

THE SCIENCE BEHIND CHAINBREAKER MICROBES FOR PARAFFIN CONTROL AND IMPROVED OIL RECOVERY

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How they work is like this. What they do is reproduce every 20 minutes. When they reproduce, they give off biosurfactants and biochemicals in their metabolic processes. Now there are 2 ways to make surfactants and chemicals. One way is synthetically and the other is biologically. With biologically the surfactants and chemicals are environmentally friendly, nontoxic, and benign in nature. These biosurfactants and biochemicals will mimic the traditional oilfield chemicals like wax dispersants, pour point depressants and crystal modifiers. And, these microbes can be used in oilfield application like paraffin control, scale, corrosion control, and production enhancement. These microbes also clean up wellbores of frac gels and drilling gels plus SRBs and iron sulfides. All this in a one package deal.

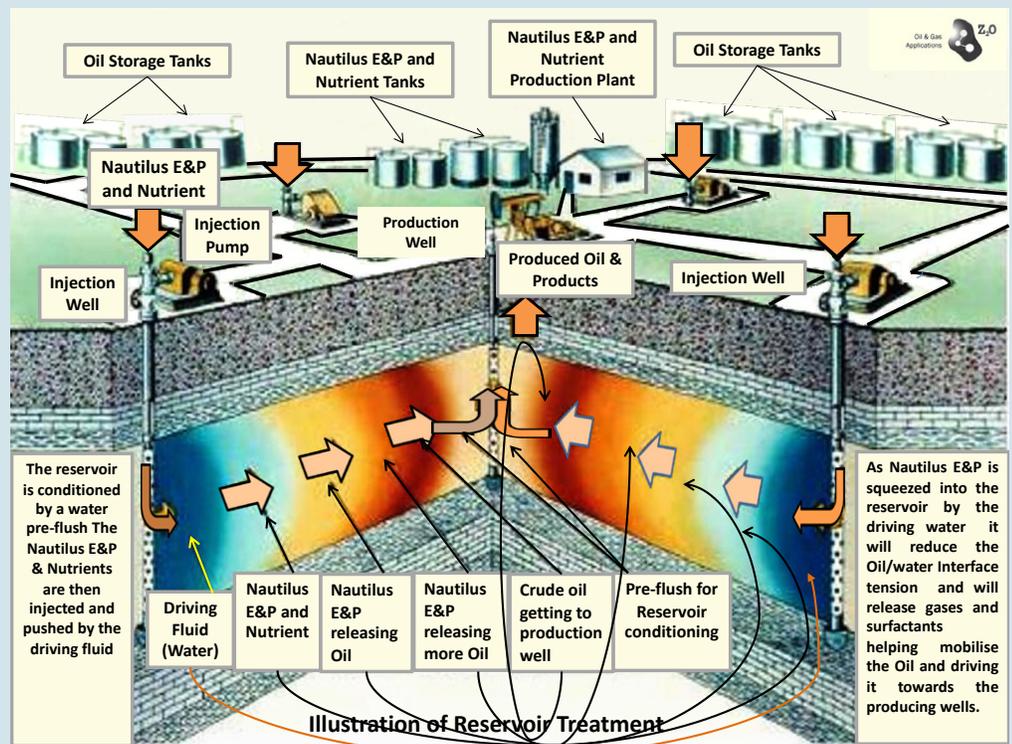
The advantage of the microbes. They produce the biosurfactants and biochemicals continuously and they attach to surfaces where the deposition is happening.

How do the ChainBreaker microbes work on Paraffins? They cut the problematic carbon chains and make them shorter so they will not precipitate out of solution. This is done by producing small solvent molecules like alcohols,

ketones, and aldehydes. The thinning action of the ChainBreaker microbes reduces viscosity and raises API gravity. For scale they form biochemicals like organic acids that act as naturally occurring chelation agents. These bind cations and restrict their capacity to form mineral deposits.

Other microbial compounds function as filming agents, coating surfaces and preventing nucleation sites for scale growth from forming. Filming activity of biosurfactants also prevent attachment of scale crystals to surfaces. With

SRBs (sulfate reducing bacteria) the ChainBreaker microbes basically fight fire with fire. The microbes will go and eat the food source of the SRBs. Then they become the dominant bacteria and starve them out. This eliminates the H₂S issues and the corrosion that come from H₂S. Such filming agents may also act as passivating agent for controlling scale of metal surfaces. By coating surfaces the interaction between compounds such as carbonic acids and sulfides are mitigated, and corrosion processes are reduced.



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TIRED OF THE STEEP DECLINE CURVES ON YOUR HORIZONTAL SHALE WELLS?

Reverse the downward trend and improve well profitability with a highly concentrated ChainBreaker Microbial Treatment aimed at addressing these key issues:

- Paraffin • Skin Damage • Scale • Iron Sulfides • Asphaltenes

In a Texas well with a 6000' lateral, a Chainbreaker Microbial Treatment provided the following results:

Well Treated on 4/2/22 and Placed on Production 4/15/22
Incremental Production Through 12/31/22: 7,215 BOE

	<u>BEFORE</u>	<u>AFTER</u>
Production Results (BOE/Day)	4.6	27.8
Cost per Incremental BOE: \$5.54		

WE CAN DO THE SAME FOR YOU!



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PARAFFIN CONTROL USING CHAINBREAKER

Paraffin has been an age-old issue as long as oil wells have existed. First on the vertical wells. Now those same zones have paraffin hindering production on the horizontal wells. And, the problem is a 1000-fold. With horizontal wells in the Woodbine formation, we are finding that the paraffin deposition in the horizontal legs is tying up with all the solids, such as formation fines, iron sulfides a little frac sand and even chlorides. We think that chlorides tied with the paraffins are the culprit on most horizontals that produce salt water.

The traditional remedy is the use of hot oiling, hot water washing, and chemicals. With horizontal wells, the traditional way is not effective or cost effective. They simply cannot reach into the horizontal leg of the well. With ChainBreaker microbes, favorable changes in flow characteristics, such as reduced viscosity and increased volatility, are another aspect of microbial treatments. That can yield more oil.

Crude oil that contains paraffins will thicken and solidify the crude at a temperature called the cloud point. That is usually where the paraffins start to crystalize. Combined with temperature change and differential in pressures they start to precipitate out of solution. Plugging of tubulars, flowlines, surface equipment and perforations start to occur. Next thing you realize, because of these restrictions, flowline pressures are starting to climb and your production is starting to decline. Plugged perforations

prevent oil and gas from coming into well bore. This happens on vertical wells as well as horizontal wells. So, you hot oil or hot water wash. It works, but it is only a temporary fix. With chemicals, you have to use a lot. It gets spent, and the contact time is very minimal. Therefore, it is ineffective.

Meanwhile your wells are slowly declining. Every year you get less production out of ground. Or, your water cuts are increasing because of the paraffin plugging off the top part of the perforation letting more water in. Now you have higher water cuts to deal with plus the disposal of the water. Some have injection wells to take this excess of water. Then what happens? The injection wells start to plug with paraffins because of carry-over from your water injection tanks. It's difficult to get all the oil out of water. There is always a little oil in the water. Therefore, you must filter the water before it goes down injection wells. Then the filters plug up with paraffins because of the oil carry over. The filters are plugging constantly, so you change to a higher micron filter which will let more particulates through to the injection wells. These particulates combined with the paraffin. Scale and particulates start to plug off the injection wells. Also, the pressures start to build because of restrictions in the tubing and perforations. So, you acidize to open up the restrictions. This works good on scale, but will not help with the paraffins. Also, you leave a lot of fines behind from the acid job. Plus, iron sulfides start to become issues. The paraffins mixed

with the particulates are still plugging perforations, and they get pushed into the formation for a bit. This is a very costly process and brings up your lifting expenses overall.

THE CHAINBREAKER MICROBIAL SOLUTION

Bioactive Services USA, Bioactive Services, Inc., and Dominion Energy Services can mitigate these issues in a cost-effective process. This will take your production decline curves and turn them around---make them into an incline instead of decline. Raising your production will make the bottom line look great for investors, plus put more money in your pockets. We are all about getting more oil out of the ground.

With our proven technology we can eliminate the paraffin issues in the Perforation, tubulars, flowlines, separators, treaters, and tanks. When the paraffin issues disappear off the walls of the pipes, you can have a more effective corrosion chemical program. Coating of the paraffin that's on the pipes prevents the corrosion inhibitor from getting to the metal. Also, pressures will reduce, and production will increase because you mitigated the restrictions. You will notice when you use the ChainBreaker microbial program that you will get longer life out of your downhole pumps as well as your tubulars. You will start to notice pitting on the rods will stop. You won't have as many rod hang ups or parted rods, which will save you on your service rig expenses, down time, and lost production. As the microbes go through the system, they will eliminate dumps from being stuck in



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separators and treaters due to paraffin deposition. The pads from the treater will disappear and start to clean up the tanks slowly. The microbes function as a demulsifier, so they will take more water out of the oil and eliminate a lot of that oil carry-over into your water injection tanks.

What we do is wellbore treatments we do not squeeze the well. We do not want to push anymore paraffins into the formation we want to get them out of the well bore. We do not use any specialized equipment. In fact, we can set a producer up for a do-it-yourself program if they wish.

In closing This ChainBreaker Microbial program on horizontals are proving a 10 fold increase in oil pro-

duction on first treatments. Then continues to increase with each follow up treatments. Cost per extra barrel of increase is approximately \$2.34 per barrel. Return on investment is running 22.25 times. ChainBreaker is the most cost-effective way to treat horizontal and vertical wells. Bioactive Services has 40 plus years of using microbes on oil wells. Now Bioactive has it's own biological products to solve production issues and no longer uses others products. If you have any questions just reach out we would be happy to answer them. ■

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