Conducting a CLEAN PROCESS

Optimise CIP cleaning and reduce maintenance costs in the beverage industry

In the drinks industry, plants are almost exclusively cleaned using a Clean-in-Place (CIP) process. The measurement of conductivity is particularly important during CIP cleaning, as conductivity can be used to monitor and control many of the automatic processes. Modular multichannel measuring devices ensure a high level of process reliability and also offer the user the additional benefit of reducing maintenance costs.

CIP cleaning has been the standard cleaning method used in the drinks industry for some years now. The principle behind the process is the optimised interaction between mechanics, time, and chemistry. Using a spray nozzle that is integrated into the plant, the cleaning agent and rinsing solutions are applied to the surfaces of the plant components. The movement of the spray nozzle ensures that all surfaces are completely covered in the cleaning solutions. The same effect is achieved inside the pipelines thanks to the flow rate of the cleaning fluid. Depending on the setting, laminar and turbulent flows can be generated. Turbulent flows enable the cleaning fluids to loosen product residues from the inner walls of the pipelines. The conductivity of the cleaning fluids is measured in order to control and monitor the CIP cleaning process.

Concentration measurement

The purpose of the first measuring point for conductivity during CIP cleaning is to safely set the concentration of acids and alkalis. These are often kept in high concentrations (approx. 55%) in storage tanks and diluted with water before application to achieve the concentration required for the cleaning solution (around 1.5-2%). The concentration is monitored by measuring the conductivity. Concentration curves of the acids and alkalis that are used can be stored in a product such as, for example, the Jumo Aquis touch P multichannel measuring device. The integrated analysis inputs convert the measured conductivity directly into concentration values using the stored tables. Once the setpoint concentration has been achieved, the device can carry out tasks such as opening or closing a valve.

Phase separation

The second measuring point is in the plant itself or on the outlet of the plant. The change in the cleaning medium is measured by the conductivity of the cleaning solutions. After cleaning using an alkali, the entire system is rinsed with water, for example. Using the conductivity measurement, the user can determine the exact time at which the alkali was completely rinsed out of the plant. In this way, the rinsing process can be limited to just the required time and the water consumption can also be reduced.

CIP return

The third measuring point of conductivity is in the return of the CIP system. Depending on whether the CIP process has been carried out as total loss or recovery cleaning, the priority of the measurement may change. In total loss cleaning, all cleaning and rinsing solutions are discharged after the cleaning process. With this option, the conductivity in the return is not as important.

In contrast, the conductivity of the return is measured in recovery cleaning so that conclusions can be made regarding the extent of soiling or the residual concentration of the acids and alkalis. Using the integrated binary inputs
and outputs, a multichannel device, taking into account the preset limit value, can switch the corresponding valves so that the solution either returns to the storage tank or is fed into the sewage system.

Resources can also be saved in this process. For example, the water from the most recent cleaning step can be used in the pre-rinse phase of the next clean, or heavily diluted alkaline and acid solutions can be concentrated again.

Low-maintenance solution

The demand for more efficient and low-maintenance cleaning and compliance with hygienic and environmental standards is steadily increasing. As a result, a high level of process reliability and monitoring is absolutely essential. By using a multichannel device, all tasks in the CIP process are combined into just one device. As explained, the most important measurement in the CIP cleaning process is the conductivity, in combination with the temperature. The conductivity is generally measured inductively during CIP cleaning. This can be done with the Jumo tecLine Ci, an inductive conductivity sensor for hygienic applications with integrated temperature probe for temperature compensation.

The main benefit of the Jumo Aquis touch P multichannel device is the fact that all the important measurement parameters can be determined with a single device. The device has two analysis inputs that can be supplied with conductivity in the flow and return during CIP cleaning. Additional analogue inputs can also be used to determine values such as the filling levels of the storage tanks, the turbidity of the return, and the flow rate. The multichannel measuring device has a number of binary inputs and outputs that can carry out various functions using a frequency measurement, such as checking the flow rate, monitoring the limit values, assuming PID controls, and switching alarms. As such, the device can also be used to control the valves for the individual cleaning stages on the basis of the measurement parameters.

The tried-and-tested integrated calibration and wash timers ensure smooth system operation and reduce the maintenance requirements. Two wash timers can be used to clean electrodes at regular intervals. Specific functions can be recurrently triggered in preset intervals. For example, wash timers can actuate binary outputs to switch on a cleaning process in the plant. The highest possible level of measuring certainty is ensured when the sensors are regularly cleaned. The calibration timer regularly reminds the operator to recalibrate the sensors. Corresponding alarms and results list entries can be configured individually. A calibration logbook is available for the analogue inputs IN 6 to IN 12, where all the successfully completed calibration processes can be found along with the date, time, and other details. In this way, the system operator always has an overview of the calibration history of the analysis sensors.

With the additional recording function, all measured data can be recorded and saved. The main advantage of this function is that the device is able to fulfill official obligations to keep records. With the two software packages Jumo PCC and Jumo PCA, the recorded data can be transferred to the database, for example using an Ethernet cable, and stored there.

All measurements that are carried out by the Jumo Aquis touch P multichannel device can be monitored on-site on the 3.5" touchscreen. In addition, the device can be connected to a central parent system through various interfaces, such as Profibus-DP, RS422/485, or Ethernet.

In practice, the data is generally all forwarded to a central PLC. This is often not designed for the large volume of data and gradually reaches its capacity over time. Using a multichannel device offers distinct benefits here, because the PLC is not put under so much load and is therefore more efficient.

Summary

With the conductivity measurement in CIP cleaning, a low-maintenance Jumo tecLine Ci conductivity measuring cell can be put to use to reduce maintenance costs and save resources by conducting measurements at different points in the process. The use of a Jumo Aquis touch P multichannel device offers an optimised, all-inclusive solution for controlling the entire CIP process.

For more information:
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