Dynamic Simulation of Pressure Head and Chlorine Concentration in the City of Asyut Water Supply Network in Abnormal Operating Conditions

Hassan Ibrahim Mohamed · Gamal Abozeid

Abstract:

This research tracks the abnormal system operating conditions of the city of Asyut water supply network over an extended period. EPANET software was used to perform hydraulic and water quality analysis. Firstly, the effect of roughness variation with time on pressure head distribution and water quality through the network is simulated. Secondly, leakage due to failure of some pipes on the flow, pressure heads and water quality are investigated. Also the effect of closing some pipes in the network on pressure head and chlorine distributions is taken into consideration. Finally, the effect of changing the source of chlorine disinfection on water quality in the network is studied. The results indicate the following: (1) The increasing roughness of pipes can significantly increase the head losses through the network and consequently decrease the head at the end of network below the minimum limit. The variability in nodal pressures also has a significant effect on chlorine decay if the bulk wall reaction coefficient is taken to be dependent on the roughness of the pipe. (2) The failure of some pipes in the networks not only increases the consumed discharge in the network and decreases the pressure head but also changes the flow directions in some pipes through the network. (3) Closing a pipeline increases pressure in a region and decreases it at another and also changes the direction of flow in the network. This may affect the chlorine distribution through the network. (4) Chlorine disinfection from one source can significantly decrease the residual concentrations under the minimum limit in part of the network, while it can increase variability in nodal concentrations.

Keywords:

Pipe network · Water quality · Abnormal operation · Extended period simulation