Moving away from chloramines while maintaining water quality

<table>
<thead>
<tr>
<th>DATE</th>
<th>PROCESS CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 2, 2007</td>
<td>MOS replaced chlorine gas at pre-treatment</td>
</tr>
<tr>
<td>March 6, 2007</td>
<td>MOS replaced chlorine gas at post filtration</td>
</tr>
<tr>
<td>April 24, 2007</td>
<td>Ammonia discontinued</td>
</tr>
<tr>
<td>August 7, 2007</td>
<td>MOS dose in pre-treatment decreased from -2.0 mg/L to ~1.5 mg/L</td>
</tr>
<tr>
<td>August 7, 2007</td>
<td>MOS dose in finished water decreased from -2.1 mg/L to ~1.6 mg/L</td>
</tr>
<tr>
<td>October 3, 2007</td>
<td>MOS dose in pre-treatment decreased from ~1.5 mg/L to ~1.0 mg/L</td>
</tr>
</tbody>
</table>

The Lake Murray Water Treatment Plant (LMWTP) in West Columbia, S.C., was dedicated in 1991 with a capacity of 6 million gal per day (mgd). With upgrades completed in 2007, the plant has a current capacity of 22.5 mgd. Most of the water from LMWTP is sold; 19% of the water is distributed to the system for which the LMWTP management and staff is responsible.

In the early 1990s, the water treatment plants in West Columbia began using chloramines as the primary disinfectant to control disinfection byproduct (DBP) concentrations in distribution. Chlorine gas was the source for the chlorine. In 2006, management at LMWTP was asked by the state regulatory agency to maintain a 30-day supply of chlorine on site. As a result, management decided to convert to a MIOX mixed-oxidant solution (MOS) onsite generation (OSG) system. The OSG system uses only salt and power to generate a dilute chlorine-based solution, eliminating the storage and handling of hazardous disinfection chemicals.

Making the Switch
The LMWTP management and staff began a three-phase transition to the new system in February 2007 by first replacing chlorine gas with MOS in pretreatment. In March, chlorine gas was replaced with MOS in the chloramination process. The third and final phase of...
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indicates that the bulk of the DBPs were formed in-plant and mostly in the clearwells, suggesting they were contaminated with biofilms which are now gradually being removed by MOS. The pretreatment dose has been reduced by 50% from 2 to 1 mg/L.

The residuals in distribution have remained greater than 0.4 mg/L at all the testing locations. This type of residual maintenance is consistent with MOS chemistry observations. The final treatment dose is now down to approximately 1.6 mg/L, a reduction of 24%. The reduction in final dosing is consistent with prior MIOX MOS experience.

Studies are currently underway at the plant to gather detailed data on how unit operations impact DBP formation. Other operational changes to optimize plant performance, including coagulation and sedimentation processes, are underway.

Conclusions
- Conversion from chloramines to MOS was successfully implemented without major chlorinous odor complaints or problems.
- DBP compliance was reached by September 2007.
- By year’s end, average DBP values were very near those of one year earlier when chloramines were used.
- MOS-treated distribution system DBP values were lower than those in the second system still using chloramines.
- Distribution system residual stability allowed lower MOS dosing at the plant.
- Increased TOC removal in treatment is possibly due to a microflocculation effect in pretreatment by MOS.
- TTHM, HAA5, and residual maintenance data suggest a gradual reduction in biofilms, in the clearwells and in distribution.

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