STRATEGIC PLANNING OPTIMIZATION OF "NAPOLI EST" WATER DISTRIBUTION SYSTEM

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ABSTRACT

The District Meter Areas (DMA) design is an innovative methodology of water networks management, based on the pressure patterns control and on the water flows monitoring, in order to reduce water losses and to optimize the water systems management. A District Meter Area is an area supplied from few water inputs, into which discharges can be easily measured to determine leaks. So, the DMA design represents an alternative to the traditional approach based on heavy looped distribution network. In the present paper the DMA design of the "Napoli Est" water distribution system (approximately 65.000÷70.000 customers), performed with the support of the Water Agency ARIN S.p.A., is discussed.

After analysis of authorized consumption, by means of a monitoring campaign of water flows over the area, the system water balance was performed, showing significant water losses, as a consequence of high pressure patterns. This situation was confirmed by the high number of maintenance operations performed in the area during the year 2005. In order to characterize the piezometric heads on the network, ARIN S.p.A. supplied to the installation of six pressure transducers in the most vulnerable areas. The water level in the supply reservoir was also measured in order to estimate its influence on the network pressure heads.

Hydraulic simulations were carried out with the EPANET software version 2.0 applied to a network layout resulted from the system "skeletonization", achieved by eliminating out of order pipes, integrating pipelines of same diameter and roughness, replacing dead-end branches and small networks supplied by a single junction with an equivalent discharge.

After the skeletonizated network was calibrated, several hypothesis of designing and implementing DMA to reduce physical losses were performed, providing adequate operating pressure of the system. Many numerical simulations were performed to guarantee adequate head pressure especially for peak hours demand, break of transmission mains and fire hydrant service. A chlorine residuals analysis was also effected, by simulating the transport and decay of chlorine through the network.

District Meter Areas, therefore, were designed, and the corresponding hydraulic and water quality investigations and simulations were carried out. Six District Meter Areas were planned, assembling 14 intercepting valves and 9 pressure reducing valves to prevent the downstream pressure head from exceeding the set value, achieving a remarkable water saving, approximately equal to 34% of the physical losses, corresponding to 16% of system input volume.

Keywords: water networks, water systems management, District Meter Areas design, pressure patterns, physical leaks, water losses reduction.