

# Peristaltic Metering Pumps Solve Clogging Problems with Ferric Sulfate

**The diaphragm pumps at the Maple Lodge Sewage Treatment Works in the UK required maintenance that was time-consuming and expensive.**

Thames Water is the United Kingdom's largest water and sewerage company, supplying nearly 9 million people with drinking water and providing wastewater services to 15 million customers. The utility's service area covers 5,000 square miles across London and the Thames Valley. On an average day, Thames Water treats more than 4 billion liters of wastewater, or about 1.05 billion gallons.

The Maple Lodge Sewage Treatment Works in Maple Cross, Hertfordshire, near Rickmansworth northwest of London, serves nearly 500,000 residents and businesses and receives up to 300,000 cubic meters of wastewater per day. At maximum capacity, the plant can generate enough renewable energy to power the equivalent of 9,000 homes.

The Maple Lodge plant was experiencing challenges with diaphragm pumps in its ferric sulfate application. Clogging occurred in the pump suction line and valves, especially when the levels in the facility's three 60-cubic-meter tanks were low. The clogging required the pumps to be taken apart and cleaned, which was time-consuming, expensive and messy.

Another issue involved nuisance alarms that would shut down the pumps. Sensitive sensors built into the system to monitor the diaphragm pumps would trigger the alarms. The system would go into an alarm condition for variations in suction line pressures because of clogging in the suction port, changes in the tank level, or changes in the concentration of the chemical when the tanks were at low levels. Service was required on the diaphragm pumps to resume operation.

The diaphragm pumps were installed in a secure room next to the storage tanks. The pump suction inlet elevation was about 2 meters above the bottom of the 60-cubic-meter (16,000-gallon) ferric sulfate tanks. The pumps worked well when the tank level was above 2 meters and when they were operating under a flooded suction. However, alarms activated and clogging occurred when the tank level fell below 2 meters and the pumps needed to lift the more concentrated ferric.

Thames Water operator Pete Thomas decided to install a peristaltic metering pump after hearing that they were more effective at pumping fluids with particles. Peristaltic pumps do not require check valves that must be used in the suction and discharge lines of diaphragm pumps. These valves can clog resulting in the pump failing, especially when pumping fluids that contain particles such as ferric sulfate. Priming can also become an issue with diaphragm pumps when the chemical level in the tank drops below the pump inlet level. However, peristaltic pumps are able to self-prime, even against their maximum rated discharge pressure. This eliminates the need for automatic priming valves or manual pump priming procedures.

The pump Thomas chose can accept 14 different tubes of various sizes and materials, allowing the pump to meter most water treatment chemicals including sodium hypochlorite, 98 percent sulfuric acid, oil-based emulsion polymers, lime slurry, and ferric sulfate at discharge pressures from a full vacuum to as high as 125 pounds per square inch (psi), or 8.6 bar. Being

able to change tube materials and sizes is also beneficial in seasonal applications where the pump's adjustable output volume range must be drastically changed. With the exception of changing o-ring materials, a diaphragm pump is typically limited to using only the pump head and materials originally shipped with the pump.

The pump now operating at Maple Lodge is using the "NP" tube which is manufactured using Norprene material, it has a maximum output of 600 liters per hour and a maximum pressure capability of 30 psi (2 bar). The pump was installed in June 2014 and has pumped at 150 liters per hour against 20 psi without fail.

The only maintenance required on the pumps is the periodic replacement of the pump tube assembly, which is a five-minute procedure. Although the tubes are estimated to last more than three months in this application, Thames Water decided to replace them monthly because of the low replacement cost—less than \$100—and the ease of maintenance compared with the overall cost of repairing the diaphragm pumps.