Waste Water Treatment Works Analysis

Glenwater Consortium
Northern Ireland

The Problem

The Glenwater Consortium (Thames Water Services and Laing O'Rourke) upgraded six existing wastewater facilities and constructed a new Wastewater Treatment Works (WTW) for North Down and Ards as part of the Omega Project. In order to understand the dynamic processes of the complete system, Glenwater asked MMI Engineering to develop a Flowmaster model of the WTW, including the inlet systems from Briggs Rock and Dongahadee, and the delivery line to the Briggs Rock outfall, as shown in Figure 1.

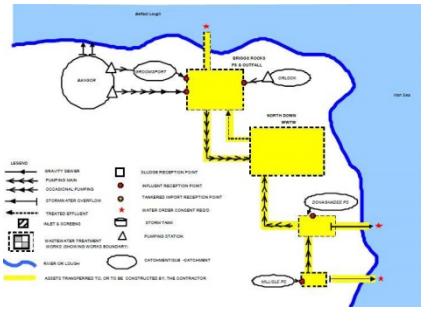

Figure 1: North Down Wastewater Network

The effluent entering the works passed through grit traps and was then pumped to the Surge Anoxic Mix (SAM) tank by inter-stage pumps. From the SAM tank, the flow would then be pumped to two of six reactor tanks, operating in pairs in sequence. The filling of the reactor tanks depleted the SAM tank. While this refilled, the pumps would re-circulate the contents of the two reactor tanks back to the SAM tank (Interact Phase). When the SAM tank became full (or after 15 minutes, whichever was longer), the SBR pair would enter the 'React Phase', followed by the 'Floculate Phase' and then the 'Settling Phase'. Finally, the contents were decanted to a decant tank for pumping onto the UV filtration system. At any given time, each pair of tanks would be carrying out a different phase of operation. The Interact and React times depended on the SAM fill time, if it was less than 56 minutes, the React and Interact times would be reduced to accommodate peak flow. However, the tanks had to complete all phases of the current cycle before running on reduced timings.

Our Approach

A Flowmaster network (Figure 2) was constructed, which included the logic and level monitoring of the complete SBR process. This model enabled the process sequences, trigger levels and timings to be assessed for a variety of system flow rates, including the switch over from low to high flows.

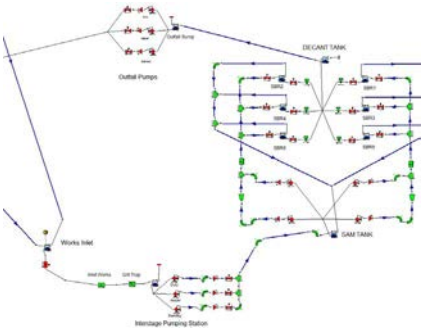

Figure 2: Flowmaster WTW Network Model

Outcome

Initial studies identified that the levels in the tanks over a number of cycles were not stable at peak flows, and so adjustments were necessary to the SBR control timings.

An analysis of the system switching from normal operation to peak operation in 1 minute was conducted to demonstrate the correct functioning of the whole process. The resulting tank levels are shown in Figure 3, illustrating the system's ability to cope with the change from low to high level inflow without triggering level alarms - even during the transition period, where the react, floculate and settle times were at their longest for 1 pair of tanks.

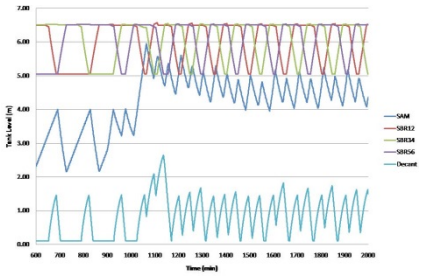

Figure 3: Tank levels for ramp up of works inlet flow (from minimum to maximum)

MMI was able to assess the complete WTW, including control system. Our analysis demonstrated the system capability to handle sudden increases of inflow, from low to peak conditions, without triggering any high or low level alarms.

www.mmiengineering.com
info@mmiengineering.com