Chasing transients in a water transmission main in Milan, Italy

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Abstract Hydraulic transients can be due to different causes, such as pump switchings, customer demand changes, maneuvers on valves. They, in turn, may cause bursts and breaks in water supply systems. The Dorsale transmission main (TMs) in the north east of Milan, Italy, has been monitored during the night at two measurement sections with a high frequency rate, that allowed to detect transients with different characteristics. The data presented in this paper show the importance of monitoring towards a better management of TMs in order to reduce leakages and bursts.

Keywords: transients, monitoring, transmission mains, field tests, frequency rate.

Methods

A field measurement campaign on the Dorsale transmission main (TM) in the north east of Milan, Italy, managed by CAP Holding SpA has been carried out during the night with an acquisition rate of 2048 Hz revealing the presence of several transients.

The Dorsale TM connects the Pozzuolo Martesana well-field (WF) to a rising main (RM) that pumps water to a reservoir. It mainly consists of cast iron pipes (alternated with relatively short iron pipes) of three different nominal diameters, for a total length of about 15591.55 m.

Results

Two types of transients can be detected:

•At WF pump switchings are evident, with large pressure variations, till to 42 m at 00:23.

•At RM pressure variations are smaller (around 4-5 m), but more numerous with respect to the WF section, and are characterized but a sort of periodicity. This is due to the fact that at RM four variable speed pumps are installed and the inverter effect reflects on the pressure signal.

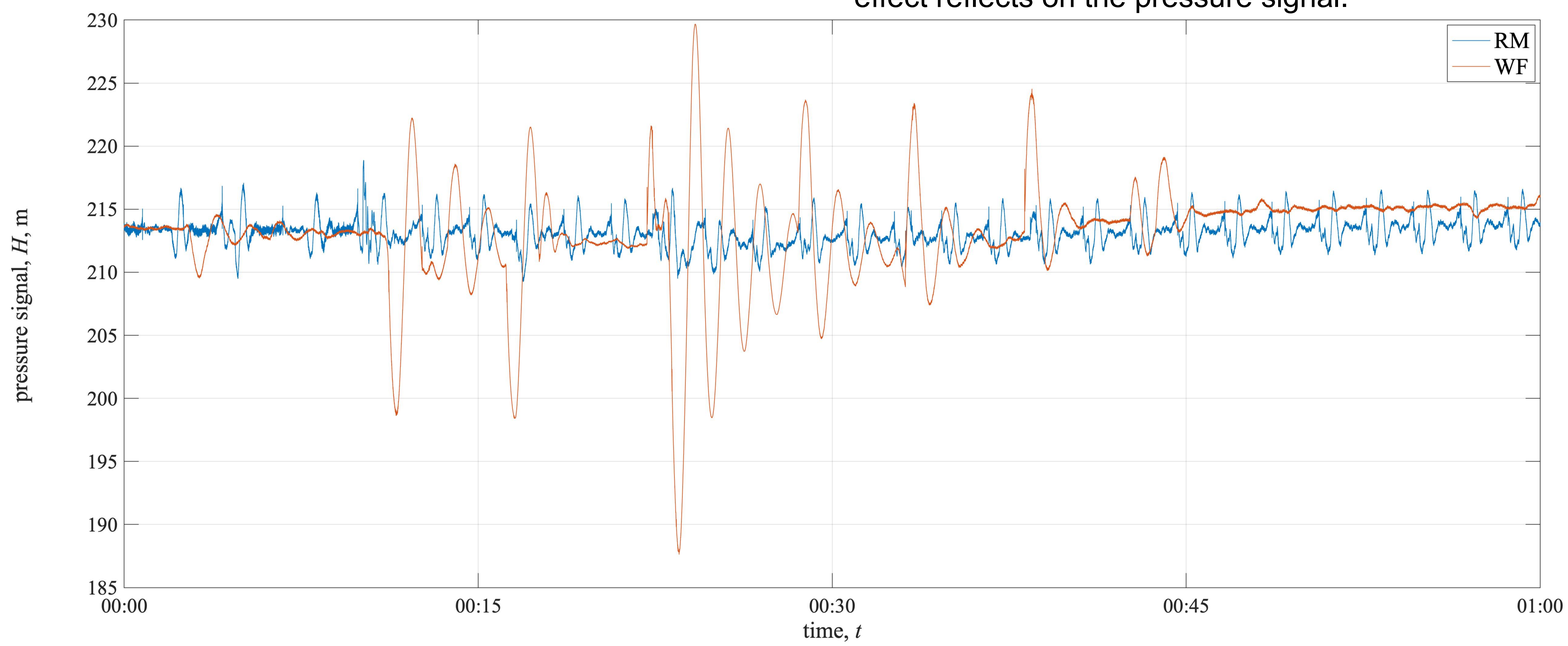

Figure 1: Pressure signal, *H (t)*, acquired at RM and WF sections between 00:00 and 01:00 a.m.

Conclusions

- Transients are a constant presence in water systems and can have different characteristics;
- High-frequency monitoring with GPS data synchronization is the key aspect to detect transients towards a better management of water systems and a reductions of leakages and bursts;
- The next step in this research is to carry out further measurements and to perform different analyses depending on the type of transient.

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