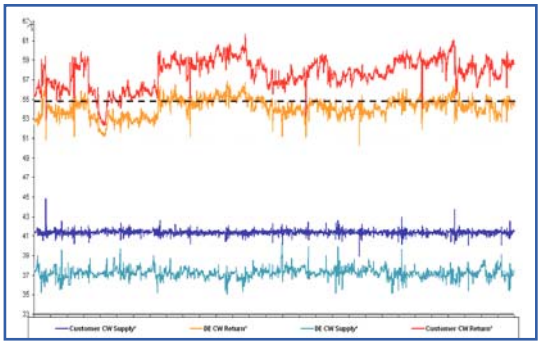


Poor Delta T

High return temperatures from chilled water customers contribute to a high "Delta T" and are critical in optimizing performance of a district energy central chilled water plant.

A poor "Delta T" (one which is below the optimal spread) requires more central plant distribution pumps to run than optimum and requires more chillers running to supply those pumps. Chillers, therefore, aren't run on their most efficient settings and use higher amounts of electricity to deliver the same total tons of chilled water.

In the charts displayed here, poor "Delta T" required 53% more chilled water flow through this customer's system than design. On the other hand, the high "Delta T" delivered by the customer in the "Optimum" chart resulted in only 97% of the chilled water flow designed to meet its demand.



Optimum Delta T

As you can see, optimization of "Delta T" results in lower costs for chilled water delivered. It's in everyone's interest to maintain internal systems and optimize building equipment so that a high "Delta T" can be achieved. Entergy Thermal stands ready to assist customers in achieving this. Optimizing is a win-win, for customers and district energy at Entergy.

Some Cool Summer Tips

Did you know that there are some measures you can perform in your building to optimize your chilled water system as well as save $$$'s?

- Make sure your air handling unit coils and filters are clean- This will increase your air flow across the coil and optimize your heat transfer.
- Balance your system- If your chilled water system is balanced you will get the proper flow to each unit which will save you pumping horsepower.
- Check Chemical Treatment- Your chilled water system still needs bio-side and corrosion inhibitor from time to time which will prevent fouling on your heat exchanger.

Employee Spotlight- Steve Barnwell -

Steve Barnwell is the Production Superintendent for Entergy Solutions District Cooling at the Union Station District Energy Center in Houston.

He began his employment at Union Station in June of 1999 while the plant was under construction and was instrumental in start up and commissioning of the district cooling system.

Steve's responsibilities include:

- Supervising eight plant operating engineers in the production, distribution and maintenance of the Union Station thermal storage facility.
- Overseeing the operation to ensure plant efficiency, reliability and customer satisfaction
- Supervising four building engineers for the Operations and Maintenance contract at 1000 Main Street.
- Steve is also responsible for the Operations and Maintenance of the HVAC equipment at the Christ Church Cathedral utilizing the staff at the Union Station facility.

Since Steve has been with District Cooling we've seen increases in:

- **Plant reliability** - there have been no unplanned plant outages or downtime since production began in August of 1999.
- **Operating efficiencies** - 1 kW/ton, which is far better than most district cooling plants.
- **Safety record** - there have been no lost time injuries or accidents at the Union Station plant or the other two O&M contract facilities in the Houston central business district.

Steve's successes are not a one man mission. According to Steve, "I attribute the success that I have enjoyed at the Union Station Plant to the support and dedication of an outstanding staff of Operating Engineers at Union Station, as well the Building Engineers at 1000 Main (Reliant Energy Plaza) and to the support from the management staff of Entergy Solutions District Cooling."

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(continued from page 1)

fin-and-tube heat exchangers conducted in 2001 at Lawrence Berkeley National Laboratory (by Jeffrey Siegel and Van P. Carey). It concluded that the buildup of an insulating layer has a very limited effect on heat transfer. Since the total surface area of an evaporator coil is so large, any deposited material only affects a small amount of the heat transfer surface. Dirty fins increase the coil air-pressure drop - reducing system air flow, increasing fan energy required to flow air through the coil surface, degrading the coil's heat transfer efficiency and significantly cutting cooling capacity.

Coil heat transfer efficiency can be reduced typically 5 percent to 10 percent for mildly dirty coils and more than 20 percent for severely dirty ones. Operating costs increase, and the life expectancy of the equipment is reduced. This is compounded in hot and humid climates (or manufacturing facilities) where coil surfaces become home to fungi, slime and micro-organisms, or coated in oily films. Dirty coils are prime breeding grounds for colonies of biological growth and will cause a biofilm slime coating on the coil surfaces. If the bio-colonies get large enough, they can be released into the air stream and eventually to occupant exposure.

As contamination builds up on fin surfaces, the condensed water removed from the air stream will not flow off the fin surfaces as efficiently. Water droplets remaining on the fin surfaces can blow into the air stream and fall out downstream in the duct system. It is this moisture that causes much of the mold growth seen inside air ducts. Organisms will grow with the right combination of moisture, mold spores, temperatures and food sources.

Proper planning during the design phase as well as proper maintenance procedures can mitigate some of these dirty coil issues. Here are some AHU/coil design considerations:

Follow ASHRAE guidelines for minimum filter selections. Standard 52.2 states that filters with a minimum efficiency reporting value rating of not less than 6 (20 percent to 30 percent efficient) be installed upstream of cooling coils.

- Provide access sections on upstream and downstream sides of coils.
- Try to limit coil depth to six to eight rows.
- Limit fin spacing to 12 to 14 fins per inch.
- Limit cooling coil face velocity between 400 and 550 feet per minute.

What do you do if you have dirty coils? It is often cheaper to replace a severely fouled coil than to try to clean it. For coils of more than four rows, if the air-pressure drop of the coil exceeds the original clean design value by a factor of 1.5 to 3 times, it may be time for replacement. The ASHRAE Equipment Handbook estimates the mean service life of heat transfer coils to be 20 years.

High-output ultraviolet C (UV-C) light sources are being marketed for the HVAC industry to eradicate mold, bacteria, viruses, odors from volatile organic compounds and other pathogens. UV lights can help destroy the biological growth, but dirt can only be removed by mechanical cleaning. UV light placement is critical since the "kill zone" is only as far as the light can penetrate the coil. Therefore, a deep coil may still have colonies in the middle of the fin pack (otherwise known as 'packing' the coil). Ultraviolet germicidal irradiation (UVGI) has been proven as a means of destroying airborne bacteria and disease, as airborne microorganisms are destroyed when subjected to certain dosages of C-band UV radiation. This technology can help to kill 60 percent to 95 percent of bacteria and viruses in the air.

The cleaner the coil, the more efficient the energy transfer between the district energy source and the building user is, resulting in lower energy use and hence, lower energy bills. The following tips should be kept in mind for effective coil cleaning:

The hotter the water, the more effective the cleaning. A minimum of 200 degrees F water should be used, except for cleaning refrigerant coils, which should remain below 150 F.

In general, the higher the pressure, the better - but stay below 1,000 psig or fins may be damaged. Caution: If the coil is more than eight rows deep and fins are densely packed, there is a danger of 'pushing' the dirt into the middle of the fin pack where it will remain and further compound the issue. It is important to clean coils from both sides. Pressure sprayers typically will only be effective for the first inch of the coil, so a coil may be visibly clean, but only packed and increasing the air-pressure drop.

Written by: Steve Tredinnick, P.E., Mechanical Systems, Affiliated Engineers Inc. for the Second Quarter 2005 issue of "Inside Insights", a column designed to address ongoing issues of interest to building owners, managers and operating engineers who use district energy services.

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