



A BRIEF HISTORY

The origins of revolutionary Aqua Freed technology.

It began in the 1970's with Igor Jaworowsky's search for an environmentally safe way to rehabilitate his neighbors' dry and low-yield wells.

His use of dry ice in an unusual, semi-controlled application proved extremely successful and led to the controlled injection of liquefied carbon dioxide known as the Aqua Freed process.

By 1985 the product, packer and process he initiated proved so innovative and effective it was granted the first of the patents that became the basis of Aqua Freed's current advanced technology.

Subsequent development of the process and equipment by the Aqua Freed corporation have extended its usage for treating larger-diameter, high-volume wells in various geological formations – both open-hole and screened. As a result, a new patent was granted in 1995.

Well Rehabilitation Technology Division

The Aqua Freed process is a highly effective, environmentally sound method for restoring lost capacity to water supply and environmental wells.

While conventional methods rely on the use of chemicals that are often dangerous to handle, and difficult and expensive to dispose of, the Aqua Freed process relies solely on inert liquids and gases that dissipate naturally.



The Advantages of Aqua Freed

Environmental Safety

The Aqua Freed process uses natural carbon dioxide in gas and liquid forms, eliminating the use or disposal of hazardous acids and chemicals, without affecting water quality.

Maximum Penetration

Achieves excellent fragment penetration into formations at greater distances from the well. The Aqua Freed process is an extremely effective method of delivering energy into the well and its surrounding aquifers.

More Economical

The superior penetration results in greater cost effectiveness because it often extends the life of the treatment beyond that of other methods. And, since carbon dioxide dissipates naturally, it eliminates neutralization and disposal costs.

Greater Effectiveness

The Aqua Freed process can fully restore water well capacity, improve the quality of water degraded by biological activity and achieves demonstrably superior results.

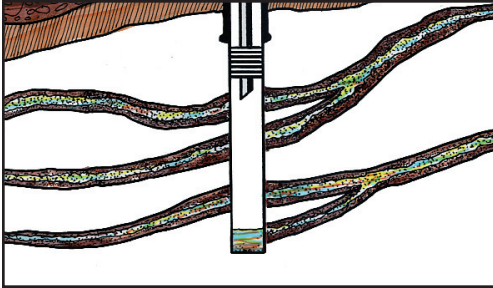
Versatility

Aqua Freed can be used for a wide range of water systems, including: Vertical Wells – screened and open hole, Horizontal and Collector Wells, Product Recovery Wells, and Monitoring Wells.

The Aqua Freed Process

Pure & Simple

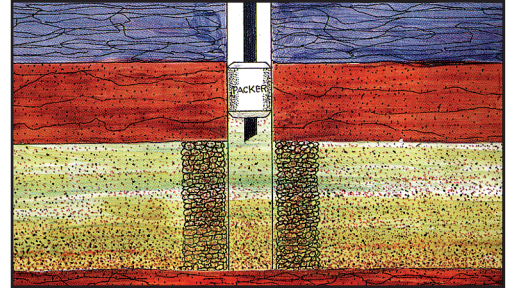
Open Hole



1

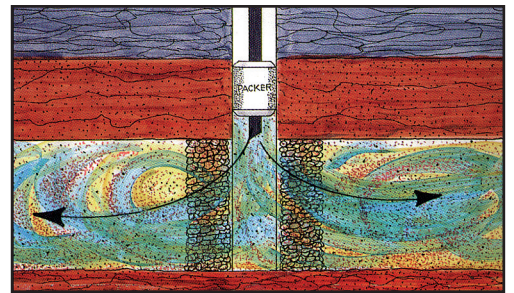
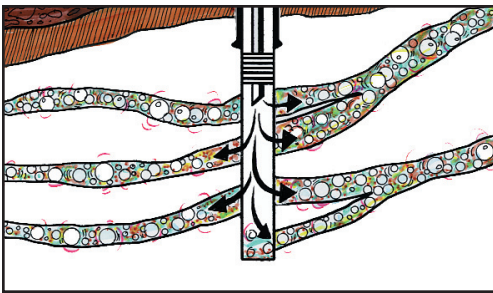
Aqua Freed personnel study the well data to determine the correct placement of the packer. After the pump is pulled, the packer is lowered to the desired depth creating a pressure seal to direct carbon dioxide into the well and surrounding formation.

Gravel Pack



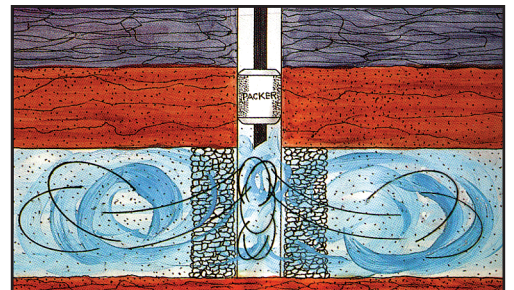
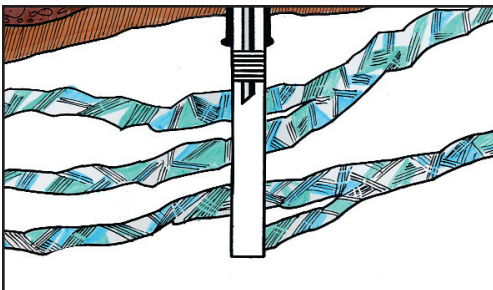
2

Carbon dioxide is injected through the packer into the well, penetrating the surrounding aquifer and producing a mild carbonic acid solution.



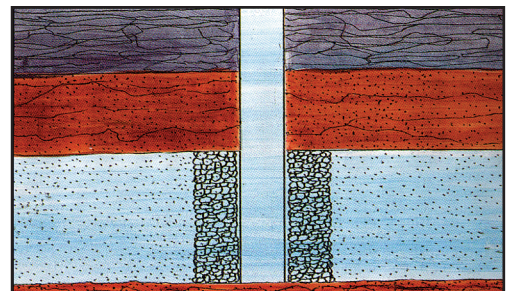
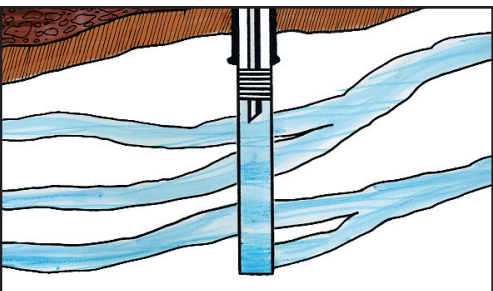
3

When liquid carbon dioxide comes into contact with water the effective reaction is the rapid expansion (570:1) of the carbon dioxide within the aquifer. This works to achieve disruption and dislodging of biological and mineral deposits. By regulating the downhole pressure, liquefied CO₂ is converted to a solid form of carbon dioxide. The ensuing sublimation produces ongoing energy of agitation.



4

After treatment, the well is mechanically developed and tested. The well pump is reinstalled and the well is returned to service.



Aqua Freed — A Proven Success

The Aqua Freed process has proven itself in action—again and again and again!

The Aqua Freed process has been employed in wells having a wide variety of construction, flow and fouling characteristics—with tremendous success. The technology is effective in rehabilitating wells experiencing lost capacity caused by mineral incrustation (i.e., iron, manganese and calcium) as well as biological fouling (such as iron-related bacteria, sulfate-reducing bacteria and slime-forming bacteria).

In fact, the Aqua Freed process produces markedly superior results compared to those using traditional chemical and physical methods, especially where iron bacteria are present. These exceptional results are due in large part to a combination of the following Aqua Freed advantages:

- ✓ Maximum penetration of the formation
- ✓ The production of carbonic acid ($\text{CO}_2 + \text{H}_2\text{O} = \text{H}_2\text{CO}_3$)
- ✓ Physical agitation caused by the rapid expansion of liquefied CO_2 to a gaseous state in the water.
- ✓ Displacement of oxygen due to the presence of CO_2 .
- ✓ Shock from the sudden change in both pH and temperature.
- ✓ The conversion of liquefied CO_2 to a solid state within the well, and the slower sublimation of the solid CO_2 to the gaseous state, allows continued energy of agitation, disruption, and detachment.

CASE STUDIES

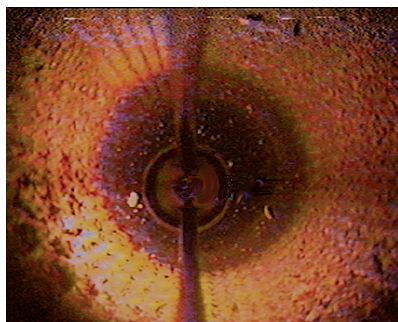
More than 5000 wells have been treated with the Aqua Freed process during the past 20 years. The following are some examples:

Study A — Institutional Application

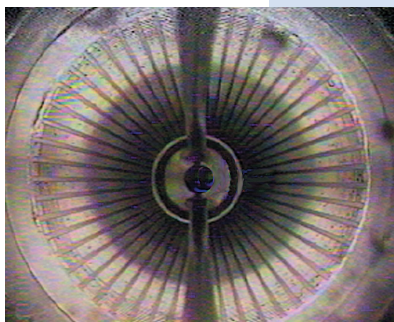
The Aqua Freed process was used to treat Bedford Hills Correctional Facility well #9, a gravel pack well installed in 1964 but never used because of a low yield. Originally the well produced 110 GPM with a Specific Capacity of 4.69. After 20+ years of sitting idle and prior to cleaning, a pumping test was performed producing 75 GPM with a Specific of 2.85, followed by a video inspection revealing significant mineral incrustation on the screen. The well was treated with Aqua Freed, followed by 2 days of surge block agitation. Post treatment pumping test produced 260 GPM with a specific capacity of 8.96.

Study B — Municipal Wells

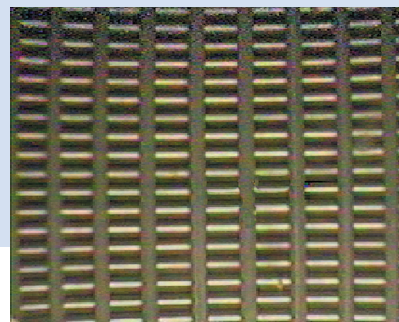
The Aqua Freed process was used to treat Hurleyville Well #2, a gravel pack well for the Town of Fallsburgh, NY. The well was originally completed in August 1957 with a reported yield of 300 GPM and a Specific Capacity of 9.32. Prior to treatment on May 20, 2005, a pretreatment video inspection showed significant deposited material to the well screen, while a pretreatment pumping test delivered a specific capacity of 5.67 at a pumping rate of 100 GPM. The well was rehabilitated with Aqua Freed during a one day injection, followed by 2 days of mechanical development to remove dislodged material. Post treatment yield testing resulted in a yield of 200 gallons per minute with a specific capacity of 9.5.



BEFORE Aqua Freed treatment
(Looking down into well)



AFTER Aqua Freed treatment
(Looking down into well)



AFTER Aqua Freed treatment
(Side wall)



CASE STUDIES

Study C—Investor Owned Utilities

The Aqua Freed process was used to treat well Marianville #4, an open hole well for Aqua America in Forest, PA. The well was completed in November 2005, yielding 100 GPM. Within 4 months, the wells capacity declined to 60 GPM, with a specific capacity of .30. On April 1, 2005 the well was treated using the Aqua Freed Process followed by airlift development for 2 days. Post treatment pumping tests produced 100 GPM with a specific of 2.1. This well was subsequently equipped with Aqua Gard preventative maintenance system, as were the other 4 wells in the well field.

Study D—Superfund product recovery well

The Aqua Freed process was used to treat a product recovery well for Ciba Specialty Corp. in King of Prussia, PA. Prior to using Aqua Freed, countless well rehabilitation efforts were made using chemical and mechanical methods, yielding little to no results. On June 4, 1996 a pretreatment pumping test was performed producing 9 GPM with a specific of .10. Post treatment pumping tests, yielded 14.8 GPM with a specific of 1.25, an increase of 955%. Since that date all wells in the pump and treat system, have been serviced using Aqua Freed with excellent results.

