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Identification of sampling locations in Al-Khobar water distribution networks using demand coverage method

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Delivering water in sufficient quantity and acceptable quality is the main objective of water distribution networks (WDN) and at the same time is the main challenge. The deterioration of water quality in the WDN leads to failure at the water quality level, which can be a serious issue since there are virtually no safety barriers before water consumption. Accordingly, developing monitoring (sampling) system which is capable of increasing the level of protection for consumers in case of water quality deterioration is essential. The purpose of this study is to develop a water quality monitoring system for Al-Khobar city WDN. Demand Coverage Method (DCM) and optimization techniques such as Integer Programming were employed to develop an enhanced monitoring system for the WDN. The monitoring system was developed for a real distribution network serving about 300,000 capita, considering the constraints provided by the water authorities. This paper also studies the effect of regional and non-regional constraints for locating optimal monitoring stations and total monitored demand (TMD). The study shows that it was possible to improve the monitoring system for Al-Khobar WDN using DCM and by dividing the day into four time zones. In addition, the study shows that effect of regional constraints on the TMD decreases as the number of monitoring stations increases.

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