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Optimal Forms of Artificial Lift

As horizontal wells in the US become more established and gradually age, operators are continually challenged to select the optimal forms of artificial lift to sustain maximum production. In the current market, increasing the overall value of a well has never been so vital. As a consequence, the artificial lift market will experience substantial growth over the next few years.

Essentially, there are seven basic types of artificial lift: electric submersible pumps (ESPs), sucker-rod lift, plunger lift, gas lift, chemical lift, progressive cavity pumps (PCPs) and hydraulic pumping systems, and each have their pros and cons and are suitable for use in different contexts.

Why Choose ESPs?

With all things considered, ESPs frequently emerge as the best artificial lift option open to operators looking to cost-effectively maximize their reservoir production. However, the full potential of ESPs in offshore and remote locations has been restricted by the high cost of intervention associated with rig deployment, the loss of production that it brings with it, and an inability to access the reservoir without pulling the production tubing. Crucially, repairing a damaged ESP system can be very expensive. In many cases, (when the rig is offshore or beset by permitting, rig availability or accessibility issues), a rigless ESP offers a more cost-efficient solution.

Rigless ESP Conveyance

AccessESP's non-invasive rigless ESP conveyance system can reduce costs, as it simplifies the ability of an operator to quickly and easily install and retrieve ESP systems on slickline, without a rig. It is designed specifically for high-value wells, where access to the location is difficult (such as onshore Alaska, offshore West Africa, the Middle East and Southeast Asia), rig interventions are cost-prohibitive and where delays in production need to be strictly avoided.

This 'rigless' conveyance system combines a robust production-tubing landing string with a side-pocket-mounted downhole wet connector and a high-power permanent magnet motor (PMM):

Permanent Completion System

The permanent completion is deployed alongside the production tubing and is formed of two components: the side-pocket-mounted downhole wet connector and the connector orientation and latching system. The side pocket wet connect system provides an electrical connection between the retrievable ESP assembly and the ESP power cable to surface. After deployment of the permanent completion, it only takes a few hours to complete through tubing installation and retrieval of the slickline assembly. The connector orientation and latching mechanism ensures that the wet connector on the retrievable ESP assembly is aligned with the mating connector on the permanent completion before engagement. Mechanical supports are also provided by the permanent completion, which take the mechanical forces generated by the retrievable ESP system.

Slickline Retrievable ESP Assembly

The high power density, lightweight PMM is only a fifth of the weight and length of conventional ESP motors. The slickline retrievable assembly integrates the PMM and wet connect system with industry-standard ESP components (pumps, gas handling equipment, seals, cables) from all major ESP providers, allowing the operator to combine the system with ESP components from whichever supplier they wish. The PMM is also compatible with surface electrical equipment (drives, transformers, cables) from all major suppliers, meaning the client's surface electrical equipment can remain the same.

The system can be easily installed and retrieved through tubing, in shut-in or live wells, with a low-cost standard

slickline unit with no need for an expensive workover rig.

The permanent completion and the slickline retrievable ESP system together form a reliable, lightweight and sturdy system to perform a rigless ESP replacement. The PMM and deployment architecture of the system ensures that it is light, (allowing slickline deployment), short (allowing easy lubricator deployment), with full bore access and highly tolerant to debris. In wells with high deviation and installations depths beyond reach of typical slickline operations, the system has been deployed using coiled tubing, wireline Tractor or Pumpdown to reach the target installation depth. Additionally, the live well intervention enables deployment with no need for pumping kill fluids, adding cost savings with no reservoir damage.

A Cost-saving System

Since the potential ramifications from failure in a production well are severe, the artificial lift segment of the oil and gas industry is understandably extremely conservative in regards to adapting and using new technology until it is proven.

Slickline retrievable ESP systems are indeed now proven in a variety of environments, making them a commercially viable choice of technology that is successfully operating in fields around the world. The application of these systems significantly reduces operating costs, capex and cost per barrel for global ESP market operators, while increasing rates of production.

While choosing to deploy this system can cost more in the short term, it can significantly reduce the costs to replace the ESP in the long run. Operators using the system generally lower their overall cost per barrel by US$2 - 5, versus a conventional ESP deployment. The AccessESP retrievable ESP system lowers the cost of oil production per barrel and simultaneously provides simple and low cost access to the reservoir. This amount of flexibility and ease of use has not been possible with ESPs previously. ■