Cooled Fusion Works for Chemical Processor

Like other chemical manufacturers, Kuehne Chemical Co. Inc. knows that you have to control the chemical reactions involved in making products, particularly products that involve the reaction between harsh chemicals.

One of the prime enemies of controlling a chemical reaction is excessive heat generated by the reaction itself, which can make a process unstable and corrupt the outcome. This not only causes product quality problems, but can also introduce elevated hazardous conditions.

Kuehne Co. is a privately held chemical manufacturer with a core competency of manufacturing concentrated solutions of bleach (sodium hypochlorite). The bleach is shipped to customers who may dilute it to desired strengths for varied applications, such as water and wastewater treatment, paper processing and cleaning/disinfection products. Kuehne is also a re-packager and distributor of semi-bulk chlorine, caustic soda and caustic potash — chemicals that are used in the bleach production process.

Richard Wilkes, director of corporate engineering, explains that the manufacture of bleach, Kuehne's primary product, involves the manufacturing of a concentrated ultra-pure brine solution. Then, through electrolysis, a chlorine molecule is split away from the brine. The resulting gaseous chlorine is quickly reacted with sodium hydroxide, and the resulting "fused" product is bleach.

Cooled Fusion

"It appears to be a fairly simple process, but we have to control the heat of reaction in the bleach-making process," says Wilkes. "The process is cooled to the appropriate temperature range partly by heat exchangers that utilize cooling water

as the exchange medium. That water, in turn, circulates through a cooling tower where the heat of the chemical reaction is dissipated into the atmosphere. The cooled water then recirculates via pipelines from the tower back to the heat exchangers, which continuously draw off heat from the combined chemical reactions.”

Until recently, one of the most vulnerable components of Kuehne Co.’s heat reaction control process was the cooling towers, which required frequent maintenance, including cleaning and fan drive system adjustments. But the most expensive part of the maintenance requirement was that it required cooling tower downtime, a situation that required the bleach process to be down for extended hours.

“The cooling towers are a cost-effective alternative to keeping the heat of reactions down,” Wilkes explains. “However, we can’t operate the process without the cooling tower system being online. So, cooling tower uptime is definitely a key piece to processing our bleach products.”

Going a New Route

To ensure maximum uptime of operations and the reliable shipment of products to customers, many industrial and commercial companies are changing over from conventional metal-clad cooling towers to the more advanced engineered plastic designs with integrated direct-drive fan motors. That is the route Kuehne decided to take as well.

With an aging metal-clad cooling tower reaching the end of its service life, the company decided to replace that unit and also add to the plant’s cooling capacity.

“The bleach manufacturing process is a tough environment. Chlorine-based

products tend to heavily corrode metals," Wilkes says. "A couple of years ago, we began trying to find some alternative materials to the galvanized steel type of tower shell. We recognized that most modern cooling tower fills (the packing material underneath the shell) are constructed of honeycombed thermoplastic, so a plastic shell also appeared to be a good solution.

"In our research of newer designs, we found Delta Cooling Towers, which makes a seamless, high-density molded polyethylene (HDPE) shell. Because it is corrosion-proof, we felt that this type of unit would be great for our application."

Wilkes adds that the engineered plastic cooling tower was competitive in purchase price, but when Kuehne compared the long-term maintenance cost and care of a galvanized steel model, the numbers were even more convincing.

After reviewing various Delta models, Kuehne decided on a Delta TM Series 2 cell model, a lightweight and compact modular design that is available from 1 to 6 cell configurations (250 to 2,000 cooling tons). Looking at long-term performance, Wilkes says Kuehne designed a very durable and maintenance-free platform large enough for the 2 cell, but with the modular expansion capacity for upgrading up to a 6 cell model.

Goodbye, Maintenance Costs

Once installed — a fairly simple operation — the engineered plastic cooling towers easily met the firm's cooling expectations. The biggest surprise came from the comparatively maintenance-free operation of the system.

"One of the things that we've found is that the surface tension for particles in the plastic cooling tower basin is much less than that of steel basins," says Wilkes.

"Even after more than two years since the startup, there has been no wind-blown particulate buildup and no mud whatsoever in the tower basin. We do scheduled blow-downs on the tower, which is standard, but unlike the metal-clad basins, the blow-downs of the new plastic towers are completely washing any foreign materials right down the waste pipe. That means no cleaning of the tower basin."

One of Wilkes' favorite features of the new cooling tower design is the direct-drive fan system, which is also a maintenance cost and downtime saver.

"Instead of having a large shaft- or belt-driven fan drive, Kuehne liked the direct-drive unit with the new Delta system. As a result, Kuehne was able to realize a reduction in total horsepower requirements, as well as maintenance," says Wilkes. "Our old cooling tower had a 75-HP shaft-drive motor system. The new modular setup has four independent 10-HP direct-drive motors. So, that's a reduction of 35 HP, which saves on energy costs for the same cooling tonnage."

Wilkes adds that, with a direct-drive motor, you have virtually no maintenance costs. He points out that there are no belts or gear reducers, internal gearboxes or bearings to take care of, and it is unnecessary to tune up the balance of the fans, as is often required with shaft- or belt-driven motors.

"Basically, we're just lubricating the motor bearings once a year as part of our preventive maintenance program," he says. "And you can do that to the direct-drive motors while they are running. So, there is negligible maintenance downtime for the tower, and that's the big payoff."

Kuehne plans to expand its plant's cooling capacity with a Delta TM Series 2 cell model in the near future.

For more information, please email sales@deltacooling.com *[1] or visit* www.deltacooling.com *[2].*

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