

Glycolic Acid

Water Treatment and Water Well Stimulation

Product Information

Glycolic Acid is used extensively to rehabilitate the flow efficiency of water wells. Glycolic Acid accomplishes this by removing hard water scale (calcium, magnesium, manganese salts), various iron deposits and polysaccharide deposits.

The efficiency of industrial and potable water wells decreases with time. This can be the result of:

- Gradual damage to the water producing formation.
- Mechanical deterioration to the down-hole well screen/ gravel pack filter system.
- Accumulation of deposits on the screen and gravel pack filter system.
- Iron bacteria.

The deposits result from hard water scale (calcium, magnesium and iron salts) accumulation or deposits of iron oxide and bioslime. The deposits can also result from build up of clay.

It should be noted that reduced water production can result from many factors in addition to scale build up. Each water well should be viewed as a distinct case. The specific cause for the reduced production should be defined by water analysis, underground surveys, well history, etc. The typical useful life of a well is 35 years. Only after reviewing this information can the appropriate remedial action be selected. Consultation with a professional water well rehabilitation company is recommended.



Glycolic Acid has the following advantages which makes it very useful for this application:

- National Sanitation Foundation (NSF) certification for use in cleaning potable water wells. (Internet reference: <http://www.nsf.org>)
- Formation of water-soluble compounds (chelates) with the hard water metal salts. The compounds are easily rinsed away.
- Low corrosion to the metal parts of the well.
- Easily handled organic wastes since Glycolic Acid biodegrades rapidly.
- Low toxicity, low odor, non-flammable, and negligible fumes.
- Easy handled liquid.
- Compatible with other acids to improve cost and effectiveness.
- Displacement of polysaccharide deposits.

The following information describes the routine maintenance procedure to increase the productivity of a water well using Glycolic Acid. This procedure is typically used every 2 to 3 years depending on well performance.

Well Pretreatment

Determine the current well flow in comparison with historical flows. Flow will deteriorate with time as formation damage occurs. This will help set a goal flow for the well cleaning.

When iron metabolizing bacteria are present, the well is treated with chlorine bleach to loosen the bioslime organic deposits.

Scale is loosened by applying high frequency shock via detonating blasting caps in the well bore.

Purge the well. Large amounts of rock and gravel can indicate serious problems with the screen and gravel pack. These should be corrected before proceeding.

Determine the pH of the well water.

Glycolic Acid Application Procedure

The recommended procedure for the use of DuPont™ Glycolic Acid 70% Solution for the treatment of water wells can be summarized as follows:

1. Amount of Glycolic Acid

Add 70% Glycolic Acid at a rate of 1/2 gallon per cubic foot standing in the well bore. This provides approximately a 5% concentration of acid in water. Refer to Table 1 to calculate total acid requirement for wells 2 inches to 30 inches bore diameter. The Glycolic Acid can also be pre-mixed with water in a preparation tank.

Table 1. Glycolic Acid Quantity Guide for Cleaning Water Wells

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

Example: A 10" diameter well 126' deep with a static water level 30 below the surface would require: $(126'-30') \times 0.241 = 23.1$ gallons of Glycolic Acid 70% solution.

2. Cleaning Procedure

After adding the acid, surging the well should be considered to facilitate mixing and to achieve penetration into the well formation. By starting and stopping the pump, surge the column of water to the top of the well every 3 to 4 hours or more often to help dislodge scale. An alternative is to surge the well by dropping and retrieving a large plug into the well bore.

Allowing the acid to remain in the well for at least 24 hours or more is recommended.

3. Removal of Cleaning Solution

Pump the water to a location (ground or biological treatment facility) in conformance with local environmental regulations.

To facilitate suspension of solid matter, the following procedure might be used:

- Purge slowly at first and then at about 25% of full flow.
- At 15 to 30 minute intervals, stop the pump long enough to allow the well to drop to its static level.

4. Before Use of Well Water

Continue pumping until the pH of water is within 0.5 pH units of the original value before treatment. This affords a concentration of approximately 25 ppm or less. This could occur in 1 to 3 hours after starting the flushing operation. Table 2 shows the relationship of free Glycolic Acid concentration and pH.

5. Repeat the above steps as necessary to achieve the optimum rate of flow.

Note: The ideal pH for cleaning is about 1.0. Periodically check the pH of the well bore contents. Consider adding more Glycolic Acid if the pH rises above 3. As an alternative, consider repeating Steps 1-4.

Table 2. pH as a Function of Free Glycolic Acid (Deionized Water)

% Concentration	pH
70	0.1
60	0.3
50	0.6
40	0.9
30	1.1
20	1.3
10	1.6
8	1.7
6	1.7
4	1.9
2	2.1
1	2.3
0.1	2.8
0.01	3.3
0.001	4.0
0.0001	4.5

Example

A water well in Pittman, Ohio, 149 feet deep, and 16 inches in diameter that contained 685 gallons of water at its static level, was treated with 47 gallons of 70% Glycolic Acid (concentration about 6 wt%). Full flow rate increased from about 200 gallons/minute prior to treatment to 400 gallons/minute following the treatment. The table below shows the change in pH and the decrease in Glycolic Acid with time after flushing of the well was started.

Change in pH After Well Flushing

Time After Flushing Began (Minutes)	pH
Before Treatment	7.6
20	6.6
40	6.9
80	7.0
180	7.1
1440	7.8

Post Treatment

The well is treated with hypochlorite bleach to eliminate any bacteria that might have been returned to the well. This helps to reduce the future build up of iron scale resulting from iron metabolizing bacteria (*Gallionella ferruginea*).

Carbonate Scale

If a persistent carbonate scale exists in the well to be cleaned, a blend of Glycolic Acid and mineral acids may be the preferential cleaning solution. A 50:50 mixture of Glycolic Acid and hydrochloric (muriatic) or sulfamic will dissolve carbonate scales more quickly. A water analysis showing a pH of 7.5 or greater and total carbonates in the 300–700 ppm range indicates heavy carbonate scales. Carbonates in the 50–300 ppm range indicate moderate to heavy scales. The blend of Glycolic Acid and a mineral acid will remove scale very effectively.

Reduced Treatment Cost

Reduced cost of treatment may be facilitated by using a blend of Glycolic Acid and sulfamic acid. The blend should be 1:1 by weight. The amount of Glycolic Acid established in **Table 1** can be reduced by ½ and for every gallon of Glycolic Acid used also use 7.3 pounds of sulfamic acid. In the example shown below **Table 1** you would use 11.6 gallons of 70% Glycolic Acid and 83.8 pounds of sulfamic acid.

Clay Removal

The use of Glycolic Acid to clean water wells does not replace the need to use dispersants if clay removal is a specific problem. If clay build up or pluggage is the cause of the decrease in well production, a clay dispersing agent may be required.

Intensive Remediation

Water wells can have serious formation damage, which could lead to drilling a new well. An intensive remediation procedure should be considered prior to drilling a new well. An example is the use of liquid carbon dioxide treatment. This expands the formation by freezing the water. The carbon dioxide evaporates to form dilute acid (carbonic acid) which frees scale. The evolution of carbon dioxide gas loosens scale. Glycolic Acid treatment can then be considered for subsequent treatment. A professional well rehabilitation company should be consulted.

For more information, visit glycolicacid.chemours.com or call (800) 441-9593.

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