Technical Bulletin

Water Treatment *for* Injection Molding

Injection Molding Plants run on more than just electricity, they run on water…and lots of it! This water must be clean, and it must contain water treatment chemicals. Every process application that uses water for heat transfer should be properly treated.

Industrial Water Treatment will both increase the operating efficiency and life expectancy of plant equipment. It does this by protecting metal system components from corrosion and keeping the heat-transfer surfaces clean. And when heat transfer surfaces are kept clean, labor costs to maintain tools and molds are reduced. Depending upon the type of system, proper water treatment will also provide substantial water and energy savings.

The following conditions are some of the indicators of water problems in an injection molding plant:

- Plugging of High-Heat, Low-Flow Areas
- Plugging/Corrosion of Process Components
- Gelatinous Deposits/Iron Oxide Tubercles
- Worker Health Complaints

Evaporative Cooling Systems, which usually have a cooling tower or an evaporative condenser, are considered open-loops and are characterized by evaporating water and have the potential for scale, corrosion, fouling and microbiological growth. Proper water treatment is critical for these complex systems and the opportunity exists for significant water and energy savings.

If this open-loop water flows through the injection molding process, then water treatment must include regular testing and monitoring for signs of scale, corrosion and microbiological growth by a water treatment professional. Since airborne dirt and debris will enter the system through the cooling tower, filtration must be installed and maintained to prevent these contaminants from reaching the process.

Consideration for open-loop process cooling systems should include closing the loop through the use of a plate and frame heat exchanger. This type of system would include two reservoirs, one for the open-loop and one for the closed loop. The closed-loop water would flow back and forth from the injection molding process without coming into direct contact with the cooling tower. The open-loop would flow back and forth to the cooling tower without coming into direct contact with the closed-loop water. The two loops are connected through the use of a plate-and-frame heat exchanger, in which heat alone is transferred from the process water to the tower water.

Return on investment for a heat exchanger is achieved through lower water and water treatment costs due cycled water and reduced equipment maintenance and downtime after closed loop is stabilized.

Closed Loop Systems or **Semi-Open Closed Loop Systems** by comparison to evaporative open-loops, do not evaporate water and do not exhibit mineral scale and deposition due to high dissolved solids. However, the potential exists for severe corrosion and accumulation of bacterial slime in these systems if left untreated. Corrosion by-products and biomass can accumulate on heat

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transfer surfaces, reducing efficiency and even restricting water flow through critical passageways. The consequences of poor or non-existent water treatment in closed loops are severe corrosion and subsequent pitting of expensive tools and molds and labor costs for repair.

Water-Related Problems in open, closed and semi-open loops can include the system metallurgy. Different metals in direct contact or in close proximity to each other, like brass and steel for example, can cause galvanic corrosion. This can be prevented by insulating the two metals with the use of dielectric couplings.

A visual inspection of the passageways inside of tools, molds and piping can provide the best indication of the condition of the process system. Mineral scale is indicated by a white or tan coating while red or brown deposits or tuberculation results from corrosion of iron and subsequent iron oxide formation. This deposition may have the consistency of mud, or it may be solid and consist of iron oxide tubercles indicating long-term accumulation. Deposition can be removed with the properly selected cleaner and cleaning method. Products are available to clean on-line during regular operation, or off-line as part of scheduled maintenance or a plant shut-down. Only when the internal surfaces are clean can the inhibitors protect.

Discolored water can often be sign of corrosion, and dirty water is bad under any circumstance. Rusty red or brown water usually means active corrosion is taking place due to oxygen in the water. While water treatment cannot repair corrosion, it can passivate the surfaces and prevent future problems. With proper filtration down to 1 µm combined with a corrosion inhibitor such as molybdate and a dispersant, corrosion can be slowed dramatically, and the water cleaned up. With proper water testing and the use of corrosion coupons installed into a system by-pass manifold, the performance of the water treatment program can be closely monitored.

A foul-smelling odor in any type of loop is an indication of microbiological contamination in the water. In addition to gelatinous deposition and biofilm, bacterial growth can lead to damaging Microbiologically Induced Corrosion (MIC). This is largely due to acidic metabolic by-products secreted by characteristic bacteria. Use of an organic dispersant can remove biofilm and return efficiency to heat exchange surfaces. And with regular use of a biocide and performance testing such as ATP or Bacterial Dipslides, bacteria levels can be held under control.

Industrial Water Treatment must be employed to the water-using process systems in the **Injection Molding Industry**. Most importantly, the water treatment program must be specifically designed for each individual system. Dirty, rusty and smelly water can wreak havoc on even the most efficiently run facility. Proper water treatment will pay for itself with water and energy saving and reduced maintenance costs, equipment failure, repairs and downtime. Make sure you have a **Sustainable Water Treatment Program** in place at your facility.