

USE WHERE CAUSTIC MEETS CO₂

Control of fermentation tank cleaning with In-line O₂ measurement

Pentair Haffmans, in collaboration with a major U.S. brewery, developed a new application for the OGM In-line O₂ Gehaltemeter. At the brewery, optical oxygen (O₂) measurement is used to monitor whether the compressed air has sufficiently expelled carbon dioxide (CO₂) from the fermentation tanks so that they can be cleaned with ambient caustic. This has allowed the company to significantly reduce caustic waste, compressed air consumption, and process time. In addition, the chance for tanks to implode due to vacuum formation is eliminated.

The brewery has an annual capacity of 10 million barrels. The brewery's fermentation tank farms are cleaned with ambient caustic in a CIP system after the fermented beer is drained. Caustic is necessary to remove organic material from the tanks.

Before a fermentation tank can be cleaned with caustic, the CO₂ must be expelled as it reacts with caustic to form sodium carbonate. This reaction lowers the caustic's cleaning effect and the solution must then be replenished, which incurs costs. In addition, the reaction creates a vacuum in the tank, which is a danger for both fermentation and storage tanks as these are designed for a minimum vacuum load.

Savings with maximum safety

Before the installation of the OGM the brewery expelled the CO₂ from the tank at specified time intervals with compressed air flushing, which required a safety buffer and took about three hours.

With the OGM, the rise in O₂ and resulting compressed air concentration is measured in the exhaust air flow. When the O₂ content is between 20 and 23 per cent, or a predefined O₂ limit value

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is reached in the exhaust air flow, the CO₂ content is low enough for cost-effective cleaning with maximum safety. This point is now reached after about a one-hour flushing time.

Then, switching to cleaning can be done either manually or automatically by integrating the OGM in a process control system, which is very simple to do. At the brewery, the device is fitted with a CIP-compatible instrument housing connector. Another option is to integrate the OGM via a 25 mm connection.

With the OGM measurement system, the brewery has significantly reduced the time required and the consumption of caustic and

compressed air. During the past year caustic use has been reduced by 20 per cent with maximum possible safety.

Optical O₂ measurement

In optical measurement, sensors determine the O₂ content according to the quenching of luminescence principle. The optical O₂ measurement offers the brewing and beverage industry many benefits in terms of measurement technology. These include very short reaction times and the analysis reacting exclusively to oxygen.

With the optical oxygen sensor, virtually no aging phenomena occur.

Empirically it has been found that after one million O₂ measurements, the deviation from zero is only 5 ppb and for higher O₂ values, no deviation is found. Assuming 500 illuminations per day, seven days per week, 52 weeks per year, the sensor would, from a purely technical perspective, only need to be replaced once every five years.

The sensor is available in two different designs. The LHO sensor measures in the range from 0 to 4.18 per cent O₂. The WLO sensor used by the brewery mentioned is, however, specified for

a range from 0.20 to 100 per cent O₂. The measurement inaccuracy for both is less than 5 per cent of the indicated measurement value.

Summary

In brief, using a tried and tested standard meter in a new application achieves substantial process optimisation. In-line O₂ measurement is useful where caustic is used for cleaning and it can react with CO₂. In breweries for example, this is the case in the pressure tank and the tank for degasified water.

Further potential application areas would be the fermentation tanks in sparkling wine or cider production plants. In general, the OGM measurement system is beneficial wherever a closed fermentation system is present or products are stored under CO₂ atmosphere. □



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