STUDY OF TRANSPORT OF CONTAMINANTS IN A PIPE NETWORK USING MODEL EPANET

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This thesis has not been previously presented in whole or part to any University or Institute for a higher degree.

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ABSTRACT

The aim of this study was to get an understanding of the transport of contaminants in a water distribution system, using the Model EPANET, in order to meet water quality regulations and customer expectations.

For the application of the model a rural water supply system , having two probable water sources, an elevated tank, three schools and a hospital was selected. The transport of a conservative substance introduced at source, within the system was analysed by varying the hydraulic and water quality parameters for a predetermined demand pattern. The model was also used to design an effective operating program in a two-source distribution system in which pumping schedules were changed to get the contaminant levels below the maximum permissible values. Another application that was studied was the travel of a contaminant introduced at a point in the distribution system other than the source. Here, the study was confined to the behaviour of a conservative tracer introduced at the hospital node. Finally, the behaviour of a non conservative substance entering the system at source was studied. Here the substance considered was residual chlorine, and the decay of the residual chlorine introduced at the source with time and distance was studied. This is helpful in determining the lowest residual chlorine levels in the system, which is a useful parameter in maintaining a safe water supply.

It was revealed that, under average demand conditions, time of travel of a contaminant to any point within the distribution system is the same irrespective of the contaminant concentration, and also it was observed that, if the contaminant is removed promptly the maximum concentration appearing at the nodes in the distribution system can be reduced to a great extent. Thus it was concluded that close monitoring of the source is extremely important in protecting the water supply from contamination.

In the application of the model to the pollution tracing situation, the observation was that, under average flow conditions, the maximum concentration was reached at all nodes located downstream of the node at which the contaminant entered within about 3hrs, irrespective of the concentration of contaminant.

In the two source supply situation, it was observed that the water quality at the critical points in the system could be maintained below the permissible fluoride levels when the pump drawing water from the high fluoride content source was operated during the reak demand period of 13 to 24 hrs only. (with the assumed pump characteristics).

When the behaviour of residual chlorine in the system was studied, it was observed that the model can be used to find out the chlorine booster points to maintain the required minimum residual chlorine content at the distribution ends.

Thus it was concluded that the Model EPANET can satisfactorily be used to study the behaviour of contaminants in a water distribution system, and also we can use this to get an effective operating program in a multy-source system which satisfy the water quality requirements.

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