

Polyethylene Cooling Tower Tames Temperatures at Meadville Forging

The induction heating line for one of 14 mechanical forging presses at Meadville Forging Co., Meadville, PA, is cooled by a unique platform-mounted cooling tower. The shell of the tower is molded of high-density polyethylene (HDPE) into a one-piece, seamless leak-proof design. Optimum air distributed through the cooling tower is provided by a top-mounted motor/fan assembly and 360-degree louvered air inlet panels around its base.

Cooling is critical for efficient induction heating of forging billets at Meadville, a closed-die forging operation. The company is a major supplier of wheel hubs and transmission gears to the automotive industry and manufactures forgings for trucks, trailers, and mining equipment.

According to Billy Paris, maintenance manager, the tower was installed in December 2004. The selection of this system was made after visiting another installation by the manufacturer, Delta Cooling Towers Inc.. "We visited another company that had several in operation for many years. We couldn't believe that one of them was 10 years old, because it looked like it had been installed maybe a year earlier. There were no leaks and no signs of any repair work were evident."

Paris explains the operating principle: "Air is drawn into the air chamber at an angle such that when the tower shuts down, any water vapor drips down into the tower sump. It is impossible for water to drip out of this cooling tower because it would have to run uphill to do so. It's a really unique design."

The cooling water is pumped to the cooling tower and into a self-propelled PVC distribution system incorporating a rotating sprinkler head and lateral distribution arms with integral drift eliminators. An inspection port is provided in the cooling tower shell at the lateral arm elevation for adjustment.

Paris states, "The nozzles spray water at an angle, which causes the manifold to rotate. With this design, no mechanical drive is needed to distribute the water, and it does a very good job of dispersing the water around the fill material evenly."

The cooling water flows in droplets on wet decking of lightweight PVC in a spiral configuration, bonded and packed for maximum film cooling efficiency. Finally, the droplets fall into the tower's sump. From there, the water feeds into the system's pump, which takes it back to the top of the tower again.

The cooling water flows through the tower in an



Cooling water flows through an open loop while process water flows through a closed loop to the cooling coils in the induction heater, and back again.

open loop, while the process water inside the heat exchanger flows through a closed loop to the cooling coils in the induction heater and back again.

Process water is pumped through the coil line in the furnace, where it cools all the copper tubing and electronics in the power supply, and into the heat exchanger in the opposite direction from the path of the cooling water.

Makeup water for the cooling tower is injected as needed into the suction side of the pump, mounted inside the building below. This eliminates the need for installing and maintaining a heat-traced make-up line back up to the tower. This water addition is metered, and water treatment chemicals are added automatically as required.

The system has a cooling capacity of 250 tons. It is designed to cool process water at a rate of 750 gpm from an incoming temperature of 100° F to an exit temperature of 90° F, at a 76° F wet bulb.

Paris reports, "I'm very happy with it so far."

According to Delta, cooling towers of corrosion-proof polyethylene plastic will not rust, chip, flake, or peel. The shell is lightweight plastic and weighs as much as 40% less than a steel tower. Additionally, the induced-draft, counter-flow design allows improved cooling efficiency for the size, allowing a smaller mounting footprint.

Using the direct-drive fan system in Delta's design minimizes maintenance because of fewer moving parts: no gear reducers, couplings, additional shafts, belts, or extra bearings.

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