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Is Your Water System Setup Helping or Harming Your Molding Plant Productivity?

The plant water system is a critical component of an injection molding facility. A poorly designed or maintained water-cooling system can have a serious impact on production efficiency and cause many maintenance issues.

Every injection molding facility should have a good understanding of the capabilities and condition of their plant cooling system. Here are some of the questions that need to be asked:

- **Is the water that goes though the mold part of an open loop? (direct cooling tower system)**

This type of plant cooling is difficult in ensuring water quality, as well as maintaining constant temperatures below 75° F.

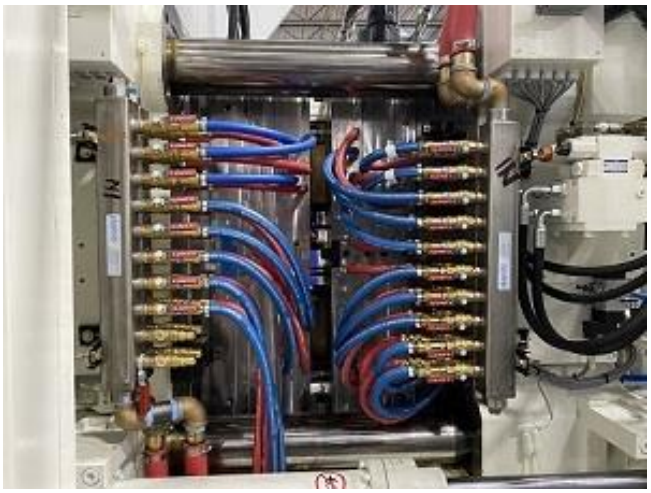
- **Is it a closed loop system with a heat exchanger between the plant piping and the cooling tower?**

This is the preferred method of utilizing a tower for cooling water because plant water is isolated from contamination by the tower but maintaining temperatures below 75° F is still a challenge.

- **Is the primary plant cooling loop a closed loop chiller system?**

This is the optimal solution for plant water systems. A tower is still utilized to cool the chiller and temperatures can be controlled to as low as 50° F or lower.

- **Is the cooling capacity of the central system big enough to meet the heat load generated by molds and machines? (has this calculation been done for current plant configuration)**



- **What is the pumping capacity and line size feeding the machines? Is this big enough to feed the required water flow (in GPM) evenly throughout the plant?**
- **Is there enough pumping and cooling capacity for expansion?**
- **Is the water treated correctly to prevent fouling and corrosion in molds and machines?**
- **Are there recommendations on the types of metals that should or should not be used with the water treatment chemicals being used?**
- **Are you addressing "scale" caused by undissolved minerals in the water that plate-out onto molds and machines, drastically reducing heat transfer?**
- **Are you filtering to a high level at the central system with full-flow filters, and at**

- **the machine level with cartridge filters, to prevent clogging of mold cooling passages?**
- **Is your system configured with that latest controls, variable speed drives and free cooling capabilities (where applicable) to lower your energy consumption and carbon footprint?**

For injection molders, maintaining optimal temperature of your molds and equipment is key to the productivity and quality of injection molded parts. The equipment, piping, hoses, fittings, and distribution manifolds are all critical components in guaranteeing that molds and machines are kept at specific temperatures to consistently produce high quality parts. The plant cooling system is like the blood in the human body – if it is in bad condition with poor water quality and poor circulation, the health (productivity) of your manufacturing plant will deteriorate. You will continue to have issues that will cause downtime, loss of production and quality issues.

The first step in this process is to understand the importance of your cooling system and all of its components and to ensure there is engineering and management support in this often overlooked area.

Protecting the Investment of New Molding Machines & Molds

Today, many companies can spend $500,000 or more on a new machine, mold and auxiliaries. One of the most common mistakes is not having a plan for implementing the supporting utilities needed to make the system run efficiently. One integral element that is often neglected are the water distribution manifolds and the quantity needed to efficiently send water to the mold. Many machine setups need 12-16 cooling circuits, or more, per each half of the mold.

Water manifolds are required to distribute water to all circuits of the mold. The goal of these installations is to minimize the pressure drop and Δ T of the water across the mold so that all parts of the mold maintain the correct temperature without any variations. Without planning and thoughtful installation, this last critical piece in your cooling system installation can have a significantly negative effect on productivity and quality. Involving a supplier who can deliver complete assembled manifold solutions can immensely improve and enhance this process.

With two decades of providing cooling manifold solutions for injection molders and extruders, we have seen a lot of problems that could've been easily avoided with the right oversite, planning and productivity tools. When new machinery arrives, planning the process for when it moves onto the floor for installation is important. The mold cooling system is intricate and complex, consisting of numerous temperature controllers, chillers and water manifolds.

Who will be assembling this equipment and what fittings, manifolds, hose, and couplers should be prepared in advance – preferably before the machine is delivered. Often, this last 5% of the machine installation is left to personnel who may not understand the importance of this critical system and how it affects mold performance. Advance planning for valve locations, quick-connect fittings for all equipment, water manifold design, and consideration of the mold purging process for tool changes can result in significant time reductions when changing from one mold to the next.

How Much Water Do You Need?

It's important to understand that GPM (gallons per minute) is the major factor in adequate mold cooling. The GPM through a given line size determines whether the water is moving through the line in laminar or turbulent flow conditions. All mold cooling lines must have adequate flow to produce a turbulent flow condition. Otherwise, the heat transfer of that circuit is severely reduced. Turbulent flow is determined by the Reynolds number. A Reynolds number of 4000 indicates turbulent flow and many mold designers are calculating optimal cooling with a Reynolds number of 6,000 – 8,000. There are a variety of charts and on-line calculators that can help determine the GPM required for given line sizes.

The amount of GPMs required to achieve turbulent flow is also affected by the temperature, and the percentage of glycol that is in the water, so there is a lot that goes into making these calculations. The ultimate goal is to understand that the pumping capacity and line size to the manifolds and molds, need to be optimized so the molding cell can achieve the performance that is expected. About 60-80% of a molding cycle is cooling time, so when cooling water called for in the mold design is not available, productivity will be impacted.

We examined a system where a line size feeding the manifold was so restricted that the molder was only getting 2.5 GPM across an entire mold half. Implementing proper line sizing and upgraded manifolds achieved 2.5 GPM per line across 8-10 circuits with the pumping capacity available in existing equipment. The increased flow provides significant cycle time reductions and quality improvements. This area of plastic processing is still getting overlooked by companies based on our experience.

Avoiding These Problems

Many of these issues are common in facilities of all sizes but can be avoided by evaluating and understanding existing systems and reaching out to industry experts when your systems need upgrading.

An inexpensive, but highly effective solution is flowmeters, which are available in a variety of sizes and provide information as to where issues exist and what areas need the most attention. Advances in manifold designs can help operators eliminate errors, and when these manifolds are paired with flowmeters, they provide real-time flow information to ensure production is running efficiently.

Talk to our experts today to find out how our advanced manifold solutions can resolve a wide range of cooling-related issues.

Contact us to learn more about injection mold cooling