Manufacturing Innovation Insider Newsletter

Four Reasons to Consider Engineered Plastic for Your Next Cooling Towers

Today's "engineered plastic" cooling towers offer significant advantages over traditional galvanized steel models. Plastic can reduce process interruptions while shaving construction, maintenance and replacement costs

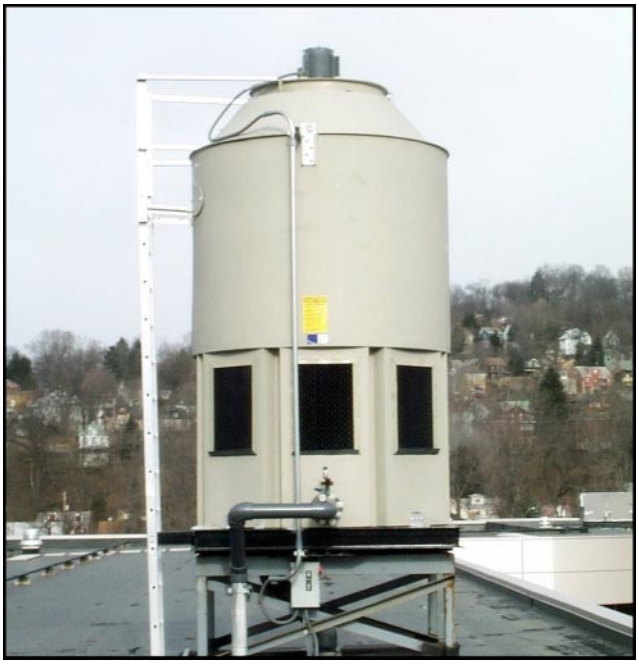
Factory-assembled cooling towers formed of engineered molded plastics continue to gain favor over galvanized sheet metal models that once dominated the industry. Just as plastics have overtaken metal for applications ranging from plumbing to aerospace, they are now the Big Idea in cooling towers for a broad range of industrial applications. Utilizing advanced resins and molding techniques, engineered plastic cooling towers are today available in larger sizes and modular configurations that make them ideal for even high-capacity applications (1,500 to 5,000 cooling tons) that traditionally depended on expensive field-constructed installations.

Here are four big reasons why you might want to consider an engineered plastic cooling tower to reduce costs and better meet your process requirements:

1. Life expectancy

Standard metal cooling towers have casings with thin sheets of galvanized steel. These sheets usually have welded seams that can deteriorate within a year and will require re-welding, patching or coating to prevent leakage.

Additionally, because the pH of cooling tower water constantly changes — requiring chemical conditioning to accurately balance the pH — the treated water tends to attack the galvanized metal, essentially wearing it out in sometimes remarkably short time. Environmental conditions such as sunlight, salt air, and harsh process chemicals also contribute to galvanized steel's early demise. Even ambient air pollution can affect galvanized steel, leading to premature failure.



Built-in pockets reinforce the tower bottom so that the tower can be easily mounted on standard I-beams or imperfect pads. A plastic cooling tower used at the Conair plastics processing plant in Pittsburg, Pennsylvania.

Some processes require that cooling towers are turned on and off with great frequency. Since metal expands and contracts depending on temperature, repeated cycling causes stress that can also accelerate corrosion, rust and leakage.

With so many inherent vulnerabilities, it is no wonder that metal-lined cooling towers generally carry only a one-year warranty.

On the other hand, engineered molded plastic cooling towers are one-piece, so there are no problems with seams, welds, and patches that wear pre-

maturely. Competitive in price, engineered plastic cooling towers are also rust- and corrosion-proof. Those manufactured by Delta Cooling Towers (Rockaway, NJ), for example, are rotary-cast with a single or double-wall UV-protective, polyethylene shell that is virtually impervious to weather conditions and harsh environmental elements. Water pH can vary wildly without affecting the resin material. Stress from frequent turning on and shutting off cooling towers poses no risk factor for engineered plastic.

The warranty on engineered plastic cooling towers is indicative of their durability. The casings on the towers offered by Delta cooling are backed by a 15-year warranty.

2. Flexible modular design

In the past, plastic cooling towers were too small for many industrial processes. For that reason, galvanized metal cooling towers were traditionally a "given" for most applications above 250 tons. Processors requiring high-capacity cooling were forced to build custom-designed towers on site, often at a high cost in labor and materials.

Today that situation has changed dramatically. Delta, for instance, has introduced its TM Series® of factory-assembled plastic towers that can be combined to provide up to 5,000 cooling tons in a single, modularized unit. Modular cooling towers also facilitate the use of an extra margin of cooling capacity that can be advantageous in adjusting to operational heat load or outflow changes, or in upgrading to meet future cooling requirements.

The modular design of plastic cooling towers has also introduced new flexibility in conserving valuable real estate, as well as creating a potential for substantial energy savings. By molding towers in a rectangular shape, some manufacturers enable users to cluster cooling towers in a group that occupies a much smaller footprint than ungrouped multiple towers. This configuration enables significantly greater cooling capacity and the opportunity to dedicate some towers to specific processes so that various towers may be turned on or off independently, in accordance with intermittent process operations.

Plastics' lighter weight makes it easier to place cooling towers on top of structures. A plastic cooling tower used for a forging application at Meadville Forging, Meadville, Pennsylvania.

3. Continuous, more economical operation

Engineered plastic can also reduce the expected and untoward consequences of operating a cooling tower, which include: electric power usage, water-treatment chemicals, labor and materials for maintenance, and unscheduled process downtime for cooling repairs.

Maintenance and repairs usually means process interruptions, the costliest of all problems related to cooling towers. Given their short lifespan, metal-lined models inevitably invite such breaches in operations, while corrosion-, rust- and leak-proof plastic cooling towers are more likely to provide continuous and reliable operation with few if any disruptions.

For instance, the "white rust" that forms on galvanized towers operating at pH higher than 8.0 can quickly lead to failure and replacement requirement.

On the other hand, the use of engineered plastic allows the use of better scale inhibitors that operate at higher pH.

Not requiring inordinate concern over pH levels or mineral deposits, engineered plastic cooling towers can operate at higher cycles of concentration — leading to operational savings. Higher cycles of concentration are achieved by lowering the amount of blowdown or bleed-off of recirculating water. For example, a cooling tower evaporating 50 GPM at 3 cycles of concentration would be bleeding off 25 GPM for a total make-up water requirement of 75 GPM. Increasing the cycles of concentration to 5 would reduce blowdown to 12.5 GPM and total make-up to 62.5 GPM, resulting in a yearly savings of $22,955 assuming cost of water at $1.50/1000 gallons and sewer fees at $2.00/1000 gallons. Reducing bleed-off by 50% would also allow a 50% reduction of chemicals for scale and corrosion control for process equipment downstream from the cooling tower. This chemical savings can easily exceed $10,000 per year.

Utility savings can also be realized. While the cost of electric power to drive cooling tower fans may seem incidental to process costs, they can add up. In the case of the engineered plastic towers manufactured by Delta, direct-drive motors are employed to power the cooling fans. With no pulleys, bearings and belts, such direct-drive motors prove more efficient, and hence, provide substantial savings in energy costs while also delivering more horsepower. Further conserving energy, when modular towers are incorporated into a cluster configuration, individual direct-drive tower motors can be shut off independent of others when supported processes are not operating.

Typically, polyethylene plastic water towers also save costs by reducing or eliminating the possibility of process material contamination. In particular, treatment chemicals can cause the leaching of zinc from galvanized metal, which in some cases could result in the zinc migrating into the process — a potential environmental discharge problem.

Further adding to savings: whereas metal towers require maintenance for the routine application of coatings, removal of rust, and re-gasketing, such labor intensive jobs are typically eliminated with engineered plastic water towers. The avoidance of maintenance further preserves process up-time.

4. Easier installation

The inherent design advantages of the latest plastic cooling towers also include easier installation — especially on rooftops — because a lightweight plastic shell weighs as much as 40% less than a steel tower, while being 5-10 times thicker. When modular cooling towers are combined in a cluster, installation is often faster and easier. For applications that require mounting flexibility, Delta pioneered an induced-draft, counter-flow design that incorporates I-beam "pockets" in the tower basin for reinforcement, so that a plastic tower can be easily mounted on standard I-beams or imperfect concrete pads.

Given these considerations, and faced with a choice between metal or plastic, many engineers and plant managers are opting for the latter in light of the new developments that increasingly tip the scales in favor of lightweight, high-capacity, reduced-maintenance engineered plastic cooling towers.

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