What’s new in artificial lift?

Part 1: In this first of two monthly reports, new innovations that improve operations and/or reduced expenses are described in the categories of Beam/Rod Pumping, Gas Well Dewatering and Gas Lift

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It has been another banner year for artificial lift innovations. The offerings have been prolific enough, that we have split this year’s report into two halves. This first-half report will cover eight developments in Beam/Rod Pumping, Gas Lift and Gas Well Dewatering.

In beam/rod pumping, a “three-in-one” solution is discussed, whereby coiled tubing is not only used as a pumping string, but as a means for the operator to preventively treat the well. Another item is a downhole sucker rod pump that sets new efficiency standards. Finally, there is a diverter downhole separator, for use in wells where one cannot locate the pump intake below the producing interval.

Among gas well dewatering developments, there is a casing plunger application that improves gas production. A second item is a plunger that provides a complete diagnostic picture of downhole conditions. Yet another device is a low-volume positive displacement pump that is well-suited for dewatering gas and CBM wells, and can be used in a various applications, including severely deviated wells.

As regards gas lift innovations, a single-point gas lift system enhances the effectiveness of wellhead compression. There is also a dual-pocket, side pocket mandrel that is suited for offshore, high-pressure, deepwater and subsea installations. It is designed to lower costs and downtime by improving the pressure integrity of the upper-completion wellbore environment.

BEAM / ROD PUMPING

New downhole sucker rod pump. Presented by Samson Pump LLC of Keller, Texas, the Samson Pump offers significant advantages over existing pumps. This patented downhole pump can be used, both to produce oil wells and, in particular, to de-water natural gas wells. An efficiency increase of 67%-plus has been shown in controlled research, and in initial field installations, a run-time improvement of tenfold-plus has been demonstrated under certain conditions.

The Pump is fitted with a plunger that is longer than the pump barrel. The plunger always projects out one end of the barrel, thereby forming a variable length seal. This new design significantly increases the surface area between the plunger and barrel (which is considered the seal). The increase in surface area, in turn, reduces leakage. The Samson Pump achieves better efficiency with the increased surface area between the plunger and the barrel. Initial testing/validation results indicate that the API/conventional sucker rod pump of equal bore, with the same clearance (or fit) between the plunger and barrel, and both having the same stroke length, had more than three times the slippage of that of the Samson Pump. The larger seal area also makes significantly greater plunger/barrel clearances possible, if desired, to reduce friction, handle solids, and extend pump run-times without sacrificing relative efficiency.

Another stated advantage of the pump is that sand and other particulates are pulled away (or “washed” with produced fluid) from the space between the plunger and barrel. The particulates no longer accumulate on top of the plunger, as it is pulled upward by the rod string. (Please refer to Fig. 1 where the flow of fluid is represented by the red arrows, and the direction of the plunger is indicated by the white arrows.) On the downstroke, the solids are “wiped” off the plunger, as it falls past the seal at the top of the barrel. The “moving seal point” within the barrel of a conventional pump is vulner-

Fig. 1. Flow of fluid is represented by the red arrows, and the direction of the plunger is indicated by the white arrows.
able to forced solids between the barrel and the plunger on the upstroke. These solids can accelerate plunger and pump barrel wear, as a result of the solids suspended in the wellbore fluids being swept into the clearance between the plunger and barrel. Some solids can have a higher Rockwell hardness than the components of the pump, and can, therefore, abrade the components during the reciprocating motion of the plunger entirely within the barrel. The frictional heat generated by this wear can also cause the pump components to gall or fuse together. In many cases, when these solids cause the plunger to seize, the barrel may also stick in the tubing. These problems result in frequent pulling jobs and pump repairs.

The Samson Pump has been tested extensively at the Rocky Mountain Oilfield Testing Center in Wyoming and the Red Raider No. 1 test well at Texas Tech University. Furthermore, field installations in the Eagle Ford shale, Hosston formation, Permian basin, and others, have verified the performance claims stated here. Samson Pump has also been awarded two grants from the U.S. Department of Energy, plus a RPSEA (Research Partnership to Secure Energy for America) Energy Award. One way to cut costs, due to sand problems, is to raise the pumps up the wellbore to lessen the amount of solids handled by the pumps. However, the ability to lower the Samson Pump and produce from the pay zone, and still handle solids as claimed here, may allow the possibility of more drawdown in solids from producing wells.

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