BEST PRACTICES WATER WELLS

HCT, LLC - WELL-KLEAN© SOLUTIONS

7/30/2018 – Rev. 1/2019-7/2019-9/2019-6/2020-11/2021

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Well-Klean® Solutions
Water Well Rehabilitation

WaterSOLV™
Making Water a Better Solution

Select Solutions Registered with:

Certified to NSF/ANSI 60

ANSI Accredited Program PRODUCT CERTIFICATION

Standards Council of Canada
Conseil canadien des normes

California Department of Food and Agriculture

Introduction

HCT is engaged in several markets, all relating to the treatment of water related problems formed from scale, sodium, corrosion, microbiology, processes and procedures. While we embrace credit for our insight and expertise to these areas of service, we also acknowledge the contributions by our partners and end users as we attempt to bring forward best practices. Following is a list of knowledge and best practices realized from over 800 projects over the past 4 years on a variety of well types including extraction, injection, vadose, artesian and de-watering.

Consider using ctrl-F to locate keywords.

For the intricate knowledge that supports this information, contact us at (888) 788-5807 or email us at info@hctllc.com.

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Personal Protection Equipment

1. Each person near the well head should wear an H2S (hydrogen sulfide) sensor.
2. If any ground subsidence is observed, all work around the well head should stop immediately.
3. Safety showers and eye washes shall be immediately accessible to workers within 5 seconds access to the chemical handling / exposure.
4. Nobody should be handing the chemistry whatsoever, that is not certified by HCT.

pH

pH does not define corrosion or the ability of a solution to dissolve, if so, we/us would not use vinegar and oil, we/us would not drink beer. Have we/us seen how corrosive Coca-Cola is? It dissolves rust and meat. We/us can have pH of zero with minimal corrosion, and the same pH with terrible corrosion, dependent on the alloys, temperature, inhibitor(s) and their stability. Evan at a pH of 7, bacteria can corrode steel at ¼ inch over 10 years and stainless steel at about the same rate. Did we/us know the shaft in pump and bowls are 416 stainless and easily dissolvable in weak acids? We are maintaining horticulture at pH 6.8 in extremely hard water with robust growth and about 20% less water. We/us have .05% HCl in we/us stomach and we/us body produces inhibitors to make it beneficial. Ph is not the answer! ORP would be much more accurate. HCT doesn't use probes, we apply product quantitively to hardness, alkalinity and sodium. The Solution – test. Buy corrosion coupons and do immersion testing, buy some calcite crystals and do some dissolution tests. Need some assistance, give us a call! Perhaps we have already tested what it is we/us are trying to figure out.

Brush and Bail

A crime! Look at it like this; if we/us pool was overloaded with algae and bacteria, can we/us brush it and turn on the filter and backwash it as often as we/us like and get rid of the problem? Absolutely not. And what is we/us pool was dirt, barriered by filter pack and metal, wouldn't that be worse? Don't we/us always battle against bacteria and algae in the low flow areas of cracks and crevices in the pool, even on PVC? So why would we/us think a water well could be brushed, bailed and put back online without spreading the bacteria throughout the well. How do we/us plan to move the attached bacteria, or bacteria under scale and nodules that are not removed by brushing, out of the perforations and adjacent filter pack therein? It's easy to hone the casing, but the problem is not just the ID of the casing. So now we/us want to brush and add some glycolic or phosphoric acid – did we/us know these are actually nutrients for bacteria and they leave behind chemical residues promoting bacteria growth? So let's add some chlorine, maybe more is better. Have we/us seen how corrosive chlorine is on iron based casing? It's worse than most acids. Have we/us seen the industry standard chart about "Declining Specific Capacity", better said, the gradual death of a well where after each cleaning the well gets sick sooner? Have we/us seen where one directional energy was used and the well not only gets sicker sooner but the recovered production is much less than when we/us didn't use one directional cleaning? How about after each cleaning to production recovery is 80% of the prior cleaning? A. We/us can't brush away scale and B. Bacteria is measured by colony forming units – so it's the number of colony forming units that "Colonized" the well and prevented water flow (in many cases or perhaps played a significant role)! The solution – brush and bail with an inhibited biocide like WaterSOLV™ BC.

Chlorine

Very few people realize the enormous corrosivity of chlorine. They typically think, red water, add chlorine. More red water, add more chlorine. Flush, flush, flush, add more chlorine. Yet chlorine is making the water red by corroding the casing. The same goes for black water (stinky black water or non-stinky and magnetite corrosion product. The solution, A. use chlorine as a disinfectant, not a cleaner! B. pre-dilute the chlorine with copious amounts of water, pH adjusted, and properly disperse throughout the well water column (bag of chlorine powder in a screened bag but the water needs to be pH adjusted). Adequately surge, plunge, brush and flush.

Assessment – Rehabilitation Assessment

We/us typically going to find 8 basic cleaning based problems in a well – carbonate scale, requiring acid, oxide scale requiring acid and soak time, aerobic iron bacteria requiring a biocide (not a dispersant), anaerobic sulfate bacteria requiring a biocide as well (not a dispersant), other forms of bacteria including filamentous, tuberculation and or nodules, each affected differently by acid or biocide and soak time, and sometimes mud as in bentonite, more readily removed by a biocide than acid or a polyacrylate. The solution – We/us don't wear flip flops on a trip to Alaska in November – and we/us don't use weak acids to bioremediate a water well. Likewise, we/us don't bioremediate bacteria with acid or a dispersant. How do we/us determine what the problems is or problems are? A ground water analysis will tell we/us what the water can do, the well schematic and age can give we/us an indication of how the water has interacted with the well, and the history of the well can provide insight as to how much is going to be needed to restore the unit – like restoring an antique car. The is the Well-Klean© Program – a system that results in a foundation reasoning, chemistry and science to determine the needs for predictable and long-term results.

Tremie (9/2019)

Liquids may travel about 30 ft. down a casing, but not much more. Tremie must be done in no more than 30 ft. increments and if we/us use water to push the chemistry, we/us displace the chemistry, so air is better unless we/us are controlling placement of the chemistry some other way. As either one of HCT's products are added, they become part of the water. Therein, don't think because the chemistry is heavier than water it will flow to the bottom of the well - It becomes part of the water. Where gradient water flow is a challenge, or unknown, it would be advisable to place and work the chemistry between plungers at time of placement.

Other techniques are found beneficial and rewarding. For example; Using column pipe, continuously placing the chemistry down a perforated pipe segment to segment, allowing gravity to the SWL place the chemistry. Chemical reactions are usually vented back down the well head.

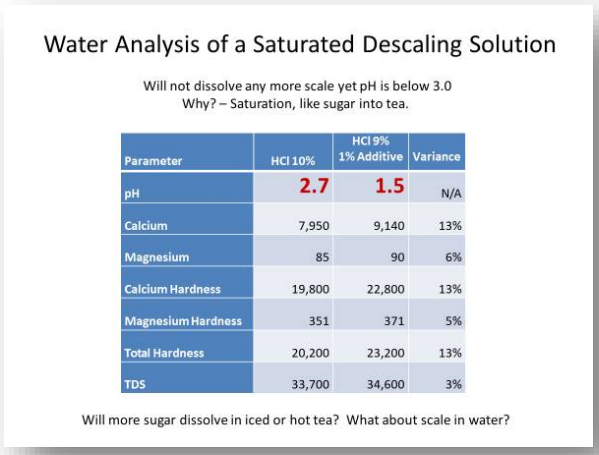
Burping: Statistics show that diluted and slower chemical addition does NOT suppress the potential for peroxide reaction with particular elements on wells. Added intermediate (Concentrate), is the primary solution to avoid complications from burping a well. Burping is usually initiated at the deeper zones of the well where the elements tend to accumulate.

Gradient Water Flow

Other than running a spinner log, does anyone see gradient water flow in the casing from a video report? This is a reason the video is needed for review. If we put chemistry downhole, will it stay there? It will not. Where gradient water flow is a challenge, or unknown, it would be advisable to place and work the chemistry between plungers.

Chemistry

A. We've seen a lot of specifications recommending keeping the pH at 3 with a defined chemical. This contradicts the solubility constants of minerals in water. Like Ice tea and sugar, we/us can only get so much in solution before it begins to settle on the bottom of the glass. The following three graphs show the solubility of calcium in water when reacted with different acids, various products capacity to dissolve calcium in water and how a pH of 2.7 and 1.5 would not dissolve any more scale due to saturation. The Solution – know the limitations of we/us chemistry and perhaps descaling has to occur in two or three processes versus one.
B. The rate of scale dissolution is critical to retain the chemistry downhole in case of any gradient water flow and labor hours.
C. Likewise, the products ability to not only dissolve carbonate scale but also oxide scale and bio-nodules.

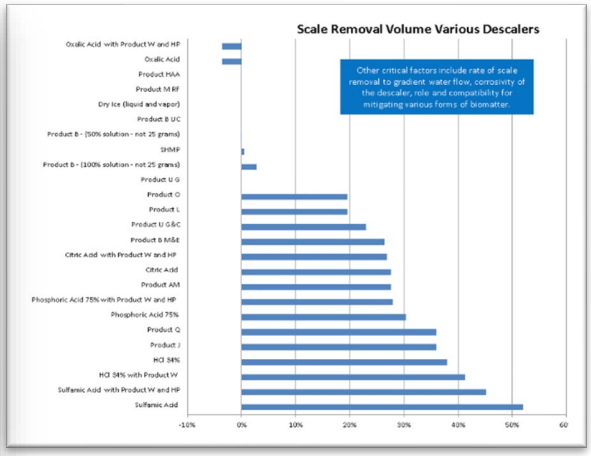


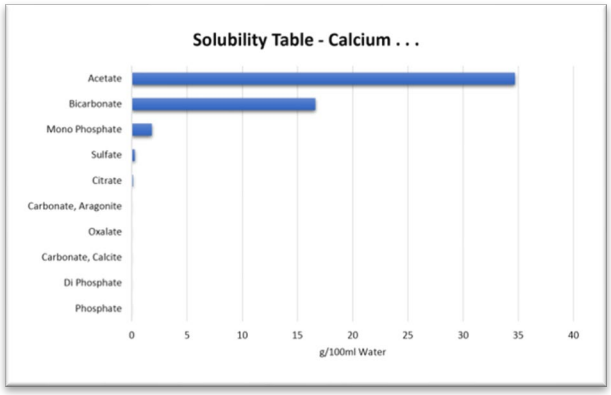
Water Analysis of a Saturated Descaling Solution

Will not dissolve any more scale yet pH is below 3.0
Why? – Saturation, like sugar into tea.

Parameter	HCl 10%	HCl 9% 1% Additive	Variance
pH	2.7	1.5	N/A
Calcium	7,950	9,140	13%
Magnesium	85	90	6%
Calcium Hardness	19,800	22,800	13%
Magnesium Hardness	351	371	5%
Total Hardness	20,200	23,200	13%
TDS	33,700	34,600	3%

Will more sugar dissolve in iced or hot tea? What about scale in water?





Disinfectants – Bio-dispersants – Biocides

We recommend we/us look at the definition of each product. The only product suitable for bio-remediation is a biocide. Disinfectants are for water and clean surfaces. Like a pool, we/us have to brush it with shock, filter the water and keep it chlorinated to prevent it from going sour again. Chlorine is not effective in an anoxic environment, the lower zones of most water wells. Same for clean surfaces, they then need to be disinfected. Chlorine is NOT a cleaner, nor is a bio-dispersant. A bio-dispersant does not break it down or kill bio matter, it disperses biomatter. Many descalers are actually food source for bacteria including glycolic acid, phosphoric acid and sulfuric acid. Whatever we/us do, be sure to include either a disinfectant or biocide when stirring up bacteria in a well to prevent spreading the bacteria in non-colonized areas and use a bio cleaner for cleaning biomatter. Acid doesn't work and here's why . . . Polysaccharides

Processes, Procedures and Polysaccharides

What order is best - brush and bail, bio-remediate, descale, bursting, jetting, bailing, lifting, zonal pumping, neutralization above or downhole, passivation of casing, disinfection, and how? What tools should be used and what tools shouldn't? The order and magnitude of processes and procedures will do two things – 1. Give we/us cleaner well and higher quality water 2. Give we/us longer lasting results in the vast majority of cases. If we/us leave colonies of bacteria in the well and or spread them around, they will come back sooner with a vengeance. Biomatter is usually resistant to acid.

CITM Scan

In general, a CITM scan will place a probe down the well to measure casing wall thickness. For older wells, this helps us assure integrity of the casing to withstand physical energy. Additionally, areas of metal deterioration are sometimes held together with scale or products of corrosion. A CITM scan will differentiate these conditions all in an effort to provide predictable, dependable outcomes. We believe CITM scans are applicable to perforated well casing, excluding most wire wrap screens.

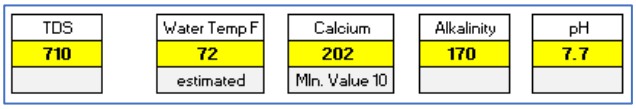
Alloy and Age

The durability of a well casing is commonly related to the materials of construction and the environment it is placed in. For example, metals galvanized from atmospheric conditions are far greater protected for enormous longer periods of time than galvanized metals in water. We use sacrificial zinc anodes with metals in water to deter corrosion to the softer alloy, zinc. Did we/us know 97% of a penny is zinc and what we/us see is actually see of a penny is a copper plating? We can dissolve the zinc, and yet leave the copper plating – all of this based on the nobility of between the metals where gold and titanium are perhaps the most noble, and zinc being the least. Yet, surprising to us and realized in the lab, where 304 and 316 stainless steel is relatively impervious to corrosion, 416 stainless dissolves like butter in a microwave in the presence of strong acids. Why that matters is that most column shafts are 416 stainless for the milling aspects of metal. Acidizing downhole with the column shat in place can result in column shafts being compromised. We/us might ask we/us if corrosive water could cause the deterioration of 416 stainless steel! We've not tested that.

More to alloy and age is the deterioration of metals by microbes. Iron reducing bacteria is not found to be that degrading to the actual integrity of the metal. On the other hand, water that is non-scaling, scale dissolving, will dissolve the steel gradually and put it into solution. The life span of the steel will depend on its thickness. Where biology presents most of its damage is with sulfate reducing bacteria (SRB). SRB is a bacterium that thrives on sulfur and sulfate. Most everyone has experienced its presence, not by smelling their feet but by smelling something that smells like stinky feet or rotten eggs. This is the gaseous excretion of the bacteria whose waste is sulfurous acid. Therein, its waste can actually degrade mild steel at the rate 4 mils per year, which is ¼ inch over 10 years. And where might we/us think these bacteria attach and form their place of residence? Usually at areas of the casing where the factory coating has been scratched or cuts, i.e. perforations and louvers, and usually at low flow areas or where attachment can be initiated.

Langelier Saturation Index

Groundwater Scale, Corrosion – it's impact on biology



TDS	Water Temp F	Calcium	Alkalinity	pH
710	72	202	170	7.7
	estimated	Min. Value 10		

LSI	CONDITION
3.0	EXTREMELY SEVERE SCALING
2.0	VERY SEVERE SCALING
1.0	SEVERE SCALING
0.5	MODERATE SCALING
0.2	SLIGHT SCALING
0	STABLE WATER
-0.2	NO SCALING, VERY SLIGHT TENDENCY TO DISSOLVE SCALE
-0.5	NO SCALING, SLIGHT TENDENCY TO DISSOLVE SCALE
-1.0	NO SCALING, MODERATE TENDENCY TO DISSOLVE SCALE
-2.0	NO SCALING, STRONG TENDENCY TO DISSOLVE SCALE
-3.0	NO SCALING, VERY STRONG TENDENCY TO DISSOLVE SCALE

The factors above define the quality of we/us water from a scale precipitation or scale dissolving perspective. It does NOT represent the water quality from a biological perspective (where bacteria, sulfur and iron some into play).

Biology

In “Alloy and Age” we talked about biology from iron and also sulfate reducing bacteria. Bacteria is where we see the harboring of coliforms, and coliforms then harbor E.coli. It’s important to know that biology are actually colony forming organisms. Our statistics show that most wells throughout the western USA become problematic after 14 years of service. Most these wells are compromised with biomatter, and it has been the colonization of the well by bacteria that has caused the need for the well rehabilitation. But ground water quality impacts the bacteria and how they can exist in the well and on the casing.

The ground water will tell a story. High sulfur or sulfate will lead towards the presence of a lot of sulfate reducing bacteria and potential corrosion. Sulfur/sulfate with scale forming water will lead to the bacteria using the scale to form almost impenetrable nodules. We/us may have seen them – blisters – broken open – if inside is red it is dead – if inside is shiny steel, it is active. If the ground water is scale dissolving, the bacteria typically form as a soft mass of matter, sometimes as big as ½ a volleyball, and running down the casing 10-20, 10, 150-200 ft. lengths.

Iron, whether in ground water or from casing, is food source for bacteria. Sulfur and sulfate is food source for sulfate reducing bacteria. Hardness in ground water will lead to both forming dense nodules. Most all of this is what we can visualize from water analyses, well schematics and down well videos but really only within the cylinder of the well, not within the perforations or back in the filter pack.

These are just some of the things to be considered in the proper approach not to just hone the cylinder of the well clean but to penetrate and reduce the absolute greatest number of biological colonies within the entire well environment – casing, perforations and filter-pack.

Placement of the right chemistry and soak times against the proper constituents, place an enormous role in cleaning efficiency and the durability of the cleaning.

HCT's Well-Klean© Algorithm

Well Dynamic	Units	Criteria	Factor Bio	Factor Scale	Selections Bio	Selections Scale	Process & Procedures
Age of well	Years	8	1	0			
		14	2	0			Average lifespan before rehab
		16	3	0.5			
		24	4	1			
Casing Material		PVC	1	0.5			
		Stainless	2	1			
		Steel	4	1.5			Wire brush if durable
Perforations		Slot	2	1			
		Louver	3	2			
		Wire Wrap	4	3			Lots of plunging
Liner		Liner	4	1			More then lots of biocide & plunging
Jetting		Jetted	4	1			Double remediate and massive plunge
LSI		Heavy Corr	3	-3			
		Lt. Corr.	2	-1			To form scale or not to form scale but be corrosive
		Lt. Scale	2	1			
		Heavy Scale	3	3			
Groundwater Sulfate /3=sulfur	mg/L	< 100	1	0			
		< 200	2	0			With bacteria, sustains sulfate reducing bacteria (bio). With scale forms nodules of sulfate reducing bacteria (descale).
		> 200	3	0			

mg/L is also ppm

Bioremediation - WaterSOLV BC

Calculation	Selection	Factor Scale	Severity Descripton	Treatment Level, ppm
0		3	Minimum	6000-12000
		5	Moderate	30000
		13	Heavy	90000
		18	Extreme	130000

Descaling - Well-Klean Pipe-Klean Descaler

Calculation	Selection	Factor Scale	Severity Descripton	Treatment Level, %
0		3	Minimum after using BC	2%
		6	Light	5%
		13	Moderate	10%
		26	Heavy	20%
		32	Heavy + Oxide	25%
		38	Extreme + Oxide	30%

General Rehabilitation Guidelines

Assessment & Recommendations

1. Complete HCT's Questionnaire
   Let's learn everything we can about the well and also what we need to know, including if matter has been directionally forced into the filter pack with jetting.
2. Ground Water Quality Report
   If it is from within the last two years, that's fine. It tells us mainly whether the water is scale forming or corrosive and whether is going to cause biological challenges with relation to sulfate content and steel casing.
3. Downhole video
   Almost priceless value. This helps us visualize the integrity of the casing, the type of biomatter, the density and volume of scale, and ability to differentiate between the two and to inspect a variety of zones and what is needed. This will also help us understand what processes to apply, how much chemistry to apply and when bailing is needed between processes.

Processes and Procedures

Tools

Plungers

Plungers are designed to create the maximum amount of flow in and out of the perforations without collapsing the casing, and while releasing any infill that may fall onto the plungers, but without sacrifice to the amount of plunging delivered. HCT usually prescribes double dual plunging discs that are rigid and V-cut. It is also important the rubber disk represents only 30% of the radius of the tool. Why do we cut V's in the plungers? To prevent filter-pack from burying the tool and to release the gasses formed when bioremediating or descaling. Contact HCT for assistance.

Brushes

Brushes are designed to operate like a drill bit and where one pass of the brush will scrub the casing twice - 720-degree coverage. Bristles must be acid and peroxide proof, polypropylene, not nylon, and or various degrees of wire. Wire scarifying scale and nodules does not work. Wire scarifying just about everything else is beneficial for physical removal of matter off of the casing, but with assurance not to damage the casing. Contact HCT for assistance.

Typical Procedures (and reasoning)

1. Clarifier (1/2021)
2. Video (1/2021)
3. Recommendations (1/2021)
4. Brush with a biocide (prevent the spread of bacteria throughout the well)
   a. Bail (if the amount of casing wall debris is a) loose matter and b) significant to increase the fill more than 5 ft.)
5. Downhole Video
6. Bioremediate (this procedure applied if biomatter is determined to have colonized perforations and into the gravel pack)
   a. Tremie chemistry
   b. Brush (type of brush and duration to be specified based on type of biomatter (slime, filamentation or nodule)
   c. Plunge (predicated on type and degree of biofouling (not scale))

    d. Bail (if the amount of casing wall debris is a) loose matter and b) significant to increase the fill more than 5 ft.)
    e. Soak (required to degrade a vast percentage of the peroxide based product prior to use of the descaler to create the chemical reaction desired and with burping the well).
7. Descale
    a. Tremie
    b. Plunge (if required - usually not necessary)
    c. Soak (required – 12 to 72 hours, depending on whether the scale is carbonate (12 hours) or oxide based (72 hours).
    d. Bail (if required – usually not necessary)
8. Neutralize descaler, passivate casing, Zonal Pump and Lift, Bail using sodium bicarbonate solution.
    a. All associated lines must be flushed with neutralizer. (2/2021)
9. Patching at this phase not prior. Must neutralize any acid before patching. (1/2021)
    a. Pre-blend the significant volume of chlorine solution
    b. pH adjust the solution with Well-Klean© Pre-blend from pH 5.5 to 6.5
    c. Tremie into place
    d. Allow to soak 12 hours minimum
        i. Zonal Pump and Lift in extreme cases when specified
10. Install Equipment
    a. Gradually develop the well
    b. Flush to NSF 60 criteria / State Statute

Soak Time(s)

Soak times are essential, critical, when and where specified. The bioremediation chemistry (WaterSOLV™ BC) is 72 hours reactions process. The acid, Well-Klean© Pre-blend, is a 12 hours reaction process for carbonate-based scales and yet 72 hours and more for the oxide (i.e. iron oxide) and oxalate complexes.

The length of time either product may remain downhole is indefinite, however, the probability the water in the casing will turn biologically rancid after 5 days is likely as the chemistry (both), are consumed.

Corrosion is not of concern if adequate chemistry has been prescribed for the alloys at play (i.e. aged and compromised wire wrap steel screen), as the chemistry contains inhibitors that block oxidation/reduction “corrosion”.

However, the propagation of biological growth, mainly anaerobic bacteria – sulfate reducing bacteria, and the rancid / potentially lethal hydrogen sulfide gas can be experienced should the water turn rancid in the casing due to the water stagnation, casing and overall environment (anaerobic). Note – hydrogen sulfide gas can be lethal and is at toxic, lethal levels when initially detected by odor. The initial odor is masked after initial exposure.

It is NOT recommended the Well-Klean© Pre-blend remain downhole longer than 5 days without being neutralized by either removal or not, then flooded with HCT’s passivation solution of sodium bicarbonate and water.

Bac T, Coliforms, e. Coli

Not passing a Bac T, Coliform and e. Coli? Have we rehabilitated an older well (+/- 20 years), there we’ve moved flow from 30 to 50 or 300 to 500 gpm? Is it possible we’ve not yet flushed out all the biology within the well under the new flow volumes followed by disinfection? This is one of the reasons you want to emulate projected flow rates and utilizing smaller tighter discs when zonal pump and lifting - to remove as much of the matter that will come out prior to disinfecting.

Insitu Rehabilitation – Preventative Maintenance – Clean in Place

If we/us looking to go onto a preventative maintenance program or trying to reduce costs cleaning a well with the pump in place, there are many things to consider. It's a commonality that wells at 14 years of age, get sick – likely biologically colonized. If the well qualifies for biological remediation maintenance, pump in place, we would consider the program be implemented each 4-6 years.

A few rules;

1. if the column shaft is 416 stainless, it is not sustainable to strong acid solutions so descaling is out of the question

2. Chemistry heavier than water does not fall to the bottom of the well. Chemistry will follow the path of least resistance and likely flow with the gradient water flow of the well so we/us might add the chemistry and it may flow downstream never making it to the problem area. We've found 1-inch chlorine tablets in the anoxic zones which had remained there for 9-years, undissolved.

3. Chemical placement and "retention" is essential for a lot of matter that we/us may be trying to remove but getting the product placed and retained to the problem area can be challenging

4. Depending on where the pump is set, how deep the well is, and that the problem is biology versus scale, determines whether an insitu program might work for we/us. We would use the LSI Index, sulfate levels and conditions of stagnation if any, the determine if the condition is likely bio.

Layup Chemistry

If we/us have wells that sit idle for a period of 15 days or more, and the water flow through the well is NOT significant, throughout, the well should be treated with "Layup Chemistry". Simply calculate the volume of water, and for every 10 gallons of water, add ¼ lb. of sodium bicarbonate – not caustic soda or soda ash, just sodium bicarbonate. It is best to pre-blend the water and the bicarbonate above ground, then flood the well with it. If gradient water flow is a problem, direct application of the powder can be trickled down the well in hopes some will reach the bottom of the well. Stagnant water is a breeding habitat for bacteria. With the presence of sodium bicarbonate and water, their breeding appears to be suppressed. The durability of the layup chemistry is limited to gradient water flow, water temperature and other factors. We would suggest we/us consider a semi-annual assessment.

Bioremediation for Under Deposit Corrosion Products and Biomatter

Situations do exit where under deposit corrosion and biology exist, warranting bioremediation after descaling.

Environmental Overview / Discharge

HCT is the developer of three proprietary solutions that is impacting the world with respect to the rehabilitation of water wells, as well as treating water that is applied to agronomy including nurseries, turf and agriculture.

Such chemistry is founded on conventional, commodity chemistry, comprised mainly of hydrochloric acid, acetic acid and hydrogen peroxide, all products used in proportion for the treatment of potable drinking water. This is NOT to imply these products may be used as potable water additives and it is explicitly noted they are NOT to be used as direct or indirect potable water additives.

In water well's, HCT's products are certified for "off-line use" for the cleaning, rehabilitation and or restoration of water wells, including potable, ASR and Vadose wells. By certified for use in wells, we are referring to the National Sanitation Foundation, a State Statute in 48 Western US States, and in many other Countries, of NSF Standard 60,

where products used in and onto our drinking water systems are subjected to review, approval and an ongoing chain of custody beginning at the raw materials and carried throughout the production facilities to the end use.

Al HCT products prescribed in the use of water well rehabilitation, whether potable or not, are certified within the criteria of NSF Standard 60.

In agronomy, whether nurseries, turf or agriculture, HCT products are registered with the departments of food and agriculture, not as a nutrient, but as an auxiliary soil and plant substance, as defined by the California Department of Food and Agriculture.

Product	NSF 60 Certification	CDFA Certification	Acidity	PPE as a concentrate
Well-Klean© Concentrate	X		Weak acid	Relatively inert
Well-Klean© Pre-blend	X		Strong acid	Highly acidic
WaterSOLV™ BC	X	X	Peroxide	Very Strong Oxidizer
WaterSOLV™ Curative		X	Strong acid	Highly acidic
WaterSOLV™ AG		X	Weak acid	Relatively inert

NSF adjoining agencies accrediting include Underwriters Laboratories, Standards Council of Canada and American National Standards Institute. All products are organically inhibited to suppress corrosion and prevent the corrosion and oxidation of organic matter.

Disposal criteria will vary between states. The reaction products and biodegradation products of HCT products are typically considered nutrition to vegetation, including the dissolved solids and bio-matter, and when properly diluted and pH adjusted to a pH value greater than 6.0 units. Acid neutralization is recommended by the use of baking soda, sodium bicarbonate. Peroxide neutralization is recommended by dilution with water to less than 3% active peroxide.

Product Functionality

Well-Klean© Concentrate, HCT WaterSOLV™ AG

> Intermediate. Protonates the electron of sodium rending sodium inert, non-toxic to vegetation. Operates as an organic corrosion inhibitor to acids and oxidizers preventing the ionization of elemental metals and organic matter from strong acids and oxidizers. Catalyzes acids through a wetting and wicking. Increases the solubilization of various bound carbonate salts and metallic oxides I water, the rate of solubilization, types of scales dissolved and solubility of salts in water. By displacing oxides and carbonates with quazi acetates, most cations become a non-scaling nutrient more desirable and favorable for plant uptake resulting in plant vitality, heat and stress tolerance.
>
> Self-life is indefinite. Thermally stable, non-fuming and technically non-corrosive. Similar to vinegar.

WaterSOLV™ Curative, Well-Klean© Preblend

> Readily disassociates bicarbonate, converting carbonate bound cations to quazi acetate nutrition, or in water wells to TDS. Soak time result in the breakdown of metallic oxide deposits. Experienced to suppress the existence of low levels of black matter. Contains sodium protonation chemistry and prevent cations from reabsorbing carbon dioxide and reforming scale.

WaterSOLV™ BC

> Utilizes peroxide linear to bacteria to prevent the formation of iron, sulfate and manganese bacteria. Bio-degrades to dissolved oxygen and water promoting an aerobic soil and vegetation profile aiding in plant vitality and plant resistance.

Technical Notice

POST AT OR NEAR PRODUCT

WaterSOLV™ BC Handling & Storage Requirements

Storage & Handling

1. Must be stored out of direct sunlight – Cover if needed
2. Must be stored out of the heat – Cover if needed
3. Spills or leaks must not come into contact with wood or fiber
4. Cannot come in contact with wood for fibers, whatsoever
    a. Do not store on wood pallets
    b. Careful on wood trailers
5. In case of spill or leak
    a. Must drain unobstructed to an adequate drain – flush with water "9" times the volume of the spill, minimum
    b. If spilled onto surfaces, wood or fiber - flush with water "9" times the volume of the spill, minimum
6. Eye and Shower wash station must be within 5 seconds of storage area, including during transportation
7. Adequate amount of shower water must be immediately available for each person handling the product – 55 gallons of potable water per person
8. An adequate water supply must be adjacent the product, 40 psi, 30 gpm minimum.

This information does not supersede the SDS

Corrective Actions

If the containers enlarge, it because they are HOT and the product is in self-accelerating decomposition – it is usually not because of pressure.

1. Wear full personal protection
2. Create a water mist to cool product down
3. Be sure product is shaded, create shade if necessary, avoiding wood and fibers
4. Once safe to approach, begin gradually draining the vessel (with the misting water), to the drain by drilling a small 1/8th inch hole in the bottom of the barrel
5. Once the drain has stopped reacting, consider adding additional holes to the bottom of the container however not to exceed the drain reaction to the chemistry

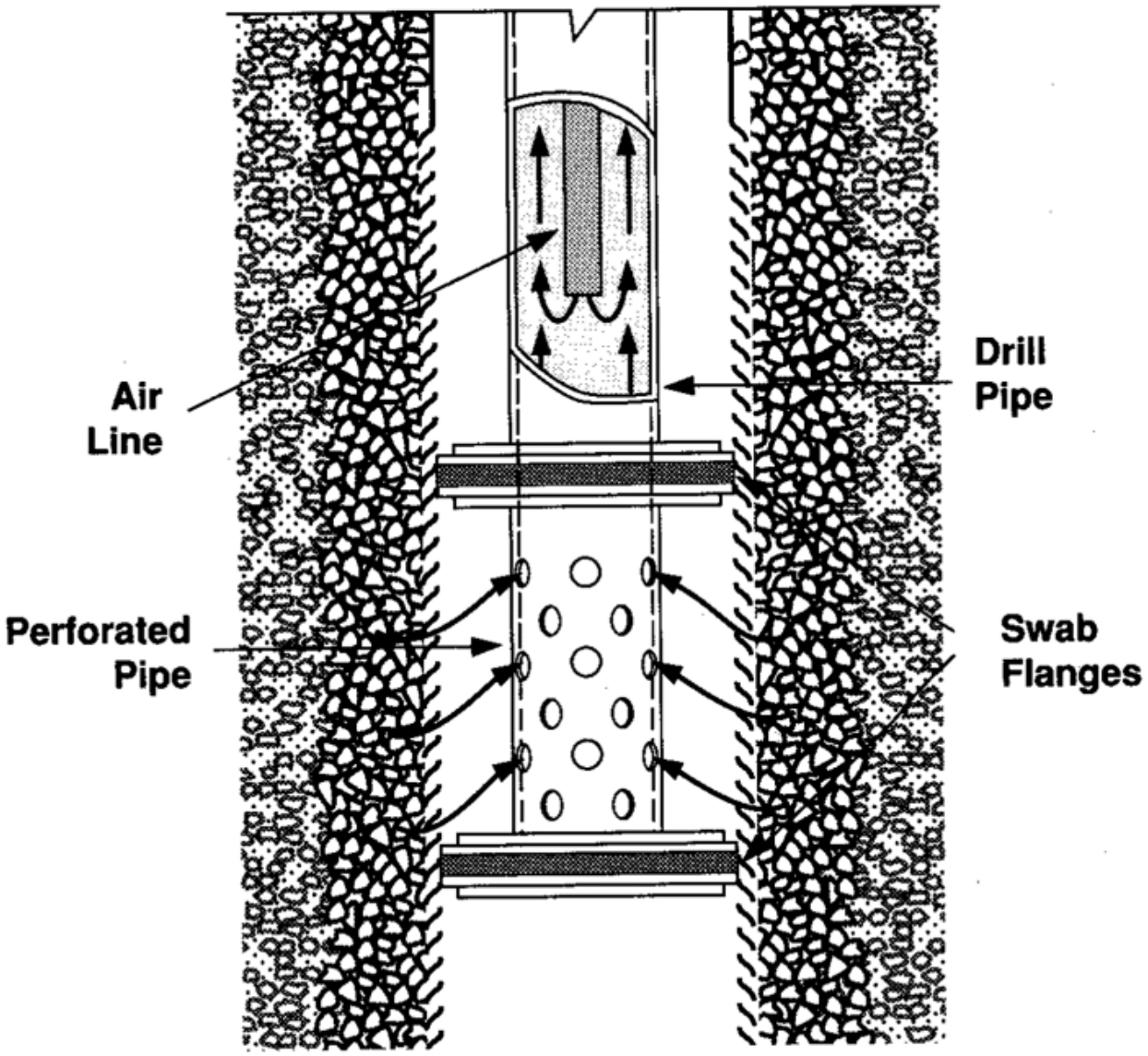
The objective is safely cooling the product and or
gradually draining it to the drain with water to a 3% solution.
Excessive volume of product to the drain can cause adverse reactions

6. Rinse empty container with water prior to discarding.

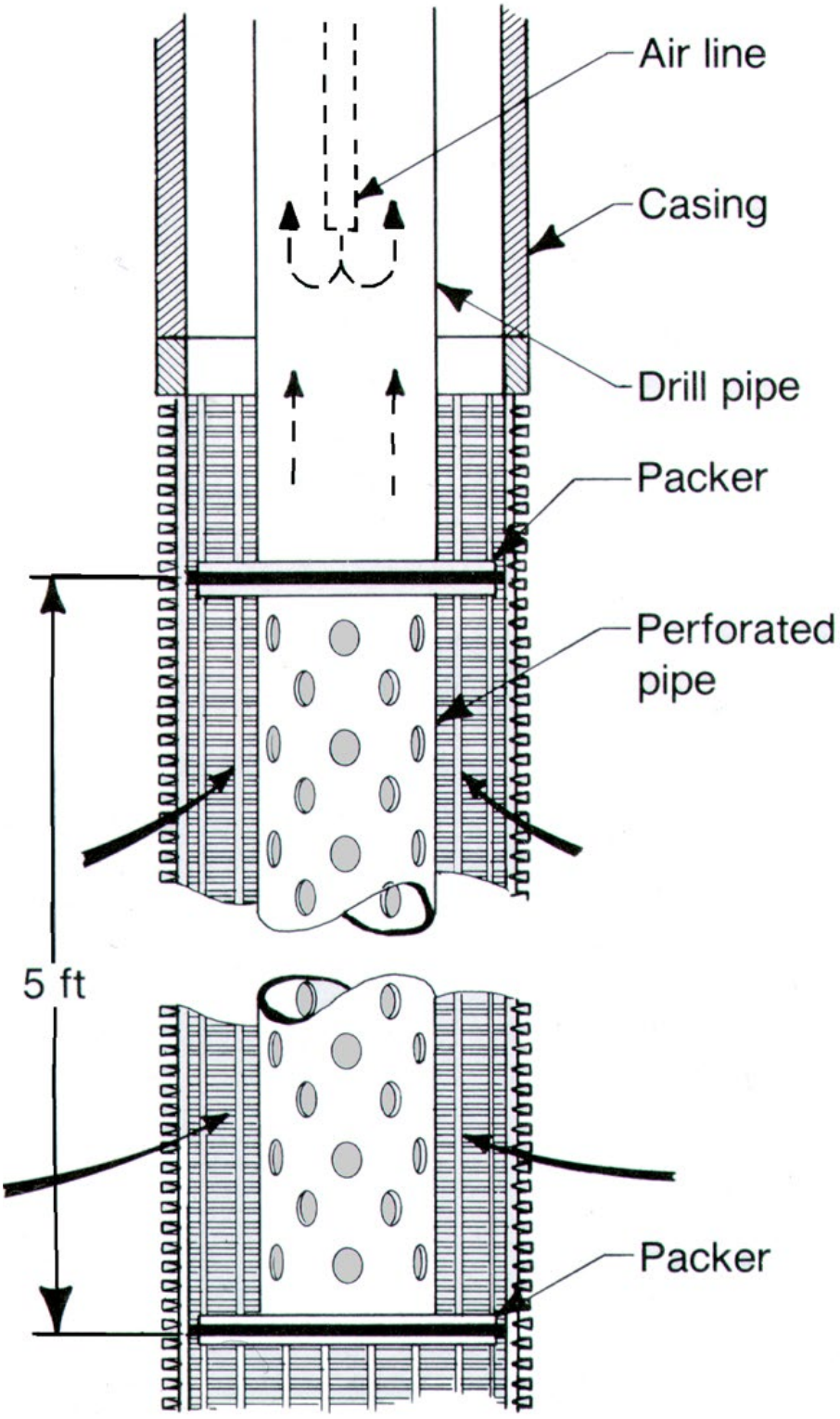
Urgent assistance call (480) 650-6955
Medical Assistance call 911

Insights – FAQ's

1. We're downhole and we can't flip the tool plungers. Were in the bottom section and pulled up for a but, but when we went back down it would not budge. Do we need to come all the way back out to flip the tool to get to the bottom 20-40 ft.?
    a. This well is anoxic in the bottom 20-40 ft. the anoxicity is bacteris that produces acid along with colonies of fluffy bacteria, - scale, no nodules. This area will be easy to clean being that we have 3 bioremediations prescribed for the well. You're welcome to apply double the bio remediation chemistry in that area on the next pass.



Airlift swabbing tool.


Air line
Casing
Drill pipe
Packer
Perforated pipe
5 ft
Packer

New Discoveries

6/2020 – Grounding the Well Head.
There are never possibilities a well head is not flammable or potentially explozise. Likewise, the gasses exuded from a well head can hydrogen, oxygen, hydrogen sulfide (from biology), and natural gasses from the geology. Even the arcing of static elcecticity from equipment, could produce a life threatening event. Well heads MUST be grounded and considered an explosive potential.

6/2020 – Project Modification
We have observed many times the Scope of Work modified without review and approval, whicj have lead to incidents creating unnecessary acatioins, reactions and expenses. On site oversight is always highly recommended and such person should be certified under the well reghabilition program and safety thereof.

1/2021 – Well continues producing iron ater enormous volumes of flushing. Rawhided passivation to alleviate the potential of dielectrics. Problems currently diagnosed as rehab chemistry was not mitigated (neutralized) prior to installing patches. Residual chemistry trapped and causing likely chloide corrosion at levels low enough to impact water quality/color.