The topic I am researching is contamination of drinking water, especially regarding how to model the transport of that contaminant in underground pipe networks. The keywords I intend to use in my search are “drinking water,” “contaminant,” “water distribution network,” and “transport.”

Sullivan [1] talks about the potential for terrorist attacks on post-treatment distribution systems and says, “The safety of drinking water cannot be guaranteed because (1) there are multiple points of attack in a posttreatment distribution system and (2) these systems require extensive and costly monitoring to detect any breach in security.”

The Handbook of Drinking Water Quality [2] gives an extensive listing of standards for drinking water relative to various chemicals, both inorganic and organic, as well as microbes and radionuclides. It also provides guidance for laboratory testing. Chapter 10 covers the water treatment cycle for wastewater. In the subchapter “Maintaining Potability,” it stated that the water plant operator must be sensitive to consumer complaints, since they may point out faults in treatment or in the distribution system.

In looking at network models for water distributions systems, Boulos [3] developed a system simulation method which solves the contaminant transport problem in drinking water distribution systems. This method models the time-varying interaction of water quality and hydraulic behavior within the water distribution network. He also says, “The resulting method can be applied to every type of water-distribution system while requiring the least number of calculations necessary to carry out the simulation process.” His model is called “Event-Driven Method” (EDM). My research uses EPANET.

Laird [4] presents an “origin tracking algorithm” to eliminate partial differential equations in the pipe expressions and take time delays from the network pipes into account. Using a direct simultaneous approach, the network model and optimization problems converge simultaneously. This algorithm also eliminates “the need to discretize along the length of the pipes.” The solution of the nonlinear program provides the time and location of potential contaminant sources.

Ostfeld [5] presents “the development and demonstration of a methodology for finding the optimal layout of an early warning detection system (EWDS), comprised of a set of monitoring stations aimed at capturing deliberate external terrorist hazard intrusions through water distribution system nodes, such as sources, tanks, and consumers.”

Bibliography


