

Well Cleaning and Rehab: The Greener, More Environmentally Friendly Way

By Jill Ross

Some new products and methods are “just saying no” to the chemicals traditionally used in water well cleaning and rehabilitation.

While specialized well cleaning chemicals will likely always have a place in the water well industry, some newer products and methods are relying on brand-new technologies to combat biofouling and other well nuisances.

Here, we’ll take a brief look at just some of the new products and methods emerging in the market, some only now making their way to the United States.

Wellan Rings

What are they?

Wellan rings are “biosignal water treatment devices” that combat rust, corrosion, lime scale, microbiological contamination, and crude oil impurities (paraffin wax) in water pipes. No chemical substances, magnetic fields, or electromagnetic radiation are released into the environment.

How do they work?

According to the manufacturer, Wellan rings work through biosignals

which are stored in the rings’ interior. These signals penetrate pipes and tubes and influence the water inside. As a result, the vibrations in the water are changed in such a way that lime, rust, scale, or biofouling matter no longer settle down but are washed out in minute particles. Frequency patterns from the ultra-fine range are modulated onto the rings with the aid of a laser technology.

What are the advantages?

Because no chemicals are used in the process, there is an environmental benefit as well as cost savings, according to the manufacturer. Also, the rings can function regardless of whether the water in the pipes is flowing or standing still.

Where can they be used?

For prevention and correction of existing water quality problems with corrosion (rust), lime scale, microbiological problems, and crude oil impurities (paraffin wax). The rings are not water-delimiting devices or lime converters.



The mineral substances are left as ions in the water.

Wellan rings are manufactured in three different styles: a Wellan 2000 ring for use in water treatment and supply, a power ring for use with diesel and gas, and problem-specific rings for custom solutions.

According to the manufacturer, Wellan rings have been used in the following applications:

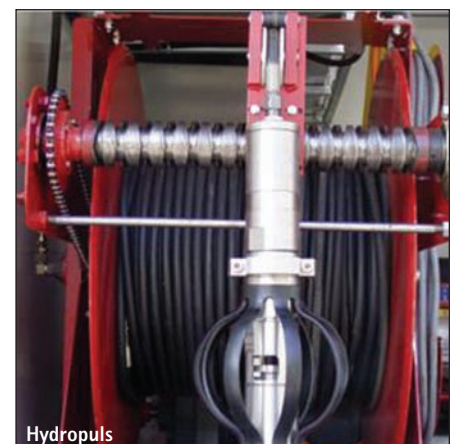
- Heat exchangers and boilers
- Cooling towers
- Cooling loops (open/closed)
- Steam boilers and boiler condensate reclamation
- Seawater vaporization and saltwater systems
- Oil extraction systems
- Bottling plants and clean water systems
- Swimming pools
- Fountain algae removal
- Legionella removal and prevention in hospitals
- Irrigation systems
- Rust and scale in sprinkler systems.

Hydropuls

What is it?

Hydropuls methodology is a patented impulse generation type technology that can effectively loosen and mobilize sediment, biogrowth, and mineral incrustation both on the well screen and within the aquifer matrix. Hydrostatic pressure is used to bring loosened material into the wellbore where the material can be removed from the well by way of pumping, airlifting, or bailing.

CLEANING AND REHAB continues on page 20



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How does it work?

According to the manufacturer, pressure pulse sequences are created by pulsing inputs of gas or water portions under high pressure, by using a pulse generator that is inserted in the well attached to the pressure hose. The pulse generator is provided with a valve system that can release the energy accumulated in the generator in the form of high-tension gas or water within milliseconds by opening large cross sections. This creates hydraulic shock waves.

At the same time, a cavitation effect is caused by the sudden volume change leading to the formation of a “vacuum bubble” that subsequently collapses and thus creates a hydraulic “suction wave.”

The alternating effect of the pressure load and the pressure relief loosens fine grain portions, iron particles, and precipitations that are found within the gravel layer and in the pore space of the water-bearing stratum. The “suction wave” transports the loosened congestion into the well where it is pumped off.

Pulse creation speed is approximately 2000 meters per second (about 6500 ft/sec) and can be adjusted within a certain spectrum during use. Thus, a soft pressure pulse can be used for extension materials like PVC, HDPE, OBO, and stoneware. The process can be set to “more intensive” or “softer” as needed, and the pulse output pressure level can be adjusted as well.

What are the advantages?

From an ecological point of view, no chemicals and explosive gases are used. It is effective in deep wells. Operators can target strongly congested areas in the wells.

Where can it be used?

The process can be used on wells and development bores and injection wells from 2 inches in diameter and up, and up to depths of 6500 feet. The technology has been used for water supply wells, injection/disposal wells, groundwater measuring points, copper and uranium extraction wells, and seismic prospecting wells. It can be used in wells lined in steel, PVC, HDPE, or in open boreholes.

i2 Phase Cleaning Method

What is it?

The patented i2 phase cleaning method is used to reduce fouling in geothermal heating and cooling systems where biological fouling can greatly reduce the efficiency of the system. The cleaning process has two steps. First, a monthly, quarterly, or yearly phase cleaning (depending on the rate of fouling) breaks up existing fouling films during a 90-minute process that takes place in the heat exchanger. Second, an automatic 20-minute i2 bubble infusion twice per day prevents biofilm and mineral beds from forming.

How does it work?

The i2 method uses matched eco-safe cleaners that are specific for the fouling agent. Used in combination with i2 bubble infusion, these chemicals dissolve minerals and biological contaminants for release into a sanitary drain.

The i2 method imparts these cleaners during a process called phase cleaning that employs hydro-shearing, pressurization, reverse pressurization, reverse turbulent flow, and cavitations to break up existing fouling films within 90 minutes, and all within the exchanger. No chemical cleaner is allowed to enter the ecosystem.

Once clean, the system is brought back on-line and the results are immediately seen in reduced pressure drop and increased heat transfer.

Twice a day, an automatic 20-minute i2 bubble infusion prevents any substantial formation of foulant between monthly cleanings. The i2 method dispenses iodinated air in a bubble form that rapidly disrupts bacterial adhesion and mineral formation through chemical, thermodynamic, and mechanical means. This flurry of bubbles contains very low-dose iodine, a well established antimicrobial that prevents bacteria from forming a biofilm. The i2 molecule also chemically converts some of the contaminants while mechanically lifting them off the surface. This method of dispersal is unaffected by water quality, temperature, pH, or turbidity. Once in contact with contaminants, the i2 converts to iodide, commonly found in

Figure 1. A heat exchanger before beginning the i2 infusion method.

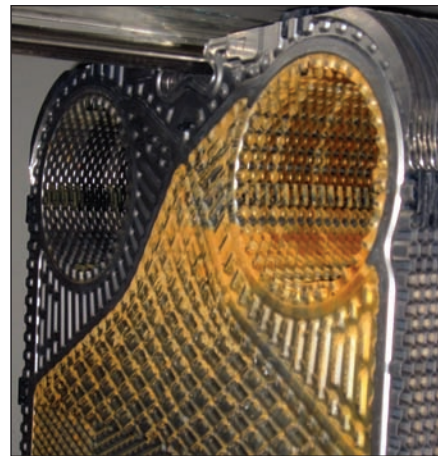
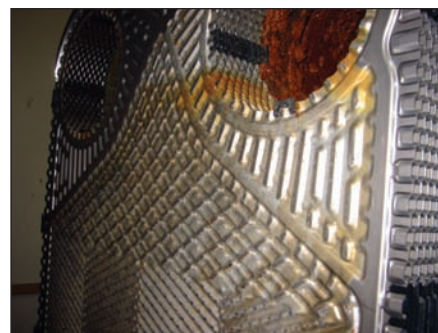


Figure 2. The same heat exchanger after the i2 infusion method cleaning.



groundwater and soil. Only grams per month of iodine are used.

What are the advantages?

According to the manufacturer, the main advantage of this process is that breakdown of the plate heat exchanger is not required, a labor-intensive process involving a minimum of two technicians. The protocol takes less than 90 minutes when needed, and if a second heat exchanger is available, the geothermal system never has to be shut down. Also, the system uses only environmentally safe cleaners and does not allow cleaners to enter the ecosystem. The i2 protocol does not expose staff or technicians to biofilms or caustic chemicals.

Other advantages include reduced plate and gasket replacement, reduced wear and tear on pumps and chillers, reduced energy needs and greenhouse gas production, and improved system function.

New studies show the i2 infusion method has been found to be effective against both staphylococcus A and

pseudomonas, as well as pathogenic E. coli. Another recent study found the protocol can be adapted for controlling insoluble rust, sand, and other water-borne inorganic particulates.

As determined by ESTCP, an ecological arm of the Department of Defense, diffusion well fouling is caused by the shearing force and displacement of biofilms from the heat exchanger plates to the recipient well screens. By preventing biofilm formation within the exchanger, i2 has shown dramatic improvement within fouled diffusion wells without the need for chlorine remediation. The system has been used to resolve fouling in geothermal diffusion wells, plate and frame exchangers, and ultraviolet purifiers in New York, Philadelphia, and Bermuda in situations previously thought to be unsolvable. According to the manufacturer, the method is being presented at the World Heat Transfer Congress as a “novel method for reducing biofouling” and for possible inclusion in the U.S. Geothermal Handbook.

Where can it be used?

The i2 infusion protocol can be used for land-based or marine plate heat exchangers as well as ultraviolet water purifiers. It is under study for shell and tube exchangers found on naval vessels.

AMPS Chemical Generators for pH Rebalancing and Cell Stress

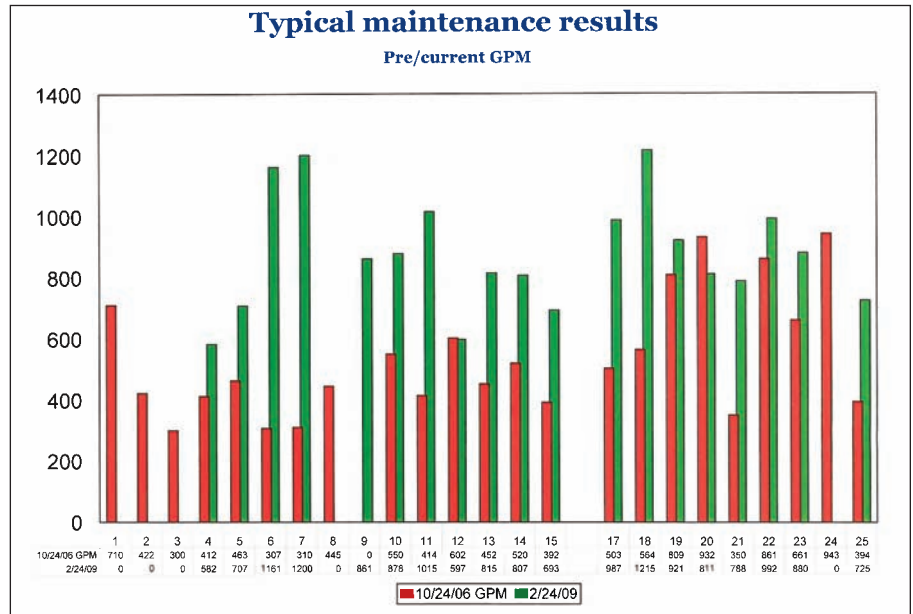
What is it?

A wellfield maintenance and management program pioneered by Aquifer Maintenance and Performance Systems Inc. It is intended to maximize water production, extend well life, and reduce or totally eliminate the need for well rehabilitations.

How does it work?

The programs are based on methods Jim Murray, president of AMPS, discovered in the early 1980s while developing vinyl reusable drilling fluids for two major U.S. drilling firms. The fluids were designed for bacteriological resistance, cost reduction, and total recovery from formation. He discovered the basic

Figure 3. The performance of a wellfield prior to and after treating with the AMPS method.



molecular structure of a biomass has a lot in common with the polymetric structure of these drilling fluids in that they are both controllable and easily manipulated with fluid polarity. Based on this, in 1992 Murray developed a method to control biogrowth and calcification in a well without the need for all the energy typically expended in a standard well rehabilitation.

AMPS programs work based on cell stress and pH imbalancing for bacteriological and parasitic control. The fluids that are needed to perform pH imbalancing and cell stress and the chemical generators used in the process are patent-pending and are currently manufactured in the AMPS West Palm Beach facility.

What are the advantages?

According to the manufacturer, advantages include a reduction of up to 90% in the use of chemicals compared to traditional well rehabilitation, a reduction of fluid disposal compared to standard well rehabilitation, reduction of sand production and bacteriological spikes, and less stress on the formation. Other advantages of using this method to control well contamination include overall lower power consumption, higher production rates with better water quality, reduction in the need for “crisis” management, fewer well equipment failures, a reduction in the cost

of well rehabilitations (when they are needed), more accurate forecasting for annual budgets, and a longer useful well life.

Where can it be used?

According to the manufacturer, each program is custom-designed for the individual wellfield to control the bacteriological and parasitic activity, taking into consideration the location, water quality, and area geology. *WWW*

For More Information:

Wellan Rings

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Hydropuls Process

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i2 Phase Cleaning Method

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