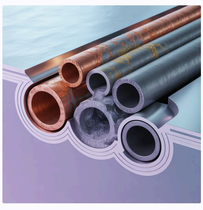
Corrosion Control and Infrastructure Longevity

Reducing chlorine dosage by 50-70% through MWT integration provides substantial infrastructure protection benefits that translate to significant economic savings and extended asset lifespans. Understanding the corrosion mechanisms and their mitigation is essential for evaluating the full value proposition of MWT technology.

Direct Chemical Corrosion from Chlorine



When chlorine is added to water, it forms hypochlorous acid and hypochlorite ion—the active forms known as free available chlorine (FAC), is a strong oxidizing agent that directly attacks metal surfaces in pipes, valves, and fittings. Higher chlorine concentrations accelerate the oxidation of iron, copper, and lead in distribution systems, leading to:

- Pitting corrosion in copper pipes
- Tuberculation (rust buildup) in iron pipes
- Leaching of lead from older pipe joints and fixtures

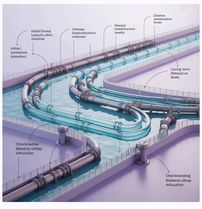
Lower chlorine dosing directly reduces oxidative stress on metallic infrastructure.

pH and Alkalinity Effects

Chlorine addition typically lowers water pH, making it more acidic. Acidic water is inherently more corrosive to metallic infrastructure. By reducing chlorine dosage by 50-70% (as MWT enables), the pH depression is minimized, maintaining water closer to neutral or slightly alkaline conditions that are less aggressive to pipe materials.

This pH stabilization is particularly important for systems with naturally low alkalinity.

Chlorine Residual in Distribution Networks



Water utilities must maintain chlorine residuals throughout the distribution system to prevent microbial regrowth. Higher initial dosing means higher residuals in pipes, prolonging exposure time of infrastructure to oxidizing conditions.

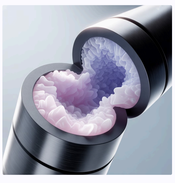
Lower dosing requirements mean reduced cumulative corrosive exposure over the pipe network's lifespan, particularly benefiting distant sections of the distribution system.

Reduced Formation of Corrosive By-Products

When chlorine reacts with natural organic matter and minerals in water, it can form acidic compounds and aggressive chlorinated species that enhance corrosion.

Lower chlorine levels mean fewer of these secondary corrosive agents, reducing both direct metal degradation and the formation of soluble metal complexes that contribute to water quality deterioration.

Scale Formation Dynamics



MWT's effect on mineral behavior contributes to infrastructure protection by preventing problematic scale formation and deposits. Magnetically treated water keeps minerals like calcium and magnesium in suspension or promotes softer, non-adherent crystal structures (aragonite instead of calcite) that don't build up as hard scale on pipe surfaces. This descaling effect provides multiple corrosion protection benefits:

- Prevents scale buildup that can trap corrosive chlorine compounds against pipe walls
- Reduces tuberculation (rough, porous rust deposits) that creates localized corrosion cells
- Maintains cleaner pipe surfaces that are less prone to pitting and crevice corrosion
- Prevents galvanic corrosion that occurs when scale deposits create differential oxygen concentration cells

By keeping pipes cleaner and free from problematic deposits, MWT reduces the conditions that accelerate infrastructure degradation.

Economic Impact of Reduced Corrosion

Infrastructure corrosion costs U.S. water utilities an estimated $50 billion annually in pipe replacement, maintenance, and water loss. Extending pipe lifespan by even 10-15% through reduced chlorine corrosion could save individual municipalities millions of dollars over decades, while improving water quality and reducing service disruptions. MWT integration offers a proactive approach to asset management that compounds benefits over time.