Subsea Lift

Inwell and caisson lifting systems
With more than 70 percent of the Earth’s surface covered by water, it was inevitable for oil and gas fields to eventually be developed in offshore areas around the world. Schlumberger has been involved in pioneering the advanced technologies necessary to produce in challenging subsea environments from the very beginning.

In 1990, REDA, a Schlumberger company, collaborated with several oil and service companies in a joint industry project aimed at understanding and implementing reliable, low-risk subsea lift systems. With a goal of installing and retrieving subsea ESP systems reliably, studies focused on tree designs, power feeding through tubing hangers, workover vessel intervention techniques, and power distribution. The venture led to a series of worldwide, industry-first subsea ESP installations, with Schlumberger playing a leading role in providing the integrated lifting solutions.

- First subsea ESP system in the industry
- First subsea ESP field: 25 wells, South China Sea
- First hybrid subsea ESP with gas lift backup
- First caisson ESP
- First ESP-specific subsea cable
- First dual ESP system in a subsea well
- First subsea ESP system powered by a subsea transformer
- First to run the vertical annular separation and pumping system
Consistently Reliable Subsea Technologies

Pod systems, bypass and dual
Our custom-designed systems encapsulate and protect ESPs in a sealed and isolated environment. In dual system configurations, a second ESP is installed along with the first and is used as an in-well backup system. This eliminates unplanned well interventions, limiting deferred production and costs.

High-pressure gas lift systems
Qualified to meet the latest API 17G1 & G2 industry standards and constructed from top-quality, corrosion-resistant materials, our high-pressure gas lift valves are specially designed for deepwater and subsea gas lift wells. The Barrier Series systems operate with the proper injection pressures and points to improve pressure integrity of the entire wellbore environment.
REDA Maximus ESP System

The REDA Maximus® ESP system, along with the Trident® extreme-conditions motor lead extension, is designed to improve reliability in the most power-demanding and critical applications. The system simplifies installations with an exclusive plug-and-play design and maintains efficiency with leak-tight seals.

Maximus system motors offer flexibility across all ESP wells, including those with high-horsepower requirements, and Maximus system protector heads feature the same abrasion-resistant bearing system that has been successfully implemented in REDA pumps for more than 15 years.

slb.com/maximus

High-Efficiency ESP pumps

The REDA Maximus ESP system fits with all of our existing pumps, which offer the widest capacity range in the industry, and includes premium materials and configurations ideal for nonabrasive to extremely abrasive well environments.

slb.com/pumps
Medium-Voltage Variable Speed Drives (MVDs)

Medium-voltage VSDs allow operators to adjust ESP-system settings to suit fluctuating deepwater environments. Featuring the industry’s smallest footprint, the SpeedStar® variable speed drive NEMA 1 enables quick power module interchangeability, along with a plug-and-play sine wave output filter that eliminates any resonance, regardless of variations in cable length or motor type. This results in lower voltage stress, which increases the life expectancy of ESP system motors, cables, and other electrical components.

slb.com/mvd

Real-Time Downhole Monitoring

The Phoenix* family of ESP gauges, along with the LiftWatcher* real-time surveillance system, provide continuous monitoring and expert analysis to manage and maintain the production and operation of your subsea wells. Being able to identify changes in productivity helps avoid potential issues, substantially increasing production, recovery, and system run life.

slb.com/phoenix
slb.com/liftwatcher
Subsea ESPs Restart After Year-Long Shutdown, Saving CNOOC USD 500 Million

ESPs in South China Sea resume pumping to bring production back on line after devastating typhoon

Field map of subsea wellhead layout. Current production in the field is about 23,000 bbls per day of crude oil.

EASTERN SOUTH CHINA SEA
LIUHUA LH 11-1 FIELD
**TECH REPORT**

**OFFSHORE BRAZIL**

**JUBARTE FIELD**

**Operator**
Petrobras

**Application**
Subsea, deepwater

**Operation depth**
1,400 m \( [4,593 \text{ ft}] \) below sea level

**Temp., reservoir**
80 degC \( [176 \text{ degF}] \)

**Temp., seabed**
4 degC \( [39 \text{ degF}] \)

**No. of wells**
15 production

**Background**
Petrobras chose Schlumberger to design and develop 15 reliable, high-horsepower ESP systems to meet the dramatic pressure and temperature swings of the Jubarte deepwater wells and minimize offshore installation operations.

**Technologies**
- Trident* motor lead extension
- Phoenix* downhole monitoring system
- REDA* Maximus* electric submersible pump system
- MaxJoint* ESP flange connection technology
- LiftWatcher* real-time surveillance service

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Custom-Designed, 1,500-hp ESP Systems Deliver Jubarte Field’s Highest Production Rates

Deepwater wells produce more than 100 million bbl of fluid since start-up and an average of 137,000 bbl/d

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The extreme reliability of Schlumberger ESP systems is due in part to the plug-and-play design and the real-time management system. The Trident motor lead extension, which is connected to the wet-mate connectors onshore to eliminate splices, includes flange connections that are pressure tested during assembly offshore. The LiftWatcher service provides expert control and constant monitoring of downhole parameters to maintain efficient operation, eliminating the need for time-consuming shutdowns and restarts.

[slb.com/subsealift](http://slb.com/subsealift)
Dedicated to refining subsea lifting, Schlumberger is currently developing alternate deployment methods, such as rigless ESP well intervention. This new technique satisfies lift assurance requirements and significantly decreases subsea ESP intervention costs.

Having contributed to the industry’s first successful subsea ESP installation, and still developing industry-changing technologies today, Schlumberger will help operators produce efficiently in the challenging environment for years to come.
Subsea Lift
Inwell and caisson lifting systems

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