Technologies Optimize Artificial Lift

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Whether it is new solutions for downhole problems or innovative ideas to increase production, improve efficiency and reduce cost, manufacturers and service companies continue to develop technologies to optimize artificial lift operations.

Higher-horsepower pumps capable of moving more fluid at lower cost, progressing cavity pumps that can lift heavy crude oil, software that can integrate numerous applications to improve the diagnosis of potential well problems, a plunger that aerates fluid to lighten the load as its lifts, a gas lift check valve that meets new standards, or a variable speed drive that matches the pumping speed to the reservoir are only a few examples of what is new in artificial lift.

Dave Phillips, president of Samson Pump, LLC in Keller, Tx., says his company has taken the oldest idea in artificial lift—the sucker rod lift pump—and revolutionized it with a new patented design.

Instead of a moving seal at the plunger barrel interface that remains constant, he explains that the new Samson Sucker Rod Pump uses a stationary but variable length seal.

“The plunger is longer than the pump barrel and a portion of it always remains above the top, or outside, of the pump barrel,” Phillips relates. “This makes the seal between the plunger and pump barrel greater than with a conventional plunger and barrel. The surface area between the plunger and the barrel is several times that of the conventional pump at the bottom of the stroke and at least equal at the top of the stroke. Therefore, better pump efficiency with less slippage is gained because of the greater interface between the plunger and the barrel throughout the entire up and down cycle.”

This larger seal area makes possible significantly bigger tolerances without sacrificing relative efficiency, he goes on. “This larger fit also reduces friction, handles solids much better, and extends pump run times, Phillips reports. “While this surface area is variable, the top of the seal—at the top of the barrel—is stationary.”

Phillips says the “lifting” or moving seal point within the barrel in a conventional pump is vulnerable to forced solids between the barrel and the plunger on the upstroke. “Solids such as formation and fracture sand, calcium carbonate and barium sulfate scales, and iron oxide and iron sulfate corrosion products can accelerate plunger and pump barrel wear. In conventional sucker rod pumps, solids also can cause the plunger to stick in the barrel or the barrel to stick in the tubing. These problems usually result in frequent pulling jobs and pump repairs.”

By contrast, he says the Samson Pump achieves better mechanical—and therefore volumetric—pump efficiency because of the increased surface area between the plunger and the barrel. In initial testing and validation, results indicate that the API/conventional sucker rod pump with the same clearance (or tolerance) between
the plunger and barrel, and with the same stroke length, leaked more than three times that of the Samson Pump, according to Phillips. In addition, he says it handles solids much better as well.

“As the plunger is pulled upward by the rod string on the up stroke, the particulates are pulled away from the seal rather than forcing them between the plunger and barrel,” Phillips explains. “Additionally, the solids are ‘washed’ off the plunger with produced fluid. On the down stroke, the solids are ‘wiped’ off the plunger as it falls past the seal at the top of the barrel.”

Phillips reports that the 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. Further field testing is beginning in numerous oil and gas wells in the Permian Basin, he notes.

“Controlled evaluations in test wells indicate that the pump has the potential to reduce pump wear and plunger sticking problems caused by solids. It has application in sand-producing areas such as the Permian Basin, heavy oil fields, cleaning up hydraulically fractured wells, and dewatering gas wells,” Phillips relates. “We are now in the process of installing pumps for ConocoPhillips as well as several smaller independents.”

Samson Pump also has been awarded two grants from the U.S. Department of Energy: one to fund research on pumps with alternative energy to remove water from gas wells, and the other to pump oil with less energy, Phillips adds. “It is a convergence of efficiencies. In addition to reducing pump wear and extending run times, the pump uses less energy per barrel of lifted fluid,” he concludes. “It saves money, and cutting costs improves the bottom line.”