The use of Hydrogen Peroxide \( (\text{H}_2\text{O}_2) \) as a pre-oxidant in municipal water treatment is well documented and has been practiced for over 15 years. Historical applications of \( \text{H}_2\text{O}_2 \) in drinking water have been for taste and odor control, hydrogen sulfide removal, iron removal and ozone enhancement/destruction. With the EPA Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) coming into effect, more recent emphasis has been on the reduction of the formation of total trihalomethanes (TTHM) and haloacetic acids (HAA5).

**TTHM and HAA5 Reduction**

Stage 2 DBPR is put into effect to reduce potential cancer, reproductive and developmental health risks from disinfection byproducts (DBP’s) in drinking water. Research on the use of \( \text{H}_2\text{O}_2 \) for this application is documented as early as the 1970’s, with actual implementation in North American municipalities over the past several years. Recent water plant applications have demonstrated positive results in reducing TTHM and HAA5 as well as improving TOC reduction. In addition, some water plants have recently documented significant reductions in TTHM and HAA5 by the use of \( \text{H}_2\text{O}_2 \) in doses as low as 0.5 mg/L. Other benefits such as algae control and taste and odor improvement have also been documented.

The use of \( \text{H}_2\text{O}_2 \) for TTHM and HAA5 reduction does not require expensive capital projects so it can be easily integrated into existing water plant operations. This allows \( \text{H}_2\text{O}_2 \) to be full-scale pilot tested so that its benefits can be documented under a plant’s specific conditions. This is a critical step since all source water varies in organics make-up and therefore individual plant results with the use of \( \text{H}_2\text{O}_2 \) may vary from plant to plant.

**Taste and Odor Control**

Surface waters often contain objectionable taste and odor compounds. Many of these can be treated with \( \text{H}_2\text{O}_2 \). In a study conducted in the late 1980’s*, \( \text{H}_2\text{O}_2 \) was equally or more effective than \( \text{KMnO}_4 \) for the removal of various taste and odor compounds. While \( \text{H}_2\text{O}_2 \) is successful in treating many taste and odor occurrences, in some instances it cannot control higher levels of geosmin and MIB. In these cases, an advanced oxidation process that involves the generation of hydroxyl radicals such as UV / \( \text{H}_2\text{O}_2 \) or Ozone / \( \text{H}_2\text{O}_2 \) is the recommended alternative.

**Ozone Enhancement/Ozone Residual Quenching**

\( \text{H}_2\text{O}_2 \) can be used to enhance the performance of ozone systems for organic oxidation (e.g. taste & odor compounds, THM precursors) or for quenching of ozone residuals near the end of the contactors.

**Hydrogen Sulfide Removal**

Hydrogen sulfide \( (\text{H}_2\text{S}) \) is a common taste and odor compound found in underground potable water sources characterized by a rotten egg odor and metallic taste. \( \text{H}_2\text{O}_2 \) can effectively oxidize \( \text{H}_2\text{S} \) to remove the taste and odor as well as corrosion associated with sulfides. The oxidation reaction can be controlled under alkaline conditions to produce soluble sulfate and a minimal amount of colloidal sulfur; hence, turbidity is minimized. For this application \( \text{H}_2\text{O}_2 \) is more economical than \( \text{KMnO}_4 \) or chlorine and has no harmful by-products.

Iron Removal

The removal of iron from potable water sources is aesthetically advantageous, since iron can discolor the water, spot laundry and stain plumbing fixtures. In addition, the growth of iron-oxidizing bacteria can result in abnormal taste and odor as well as contribute to biofouling in water distribution systems. \( \text{H}_2\text{O}_2 \) is very effective in the oxidation and precipitation of iron as it rapidly oxidizes iron to a ferric state to form dense, easily settled solids, which are then removed through conventional flocculation/precipitation/filtration systems. \( \text{H}_2\text{O}_2 \) has a fast reaction rate and is also more economical for this application than KMnO\(_4\) or chlorine.

Safety

\( \text{H}_2\text{O}_2 \) stored and handled in a safe manner can be integrated into almost any environment, including raw water lift stations at water plant intakes or in the water plant itself. Compared to other chemicals typically used in water plants, \( \text{H}_2\text{O}_2 \) has a lower oxidizer class rating (see table below) making it easy to integrate into existing and new plants.

### NFPA Hazard Code of Common Chemicals

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Health</th>
<th>Flammability</th>
<th>Reactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone</td>
<td>4</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Chlorine</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Sodium Hypochlorite (12-15%)</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Potassium Permanganate</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Hydrogen Peroxide (35% &amp; 50%)</td>
<td>3</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

About US Peroxide

US Peroxide is the leading supplier of hydrogen peroxide based technologies and services for environmental applications. We have been serving the Municipal market for over 15 years and have offices and field service locations throughout North America.

Our consultative approach to problem solving includes performing objective customer “needs” assessments, application modeling and development of chemical treatment programs tailored to a customer’s specific requirements.

Use of full-service programs successfully integrates storage and dosing equipment systems, chemical supply, inventory and logistics management as well as ongoing field and technical support. This comprehensive operations and program management approach provides cost effective turn-key solutions to our customers.

Please contact one of our water specialists for assistance on your particular application.

US Peroxide treatment provides benefits over other oxidative technologies:

- Economical
- Fast reaction rate
- Easily settled solids
- Minimal equipment requirements

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