While iron (Fe) and manganese (Mn) don't pose health problems, water contaminated by these species can stain water fixtures and clothing that is washed with this water. A typical treatment process involves oxidation, which makes the metals insoluble, followed by filtration.

In general, Fe is fairly easily oxidized by oxygen or chlorine. Mn is more difficult to oxidize, but can still be oxidized by chlorine at the proper pH levels. For both Fe and Mn there are conditions involving pH or Fe/Mn complexes with organics that make removal less efficient. In these cases ozone can be an effective oxidizing agent that is not as sensitive to pH and organics.

Another issue with the use of chlorine based compounds such as bleach is the potential to form trihalomethanes (THM) from organics in water. Control of THM has become a public health issue and the EPA regulates these compounds in water to less than 100 ppb. Some public water systems have switched to ozone from chlorine due to this issue.

Application of ozone for iron and manganese removal depends on a variety of factors. The following discussion provides some base line information on the conditions and amounts of ozone required. Pilot testing will define the exact amount of ozone required and the type of ozone generator equipment required.

Ozone oxidizes iron from Fe (II) to Fe (III). Fe (III) hydrolyzes to Fe (OH)3 which precipitates to a solid form which can be filtered. The oxidation reaction requires 0.43 mg of ozone per mg of Fe (II). Excess ozone can be used without negative effect. Typically, a dose of 0.50 mg/l is used. Note that we are referring to the transferred dose of ozone since there is some loss of ozone in the dissolution process. Fe oxidizes in the pH range of 6-9.

In general, when organic materials are present in water, more ozone may be required than the amount shown above since ozone will also oxidize these materials. The nature of the precipitate will depend on temperature and water chemistry.

Ozone oxidizes Mn (II) to MnO2 (Mn IV) which is insoluble and can be filtered out of the water. The oxidation reaction requires 0.88 mg of ozone per mg of Mn (II). Excess ozone beyond this ratio will form soluble Mn (VII), permanganate, turning the water pink. If oxidizable organic material is present in the water and there is sufficient contact time, permanganate will be reduced back to MnO2 (Mn (IV)). Manganese oxidation is most effective around a pH of 8.

Ozone generator output can be controlled via an ORP monitor automatically. This prevent over or under dosing of ozone into the water.

It is important to note that at start-up ozone might strip deposits of iron and manganese in the treatment plant. During the break in period, therefore, iron and manganese may remain high until these deposits are removed.

To learn more about ozone in drinking water treatment visit:

http://www.spartanwatertreatment.com/drinking-water.html