

# Glycolic Acid

## Industrial Water and Boiler Systems

### Product Information

Glycolic acid has a unique combination of attributes that makes it attractive in a wide variety of water treatment applications. Glycolic acid can work in these systems to remove hard water scale deposits (calcium, iron, magnesium, manganese salts) by forming water-soluble complexes (chelates) that are easily rinsed away.

#### Glycolic Acid Attributes

- Good acidification properties to decompose carbonates.
- Ready biodegradability that helps waste treatment and prevents accumulation in the environment.
- Low corrosion to most metals and synthetic materials.
- Low toxicity, low odor, and negligible volatility (low VOC).
- Ease of handling and storage: very water-soluble, nonflammable liquid.
- Contains no phosphates.
- Compatibility with other acids and additives.

#### Applications

- Cooling Towers—hard water scale deposits reduce cooling tower heat exchange efficiency
- Ground Water Remediation Systems—designed to remove organic impurities in ground water often use vapor flashing and/or activated carbon systems. Iron and other mineral deposits can cause fouling of feeds, flash equipment, and carbon bed equipment.
- Boiler Cleaner—a mixture of glycolic acid and formic acid is fast and effective for cleaning high pressure stainless steel steam generators. The mixture has been tested extensively to establish its safety and confirm its effectiveness. Residue from the glycolic acid and formic acid process decomposes to volatile, non-corrosive products. Wastewater from this process is easy to treat.



- Water Well Rehabilitation—due to scale buildup, the flow from water wells diminishes with time. Please see “Water Treatment and Water Well Stimulation” technical bulletin.

The glycolic acid and formic acid mixture offers the following advantages:

- Rapid, effective removal of mill scale (including iron oxides, calcium salts, magnesium salts, silica, silt, nickel oxides, and copper oxides)
- Freedom from organic iron precipitation
- No chlorides—it can be used for cleaning stainless steel, without the possible chloride cracking or embrittlement sometimes experienced in acid chloride systems
- Low corrosion rate on most metals
- Volatile, non-corrosive decomposition products
- Easy waste treatment (glycolic acid is readily biodegradable; heavy metals can readily be removed from wastewater)

The typical cleaning procedure utilized is:

1. Alkaline pre-boil to remove petroleum-based soils
2. Circulate acid solution
  - 3% solution
    - 2% glycolic acid
    - 1% formic acid
    - <1% corrosion inhibitor
    - <1% surfactant
  - Temperature: 82-104 °C (180-220 °F)
  - Circulation rate: 0.3-0.6 m/sec (1-2 ft/sec)
  - Contact time: 2 hr (10-12 cycles through system)
3. Drain

Versus competitive systems, the glycolic acid system offers these advantages:

EDTA is generally higher cost than glycolic acid. Scale is removed more slowly. Pound for pound, EDTA has a lower total capacity for iron oxide scale than the glycolic/formic acid mixture; this can be seen from the data in Table 1. In addition, there are environmental concerns about the use of EDTA regarding carryover of heavy metals.

**Table 1.** Scale Deposit Holding Capacity, lb of Iron Oxide per gal of Cleaner\*

Cleaner	Holding Capacity
3% Glycolic Acid and Formic Acid Mixture	0.11
12% Sodium EDTA	0.05
6% Ammonium EDTA	0.05

\* Water Formed Scale Deposits, J.C. Cowan & D.J. Weintritt, Gulf Publishing Co., 1976

Citric acid removes scale more slowly than glycolic acid. Also, iron and calcium salts of citric acid are less soluble than those of glycolic acid; so, they may precipitate onto the surfaces of the boiler, diminishing cleaning effectiveness. Hydrochloric acid, while generally much less expensive than glycolic acid, has been found to cause stress cracking in austenitic stainless steel. It is also much more corrosive and difficult to handle (fumes, odor) than glycolic acid. The glycolic acid and formic acid mixture is generally not used on low pressure boilers, because of the high rate of circulation needed to make the glycolic acid and formic acid mixture work effectively.

For more information, visit [glycolicacid.chemours.com](http://glycolicacid.chemours.com) or call (800) 441-9593.

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