

Glycolic Acid for Water Well Stimulation

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The water flow of potable and industrial underground water wells typically decreases over time. One of the main reasons for the decline in water productivity is the accumulation of scale, biofilm, clay, and iron oxide deposits. The contaminants block the water flow causing gradual damage to the water-well foundation and water-producing formation.

A rehabilitation process is required as part of the water-well maintenance routine to restore the water quality and pressure. Low toxicity and high-biodegradability acids are used to rehabilitate wells and clean scale, deposits, and biofouling off the well pumps.

Glycolic acid (hydroxyacetic acid) is one of the top solutions for well rehabilitation, flow stimulation, downhole drilling, and new well-cleaning applications. It is an organic acid that provides superior cleaning efficacy for hard water scales, including calcium carbonates, magnesium carbonates, manganese, and other mineral salts. It also cleans various iron deposits, polysaccharide deposits, and biofouling or biological film formations. In addition, Glycolic acid is widely used as a descaler for inorganic and organic impurities in various industrial applications, including water treatment, and oil and gas.

Why Glycolic Acid for Water-Well Rehabilitation?

- Glycolic acid from Chemours is NSF certified for the cleaning of potable water wells
- It chelates iron and metal salts by forming water-soluble compounds that are easily rinsed away
- Glycolic acid is less corrosive and safer to use in contact with the well metal compared to mineral acids such as hydrochloric
- Its low molecular weight and small molecule size enable fast penetration into difficult deposits
- Glycolic acid from Chemours is chloride-free for lower corrosion rates on sensitive metals

- Glycolic is biodegradable and non-flammable, and it has low odor, low toxicity, and negligible fumes.
- It has higher efficacy in removing hydrocarbons and tough scales compared to citric and formic acids
- It has excellent compatibility when blended with other acids to improve the cost efficiency and cleaning effectiveness
- The carboxylic acid provides excellent removal of polysaccharides and common organic deposits

How to use Glycolic Acid for the rehabilitation of water wells

The Pretreatment Steps of Well Stimulation:

- Measure the water flow and compare it with historical flows to determine the flow deterioration over time, and set a goal for when the cleaning procedure is required. The flow typically deteriorates because of gradual damage to the well formation, accumulation of carbonate deposits, or mechanical damage to the downhole filter system.
- If iron bacteria is present, the well will need a chlorination shock treatment by the injection of chlorine solution to loosen the slime and organic biofilm deposits.
- Apply a high-frequency shock to loosen the scale by detonating blasting caps in the water wellbore.
- Purge the well and check for large amounts of rock and gravel that can indicate a problem with the screen or the gravel pack. If a mechanical issue is present, it needs to be fixed before the cleaning procedure.
- Measure the water pH to determine the required amount of Glycolic acid for the cleaning procedure.

The Application Steps of Well Rehabilitation:

Determine the Required Amount of Glycolic Acid:

Add Glycolic acid 70% solution at a rate of 1/2 gallon/ ft³ standing in the wellbore. This should give about a 5% concentration of the acid in the water. The acid can also be pre-mixed with water in a preparation tank if needed.

Example: A well with a diameter of 10" and 126 ft deep with a static water level of 30 ft below the surface would require $(126 - 30 \text{ ft}) \times 0.241 = 23.1$ gal of Glycolic acid 70% solution.

Diameter of Well, in.	Gallons of Glycolic Acid, 70%, to add per foot of water to give a 5% (wt) solution

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2	0.010
4	0.040
6	0.090
8	0.160
10	0.241
12	0.361
14	0.491
16	0.641
18	0.811
20	1.000
22	1.210
24	1.440
26	1.690
28	1.960
30	2.250

The Cleaning Procedure:

Add the determined Glycolic acid amount and surge the well to facilitate the mixing and allow the acid to penetrate the formation of the well. Dislodge the scale by starting and stopping the pump every 3 - 4 hours. If surging the water column is not applicable, a large plug can also be dropped into the wellbore. It is recommended to allow Glycolic acid in the well for at least 24 hours or more.

Removal of the Cleaning Solution

Pump the cleaning solution mixed with water to the ground or biological treatment facility in conformance with local environmental regulations. To facilitate the suspension of solid matter, purge the well slowly at first and then at about 25% of full flow. Also, At intervals 15 - 30 minutes, stop the pump long enough to allow the well to drop to its static level.

Flushing and Finalizing the Cleaning Procedure

Continue pumping the water until the pH is within 0.5 of the original pretreatment value. This will typically take about 1 - 3 hours from the start of the flushing procedure. Repeat the flushing and pH control as necessary if the water flow is not fully restored.