

Treatable Well Problem

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Bacterial Report - "Timed" Test Aerobic & Anaerobic Bacteria

Project ██████████ - Nebraska **Date** Dec 28, 2010 **Lab Report** #1228710-1
Contractor Premier Pump/Cody **Engineer** N/A **Analysis by:** David Hanson
Comments The purpose of a "timed" bacterial analysis is to potentially determine if there is major amount of biofouling in the "Casing" Sample and if the problem is contained in the "Casing" Sample (treatable) or as a continuing source with time of pumping in the "Aquifer" Sample (untreatable) due to a physical problem in the well. Each test is explained as to what is normal and abnormal and whether this well can be successfully treated, longterm.

Sample Numbers above Bacterial Identification, Counts, & Information		
Times of sample =	"Casing" Sample @ 1.75 min	"Aquifer" Sample @ 6 hrs
Nutrient Plate Count	> 1500 colonies/ml ●	No growth at 10 days
Bacterial Identification	Citrobacter ● Staphylococcus sciuri ●	No ID possible as no growth
ATP Count	1.2 million cells/ml ●	39,000 cells/ml
Sulfate Reducing Bacteria	Present-Excessive ●	Negative
Anaerobic Growth	35% of all bacteria ●	15% of all bacteria
Coliform Bacteria	Present, 100 counts/100 ml ●	Absent Zero
E.coli	Negative	Negative
Microscopic Analysis	Extr large number Gallionella ●, Large number of Leptothrix ●, Moderate iron oxides ●,	Trace of Gallionella, Trace of Leptothrix, Minor iron oxides,
Notes	pH 7.20, TDS 848 ppm, Iron 12 ppm ● Phosphate 2.2 ppm ●	pH 7.25, TDS 781 ppm, Iron 0.13 ppm, Phosphate 0.61 ppm

● areas of concern

Brief Explanation of These Results

Notice the red dots present in the "Casing" Sample but NOT present in the "Aquifer" Sample. The "Aquifer" Sample tests are all normal indicating the bacterial issues are contained within the borehole and therefore treatable, long term.

The Iron Bacteria families as IDd above in the Microscopic Analysis (Gallionella & Lettothrix) only represents approximately 12% of all the reddish, snotty plugging you see in wells and systems. 88% of plugging of this snotty plugging is due to Heterotrophic bacteria (Plate Count above). These bacteria are present in every well in small numbers but only pose a plugging problem in 4-5% of all wells. So if you have an Iron Bacteria test done which shows no iron bacteria, it doesn't necessarily mean you don't have bacterial, slime formation due to Heterotrophic bacteria.

Plate Count. A normal Plate Count in an aquifer is < 60 colonies/ml. All slime forming bacteria are aerobic in nature which means they thrive in a oxygenated environment. These environments in a well include areas from the static level to the pumping level, the intake of the pump, and in higher velocity areas of a screen or crevices in fractured rock. Elevated numbers in the “Casing” Sample only, indicate a growth potential in the well (slime formers). Numbers above 300 colonies/ml, you can often see huge plugging problems in wells, pumps, and piping. Normal number in the “Aquifer” Sample indicate the problem is contained in the well (treatable, long term).

ID of bacteria. ID can be critical as there are differences between normal aquifer bacteria and surface water organisms which often are pathogens or opportunistic pathogens. Often we find these in deeper aquifers due to failures in the well casing or a failure of grout around the well casing. Note the bacteria found in the “Casing” Sample are normal but massive slime formers. The bacteria in the “Aquifer” Sample did not grow in the lab which can occur but the ATP Count was normal (see below).

ATP Count. Some bacteria do not grow well on a nutrient plate in the lab. This count is independent of the (Heterotrophic) Plate Count in case that condition occurs. A normal aquifer count for ATP would be 60,000-100,000 counts/ml. The ATP Count is excessive in the “Casing” Sample but low/normal in the “Aquifer Sample indicating growth is contained in the borehole and treatable, long term.

Sulfate Reducing Bacteria (SRB). SRBs produce the “rotten egg” odor sometimes found in wells. These bacteria are anaerobic in nature meaning they thrive in a low oxygen environment. This environment can be naturally occurring in shale/clay formations so this odor can be present in new wells. If that is the case, aeration is the only solution. SRBs often harbor beneath the slimy debris produced by Heterotrophic bacteria so the odor can suddenly appear where it was not previously noted. Note the presence is Excessive in the “Casing” but Negative in the “Aquifer” Sample indicating large amounts of bio growth in the borehole only.

Anaerobic bacteria. These thrive in a very low oxygen environment and often burrow within large amounts of slime and decaying debris from dead bacteria. A change in the percentage from the “Casing” to the “Aquifer” Sample as found in these samples indicate large amounts of decaying bacteria and severe plugging in the well and system.

pH of water. We look at some chemical parameters because they can be associated with bacterial activity. Some bacteria secrete a slightly corrosive enzyme so pH may change between the “Timed” tests. Depending on the ID of bacteria found, pH can change 2-3 points lower on the “Casing” Sample which indicates the presence of these bacteria and found through ID.

Iron & phosphates. The “Aquifer” Sample is considered the actual water chemistry. Slime forming bacteria consume soluble iron, manganese, and even phosphates as a nutrient. They use and then excrete it through their body walls as a somewhat concentrated deposit of whatever nutrient consumed. Their lifespan is approximately 28 minutes. When they die, this excrement stiffens over time. As water sits in the well when the pump is not operational, the solidified debris goes into solution providing a high concentration. These changes help us determine if there is massive decaying debris on the inside of the well casing as indicated in this study but not continuing in the aquifer so this well is treatable, long term.

Results. The results of this actual “Timed” test indicate this well is “**Treatable**” because all parameters are contained in the “Casing” Sample. If this well were treated with the Unacid chemistry, you could expect long term results. 35,000 wells have been treated with the Unacid chemistry with only 19 failures in 25 years and ALL 19 had a continuing source. Chemistry can not fix a physical problem in a well. Wouldn't you rather find out if your well can be treated successfully, longterm FIRST for some lab costs rather than spending major funds in contractor time plus chemistry costs and fail? A “Timed” Bacterial tests is great insurance.