

# UN-treatable Well problems

## DavidTHansonAssociates

### Bacterial Report - "Timed" Test Aerobic and Anaerobic Bacteria

**Project:** ██████████ - Nebraska      **Date:** March 20, 2017      **Lab Report #**032017  
**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.

Times of samples	"Casing" Sample @ 60 sec	"Aquifer" Sample @ 3 hrs
<b>Plate Count</b>	> 1500 colonies/ml ●	250 colonies/ml ●
<b>Identification</b>	Aeromonas allosacharophilia ● Bacillus thuringiensis/cereus ●	Acinetobacter nosocomialis ● Vogesella indigofera ●
<b>ATP Count</b>	5.6 million cells/ml ●	580,000 cells/ml ●
<b>Anaerobic Percentage</b>	< 20% ●	< 20% ●
<b>Sulfate Reducing Bacteria</b>	Negative	Negative
<b>Total coliform</b>	Present ●	Negative
<b>Counts of coliform</b>	370/100 ml ●	Zero
<b>E.coli</b>	Absent	Absent
<b>Iron Oxidizing Bacteria</b>	Absent	Absent
<b>Microscopic analysis</b>	Heavy growth ● Moderate protozoans ● Moderate iron oxides/biomass ●	Minor growth Absent Trace iron oxides/biomass
<b>Inorganic Analysis</b>		
<b>pH</b>	7.03	7.00
<b>Total Dissolved Solids</b>	660 ppm	467 ppm
<b>Iron</b>	0.63 ppm	0.18 ppm
<b>Phosphates</b>	0.40 ppm	024 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 and “Aquifer” Sample indicate a continuing source of organisms that are not normal.

**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 4 types of bacteria found in both samples are NOT normal, aquifer bacteria and ARE opportunistic pathogens indicating a physical well failure.

**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. In both samples, the ATP Count is excessive indicating a continuing source of organisms.

**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.

**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 may 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 would be 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. The water chemistry would be considered normal in both samples with no changes.

**Results.** The results of this actual “Timed” Bacterial Test was is “**UN-treatable**” because it indicates many parameters are on a continuous flow with time of pumping. If this well were treated, the treatment would fail quickly. 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.