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Photo: Hammann

Complex is able to generate high flow velocities and strong shear and drag forces inside the pipelines based solely on water and specifically dosed compressed air pulses.

Reliable cooling guaranteed

How the cleaning of cooling circuits without chemical additives can improve and continuously maintain process stability during injection molding

Gerhard Maier

Nan industrial production, the influence of process water on productivity and process quality is often underestimated. With occurring problems in the process, many adjustments are quickly made. However, the fact that the quality of the cooling water plays a key role in the overall process and can be responsible for problems is often neglected by manufacturing companies. By their very nature, companies do not focus on the handling of such operating resources. This is also the case in the field of injection molding technology. Cooling water plays a not insignificant role here, as an inconstant volume flow has a considerable impact on the process time and possibly also the process quality. Biological growth, deposits and corrosion products in the cooling water are therefore challenges that manufacturers of injection molded parts have to face. In most cases, the use of chemicals is the method of choice. However, the use of corrosion inhibitors or biocides against microbial growth increases the conductivity of the water and, at the same time, biocides have a lowering effect on the pH value.

Solution found

One solution was found by a manufacturer of injection molded components whose 1.5 m³ cooling circuit was repeatedly experiencing severe corrosion problems. The annual refill volume required is 7.5 m³ of water, with a temperature of 20 °C in the flow and 30 °C in the return. These are ideal conditions for bacterial growth. In addition, water from the drinking water network was used, which is only suitable for use as cooling water to a limited extent due to its composition. Finally, the aim was to avoid corrosion processes in the cooling water.

An Enwa Matic bypass filter was used, which was integrated into the hot return of the system. The patented Enwa Matic technology ensures chemical-free, self-regulating corrosion protection for semi-open and closed heating and cooling circuits,

which also provides a bacterial barrier and thus prevents their formation by keeping the pH value of the process water constant between 9 and 10.5. Since the installation of the bypass filter, the water has been freed of magnetite and suspended solids down to 5 µm. Dissolved deposits are filtered out in the process. The filter bed is automatically flushed back with drinking water at set intervals and the filtered particles are removed from the system directly via the domestic drain. The constant pH value of between 9 and 10.5 creates a stable oxide layer that protects against corrosion and ensures clear water. According to the manufacturer, the technology is based on the use of environmentally friendly minerals, which means that no organic substances are released into the process water, thus depriving bacteria of a food source. The Norwegian manufacturer Enwa Water Technology AS has developed filter media that self-regulate to ensure a constantly high pH value. For the operators of the system, this means high operational reliability and minimal maintenance, which is usually commissioned to the manufacturer on an annual basis.

Problems not solved straight away

However, as the process is not aggressive towards surfaces and materials, the problems with the impaired coolant volume flow could not be eliminated in the first step, as the technology was not designed to remove existing deposits in the piping system. Due to a long history of corrosion, the old pipe system had very heavy incrustations that kept coming loose and causing problems. Another technology had to be used to remove the deposits in the long term.

The customer therefore opted for additional cleaning of the entire cooling circuit. The first choice for this was the patented Complex impulse flushing process from Hammann GmbH, which promises the best results without the use of aggressive chemicals. Complex is able to,

high flow velocities and strong shear and drag forces based solely on water and specifically dosed compressed air pulses. This makes it possible to mobilize and reliably remove even stubborn deposits, biofilms and impurities. The entire cooling circuit in the company was cleaned in this way. Sven Kopp, Senior Key Account Manager Industry at Hammann, explains: "The use of Enwa Matic technology quickly revealed crystal-clear water quality in the circuits. However, as the old corrosion residues dissolved uncontrollably in various places, some of the particles did not get into the bypass filter but first into the pre-filters of the machines, which became clogged as a result. This naturally led to repeated breakdowns." This is why intensive pre-cleaning of the entire piping system with the Complex process was recommended.

"Another problem arises with the injection molding tools. If the tools are not properly cleaned after use, stored and then put back on the machine without being cleaned again, new dirt is constantly being drawn into the circuits. The narrow cooling channels of the tool then also tend to clog up quickly," explains Sven Kopp. It therefore makes more sense to approach the cleaning process in reverse order: first remove the dirt with Complex, then use the Enwa Matic technology to maintain the crystal-clear water quality.

In order to be well positioned here too, the company decided to purchase a mobile cleaning system (mobile Complex Unit MCU-20) from Hammann for regular tool cleaning. This is now used to clean all tools before storage in order to prevent dirt and corrosion products from being carried in - with success, as the flow measurement before and after cleaning shows.

The MCU-20 allows the molds to be cleaned directly on the injection molding machine used - using only air and water. After the Complex cleaning process, the molds are dried

blown so that as little residual moisture as possible remains. The tools are stored and placed back on the machine months later. Incorrect storage, moisture or temperature fluctuations can cause condensation, which in turn can lead to problems. The MCU-20 is therefore used again briefly before the tool can be returned to the process clean.

Increasing effectiveness

In the standard configuration, this Complex unit is designed for pipe diameters up to around 20 mm. Individually stored cleaning programs with flow direction changes to increase effectiveness ensure that pipes and ducts are cleaned effectively at all points. But what is the difference between the Complex process and pure water flushing or other processes with an air/water mixture? Hans-Gerd Hammann, Managing Director of the company, explains: "Years of research and development have gone into our system. With pure water flushing, for example, the highest flow velocity is achieved in the middle of the pipe. However, the deposits are located on the pipe walls. The aim here is to achieve high shear forces." The Complex process achieves this by feeding less water into the pipes and adding compressed air in targeted pulses. This creates a wave that pushes a kind of plug in front of it.

The company also offers this service over the weekend to ensure that production processes are not disrupted in the long term. Also of interest are the mobile systems that the subsidiary Hammann Engineering GmbH designs, manufactures and sells "By selling these cleaning units, we are responding to customer requirements that are brought to us. The injection molds to be cleaned are a good example. With the MCU-20, the customer had us design a system that achieves good cleaning performance with predefined cleaning programs."