

Ozone Water Treatment for Taste and Odor Control

Background

Taste and odors found in drinking water can be from inorganic or organic sources. Iron and hydrogen sulfide are two common inorganic compounds known to produce odors in drinking water. Both are easily treated via oxidation. Organic compounds are normally the result of life processes of micro organisms and are often found in nanograms (ng)/l concentrations. Organically derived tastes and odor tend to be seasonal with most of the issues arising in summer months from impounded water. Two noteworthy compounds are geosim and MIB (taste and odor thresholds of 6 and 10 ng/l). There are other types of odor causing compounds such as those from industrial pollution and by-products from the drinking water treatment process itself. The latter is most notably caused by the reaction of chlorine or chloramines with materials found in the water.

Treatment form taste and odor can be carried out by both oxidative and non oxidative methods. Examples of non oxidative process include air stripping to remove dissolved gases, powdered activated carbon and granulated activated carbon. The effectiveness of these methods depends on the specific organic compounds causing the tastes and odors. In some cases, absorbents such as PAC/GAC might be economical. Various oxidants have been used with varying success for taste and odor control. Simple aeration may be effective for iron and hydrogen sulfide depending on pH and, in the case of iron, whether the iron is complexed with organic compounds. Chlorine is effective in some situation and in other actually creates odors itself or through it's by products. Potassium permanganate at high concentrations is effective against some compounds, but not very effective against the important compounds geosim and MIB.

Ozone Water Treatment

Ozone used by itself or with peroxide/UV has been found to be effective in removing many taste and odor compounds including geosim and MIB (1,2,3). In some cases the same levels of ozone used for disinfection are also effective at removing taste and odor. The Metropolitan Water District of Southern California did studies on the use of ozone and ozone with peroxide and found that with ozone alone dosages of 4 mg/l were necessary to treat pilot plant effluent spiked with geosim and MIB. When peroxide was added, the ozone dosage was dropped to 2 mg/l (4)

It is believed that ozone is most effective where the formation of hydroxyl radicals is favored and where compounds that can scavenge these radicals is minimized. Where ozone is a slow and selective oxidant, hydroxyl radicals, a natural by product formed by

ozone in water, is a fast and non selective oxidant. Carbonates tend to scavenge hydroxyl radicals and thus reduce the concentration in the water. Elevated pH, hydrogen peroxide and UV increase the amount of hydroxyl radicals formed from ozone.

Peroxide is added with ozone when the concentration of Geosim and MIB are particularly high, on the order of hundreds of ng/l. Adding ozone alone in the first chamber of an ozone contactor can permit CT credits for disinfection to be earned. Ozone and peroxide can then added in later chambers of the contactor to create condition favorable for hydroxyl radical formation for taste and odor control. This allows two treatment objectives to be achieved in the same unit operation. The use of ozone to affect two or more treatment objective is a good reason to employ this powerful oxidant and disinfectant.

The effectiveness of ozone is also enhanced if it is followed by biological filtration. Ozone partially oxidizes the geosim and MIB and the biological filters continue the oxidation. The combination can result in 90-100% removal of these compounds (5). The explanation for this effect may be that ozone is very effective at taking non biodegradable compounds and making them biodegradable. This may be what is occurring in systems that employ both ozone and biological filters, normally the biological filters would not be able to treat the geosim or MIB, but after exposure to ozone and the presence of the high dissolved oxygen levels the filters become effective.

Spartan Environmental Technologies

Spartan can provide complete ozone water treatment systems using ozone and advanced oxidation processes including ozone/peroxide for treatment of taste and odors in water. Please contact us for further information by phone, fax or e-mail using the contact information at the bottom of the page.

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