

Tools and procedures for an advanced and sustainable management of water distribution systems

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The objective of this research project is to provide Water Utility managers with useful tools to set up their planning and management strategies, as well as to develop, from the scientific and technical viewpoints, all the subjects in Hydraulics pertaining to the design, maintenance, management, updating, transformation and sustainability of water distribution systems. The tools that we intend to focus on, consist in procedures, mathematical and laboratory models. At the same time, we will also develop decision support systems in the MS-Excel environment in order to transfer in a short time the results of the project to the technical world. The main themes dealt with in the project will be i) the phasing of construction; ii) the representation of the relationship between leakage and service pressure; iii) the spatial and temporal variability in users' demands. Other themes of interest will be: i) non-invasive procedures based on the rapidly varied flow and aimed at identifying pipe obstructions and leakage; ii) techniques for the definition of network districts with the objective to better characterize water consumption on local and temporal scale; iii) optimization of pumping systems, also considering demand uncertainty; iv) techniques for the real time control of pressure by means of suitable self-adapting

systems.

All the previous activities will lead to the development of a decision support system which will include multi-objective optimization procedures, based on algorithms of various kind, such as the evolutionary techniques. The algorithms will be made effective and efficient to such an extent as to be reliably applicable to large and

complex water distribution systems, as those which are managed by the water utilities the research units cooperate with.