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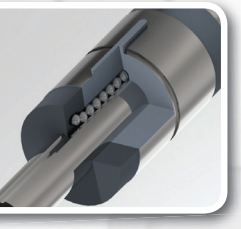

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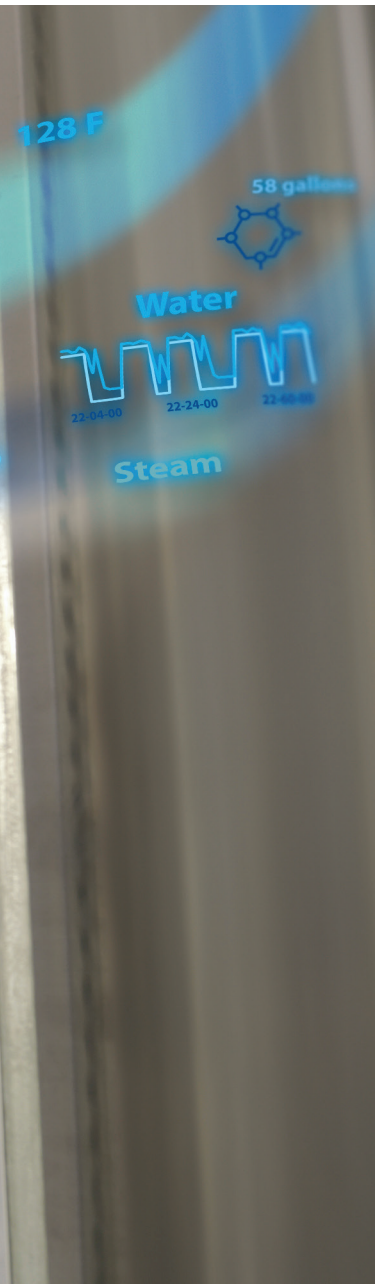
How to digitally transform your CIP operation

Edited by **Mike Santora** • Managing Editor

In CIP systems in food and beverage processing, a batch tank is connected to a water supply line and cleaning supply tanks. Each tank pumps a process fluid into the batch tank according to the cleaning protocol.

| courtesy of Emerson



In food and beverage manufacturing, clean-in-place (CIP) systems are a fundamental part of daily production that allow manufacturers to clean internal piping, tanks, and machines from one batch to the next to meet government regulations and ensure product quality and safety. For these manufacturers and others who use CIP systems, this cleaning process can represent up to 30% of a facility's total utility costs.

These factors make the CIP operation a perfect candidate to be digitally transformed. By combining sensor-equipped devices like pressure regulators and valves and overlaying CIP software to capture and analyze critical process data, Emerson has designed a new CIP solution that combines sensors, hardware, and analytics that will soon offer manufacturers a fresh set of options for optimizing utilities and enable automating reporting.

To understand the impact that this new digital solution can have on CIP processes in food and beverage manufacturing, consider a manual or sub-optimized CIP system in a brewery or dairy. A batch tank is connected to a water supply line and a series of cleaning supply tanks that contain media such as disinfectant, acid, and caustic and reused water. Each media tank pumps a process fluid into the batch tank in a sequence according to the cleaning protocol until the timed cycle is complete and the tank is considered clean.

Despite the simplicity of this configuration, many inefficiencies can exist. First, the operator overseeing the CIP system often does not know how much media is consumed during each timed cleaning cycle. The operator monitors and fills the supply tanks and makes manual adjustments to flows, but the specific volume of media per wash cycle is often unknown, creating an opportunity for untracked waste.

Second, the cleaning cycle may run for a preset amount of time deemed sufficient for cleaning, but if no sensors or metrics are in place, then waste is likely occurring during the cycle.

Yet another common inefficiency and hidden cost within a CIP system is when an operator is manually logging process data like cycle times, pressures, and temperatures and completing routine system reporting on paper. This pencil-and-paper approach not only requires time for the operator to capture the data for reporting, but it also adds opportunities for human error during the recording process.

To achieve digital transformation of the CIP process, Emerson identified the valves, sensors, and instruments required to gather critical process data and combined them with newly developed

Manufacturers can access real-time process information via analytics software, equipping them with the tools to optimize efficiency and productivity.

courtesy of Emerson

software that collects and analyzes the data and presents it in report form. The system diagram shows how data collected on air, water, steam, chemicals, and energy is delivered to both the PLC that runs the machine or process and to an edge device where data is collected for local analysis and potentially forwarded to an enterprise-level system or the cloud.

With access to real-time process information via analytics software and available through automatic report generation, manufacturers can automate and optimize wash cycle settings, including cycle duration and media use, for optimal efficiency and maximum productivity. They also have the option to take the data and analytics further into enterprise-wide systems.

As part of its initial testing, Emerson developed an analytics package for beverage manufacturing with Lakeside Process Controls, a long-time Emerson channel partner who was tapped to bring customer knowledge and insight into the development process. The test skid used sample data to demonstrate how water, acid, detergent, and reclaim can be optimized during a CIP cycle, and it produced a 30% to 45% reduction in water consumption and a 20% reduction in operator time spent at the CIP station. This reduction in operator time alone represents a savings of $20K to $40K annually, and it can help to alleviate the all-too-common stress of a stretched workforce.

Digitalization of CIP systems also eliminates pencil-and-paper record keeping and replaces it with software capable of instantly converting process data into organized reports. Reports can be generated for satisfying government regulation and compliance requirements, planning system maintenance, scheduling downtime, and ordering media supplies.

Another unique feature of the CIP software is its ability to generate a "golden batch" score that represents the ideal benchmarks of a cycle running at optimal efficiency. Automated reports can then be set up to compare each wash cycle's utilities

In CIP systems, sensors like Emerson's AVENTICS Series AF2 Flow Sensor monitor air consumption to provide real-time data.

courtesy of Emerson

consumption to the “golden batch” to track process improvements.

In addition to optimizing process efficiency, other productivity improvements were also demonstrated with the Lakeside skid. For instance, shorter cycle times resulted in up to 50% faster changeovers. Instead of using a timed cycle, sensors and software can tell the operator when the cleaning cycle is complete. This delivers a huge benefit for manufacturers in terms of conserving media usage and reducing overall energy consumption. Shorter cycle times also get batch tanks back online faster, increasing uptime and improving productivity.

While many suppliers offer CIP hardware and sensors, few have taken the steps to apply the available data to the deep analytics that can fully unlock the advantages of digitalization. And even fewer have done so in a way that allows manufacturers to pick and choose how they access the process data and whose components they use to make that data available. This is where Emerson has taken a different approach by giving manufacturers the power to decide where and how they enter the digitalization process and by providing the software to capture significant benefits without requiring that the software be supported by Emerson brand components.

For instance, the Emerson CIP system built by Lakeside represents a complete end-to-end solution, but the software itself is agnostic and is designed to work with Emerson equipment and with competitor equipment to deliver the greatest amount of flexibility. This allows manufacturers at any stage of digital transformation to integrate any or all components, including the software, and to customize it for their needs. DW

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Emerson’s ASCO Series 290C is a fast-closing motorized piston valve that can be used in applications including sterilizers, wine production, and food processing.

courtesy of Emerson

By harnessing data gathered by Emerson’s RXi2-BP, manufacturers have the tools needed to meet broader sustainability goals.

courtesy of Emerson

Emerson’s ASCO Series 290D Pressure Operated Piston Valve is built for demanding applications like those found in food and beverage processing.

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