

DROPS OF WATER INFORMATION

Laboratory Notes from Water Systems Engineering

Common Mineral Deposits that may Foul a Well System

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Mineral scale is the most readily identified and often misunderstood well foulant. Mineral scale development is often associated with bacterial fouling at some level. In this write-up, the most common mineral scales identified in well systems are discussed.

Carbonates (Calcite)

Almost always calcium carbonate, but on some occasions, magnesium and iron carbonate. Carbonate scale typically reflects the tapped and surrounding aquifers. The potential for accumulations in your well is measured by the analyses for:

- Alkalinity
- Calcium
- Total Dissolved Solids
- pH
- Temperature

Key to Determination:

Calculate the Langelier Saturation Index; a positive number indicates a potential for carbonate deposits to form in the well. Conversely, a negative number indicates a reduced likelihood for carbonate deposition and may indicate the potential for some corrosion activity. Deposits of carbonate scale are likely if pH is >7, hardness is >180 mg/l, and alkalinity is >150 mg/l.

Calcium Sulfate (Gypsum)

An often overlooked and rare form of scale found in well systems. The potential in the well is measured by analysis for the above parameters plus the following:

- Carbonate Hardness
- Non Carbonate Hardness
- Sulfates

Key to Determination:

If the Saturation Index is positive indicating potential for calcite deposits, the non carbonate hardness is greater than the carbonate hardness, and sulfate levels are in excess of 100 mg/l, then gypsum or sulfate scale are likely. Sulfate scale may be major blockage if pH is >7, hardness is >180 mg/l, alkalinity is >150 mg/l, and sulfates are >150 mg/l.

Oxides

Oxide deposits are most often an oxidized form of metals, commonly iron and manganese. As this is often a form of corrosion by-products, the potential may require not only knowledge of the existence of iron and manganese levels in the aquifer, but also the potential for corrosion of the well structure. Therefore, run all of the tests above plus:

- Iron
- Manganese
- ORP (Oxidation Reduction Potential)

Note: Oxide deposits may be the result of the involvement of iron or manganese oxidizing bacteria.

Key to Determination:

If the Saturation Index is negative and the ORP is below 150 mV, the well contains corrosive water and any metal in the system is subject to releasing ions (most likely iron) into the water to become oxidized. You may also accumulate iron and manganese oxides, which are red (usually iron) and black (usually manganese) from oxidation of the iron and manganese found in the aquifer water. Serious fouling can occur when iron levels are in excess of 1.0 mg/l and manganese is above 0.1 mg/l.

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