

Minimizing risk  
with **innovative design**



**Dual ESP Systems  
and Accessories**



# Dual ESP Systems

**When you need to improve the performance of your high-asset-value wells, Schlumberger dual ESP systems provide the power and reliability demanded in high-risk, high-cost producing wells.**

Schlumberger dual ESP systems double the production or the run life of a well and also provide an in-well, cost-effective backup system that minimizes the downtime caused by ESP failures. By utilizing dual ESP systems in high-value wells, you can improve the net present value of the project and eliminate costly deferred production while waiting on a workover rig.



## APPLICATIONS

- Subsea or deepwater production
- High-workover-cost areas
- High-volume ESP production
- High-horsepower ESP production
- Dual zone production in isolation
- In-well backup
- Custom completion design

## FEATURES

- Reservoir access below ESP
- Production logging ability during ESP operations
- Reservoir isolation
- Parallel ESP system option (in-well backup)
- Series ESP system option (double the horsepower)
- Independent operation
- Automatic switching between ESPs
- Flow bypass
- Casing protection
- Continuous monitoring and control

In deepwater, subsea, and multizone applications, dual ESP systems can be used in many ways to improve the financial performance of the well. In series, the two systems work together to provide double the lift or double the horsepower. The lower system in the well charges the upper system and produces a high volume of fluid at a greater distance. Essentially, the system is used to provide a greater drawdown, thus increasing the production from deep or remote wells.

Parallel systems can virtually eliminate the cost of deferred production caused by workover rig delays or scheduling. They provide reliable in-well backup systems when the performance of the initial ESP systems declines or ceases. The systems can be configured to automatically switch from one system to another without slickline or human intervention. With automation, production losses are effectively eliminated.

# Enabling cost-effective production

## APPLICATIONS AND CONFIGURATIONS

Schlumberger dual ESP systems offer a range of completion designs that address some increasingly common production needs beyond what can be achieved from a conventional artificial lift completion.

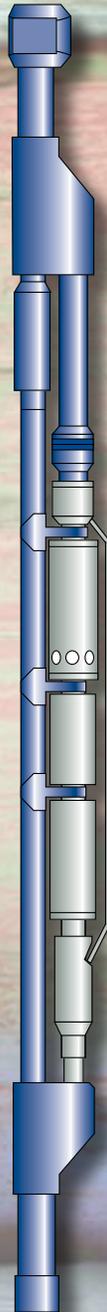
## ACCESS BELOW THE ESP

The ESP Y-tool and bypass system provides a conduit for wireline or coiled tubing intervention below an ESP. The use of Y-tool systems enables production logging and other evaluation techniques below the ESP for obtaining critical information needed in making decisions on subsequent perforating, stimulation, and plugging operations. Production logging can be conducted while the ESP system is operating, allowing accurate reservoir analysis. These operations can be made without removing the ESP system.

## INCREASED LIFT

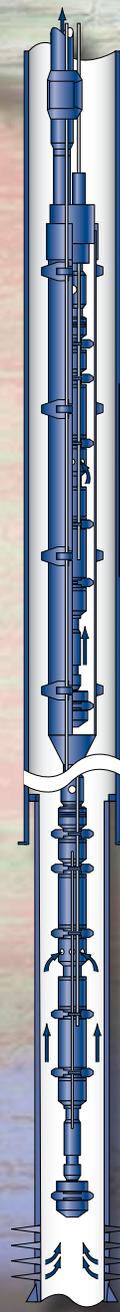
Multiple ESPs can be used in series, allowing the lower pump to boost the intake pressure of the pump above it, enabling systems exceeding 2,000 hp to be deployed within casing constraints. In these UltraHi\* horsepower-increasing systems, one or more ESPs are deployed within pod assemblies that divert fluids from the discharge of one ESP into the intake of another ESP. The pod assembly can also be used to divert fluid from below an isolation packer into the ESP or to isolate casing from produced fluid to prevent overpressure, collapse, corrosion, and erosion. An Auto Flow Sub\* subsurface automatic flow check system is installed within the pod assembly to allow fluid to bypass the pump if it is not operating.

**Basic Y-Tool and Bypass System**



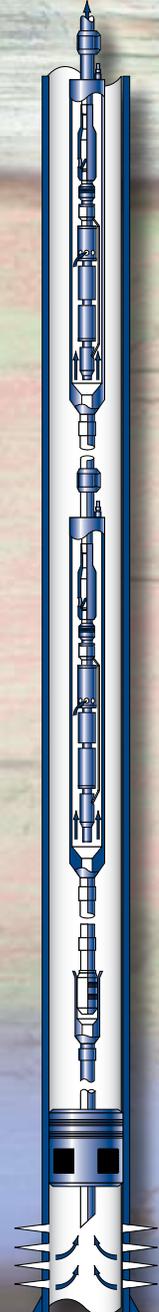
*Typical configuration of a Y-tool and bypass system with a single ESP gains reservoir access below the ESP.*

**Dual ESP with Single Pod System**



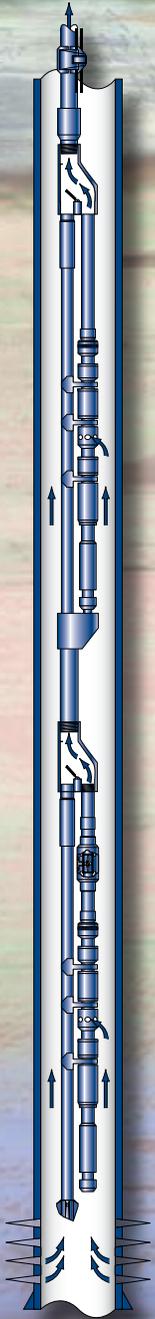
*Dual boost with a single pod system enables double the horsepower in a single well.*

**Dual ESP with Dual Pod System (Series)**



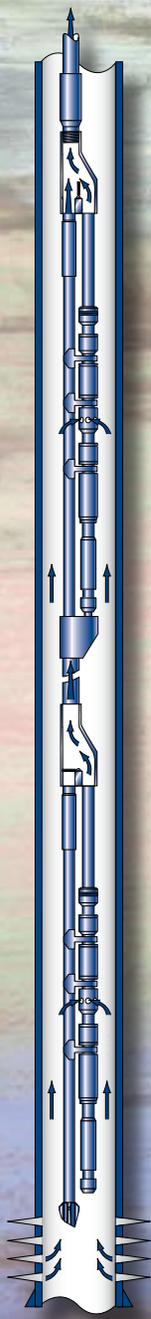
*Dual pod system enables double the horsepower and delivers more fluid from deeper in the well.*

**Dual ESP In-Well Backup (Parallel)**



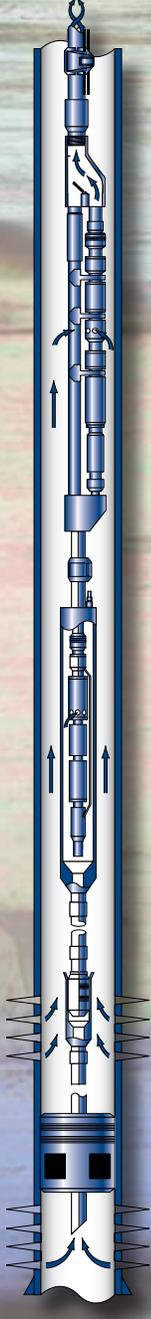
*Dual parallel ESP systems provide in-well backup to minimize workover and deferred oil cost.*

**Dual ESP Increased Production (Parallel)**



*Dual parallel ESP systems enable increased production from a single or commingled reservoir.*

**Dual ESP Dual Zone Production (Concentric)**



*Dual concentric pod system enables production from multiple zones without commingling fluids.*

**INCREASED PRODUCTION**

Parallel ESP systems can be used to overcome the limitations of surface equipment, casing size, and pump-shaft torque of wells that are being produced far below their optimum capacity. Dual ESP systems in parallel use multiple ESPs to substantially increase production from these wells. Each ESP is a wholly independent system, so failure of one ESP does not result in a total loss of production from the well.

**DECREASED WORKOVERS**

The opportunity to reduce workover costs makes it relatively straightforward to justify investment in a DuaLife\* tandem ESP completion system. The benefits of being able to stretch operational run life and continue oil production until a scheduled workover tip the economic scales in favor of dual ESP systems for many applications in offshore and subsea environments. Often the ESP systems are deployed with bypass systems that allow access below the ESPs.

**ZONE MANAGEMENT**

Multiple reservoirs can be produced through the same wellbore by using a dual ESP system. Typically, two reservoirs are produced by entirely separate ESP systems, allowing the application of a differential drawdown across the wellbore to manage zonal contribution, prevent crossflow during shutdown, and conduct isolated well tests to establish reservoir parameters, production characteristics, and production allocation. With different options, fluid from different zones may be produced independently or commingled.

# Key technologies

## INNOVATIVE ENGINEERING

The Y-tool is a key completion component that enables specialized ESP completion designs. Incorporating the Y-tool in the completion design leads to significant cost savings by eliminating the need to pull the completion string when remedial borehole intervention is required. The Y-tool, which permits access to the well below the ESP, allows logging and other intervention operations. In multiple ESP completion designs, the proprietary Auto Y-Tool\* subsurface automatic diverter system prevents fluid recirculation. When an ESP is not running, the diverter opens automatically, permitting access below the pump. The Auto Flow Sub system allows unassisted flow to bypass an ESP that is not running. A stationary pump impedes natural flow and can restrict flow as it moves through the pump stages. This choking effect will raise bottomhole pressure, effectively reducing production. The Auto Flow Sub device automatically creates an unrestricted bypass path for production flow.

## SUBSEA AND DEEPWATER APPLICATIONS

The development of marginal and satellite fields has been enhanced with the application of artificial lift systems in subsea environments. More than a decade of experience fuels our fully integrated solutions, which use an advanced project management methodology to meet the demands of ultradeepwater and extended-host tieback developments.

## ARTIFICIAL LIFT CENTER OF EXCELLENCE

More than 85 dual ESP completion systems have been designed and installed in oil wells around the world. Schlumberger specialists at the Artificial Lift Center of Excellence in Inverurie, Scotland, support field locations worldwide in the design of these completion systems using proprietary software tools to model tubing size, stress analysis, ESP performance, and surface conditions. These include PIPESIM\* production system analysis software, DesignPro\* ESP design software, and Avocet\* production software well and surface modeler. All completions are designed to incorporate Phoenix\* artificial lift monitoring systems and record parameters, including both intake and discharge pressures, which can be used in validating system performance against the nodal analysis model created during the design phase. Through application of the Advanced Lifting Services monitoring, surveillance, and control system for ESPs, these data can be made available to the center's design team for validation purposes.



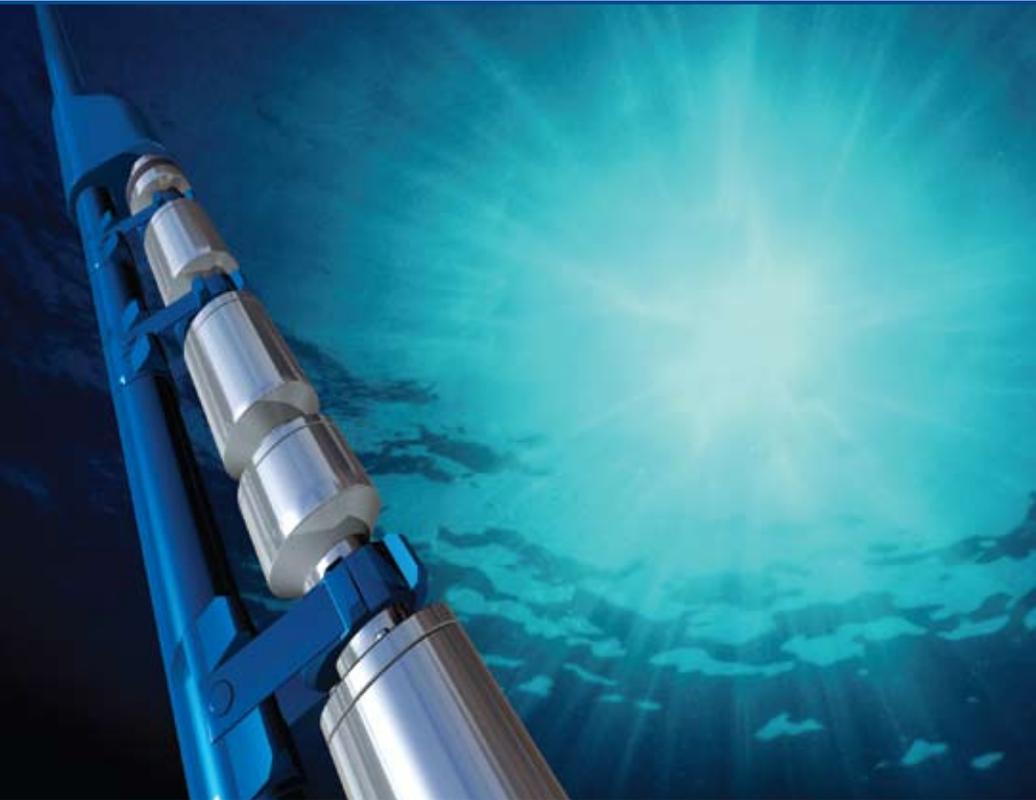
*Collaboration between production and artificial lift experts provides innovative solutions to the most challenging problems.*



## **ADVANTAGES**

- **Increased production**
- **Minimized deferred oil cost**
- **Reduced workover cost**
- **Reduced drilling and completion cost**
- **Improved reservoir management**

# Dual ESP Systems



Whether your goal is doubling production in the same well or providing in-well backup systems, our innovative lift solutions provide the power to increase your production and minimize your downtime. Schlumberger dual ESP systems combine our global engineering expertise with artificial lift technology to enable effective production and management in deepwater, high-cost operations.

[www.slb.com/artificiallift](http://www.slb.com/artificiallift)

**Schlumberger**