Best Practices: Complying With the Stage 2 D/DBP Rule

By optimizing operations and maintenance and deploying new technologies, distribution system operators can improve water quality and achieve and maintain compliance. **BY PETER FISKE AND RANDY MOORE**

**Editor’s Note:** Based on a series of AWWA webcasts, this article is the third of three on important distribution system issues. This article provides operations and maintenance options for complying with the US Environmental Protection Agency’s Stage 2 Disinfectants and Disinfection Byproducts Rule. The first article (Opflow, July 2012) focused on storage tank operations and maintenance, and the second article (Opflow, August 2012) focused on best practices for cleaning water mains. To order the original webcasts, visit www.awwa.org/webcasts and click on the Webcast Library link. Also check out the complete lineup of upcoming webcasts.

WITH THE ARRIVAL of the US Environmental Protection Agency’s Stage 2 Disinfectants and Disinfection Byproducts (D/DBP) Rule in 2006, water utilities began examining options to achieve compliance. Much of the attention has focused on ways of lowering organic matter concentrations at water treatment plants. Although treatment strategies often entail high capital (CapEx) and operational (OpEx) expenses, distribution system operations and maintenance (O&M) practices can also significantly affect D/DBP levels. Fortunately, distribution system O&M strategies often can be implemented quickly and inexpensively.

**STRATEGIES AND TRADEOFFS**

O&M strategies focus on meeting three basic goals: improve source water quality, reduce water age, and right-size disinfectant levels. Unfortunately, meeting these goals often involves trade-offs, the costs and benefits of which must be carefully analyzed.

For example, consider shifting from chlorine to chloramines as a secondary disinfectant. Chloramine disinfectant significantly lowers trihalomethane (THM)
Chemical cleaning prior to installing an in-tank aeration system improves THM removal results by removing sediment and biofilm.

and haloacetic acid (HAA) levels, but making the change can involve significant treatment plant upgrades and exposure to nitrification risk, a water quality challenge not present in a chlorinated distribution system. In addition, chlorine is less effective at neutralized pH levels often targeted in distribution systems, whereas chloramines are most effective at these higher pH levels.

Although reducing water age and increasing flow throughout a distribution system improves water quality, strategies for achieving this also involve trade-offs. A computer model can help you understand how a distribution system operates. Such models can often identify areas in which water age can be reduced or residual levels are insufficient, but they take time and money to build and calibrate. Similarly, flushing can reduce water age in selected parts of a distribution system, but flushing entails a significant amount of operator time, requires additional equipment (such as automated flushing systems), and increases nonrevenue water. In areas where supply is scarce and conservation is a priority, flushing isn’t a viable solution.

TANKS—PROBLEM OR SOLUTION?
Tanks can cause significant problems in maintaining distribution system water quality. Operators must often deal with tanks that are bigger than needed to satisfy demand. In addition, water levels within tanks are often dictated by pressure or emergency reserve requirements. As a result, tank detention times can significantly contribute to a system’s total water age. When residual levels decline, biofilm growth occurs rapidly, especially during summer months.

Forcing turnover has been the traditional approach for reducing water age in
Distribution

An in-tank aeration system pilot study at a Stanly County Public Utilities elevated storage tank reduced THM levels to zero.

IN-TANK AERATION

Some utilities are installing aeration technologies inside water storage tanks to remove THMs, the most common DBP. Results from recent case studies are encouraging. At Stanly County Public Utilities, Albemarle, N.C., a spray aeration system reduced THM levels to zero from an average of 78 mg/L (Figure 2).

Unlike HAAs, THMs are volatile chemical compounds that will evaporate if given a chance. Several aeration technologies are available: bubble-based systems, surface aerator systems, and spray aeration systems, all of which expose water to air and allow THMs to evaporate. Because each technology has a different effectiveness and reliability level, designing a reliable aeration system with predictable results is complex. In addition, each technology’s CapEx and OpEx can vary widely. Deploying multiple strategies simultaneously often yields the best systemwide results. That’s why other strategies, such as tank maintenance, mixing, main cleaning, and chemical cleaning, may be used holistically to improve and manage water quality.

BALANCED TRADE-OFFS YIELD SUPERIOR RESULTS

Compliance with the Stage 2 D/DBP Rule represents a burden and an opportunity. Compliance takes time and resources. Deploying multiple O&M strategies within the distribution system often means significantly lower CapEx and OpEx than those required for treatment plant changes. It makes sense to first exhaust O&M improvements within a distribution system before making treatment plant changes to achieve compliance.

Figure 2. THM Reduction

An in-tank aeration system pilot study at a Stanly County Public Utilities elevated storage tank reduced THM levels to zero.