The majority of Wisconsin's public water systems may be considered to be small systems, yet many of these utilities are not members and don't even know about the Wisconsin Water Association and its wealth of resources.

During 2011, the WWA's Small Systems Committee has focused its efforts on bringing the benefits of the association to Wisconsin's smaller utility operators and managers to provide them with new outlets for learning, new resources for training, and new opportunities to learn more about what's happening with drinking water regulations and legislation.

The committee's members represent small utilities from throughout the state - utilities that serve between a few hundred and a few thousand customers - and are seeking ways to get small utilities more involved in WWA programs and activities. One of the particular challenges the committee has identified is connecting with small-system operators who may not use computers for communication and aren't on member mailing lists. To overcome this handicap, committee members have been personally visiting small systems to tell them about WWA and its programs.

One of the biggest benefits an industry organization can offer to members is the opportunity to interact with comparably-sized utilities and share experiences and knowledge, as well as learn from and provide learning opportunities to larger utilities.

"There are so many resources available through WWA, including the national AWWA education and advocacy programs," committee chair Ann-Perry Witmer said. "If we can get the word to utilities that haven't been involved with WWA before that there are so many practical benefits to being involved, we can broaden our knowledge base as an association and at the same time provide money-saving and time-saving resources to our smaller-system colleagues."

Among the first programs the committee introduced this year was a Hands-On Workshop in Onalaska designed to give participants practical training on operations and maintenance. The one-day workshop was intended to provide training opportunity to utilities in the western part of the state, where small-system operators traditionally have had to travel longer distances to attend WWA educational programs that offer significant continuing education hours. The success of the initial workshop has encouraged the Committee to plan similar events in 2012 in other parts of the state.

Small Systems also will have a more visible presence at WWA's Annual Meeting in September. Programs and technical sessions have been incorporated into the conference to meet Small System needs, and a reception will be held to bring together attendees who are interested in Small Systems for networking and camaraderie.

If you'd like to be involved with the Small Systems Committee, please contact any committee member listed on the roster on WWA's website for more information about meeting times and locations. ✪
Emergency Chlorination Plan

The 2010 code change put into effect a new requirement for municipal water systems for public health protection - Emergency Chlorination Plan (ECP). This article provides some guidance for putting together a quality plan and avoiding some pitfalls.

![Typical Gas Chlorination System](image1)

**Plan Objective**
Per chapter NR819.26(8) Wisconsin Administrative Code, the purpose of the ECP is to ensure municipal water systems can achieve:

- 0.5 mg/l free chlorine
- System-wide
- Within 4 hours

Systems will be required to implement their ECP when they have a confirmed unsafe (bacteriological MCL) water sample. This will not be a big deal for systems already carrying a 0.5 mg/l residual... but could be difficult to achieve for others. The alternative is an immediate boil-water advisory.

![Chlorine Test Meter](image2)

**Code Requirements**
Code requires that plans have the following elements:

- Location/description of chlorine pumps, solution container, chemical, and chlorine test meter.
- Example calculations for determining dosage requirements.
- Procedures for adding the chlorine to the water system, flushing the water system to move it to system extremities, and testing chlorine levels.

A few items should be mentioned before discussing the requirements in more detail. If you have ever put together a plan, you probably realize from experience that plans can get outdated and dusty real fast. It is recommended that the plan be simple and contain facts that are not expected to change from year-to-year (contacts and telephone numbers). Keep the main objective for the plan in mind and you will have a successful plan with minimum administrative time invested.

**Equipment Specifications**
It’s advisable to keep the narrative part of the plan to a minimum by providing tables for quick reference. This works well in the equipment location and description section of your plan. An example of this for systems using liquid chlorine is as follows:

Once the equipment specifications are known, you will have the critical information needed to calculate your dose.

<table>
<thead>
<tr>
<th>WELL/PUMP STATION</th>
<th>STORAGe RESERVOIR(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumping Capacity (gpm)</td>
<td>Type (chlorine/ground/relevant)</td>
</tr>
<tr>
<td>STORAGE LOCATION</td>
<td>Capacity (gal)</td>
</tr>
</tbody>
</table>

**Chlorine Feed System**
- Pump Make/Model
- Max Design Inflow Rate (gpm)
- Solution Container Volume (gal)

**Chlorine**
- Supplier
- Type or Name of Chlorine
- Percent Strength on Label (%) (wt/vol)
- Density (lbs/gal)

**Chlorine Test Kit**
- Make and Model
- Reagent for Free Chlorine Test

**Chlorine Calculations**
Chemical dose calculations will vary depending on type of...
Chlorine continued from previous page

chlorine (gas, liquid, solid) being used and whether dilution is needed for your target dose. While I will not provide examples for each situation, I will mention here that two calculation examples should be included in your plan.

1. Sourcewater Dose
2. Reservoir/Storage Vessel Dose

First, provide a calculation for injecting chlorine into the water at the source. This will most likely be right after the well or treatment plant before entering the distribution system. Hopefully you are already practicing continuous disinfection at these locations to prevent bacteriological contamination events and to deactivate viruses. Simplify by using the same formula for calculating dose currently used for your monthly DNR reports. The only change would be the need to account for higher injection rates or reduced dilution ratios for achieving a higher dose.

Second, provide a calculation for shock chlorinating the reservoir or other storage vessels in the distribution system. If these units are not chlorinated right away, you will find it impossible to meet the 4-hour requirement through source injection and flushing. You have to get chlorine levels up in these large storage basins/tanks before flushing; otherwise, you are drawing low chlorine water out into the system.

Chlorine Dose
At this point, you may be asking yourself: “What should my target dose be?” While this is system specific, some generalities can be made.

First, you want to ensure your dose is high enough to overcome any chlorine demand you might have at the source and in the distribution system. Some chlorine will be used up oxidizing minerals, nitrogen based compounds, and carbon based molecules at the source while some will be used up breaking down films in the distribution system. You do not want to dose at 0.5 mg/l and find out it drops to 0.45 mg/l or lower in the system. You do not have the time for an iterative approach to increasing chlorine levels. You need to start with a higher dose to account for chlorine demand.

Second, keep in mind that the MCL (maximum contaminant level) for chlorine is 4 mg/l. You can add quite a lot of chlorine to the water system without even approaching the MCL. So do not spare chlorine hoping to hit 0.5 mg/l “on-the-money.” If you hit 1 mg/l free chlorine in the system, fine. Don’t second guess and worry about it. You are below the MCL and have a good residual within the allotted time frame.

I was involved in a bacteriological incident last summer in a fairly large system where we required emergency chlorination. A dose of about 0.75 mg/l was specified to ensure chlorine demand was met and the end product was above 0.5 mg/l with room to spare. The reservoir serving the area of the unsafe sample was chlorinated at a higher dose with the thought that demand may be higher in this unit. The residual at the unsafe location ended up reaching a little higher than 1 mg/l free chlorine. Going through this for the first time, the utility manager was a little stressed and concerned that many of his customers would be calling about chlorine related issues and he would be facing a public relations nightmare. I explained to him that this will not be the case since free chlorine does not impart taste and odors at these levels and ascetic problems are typically encountered when demand is not met. This was in fact the case; he had zero complaints. Nobody even knew we were in emergency chlorination mode and on the verge of a boil-water advisory. Many systems across Wisconsin disinfect all the time at these higher levels 24/7 and have excellent aesthetics.

On the other hand, if this system had not been chlorinating prior to the event, the demand could have been greater due to biofilm… the same films that are probably causing unsafe samples to begin with. Breaking down films can create odor and taste issues until stable free chlorine residual is achieved and this takes time. In fact, some systems may need a dose of 2 mg/l or more to obtain a 0.5 mg/l at system extremities. The target dose should never exceed 4 mg/l though without consulting with the Department.

Procedures

Figure 3: Reservoir Biofilm Floc

The last element in your plan should be a simple step-by-step outline on administering emergency chlorination. Procedures should be detailed enough so that the standby operator does not get lost in the process but not too detailed to where the plan is outdated within a few months of being written. In other words, find balance between being “generic” and being “detailed.” Before finalizing the plan, have the standby operator go through it in a simulation. Example steps could be as simple as:

Example Procedure: Systems Already Chlorinating
Objective: Get 0.5 mg/l of free chlorine throughout the distribution system within 4 hours.

1. Increase the chemical feed rate or dose at the well house or pumping station.

2. Add additional chlorine to the reservoir.

3. Open hydrants and flush water from the system to draw chlorine out into it.

4. Using the chlorine meter, test the water in the system as follows: use correct pillow packets labeled “free chlorine,” run test within 3 minutes of collecting the sample, read the meter within 1 minute of adding the reagent. The chlorine must be at least 0.5 mg/l as “free” chlorine.

5. Obtain follow-up bacti samples as directed by the WDNR; be sure to test free chlorine concentration at each sample location.

6. Continue emergency chlorination until all follow-up samples come back safe and the WDNR lifts the requirement.

7. Report the amount of chlorine used and test results on the monthly well pumpage report forms.

Note: See enclosed calculation procedures to check dilution, solution needed, & reservoir disinfection.

Summary
Having an emergency chlorination plan in place before an “unsafe” bacteria event occurs is good policy. It is a good starting point to ensure a safe, skilled approach to disinfecting a water system in a short time period during times of crisis. It is also a code requirement.

A good plan will have all of the required elements. It will not be so detailed so as to make it impractical to follow in an emergency or become quickly outdated. Using tables for critical system information as well as their location reduces tedious reading when it must be implemented immediately. Dosage calculations will provide the operator with information to accurately determine the amount of chlorine to add at the wells and reservoirs to satisfy chlorine demand and meet the 0.5 mg/l requirement at system extremities. Simplified procedures allow the standby operator to get up and running in no time.

Every water system will eventually have positive bacteria tests and some will be required to emergency chlorinate after they are confirmed. The alternative of meeting emergency chlorine levels within 4 hours is a boil-water advisory. Public health must be protected one way or the other and a good emergency chlorination plan will take the edge off when that time arrives.
Small Systems

Small Systems Hands-On Workshop
Debuts to Rave Reviews

More than 70 participants learned about leak detection, confined entry, sampling protocol, hydrant flushing, and a host of other topics offered at the Small Systems Committee’s inaugural Hands-On Workshop. The program was held May 11th at the Omni Center in Onalaska and featured stations that included regulatory reporting, pump maintenance, and safety training for operators from smaller water utilities throughout the state. Representatives of the Department of Natural Resources, the Public Service Commission, WisWARN, WWA Membership, and many vendors provided participants with hands-on training at each of the stations.

The program marked the first event sponsored by the newly reactivated Small Systems Committee, which focuses on topics and events of specific interest to the state’s smaller utilities, particularly those with limited resources and personnel. Many of the participants in the May 11th program were new to Wisconsin Water Association, and a number of attendees expressed an interest in learning more about the Association and its programs.

Workshop coordinator and committee Vice Chair Jim Prindle was pleased with the number of participants at the first-ever workshop and envisions another hands-on workshop in 2012 in another region of Wisconsin, possibly in Marshfield. By moving the one-day event to a new region each year, the program has the ability to reach operators who otherwise would be unable to attend a training program or conference.

“The goal is to make this program as accessible as possible for utilities with limited resources,” Prindle said. “We’ve talked with operators and learned that the thing they value most is hands-on training, so we put the focus on keeping stations small enough that participants can receive individual attention while they learn.”

Comments received from participants indicate the first program was successful. “Excellent first-time event!” wrote one participant. Said another: “Thanks, this was great.”

The Small Systems Committee looks forward to its next Hands-On Workshop and welcomes ideas for topics, presenters and hosts for upcoming programs. Contact any committee member (roster is listed on the WWA website) if you’d like to become involved.

Small Systems Ups Their Profile at Annual Meeting

WWA’s Small Systems members will have a higher profile at this year’s WWA Annual Meeting in Wisconsin Dells, with more technical sessions, activities, and programs specifically targeted to representatives of the state’s smaller water utilities.

Participants in this year’s conference who consider themselves to be associated with small systems should check the Small Systems box on the registration form to be recognized for their special status. All self-designated Small Systems participants will be given a special name badge ribbon so they can recognize and network with other small system members.

The Small Systems Committee this year decided that customer numbers do not necessarily define whether a water system operates as a small system or not, so it invites WWA members and guests to define themselves as a Small System based on how their utility is configured and administered. In this way, WWA’s members can network and share resources and experience based on their own needs rather than on their Utility Class or customer base.

While it’ll be easier for Small Systems attendees to find each other by name badge designation at this year’s Annual Meeting, the Small System Committee will provide a special opportunity for small-utility operators and managers to come together at the first Small System reception, which will be held Sept. 21 before MAC Night events. This event will provide participants with a great opportunity to meet other attendees who have faced similar challenges and situations, and to share experience and resources.

Several technical sessions will be held that offer topics of specific interest to our smaller utilities. Topics include public relations for small systems, infrastructure funding in tough economic times, and making operational modifications that improve your utility without straining your pocketbook.

If you don’t consider yourself a Small Systems member, please look for those who are wearing the Small Systems ribbon on their name badge and welcome them to this year’s WWA Annual Meeting.