Why should you look for ammonia?

Ammonia is not commonly measured in drinking water despite potentially being problematic in your source water, especially in groundwater. It can create a large chlorine demand, as the ammonia is converted to nitrogen gas and the chlorine becomes chloride. Depending on the amount of chlorine added, it is possible for the combination of the two to form chloramines by accident which can then increase the risk for nitrification and biofilm growth in the distribution system. Some systems have seen such a dramatic pH drop due to nitrification that it has resulted in lead and copper corrosion.

Testing for ammonia is recommended if you have any of the following issues in groundwater or in your distribution system:

- Difficulty achieving or maintaining a free chlorine residual
- Iron or manganese
- Color
- Hydrogen sulfide (H₂S—rotten egg odor)
- Difficulty achieving or maintaining a free chlorine residual
- Drop in distribution system pH
- Copper or lead corrosion issues in the distribution system
- Nitrification-related symptoms in the distribution system

You can send samples to a laboratory (Standard Method 4500 NH₃), or you can use a portable test kit. Testing for total organic carbon and methane is also recommended, since these compounds frequently co-occur. Keep in mind that methane can build up in the headspace of tanks and create an explosion risk.

Ammonia Treatment

Three of the most common options for treatment are discussed in the following table. In addition to those options reverse osmosis, ion exchange and air stripping with pH adjustment may be appropriate in some applications. For air stripping to be viable the pH needs to be adjusted to 11, which may not be cost effective for hard water.

<table>
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<tr>
<th>Treatment Type</th>
<th>Details</th>
<th>Important Considerations</th>
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<tr>
<td>BREAKPOINT CHLORINATION</td>
<td>The idea here is to add enough chlorine to convert all of the ammonia to nitrogen gas. The chlorine is converted to chloride. Additional chlorine is added to maintain a free chlorine residual in the distribution system.</td>
<td>It requires 8 to 12 mg/L of chlorine for every 1 mg/L of ammonia to complete the reaction. Applying high doses of chlorine can lead to disinfection byproduct formation. Competition from other chlorine demanding compounds (i.e. Fe, Mn, H₂S, TOC) will drive up required chlorine dosage even higher.</td>
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<tr>
<td>CHLORAMINATION</td>
<td>If you have naturally occurring ammonia at about 0.5 mg N/L or less, you may be able to add chlorine to form chloramines.</td>
<td>If you have color due to organics (e.g. total organic carbon or TOC) or hydrogen sulfide (H₂S), then this may not be the best option. You will still have color and odor issues after chlorine addition.</td>
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<td>BIOLOGICAL OXIDATION</td>
<td>Microbes use oxygen to convert ammonia to nitrite and then into nitrate. This is called nitrification. While nitrification is typically discouraged in distribution systems, this process encourages nitrification in the treatment plant to avoid subsequent impacts on disinfection.</td>
<td>In order to achieve biological removal of ammonia, you need to have water with adequate dissolved oxygen. The process can lower the pH, and does use the dissolved oxygen. Need a reactor vessel/pressure vessel for the biological growth to remain as an attached growth process.</td>
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