SAND-PRO® CONGER FMT PRESENTATION

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ABSTRACT AND SCOPE

After many years of producing a lower zone in the Conger FMT Chevron recompleted existing wells in an upper zone. The lower zone was closed off with a cast iron bridge plug for a certain period with plans to open that zone back up after a required time period.

This paper will review the problems and solutions encountered when these changes were made. It will also review the different pump designs that were used and which were successful.

INTRODUCTION AND BACKGROUND

Sand is among the hardest materials located in a sucker rod pumped well. Its hardness is about 7 on the Mohs scale, the same as quartz rock and about the same as hardened stainless steel sucker rod pump components (stainless steel balls and seats), and only slightly less hard than carbonitrided sucker rod pump barrels or sprayed metal plungers. Some sucker rod pump components are harder; such as nickel carbide plated barrels, carbide/sprayed metal plungers, and carbide balls and seats.

When the upper zone was completed in these Conger wells a large amount of sand was in the produced fluid. In these wells the pump life was shortened due to wear of the plunger and/or barrel. Generally the shorter of the two receives the most wear during its pumping life. Standard API style sucker rod pumps use plungers that are shorter than their barrels. This design causes the plunger to try and run over the sand because pressure forces sand between the barrel and plunger.

Many methods have been tried over the years to lengthen sucker rod pump runs in sand production conditions wherein the pump is worn prematurely by sandy abrasives. Plunger and barrel treatments as well as various sucker rod pump configurations have been tried. Initially two changes were made in the Conger standard pump design with some success. The plunger to barrel fit was increased allowing sand to pass by the plunger. This helped but we still did not achieve the run time between failures that was desired.

A well design was the next change made with the seating nipple being set above the new perforations to let the sand fall out. We would produce the well from this depth until the well had "cleaned up" then the pump would be lowered below the new perforations. This second placement allowed the well to have a natural gas anchor and avoid the problems with gas interference when a well is placed above the producing zone.

The third change that was made was a pump design and a well design change. We set the seating nipple below the new set of perforations as soon as they were opened up. We also ran a Sand-Pro® pump to combat the sand in the produced fluid.

THEORY OF PUMP OPERATION

We attempted this hoping to have the pump set in the most desirable location and to eliminate a second tubing job after the initial well work.

The Harbison-Fischer Sand-Pro® Sucker Rod Pump: All pump companies and many inventors and operators have come up with ways to address the abrasive sand production problem, mostly through harder coatings or ways to keep the sand away from the plunger-barrel interface. Many of these ideas were tested and some are still undergoing field tests.

The Sand-Pro® pump has a two-plunger system where the upper plunger handles the sand without pressure and the lower plunger handles the pressure without sand.

The Sand-Pro® sucker rod pump uses this concept to separate the pressure sealing function from the sand handling function. The upper, sand handling plunger keeps the sand away from the lower, pressure sealing plunger enabling it to function with less wear since it does not have to contend with the majority of the sand particles.

The upper sand-handling plunger is characterized by having balanced pressure above and below the plunger. This gives the relatively soft composition rings a longer life since they do not seal against the high pressure of the pump installation depth.

The lower, pressure sealing plunger is sprayed metal coated with a hard, HRC 58-62 sprayed metal coating to resist wear due to the high pressure and sand particles that may come into contact with the leading edge of the plunger.

The two plungers are connected with a tube with holes in its lower end. A sand shield is installed between the outside diameter of the tube and the inside diameter of the pump barrel. The sand shield prevents or minimizes sand infiltration into the area above the lower plunger. Sand can accumulate in the annular area between the tube and sand shield and flow back into the interior of the tube to be produced up the tubing.

TESTING

This design was tested for a period of time with a small number of wells. We first determined that we had achieved a longer run time than we had previously. Then we completely changed to this design on all of the wells where the new producing zone was added. We felt confident in doing this as the Sand-Pro® pump can easily be converted back to the original design if needed. There are only 4 parts that are not “off the shelf items”.

SUMMARY

To date in the Conger field we have about sixty Sand-Pro® pumps installed. We have experienced much longer run time between failures. At this writing we have not pulled a well that the Sand-Pro® pump was installed in where pump abrasion was the primary cause of pulling the well. By eliminating one of the tubing jobs we save on all the costs related to pulling tubing. We also eliminated the loss of production and any potential accidents that could occur with a pulling unit event.