Fact Sheet

Reminder to Surface Water Systems: Adjust Operations for Cold Weather

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If you operate a surface water source throughout the year, you need to make seasonal adjustments to your treatment processes when temperatures drop. Some of these are covered below.

Disinfection

Chlorine is less effective under cold-water conditions. For example, consider a filtered system that is required to provide 1 log inactivation of Giardia lamblia cysts through the disinfection process. As you can see from the following table, this example system must double its usual summertime residual to achieve the same level of Giardia inactivation in winter.

	pH	Temperature (°C)	Contact Time (Minutes)	Required Chlorine Residual (mg/l)
Summer Conditions	7.8	16.0	54	0.6
Winter Conditions	7.8	8.0	54	1.2

A check of last year's records will help you predict the correct target for winter operation.

First, a quick review: CT is the residual disinfectant concentration leaving the contact basin in mg/L multiplied by the time in minutes that chlorine is in contact with water. CT_{calc} is your daily calculated CT value. It must always be greater than $CT_{required}$ which depends on pH, temperature, chlorine residual and your required Giardia inactivation.

To calculate $CT_{required}$ enter your winter water quality conditions and Giardia inactivation requirement on the disinfection tab of the SWTR Monthly Report workbook for your system. You can find the workbooks for each filtration technology on our surface water treatment page.

The workbook automatically calculates the inactivation ratio, $CT_{calc}/CT_{required}$. Adjust the chlorine residual to achieve an inactivation ratio of at least 1.0. Consider using a safety factor of 1.2 to 1.5 to establish your feed pump and alarm settings. Then daily CT monitoring will make sure you stay on track.

Alternative disinfectants like ozone, chlorine dioxide and chloramines are also sensitive to temperature. For more information see the CT tables in EPA's SWTR Guidance Manual.

Coagulation

Winter weather may bring source water quality changes such as turbidity spikes or increases in iron or manganese levels. In addition, the performance of your coagulation chemical may be temperature-dependent. Check historical records for your plant or try some jar testing to determine what adjustments may be necessary to keep your plant operating in top condition under winter conditions.

Systems that use a streaming current detector (SCD) will need to re-evaluate optimum set-points. They may also need to relocate their SCD sampling point farther downstream of chemical injection to reflect slower chemical reaction times at low temperatures.

Filter aid polymers (such as polyacrylamide products) may dramatically improve filter performance during cold weather operation—perhaps more than at any other time of year.

Backwash expansion

For systems that operate rapid sand filtration plants, proper cleaning of the filter bed during the backwash cycle depends on maintaining proper bed expansion. This expansion should remain constant year-round. In general, a lower flow rate is needed to achieve the same bed expansion during cold water periods than in warm water periods. This is because cold water has more lifting power than warm water due to the difference in viscosity. If you are located in an area with wide temperature variations and you do not make an adjustment for temperature, your filters may not be sufficiently cleaned in summer, or you may lose filter media due to carryover in winter. Develop a standard operating procedure for measuring filter bed expansion and use it each season when water temperatures change.

For more information

Other sources of information include the following.

- Filter Backwash 331-624
- Monitoring Surface Water Treatment Processes 331-620
- USEPA, 1991. Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources
- "Bed Expansion Affects Performance", Opflow, AWWA, November 2003
- "Question of the Month", Opflow, AWWA, January 1996

Our publications are online at doh.wa.gov/drinkingwater.

Contact our nearest regional office from 8 AM to 5 PM, Monday through Friday. If you have an after-hours emergency, call 877-481-4901.

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