CRC for Water Sensitive Cities

Adam Sypanski[1],
Dr. Keshab Sharma[1],
Prof. Zhiguo Yuan[1]
[1]University of Queensland

Program C –Future Technologies

Project C3.1: Managing interactions between decentralized and centralized wastewater systems

# Adapting Sewers Infrastructure for a Water Sensitive Future

## Optimizing Sewer Pumping Stations to Reduce Hydrogen Sulfide Generation

Our sewers are the most critical piece of municipal infrastructure for preserving the health and wellbeing of our communities but they were designed without consideration for water conservation. Our goal of creating a more water sensitive society means less water is available for transporting our wastes through our sewers and that has the potential to have major impacts on their reliability.

We focused on how changes to pumping operation at pressure main sites could impact hydrogen sulfide generation in the sewer system. Hydrogen sulfide decreases sewer integrity by acting as a corrosive agent when it is in contact with cement. The premature failure of sewer infrastructure from corrosion is expected to result in an additional 400 million dollars of expenses over 20 years in Australia[1].

## It's in the mixing

Pumping mains are used when wastewater must travel over hills. They pump intermittently based on how much water is flowing into its wet well (Figure 1). Our research demonstrates that the chemical sulfate, which feeds hydrogen sulfide producing bacteria, is only abundant at the biofilm surface during and immediately after pumping (Figure 2).

Pictured Above: The Innovation Centre Sewer Pilot allowed for this research to be carried out using two parallel 300 meter long pressure main pipes. With this, we were able to control critical variables while still mirroring real world conditions .

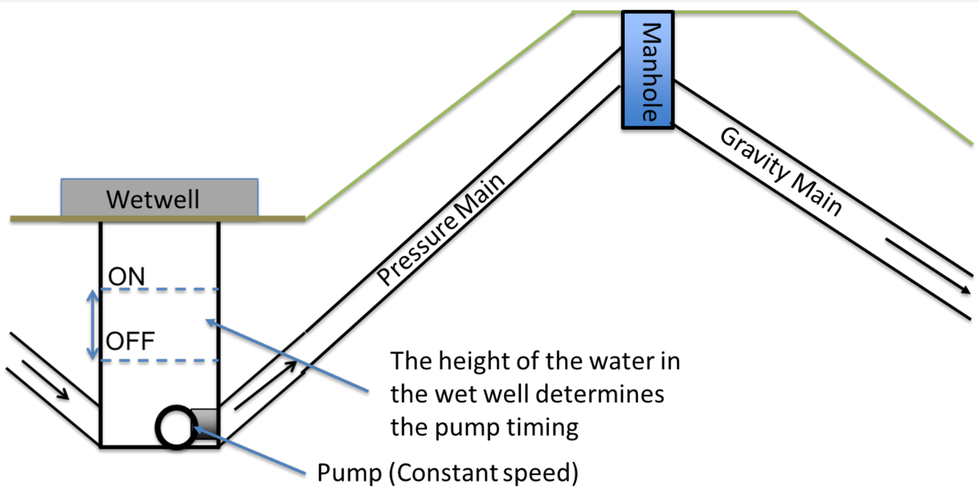


Figure 1: Simplified Schematic of Sanitary Pumping Station

By exploiting this limitation and by taking advantage of the reduced wastewater flows resulting from water conservation, operators can substantially reduce sulfide generation in their sewers (Figure 3).

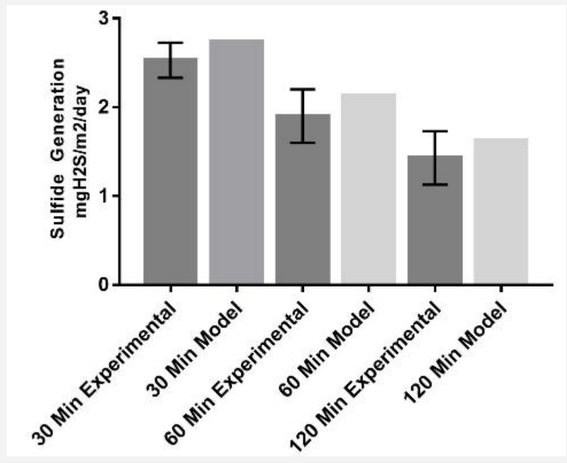


Figure 3: Experimental / Modelled Sulfide Generation

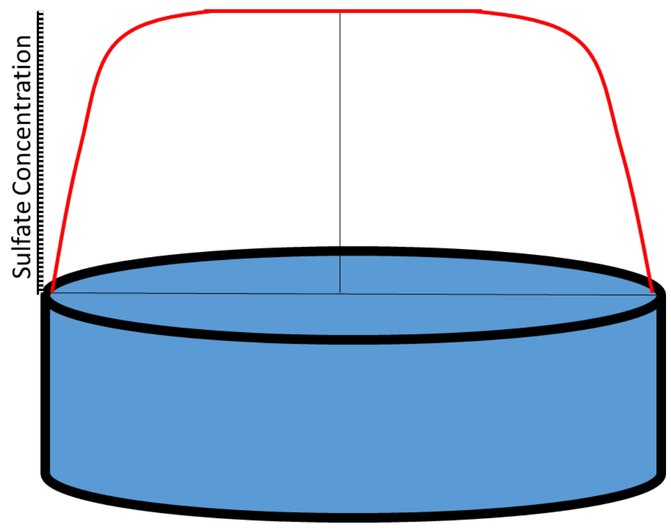


Figure 2: A representation of the sulfate concentration profile along the centreline of a pipe shortly after active mixing ceases. The sulfate concentration collapses as it approaches the pipe walls where the sulfate consuming bacteria are present. Hydrogen sulfide generation is limited without sufficient sulfate availability.

## Realizable Benefits

Using the Innovation Centre sewer pilot system, we have demonstrated that by optimizing pumping frequency under future low flow scenarios, we can reduce sulfide generation by 20 to 40%. Similarly our research is providing guidance on pump selection, pipe sizing and wet well design.

Implementation of our recommendations will increase asset lifespan and provide for a more versatile network under a more water sensitive future.

[1]Internal industry consultation

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