Solving vapour lock issues at US wastewater treatment plant

TOPIC:

SMART Digital solution doses sodium hypochlorite in WWTP application without vapour lock issues

LOCATION:

Point South, SC, USA

COMPANY:

The Beaufort-Jasper Water and Sewer Authority

The Beaufort-Jasper Water and Sewer Authority (BJWSA) is a non-profit authority established by the State of South Carolina to provide drinking water and treat wastewater in Beaufort and Jasper counties of south-eastern South Carolina, USA. The BJWSA is a leader in water reuse and is capable of reclaiming up to 5 MGD of water for irrigation, including South Carolina's first residential irrigation service.

The situation

The BJWSA operates a lagoon style wastewater treatment plant (WWTP) at Point South, South Carolina. The .35 MGD plant was upgraded in 2009 to collect and treat wastewater from the small community of Point South as well as a new planned community designed for 2,500 homes. Due to the recession of 2009, the planned community was put on hold, and to date no homes have been built. As a result, monthly flow to the new plant averages only 50,000 gallons per day, with night-time flows falling to as little as 12 gpm.

The Point South WWTP discharges effluent by pumping to a spray field. The BJWSA's goal is to maintain a 1.5 ppm chlorine residual in the final effluent. During the upgrade of the plant, the contractor installed two ½ HP motor-driven mechanical diaphragm pumps, equipped with an auto-degassing liquid end to dose 12.5 percent sodium hypochlorite. The mechanical diaphragm pumps, equipped with an internal variable frequency drive (VFD) and stroke length adjustment, were sized for up to 26.7 gph at 150 psi. The amount of 12.5 percent hypochlorite required to treat the effluent ranged from a high of 2.5 gph on summer weekends and major rain events to a low of .1 gph during the winter months.

The original pumps worked satisfactorily at higher chemical flow rates but repeatedly vapour locked at lower flows. To manage the problem of off-gassing and the resultant vapour lock, plant personnel were maintaining higher rates of chemical injection than required, and constantly bleeding off the vapours from the pump head during their morning inspection. The degassing device on the pumps failed to evacuate the gas from the pump head. Eventually, plant personnel were forced to cut the sodium hypochlorite concentration from 12.5 percent to 6 percent in order to increase the reliability of the chemical metering pumps. This manual dilution operation had to be done by the plant operator about every 7 days, resulting in increased operational and chemical costs for the BJWSA.

The Grundfos solution

The BJWSA was already familiar with the Grundfos DME dosing pump and digital dosing technology and understood the advantages of digital dosing. Their interest was to go back to using full strength 12.5 percent hypochlorite and avoid the process of diluting the chemical to accommodate the existing pumps. It was agreed to test a Grundfos SMART Digital DDA pump at the WWTP. The pump would be required to follow a 4-20 mA signal from an open channel flow meter installed in the chlorine contact chamber. This was the right opportunity to test the pump's ability to handle off-gassing liquids while operating at low flows.

The DDA pump was powered up and primed using the diluted 6 percent hypochlorite. Dozens of hypochlorite bubbles the size of a dime were seen moving up the clear plastic tubing through the pump head and out the discharge, an assurance that the pump was performing as desired. The Auto Deaeration, Flow Control and AutoFlowAdapt features of the DDA allowed the pump to automatically adjust the speed to remove air bubbles while matching the capacity set point, even with pressure fluctuations in the line. The 4-20 mA input was scaled to match the minimum and maximum flow desired.

The outcome

The BJWSA watched the pump closely for a little over a week and noted that it performed perfectly without experiencing a single incidence of vapour lock. It was then decided to try the DDA on the full strength 12.5 percent solution. After the switch to the full strength chemical, the pump continued to perform without a problem. In the following weeks, coastal South Carolina experienced a very hot summer with temperatures often exceeding 37° C and not often below 32° C. Throughout the hot summer, the autumn and winter, the SMART Digital DDA never experienced a vapour lock problem.

Beyond the substantial increase in reliability and the ability to meter full strength sodium hypochlorite, the BJWSA noted two additional benefits. First, their chemical usage

dropped from an average of 11 gpd with the 6 percent concentration and down to 2 gpd with the 12.5 percent concentration, saving costs for the BJWSA. Secondly, the DDA installation is connected to a Universal Power Supply which displays the electrical load. The pump consumes only 1 percent of the UPC load. The original pumps were not reconnected to determine the load, but the plant operator noted that during a power failure the UPC would last only 15 minutes with the motor-driven pumps and now lasts 45 minutes with the SMART Digital DDA. By reducing chemical use and power consumption through the use of the DDA, the BJWSA is also reducing their footprint and environmental impact.

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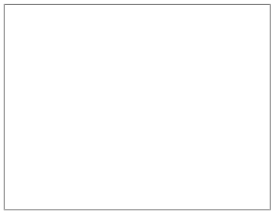

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