

# Hydrogen Sulfide

Hydrogen sulfide is a flammable gas produced by the decay of organic material. Because it vaporizes almost instantly, hydrogen sulfide is very difficult to detect analytically in a water sample. Generally, the odor of hydrogen sulfide is enough to determine its presence. Although an official limit has not been established for hydrogen sulfide in drinking water, a recommended limit of 0.05 milligrams per liter (mg/l) has been proposed.

## CAUSES:

Hydrogen sulfide is a dissolved gas that occurs naturally in water supplies as a result of the decomposition of underground deposits of organic material.

Hydrogen sulfide can also appear suddenly in wells as a result of the growth of a

group of bacteria known as “sulfate reducing” bacteria. These bacteria break down the naturally occurring sulfate compounds in the water, producing hydrogen sulfide as a by-product. Disinfection of the well system is generally sufficient to remove the sulfate reducing bacteria.

In some cases, hydrogen sulfide will occur only in the hot water as a result of a chemical reaction in the water heater itself. Most water heaters contain a corrosion protection device known as a “sacrificial anode.” When dissolved sulfate compounds come in contact with the anode, the resulting chemical reaction converts the sulfates into hydrogen sulfide.

Removal of the sacrificial anode will generally eliminate the problem. However, this may void the warranty on the water heater. The manufacturer’s service representative can best advise you in this regard.

## **EFFECTS:**

The most noticeable effect of hydrogen sulfide is the “rotten egg” odor and sulfur taste it gives to water. The odor and taste of hydrogen sulfide can be detected at levels as low as two-hundredths of a milligram per liter. At the levels normally occurring in drinking water, hydrogen sulfide is not considered a health hazard.

The presence of hydrogen sulfide speeds up the corrosion of metal plumbing materials. It will attack iron, steel, copper, and galvanized plumbing, producing a black color in the water. The effects of corrosion by hydrogen sulfide may go unnoticed for as long as several months, then suddenly become severe.

In combination with dissolved iron, hydrogen sulfide can produce black stains in plumbing fixtures and laundry. A black deposit may also collect in piping and on fixtures.

## **TREATMENT:**

Activated carbon filters, sometimes sold as “taste and odor” filters, are not effective for hydrogen sulfide removal. Some form of chemical oxidation is the most effective method of removal. In chemical oxidation, the hydrogen sulfide is converted to an insoluble sulfur particle, which is then collected on a filter. Some of the sulfide may be converted to a sulfate compound which remains dissolved in the water. The following methods are generally acceptable for sulfide removal:

- 1. Automatic Chlorination and Filtration:** With this method, small amounts of a chlorine solution are continuously added to the water using a small metering pump. The chlorine chemically oxidizes the hydrogen sulfide to an insoluble sulfur particle which can then be filtered. The filter must be periodically backwashed to remove the accumulated sulfur.
- 2. Manganese Zeolite (Greensand) Filters:** Greensand filters use a filter material that contains manganese dioxide. This compound releases an atom of oxygen to oxidize the hydrogen sulfide. The oxidized particles are then collected on the filter bed. These filters require periodic regeneration with potassium permanganate to replace the oxygen used in the removal process. Backwashing is also required to remove the accumulated sulfur.
- 3. Water Softeners:** Water softeners may be used for hydrogen sulfide removal only under certain conditions. Always check the manufacturer’s recommendations before using softeners for sulfide removal.