With the recent dramatic slide in the global price of oil, operators will be looking to make the most out of their existing wells, in a climate where exploration costs are high and budgets are low. Increasing the overall value of a well has never been so critical, and that need, against a backdrop of increasing global energy demands and ageing oil and gas fields, suggests that the artificial lift market will witness substantial growth over the next few years.

Artificial lift is a method employed in more than 60% of producing oil wells to increase the flow of liquids to the surface when insufficient pressure exists in the reservoir, or to boost the existing flow rate. Either a mechanical device (pump) can be placed inside the well, or the weight of the liquid/gas column can be decreased with high-pressure gas. There are several artificial lift technology options available, such as plunger lift, beam/sucker rod pumps, gas lift, progressive cavity pumps (PCP) or electric submersible pumps (ESPs). Even when oil prices are depressed, Todd C. Wray, AccessESP LLC, USA, explains how the company is expanding the market for the deployment of ESPs in challenging artificial lift applications.
installing artificial lift or switching to a different lift system can boost oil output and economic return.

Electric submersible pumps (ESPs)
Reliable and efficient, ESPs are a key product segment in the artificial lift market. The system is generally comprised of a multistage centrifugal pump with either an integral intake or separate, bolt-on intake, a seal-chamber section, a three-phase induction motor, with or without a sensor package, a surface control package and a three-phase power cable running downhole to the motor.

ESPs are adaptable to highly deviated wells, and do not require a large amount of space for subsurface controls and associated production facilities. They are considered to be high-volume pumps, which are quiet, safe and clean for use in offshore, harsh and environmentally sensitive locations.

However, the full potential of ESPs in offshore and remote locations has been limited by two key challenges: rig deployment with its associated high intervention costs, non-productive time and lost production; and the inability to access the reservoir without pulling the production tubing.

An easier way to install and retrieve ESPs
AccessESP develops systems for operators that make it possible for ESP systems to be deployed in a much simpler and more economic manner. The goal is to make it possible for clients to select ESPs for deployment in circumstances that would typically be unfeasible due to the high cost of intervention or the lost production associated with the time it takes to replace an ESP.

The company has developed a unique rigless ESP conveyance solution for the global oil and gas industry. The company has addressed the traditional challenges in deployment of ESPs offshore by integrating two practical technologies into a solution that radically simplifies the conveyance of ESPs without the use of a rig. The aim is to assist clients in maximising the value of their ESP wells with greatly reduced intervention costs (by using standard slickline, coil tubing or downhole tractors with a small operational footprint, rather than expensive and difficult to source workover rigs).

Replacing an ESP in hours, not months
In many locations around the world, it is difficult to mobilise workover equipment, i.e. rig, to a location in a short timeframe. A client waiting to move a rig onto a location to replace an ESP can result in 60 days of lost production. However, AccessESP’s rigless conveyance system eliminates the need for a rig, and can reduce that downtime to 7 days; significantly increasing the production potential while cutting workover costs.

Using conventional slickline to deploy and retrieve the ESP system, reduces the time necessary to replace an ESP, minimising operating expense and time in comparison to a workover rig, while significantly reducing the operational footprint required on location.

Increasing access
Access ESP’s conveyance system is the industry’s only solution deployed via slickline. In addition, this system provides full bore reservoir access for through-tubing, live wellbore production operations. This unique combination delivers to their clients, the ideal solution, for both deployment and intervention options. Today, conventional ESP operations require a very time consuming and expensive workover operation to provide access to the reservoir. AccessESP retrieves the ESP system as simply as it installs it. To acquire access to the reservoir, a slickline unit is mobilised to location and the ESP system is retrieved, once retrieved, any number of reservoir operations can begin.

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**Figure 1.** AccessESP’s Access375 slickline conveyance system.

**Figure 2.** The company’s permanent magnet motor (PMM).

**Figure 3.** AccessESP’s side pocket downhole wet connect.
From gas lift to ESPs

AccessESP is one of a limited number of companies that are changing the way ESP systems are deployed and utilised, in order to make them a practical option in locations where they were not previously considered. In offshore applications, gas lift has traditionally been the predominant artificial lift technique. However, as the water-cut in a well increases, gas lift becomes less and less efficient, making the switch to an ESP favourable. However, the cost of installing and retrieving an ESP can exceed US$10 million, and is therefore cost prohibitive for many clients. With rigless conveyance, an ESP can be replaced in hours instead of months, and wells that would typically have been sourced for gas lift become candidates for ESP systems.

The method

A permanent magnet motor and side pocket wet connect are the key technologies of the AccessESP system. Which consists of a tubing-mounted permanent completion and a slickline retrievable assembly.

The permanent completion is installed with the production tubing. The one-time installation of the permanent completion is identical in operational processes to installing a conventional ESP, and therefore requires a workover rig, however, subsequent deployments require only slickline, a tractor, or coiled tubing. There are two options for the permanent completion. For annular intake of production fluid, similar to conventional ESP operations, the production casing is exposed to the producing fluid. However, the in-line fluid intake system connects to the lower completion through production tubing, ensuring that the production casing is not exposed to the producing fluid.

The slickline retrievable assembly integrates a high power density, lightweight permanent magnet motor with industry standard ESP components and is deployed through tubing to the permanent completion. This assembly includes industry standard pumps, protectors, intake etc. that can be configured and designed in a similar fashion to a conventional ESP. The company has two distinct technologies:

Permanent magnet motor (PMM)

The lightweight, high power density PMM is one fifth the weight and length of most conventional motors. The slickline retrievable assembly integrates the motor with industry standard ESP components. Because of the retrievable assembly’s compact design, it can be installed and retrieved through tubing, in shut-in or live wells, with a low-cost standard slickline unit, without the need for a workover rig.

The company’s PMM has been continually improved over its seven years of operation, today it is the industry’s most robust and reliable ESP motor, features include:

- Five times the power output of a conventional ESP motor, despite its light and small build.
- Very high efficiency.
- High starting torque.
- The only PMM compatible with all VSDs used in the market.

Side pocket wet connect system

The permanent completion is installed with the production tubing. The side pocket wet connect system then seamlessly connects the slickline retrievable assembly to the permanent completion, completing the electrical connection from surface to the ESP assembly.

The side pocket wet connect system makes intervention practical. Features include:

- Robust connector providing electrical connection between the surface equipment and the ESP system.
- Provides full bore access when ESP is removed (such as gas lift valve).
- Inline and annular flow options.
- Available for 7 in. and larger casing, 4.5 in. and larger tubing.

Additional technology capabilities

- Standard slickline deployment on 0.125 in. slickline.
- Live well retrieval/installation through standard lubricator.
- Only PMM proven compatible with all VSDs used in the market.
- The only solution to provide full bore access when ESP is removed. Can run perforating guns, re-entry, coiled tubing, logging tools, etc.
- Up to 380 HP through 4.5 in. tubing, 800 HP through 5.5 in. tubing, 1300 HP through 7 in. tubing.

During rigless deployment, the retrievable assembly has been divided into four runs, designed to be deployed well below the safe working load of standard slickline. Each run is installed and retrieved individually to mitigate operational challenges. AccessESP’s retrievable assembly has been deployed and retrieved in a variety of fluids, in sand laden environments in both vertical and horizontal wellsbores.

AccessESP systems are built to tolerate difficult environments, with great success in H2S and CO2. These different applications are addressed in the job planning stage during material selection. Production rates are limited only by the capacity of the pump. As a point of reference, Access375 can produce up to 6000 bpd with conventional ESP pumps. Access450 can produce up to 10 000 bpd and Access562 can produce 20 000 bpd.

Conclusion

It is now possible for a practical and unique conveyance technology to be seamlessly integrated into standard oilfield operating practices. The slickline retrievable assembly is provided in a variety of sizes and integrates with industry standard ESP components, with in-line and annular options that work with or without a lubricator, for live well deployment. One-time installation of the permanent completion is similar in all respects to conventional ESP deployment. Once the permanent completion is deployed, installing and retrieving an ESP system can be completed in hours.

The equipment is delivered preconfigured and assembled, with no oil filling required and minimal wellsite make-up. Each system is designed, developed, tested and manufactured at AccessESP’s own facility. The patented technology has been in operation since 2008, globally, for IOC’s and NOC’s, and has passed through rigorous qualification and testing protocols.

ESP’s have been a neglected technology. The full potential of ESPs has, to date, been limited not by the ESP methodology but by dated, rig-based, intrusive conveyance methods. Through continual improvement in the technology and installation processes, systems are being developed that minimise installation time, simplify deployment and maximise production, while maintaining a safe working environment for all.