How to define the economic level of leakage in water supply systems
Although water is a precious resource, water distribution networks lose on average approximately half of the input resource. If we consider that water is supplied through a pumping station and that water shall be purified, water losses have an enormous economic value and their recovery requires considerable investments. But to what extent water loss reduction is appropriate? The answer to this question cannot be given haphazardly as it often happens, but comes from a detailed assessment of costs and benefits. The PALM project aims at defining this optimal level of leakage for each water distribution network.

The PALM project, co-funded by the European Commission through the LIFE+ program and by the Ministry of the Environment, aims at developing a decision support system to calculate the optimum water loss level. This system not only evaluates all the elements of water loss accounting, but also considers important economic factors such as the investment required to compensate for water losses, the production cost, the benefit of pumping optimization and the value of the recovered water. The water loss reduction in a water distribution network allows for production optimization, for example by decreasing water extraction from the most expensive supply sources or by loading the water distribution tanks during the night when the electricity costs are lower.

The project is developed through following activities:

- network modeling through GIS (Geographic Information System),
- hydraulic model development and calibration with flow rate and pressure data,
- network sectorization,
- water loss detection in each sector through field measurement,
- implementation of a water loss reduction program: pressure control, water detection through electro-acoustic instruments, servicing, installation of a continuous monitoring system,
- cost and benefit assessment to reach the optimum water loss level.

Testing and validation of the proposed system are made in the water distribution network of Perugia, managed by Umbra Acque SpA, a company with a wide experience in water loss management. The water distribution network of Perugia was selected for its hydraulic complexity management. In fact the system is supplied by 5 interconnected water mains covered by two Apennines sources, three well fields and by various minor sources used as water reservoir. The water distribution network of Perugia is also supplied by 20 tanks and approximately 100 pumps.