Case Study: pH Control of Industrial Wastewater Effluent at Interbrand SAL, Lebanon

Problem

Interbrand SAL is located in a suburb of Beirut, Lebanon. It produces bottled fruit juices, tomato ketchup and carbonated soft drinks. Water is the key ingredient. A modular reverse osmosis (RO) system produces 40,000 litres/hour (0.254 mgd). Feed water is drawn from wells in a rocky area outside of Beirut. Cartridge filters provide initial filtration to minimize fouling of the RO membranes. To prevent biofouling of the membranes via bacteria contamination the plant disinfects the feed water using either gaseous chlorine or liquid hypochlorite. Since free chlorine will damage the RO membranes the plant injects sodium metabisulfite upstream of the RO filters to neutralize any remaining free chlorine.

To insure disinfection of the feed water operators maintain the ORP value between 850 and 900 mV. Workers also monitor the free chlorine concentration required to achieve this relatively high ORP level. Concentrations as high as 6 ppm are often needed to achieve this level. To insure that all free chlorine is destroyed prior to RO filtration they set an ORP maximum of 250 mV.

Seasonal variations in pH and organic matter in the ground water can lower the free chlorine demand a high of 6 ppm to a low of 2 ppm. The problem was that, without long-term monitoring and recording of ORP levels control had to be done on a day-by-day basis. To insure adequate disinfection workers erred on the side of overdosing free chlorine. This meant a higher consumption of chlorine as well as the disinfectant needed to neutralize it.

Vicken Sabounjian, Production Manager for Interbrand, wanted to monitor and log the ORP and pH values of the feed water and permeate. He was especially interested in logging the pH and ORP so that he could have a better understanding of the seasonal variation of pH and ORP values required for meeting the disinfection target.

Solution

Vicken searched for a controller that could input multiple sensors, contain relays, enable remote monitoring and log sensor data. Only the AquaMetrix 2300 controller provided four analog inputs, three flow inputs, four relays, data logging and complete control over a web interface for under $2000. The company purchased its first 2300 controller in early 2015.

An AquaMetrix R65C8 ORP sensor, with direct 4-20 mA output, monitors the ORP in the feed water. As stated above they maintain a reading between 850 and 900 mV, which sometimes corresponds to free chlorine levels as high as 6 ppm—depending on the pH of the feed water.

In addition to email alerts the 2300 contains four dry contact relays. Vicken uses one to trigger a warning light for low disinfectant.

A second R65C8 ORP sensor (also with direct 4-20 mA output) monitors the ORP level of the dechlorinated water. The 200-250 mV desired range is well below the 360 mV threshold for detectable chlorine concentration. An ORP level higher than 250 mV triggers a second relay, which activates a siren, shuts down the RO unit and switches a valve to divert the potentially harmful water away from the membranes into the drain.

The third and fourth channels on the 2300 are connected to P65C8 pH sensors that monitor the feed and permeate waters, respectively. Data logs are vital for looking at long-term trends in pH.

Results

Since installing the AquaMetrix 2300 Vicken and his staff have been able to visualize the variation of ORP over months. They were thus able to understand that the variation was seasonal, with demand for chlorine being minimal during February and maximum between October and November. By collecting logs of ORP values over time Interbrand was able to minimize the dosage of free chlorine to values closer to the 2-3 ppm range.

The company recently added a flow sensor (magmeter) to the input of the RO system. It plans to add two additional flow sensors to the existing 2300 to measure and control flow rates of the feed, concentrate and permeate of the RO system. Vicken will buy a second 2300 to monitor the water parameters on non-RO areas in the factory. This will involve monitoring the water consumption for product preparation, water consumption for evaporative cooling towers and water feed to the boiler. This second 2300 will also monitor and control the ORP before and after the activated carbon filters. Of particular importance, It will insure that the pH of the boiler water stays above a critical value.

According to Vicken, *“Using the 2300 has given us the insight and opportunity of designing our new RO system and retrofitting sensors on old systems, something that drew us back in the past because of the amount of work and number of instruments involved. But with the multichannel and multifunction capability of the 2300 and its ease of configuration and use, operators can easily monitor the process values on the instrument’s screen as well as the web display.*

At just a fractional addition of price of a typical controller, we received a lot of features that were not available on the units we usetd in the past.”

AquaMetrix by Water Analytics

AquaMetrix by Water Analytics


Aquametrix 2300
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Reverse Osmosis Controllers