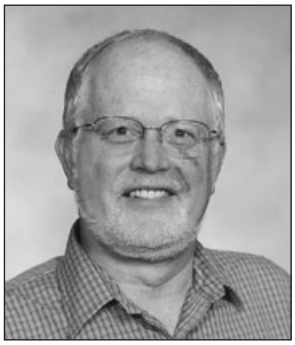
by Pat McCool

Continuous chlorine monitoring helps systems ensure water quality

There have been considerable changes in the monitoring and recording of chlorine residuals in water treatment plant processes in the last 10-15 years. The use of continuous chlorine monitoring and recording equipment has occurred due to several factors. State and federal regulations require such on surface water treatment plants. Also, with plants that operated automatically when water is needed, such monitoring and recording equipment is needed since the operators may not be present during plant operation.

Fortunately, the technology and equipment for continuous monitoring and recording are now available in accurate and reliable equipment. Residuals can be recorded automatically in plant computer databases. If residuals become too low or too high from operator-determined limits, the computer and control system can automatically shut-down plant operations and place calls to operators about the situation.

Pat McCool
Consultant



Most continuous chlorine monitoring locations are where the water enters the distribution system; this is required by the regulations to help ensure that the water leaving the treatment plant has the required residual. However, at surface water treatment plants using combined chlorine residuals, the monitoring at this location most likely does not show whether adequate disinfection has taken place.

Max Kraus, Alma city superintendent, makes an adjustment on the chlorine analyzer at the city water plant.

The location that determines whether or not adequate disinfection has occurred is usually the location after disinfection with free chlorine and just before where the ammonia is being added. The free chlorine residual at that location is usually the most important measurement for disinfection and whether the plant is meeting Contact Time (CT) requirements of the regulations. of the regulations. Continuous free chlorine monitoring and recording equipment should also be installed at this location if it has not been. This will provide the operators with continuous data on this most important plant process (disinfection with free chlorine) even when operators are not present.

The free chlorine residual at this location can be highly variable – thus the importance of continuous monitoring. The residual can vary due to chlorine demand in the water, sunlight on the water, changes in detention time due to operation, and no operation or malfunction of

The location that determines whether or not adequate disinfection has occurred is usually the location after disinfection with free chlorine and just before where the ammonia is being added.

chlorine feed systems. It is the malfunction of chlorine feed systems that potentially presents the most dangerous situation.

Several years ago a large surface water treatment plant had a malfunction of the chlorine feed system that caused a major problem. Because most plant functions were automated, operators were generally not at the plant. The plant *only* had continuous chlorine monitoring on the water being pumped to the customers as required by law. If the chlorine residual at that location went below an operator-determined level, the plant's automatic control system called the operators to inform them of such.

Chlorine was being added at the rapid-mix at the beginning of the plant processes. Ammonia was being added to the filter effluent to form combine chlorine to limit trihalomethane and haloacetic acid production. There were many hours of treatment and storage between the point of chlorine addition and the location where the chlorine was being continuously monitored.

One evening, no operators were at the plant as it was set to operate on automatic controls. A low chlorine residual alarm called an operator at his home. The operator immediately drove to the plant, confirmed that the residual was zero; he immediately shut the plant down. The result was to have a surface water treatment plant full of non-chlorinated water and some non-chlorinated water had been pumped to the distribution system. Needless to say, much time and effort was needed to flush the distribution system and treatment plant, sample for coliform bacteria, and re-start all plant operations. The repair of the chlorine system was easy compared to the problem of non-chlorinated water in the plant and distribution system.

If this plant had had an additional continuous chlorine analyzer and call-out, for example at the sedimentation basin effluent or before, then the operator would have had to address the non-chlorinated water in that basin only, a much smaller problem indeed. This plant did have an additional chlorination point on the sedimentation basin effluent line; this chlorination point could have been and was used to chlorinate the non-chlorinated water in the basin. Thus, correcting the problem would have been much easier than having to also address non-chlorinated water in the filters, clearwell, and distribution lines.

Operators and managers of surface water treatment plants should consider installing an additional continuous chlorine monitoring location. They should choose the location where the free chlorine is most important in the CT calculation and most important for disinfection. Controls for shutting down the plant if chlorine residuals are too low should also be installed along with call-out to operators when such conditions occur.

If you wish to have any assistance in determining locations for additional monitoring or controls, contact me through KRWA a 785/336-3760. Either I

The residual can vary due to chlorine demand in the water, sunlight on the water, changes in detention time due to on-off operation, and malfunction of chlorine feed systems.

or other KRWA staff will be glad review your situation and provide advice on this matter.

Later this year, KRWA will be offering one-day workshops at various state-wide locations that cover in detail the topics of chlorination, chlorination by-product reduction, CT calculations, chlorine monitoring and possible operations problems. All surface water treatment systems are encouraged to attend.

Also, I encourage you to attend the many excellent technical topics that will be presented at the 2005 KRWA Annual Conference & Exhibition, March 29 – 31 at Wichita. I hope that board and council members can also accompany operators who attend. The conference offers outstanding opportunities to learn about new technologies and processes. I hope to see you there.

A continuous chlorine analyzer shows the instantaneous 3.64 mg/l total chlorine residual. The circular chart recorder records data over a day's or week's period of time before the paper chart is replaced with a new chart. These paper charts are kept as required by law.