

Evaluation of Leakages Effects in the Water Supply System of Moratalla (Spain)

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Abstract

One of the risk management requirements is the assessment of the effect of each kind of possible failure. In water supply systems, the most common failures are the pipe leakages. Most leakages can be modelled as orifices in a pipe [1].

At this paper, a leakage pattern is defined for each of the 300 pipes in Moratalla's water supply system. That leakage pattern is defined as an orifice whose diameter length is 1/10 of the pipe diameter.

Epanet-Octave is a GNU Octave wrapper that makes easy and vector oriented the use of EPANET ToolKit. Epanet-Octave library has been used to carry out a simulation for each pipe which may have a leakage. Each simulation lasts a whole simulated day to include leakage effects for the different pressures and demands that happen during the day. Then, the results are summarised by using an index which weights the negative effect of the leakages. Usually leakages are evaluated mainly by the energy waste in pumping that water [2-3]. In this case, the suggested index accounts for leakage flow rates, water quality deterioration and service deterioration.

Leakage flow rates effects are included through the maximum leakage flow rate (in time) and its average value, which in this case is proportional to the energy cost used in other works as the system distributes the water from the reservoirs to customers by gravity. Water quality deterioration is evaluated by the presence of negative pressures around the orifice. Finally, service deterioration is measured through the water that would be supplied below the regulated minimum pressure.

This weighted index, which is shown in figure 1, can be used, together with other non-hydraulic factors like pipe-age or pipe-material, to prioritise the maintenance and even the replacement of pipes according to a risk management strategy.

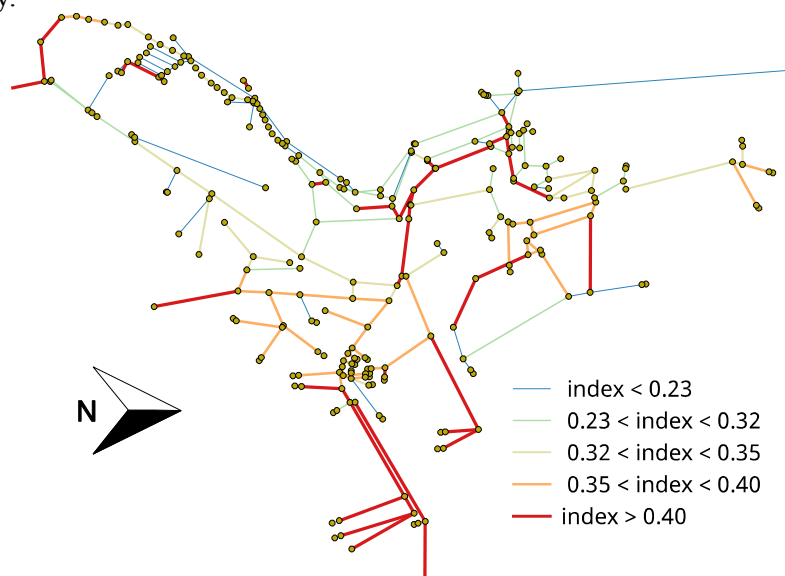


Figure 1: Distribution of the leakage effect index in the Water Supply System of Moratalla.

References

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