Sewer blockages: Detection, Prediction and Management in networks with South West Water

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What are blockages?

A blockage in sewer networks can be anything that impedes the flow through sewer networks. They can be made up of sediment, rags, fats, oil, greases, ice, structural material and anything else that finds its way into sewer networks. Any selection of these components can combine to form difficult composite blockages which need shovels and pickaxes to break up and excavate. Alternatively high pressure water jetting can clean pipes and blast through small blockages to clear the network. The common factor between all blockages is that they are expensive to remove.

While blockages can form anywhere in the complex sewer environment typically a large proportion of blockages occur in a small proportion of the network. Blockages may concentrate around fast food restaurants, near sandy beaches or under trees. With sewer networks demonstrating huge variation in all aspects including design, climate and topography a huge number of different physical mechanisms of formation can be involved in any blockage.

The cost of blockages

- Increased risk to public health
- Impaired network functionality
- Potential for surface foul flooding
- Increased hydraulic retention time
- Reduced levels of service for customers

“88 million per year spent by UK water companies on sewer blockages”

- UNFLUSHABLES REPORT 2017/18

“366,000 sewer blockages per year”

- UNFLUSHABLES REPORT 2017/18

The challenges in sewers

- Lack of public engagement
- Rapid technological growth
- Climate change and uncertainty
- Hazardous working environment
- Many sources of noise in the data
- Changing sewer use and consents
- Urbanisation and population density
- Limited investment for operational costs

Solutions for the future

With the common saying that prevention is better than the cure **legislation** concerning inflows into sewers is the first place to start. FOG, wet wipes and Q-tips are just a few of the domestic products unsuitable for sewers. Water companies across the UK proactively engage customers through public awareness campaigns like the three P’s – Pee, Paper and Poo:

Another solution is found in **preventative flush programs** which clean the most vulnerable parts of the network. This approach uses historical records of previous blockages with cost estimates to identify high risk assets. These assets are prioritised and targeted for cleaning.

Finally **sensors and real time monitoring** enable detection and prediction of blockages in networks using machine learning like fuzzy logic and artificial neural networks. Currently anomaly detection for blockage detection is at the frontier of the field however a consensus on the best approach has not been reached. Research in this area remains exciting and rewarding.

A case study?

My research will focus on identifying optimal sensor locations in networks and developing data methods for blockage prediction using real time data. In addition I am interested in exploring the difference between networks and blockage modes to match and adapt methods to any given network.

With data from South West Water my research will cover three coastal catchments with real time sensors measuring parameters like depth and velocity. Radar and rain gauge data with blockage records and hydraulic models will also be useful in solving my research questions. Looking to the future any developments in this field will be particularly important in networks like this one which struggle with blockages along the coastline:

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