Application Data Sheet
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Life Sciences

Tighter pH Control in Biopharmaceutical Applications

RESULTS

- Minimize off line calibration requirements
- Reduce pH Drift
- Reduce off-spec product
- Maximize on-line pH control uptime

APPLICATION

pH Control in Fermentation and Cell Culture

CHALLENGE

In fermentation and cell culture, one of the most critical process challenges is to maintain the optimal pH level. Fermentation process utilizes a living organism such as a yeast, bacteria, or fungus strain to produce an active ingredient. Fermentation process is normally shorter in duration (2-7 days). Cell culture is a process in which a mammalian cell is grown to produce the active ingredient. The cell culture process is typically longer (2-8 weeks).

One big challenge for the pH measurement is the cleaning process. The fermentor or bioreactor has to be sterilized prior to the start of either process to ensure no cross batch contamination or any unwanted growths are present. In addition, pH sensors undergo a 2 point calibration using buffer solutions. The residual buffer chemicals must be removed prior to start of the batch. The Clean In Place system (CIP) consists of Steam in Place (SIP) and sometimes additional chemical cleaning steps. Exposure to high temperature steam and rapid thermal shock significantly affect the sensor's life.

Different batches will have different optimal set points, and the pH levels may change when the batch moves to different phases. Tighter pH controls are required to ensure reaction is proceeding according to plan. A number of factors may attribute to pH values drifting. One major factor causing pH drift is the reference electrode becoming unstable due to fouling or coated junctions. When pH values start to drift, there is less confidence in the on-line measurement. In many industries maintenance personnel will perform 2-point buffer calibration. However, this cannot be performed with sensors mounted in a vessel that has already been sanitized since the batch cannot be exposed to those buffer standards. Therefore the net result is to perform more frequent off-line pH tests and then standardize the on-line measurement to the off-line values. This is more pronounced in longer batches where the well-trained personnel must be on site to properly perform the tasks.

ROSEMOUNT® Analytical

EMERSON™ Process Management

pH SOLUTION

The PUR-SENSE™ family of pH sensors is designed to meet the demanding requirements for fermentation and cell culture applications. The Accuglass® pH glass used in the Model 3800 is proven to withstand repeated exposure to high temperatures as well as thermal cycling. Since the Model 3800 is designed to withstand over 50 steam sterilization cycles, the sensor will make an accurate measurement after SIP cleaning.

The reference electrode uses a novel silver-silver chloride sensor in combination with a new gelled potassium chloride electrolyte to provide a stable reference potential through a proprietary ceramic reference junction. This reference design delivers superior performance. In comparison tests, competitive sensors experienced 2-5 times more drift than the 3800 sensor (see figure 1). The improved pH performance allows operators to increase the period between off-line pH verification checks as well as the frequency the on-line measurement has to be standardized to the off-line measurement.

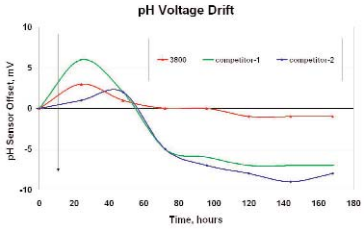

Figure 1.

INSTRUMENTATION

PUR-SENSE Model 3800 pH Sensor

- Improved stability with proprietary Reference Technology minimizes pH drift
- Proven Accuglass ® pH glass withstands multiple SIP and autoclave cycles
- Documented Lot traceability on wetted components

Model XMT-P Analyzer

- Foundation Fieldbus or EDDL HART Communication protocols
- Bi-directional communications captures events and configurations
- Easy to use menu structure

Emerson Process Management

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