

Using fiber optics to fight water wastage

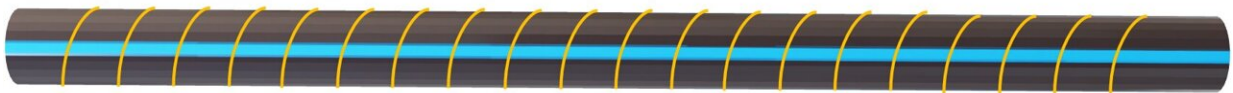
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A photo of the tubes used during the experiments. Credit: Politecnico di Milano

Researchers from the Department of Civil and Environmental Engineering pioneered the use of distributed fiber optic sensing (DFOS) based on Stimulated Brillouin Scattering (SBS) technology for monitoring water pipeline networks over long distances. At the heart of this technology is the common and inexpensive optical fiber used for telecommunications (which brings the internet into our homes) capable of measuring deformations to a hundredth of a millimeter.

The scholars worked on High Density Polyethylene (HDPE) piping, today the most commonly used material for distribution systems. By wrapping and fixing the fiber optic sensor cable on the outer surface of the pipe, they tested the ability to detect deformations related to pressure anomalies along a pipe, such as those caused by water leaks.



Virtual schematic of the sensor layout adopted. Credit: Politecnico di Milano

The experiment consisted of two phases. "In the first one," the researchers explain, "we assessed the sensitivity of the sensor layout on an HDPE pipe stressed with static pressure. This [first stage](#) was successful, so we then concentrated on detecting the pressure anomaly produced by a leak in a piping circuit with flowing water. Overall, the results returned [positive feedback](#) on the use of DFOS, confirming the possibility of identifying and localizing even very small water leaks."

In the future, the tested technology will be further developed towards industrial-scale production of 'natively smart' HDPE pipes, where DFOS are integrated into the pipe surface during the extrusion process.

The work is published in the journal *Sensors*.

More information: Manuel Bertulesi et al, Experimental Investigations of Distributed Fiber Optic Sensors for Water Pipeline Monitoring, *Sensors* (2023). [DOI: 10.3390/s23136205](https://doi.org/10.3390/s23136205)

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