



## Technology Testimonial and Case Study

### Recompleting Oil Recovery Wells with Casing Cutter

The following logs the experience of a large petroleum company using WISE technology:

The only way income can be made from an oil recovery operation is to actually succeed in recovering oil. We were all aware that this technology could be used to degrade hydrocarbons, because I had done that repeatedly in wetlands ponds, successfully treated a large area of ground contamination that had resulted from an underground oil line rupture, and a variety of other small oil degradation applications.

It was time to do some scheduled oil recovery wells , re-completions to clean scale off the inside of the well casing, clean the casing screens, and clean out the impacted soil surrounding the immediate vicinity of the well bore because flow rates were beginning to decline in one area of operations. I was told that two products had been used in the past to perform this operation. However, there were several problems associated with use of these chemicals (LBA and DBA), even though they were an effective and industry recognized chemical used specifically for this process:

- First, they were hazardous to use because they were acidic.
- Second, re-completing each well required constant swabbing with the first chemical continuously for a period of 6 hours, followed by introduction of the second chemical and isolation of the well for another 24 hours before airlifting sediments had to be done prior to putting the well back into operation and reinstalling all of the pumping equipment.
- Third, use of these two chemicals caused off-gassing of hydrogen sulfide gas from the well which caused dangerous conditions to the re-completion crew as well as complaints from neighborhoods and businesses downwind.

Of course, since these were oil recovery wells we suspected that WISE technology might not be the best option. I called and described the situation. As always, they had the right solution at the right time.

I relayed information about Casing Cutter to my management team. We decided to purchase a small quantity and try it for well re-completions for the following reasons:

- Casing Cutter would allow us to still recover approximately 80% of treated oil.
- We were assured me that no off gassing of hydrogen sulfide would occur.
- The entire procedure of swabbing each well could be accomplished in a fraction of the time previously expended in re-completing the wells.

This is a case where the proof was in the performance. After introducing the Casing Cutter into the well at the rate of 8 ounces per column foot of water, the driller immediately began swabbing the well. We obtained the following results.

- Fifteen minutes of swabbing resulted in the swab no longer sticking or hanging up on the walls of the casing, which was an indicator that scale had been removed that quickly from the entire inner surface of the well casing.
- Use of a calibrated gas detector revealed no release of any VOC's (volatile organic compounds) from the well bore. Actually, there was a pleasant odor of citrus coming from the well during the swabbing procedure which was a welcome surprise to the crew. A nasty task that became suddenly pleasant was an unexpected benefit.
- When the driller removed his swab from the well, he was quick to remark that even though there had been a 12 inch layer of oil floating on the surface of the water when swabbing commenced, his tools came out of the well completely clean. He had never experienced this before, and usually had to spend extra time cleaning each joint of the swab pipe when dismantling the sections and stacking them back onto the rig trailer.

It is important to note that although every indication existed that the swabbing job was complete in 15 minutes, we continued to swab the well for one hour to assure thorough cleaning of the well screens and to also push the product out into the formation to make sure that we had sufficient treatment to the impacted soil surrounding the outside of the well bore.

In comparison, the old treatment system would have required 6 hours of continual swabbing with 5 gallons of LBA concentrate, followed by removal of the swab, adding another 5 gallons of DBA (both hazardous products), reassembly of the swab followed by at least 1 more hour of swabbing to push the second product through the screens and into the impacted soil, and removing / cleaning / and breaking down the joints of the swab pipe a second time. One full day would have been required just to set up, swab one well, and break down the equipment. A second day would have been required to set up equipment and air lift sediments from the same well. A slow release of H<sub>2</sub>S gas byproduct would have been happening during this entire time.

Using the Casing Cutter allowed us to re-complete two wells per day, one before lunch and one after. When the swabbing unit moved to the second well, I added additional Casing Cutter to the first well at the rate of 10 ounces per column foot of water, and when swabbing was finished on the second well I repeated this procedure. We allowed both wells to set overnight undisturbed and the next day; we were able to air lift the loosened sediments from the bottom of each well bore. This process actually took more time than usual, but it was because there was more sediment to remove from each well. The Casing Cutter performed exactly as described, and even better than we had anticipated.



Shown at the far left is a photo of a stainless steel Grundfos submersible water pump. It is covered with an iron sediment bacterium that builds up in some of the recovery wells.

The right photo is the 2 inch discharge end of this same water pump. It is easy to see that the flow of water was seriously restricted.

These photos show dismantling of the discharge manifold located at the surface above the submersible pump.



Note how the outside of the pump, the intake ports on the pump, the check valve and discharge line are all either covered or plugged with this buildup of iron sediment bacteria. This pump had been in service for less than one year.

The next application that was proposed to me by my supervisors was whether or not the Casing Cutter could be used as a preventive maintenance treatment to just this one well to prevent this type of buildup. This is an ongoing problem that requires additional maintenance to remove, clean, and reinstall equipment. Quite often, this buildup results in replacing equipment that fails prematurely.

Since this was a relatively new pump, it was scrapped, cleaned completely (with a sonic cleaner, and without benefit of a colloidal product because I was working on a different project elsewhere) and returned to service. For the next two months, I “slugged” this well once per week with Casing Cutter and this water pump was run continually at a flow rate of 25gpm. There was no noticeable reduction in the oil production of this well during the 8 week “slugging” process, using Casing Cutter. I used 1 gallon of Casing Cutter per treatment, and circulated the treated water back into the well via a 2 inch hose attached to the 2 inch discharge piping at the top of the well. I would circulate the flow of water back into the well for a period of 5 minutes with each weekly treatment.



Here is a photo of the same water pump that is shown above after eight weeks of once-per-week treatments of Casing Cutter (a total of 8 gallons of product used during 2 months).

During the timeframe of this treatment test of this particular well, the water flow rate stayed at 25.953gpm without faltering even once.

### **Results & Conclusions**

Results of this test were a directive for me to immediately begin a preventive maintenance treatment of each and every recovery well (52 total) once per month across the site. I would have preferred a bi-monthly treatment but the general consensus was to start cautiously and see what results we get.

Due to other work tasks with the onset of winter weather, two employees quitting, and taking time to train new personnel, treatment at this time has been sporadic. It has not occurred with each well receiving treatment each month. However, all of the wells have been treated, just not as consistently as we had planned. We have also used Casing Cutter to treat problem wells more often than once per month, and I have treated specific wells occasionally as a means of getting treatment into the water conveyance lines to remove oil that has gotten into the water system through equipment malfunctions, not related to iron sediment buildup.

Downstream, our Oil Water Separator has never looked better. This was another added and unexpected benefit.

It is important to note that I have not been using Casing Cutter all by itself. I premix a 55 gallon drum of the Casing Cutter that is used in treating the wells. The mix contains 7.25 gallons of WISE All Purpose Colloidal Cleaner concentrate and 47.75 gallons of Casing Cutter concentrate. The concentrate colloidal product is added to make the Casing Cutter more active, without mixing in enough to degrade the oil that we are trying to recover, while simultaneously treating the wells to prevent iron sediment buildup.

We also use this mixture to clean our oil and water sensing probes that are suspended inside each recovery well whenever they show signs of any type of a buildup.

For more information or to obtain samples, contact:

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