Abstract

Loss of water caused by leakage is a common phenomenon observed in all water distribution systems (WDSs). The volume of leakage around the world is considerably high, and its control is crucial to meet the increasing water demand caused by rapid population growth and urbanization. The most important component of a leakage-control strategy is target setting in terms of economic level of leakage (ELL). The ELL is an economic indication depending on individual network conditions, operating system pressures, demands and their patterns, marginal cost of water, and operating practices. This paper discusses the economic aspects of leakage for a pilot district metered area (DMA) of the WDS of the Metropolitan Waterworks Authority (MWA) in Bangkok, Thailand. The study developed two nomographs for the quick estimation of ELL and active leakage-control cost (ALC) with minimal data analysis. The first nomograph shows the relationship between cost of leakage control, average operating pressure, and level of leakage in the WDS. The second nomograph shows the relationship between ELL, operating-system pressure, and marginal cost of water. The nomographs have been developed based on leakage volume, cost of water, and hydraulic and operational conditions of the WDS. To model different hydraulic and leakage scenarios, the U.S. EPA's EPANET simulation engine has been used. The research will help utility managers understand different aspects of leakage economics and will lead to better management of their WDSs.

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References

Ashton, V., Gordon-Walker, S., and Marshallsay, D. (2009). *Leakage target setting in London*, Artesia Consulting, Chipping Sodbury, U.K.

Google Scholar

Babel, M. S., Islam, M. S., and Gupta, G. D. (2009). "Leakage management in a low-pressure water distribution network of Bangkok." *Water Sci. Technol.: Water Supply*, 9(2), 141–147.

Crossref | Google Scholar

Fanner, P., and Lambert, A. (2009). "Calculating SRELL with pressure management, active leakage control and leak run-time options, with confidence limits." Proc., WaterLoss 2009, IWA Int. Conf., IWA Publishing, London, 373–380.

Google Scholar

Farley, M., and Trow, S. (2003). *Losses in water distribution networks: A practitioner's guide to assessment, monitoring and control*, 1st Ed., IWA Publishing, London.

Google Scholar