Subsea Production Assurance Service

Unlock the full productivity potential of subsea assets
The oil and gas industry is constantly evolving; we are always looking for a better way to get the job done. The best tools and methods are the ones that fit your business needs. That is why we develop solutions with you—not just for you. Your local knowledge is combined with our multidisciplinary industry expertise and the most advanced technologies in the business. Together, our combined team develops work-flows that fit wherever you need them, anywhere in the world, resulting in decisions that work for your bottom line.
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Apply Schlumberger project management, system engineering, and technology expertise to the design of integrated, scalable systems suited to all phases of subsea field development.

Applications
- Monitoring and control
- Flow assurance
- Flow boosting
- Production allocation
- Extended-reach tieback developments

Technologies
- Intelligent well systems (downhole measurement and flow control)
- Sensa* fiber-optic distributed temperature measurement for wellbore and seafloor applications
- Seabed instrumentation (sand detection and corrosion monitoring)
- Oilphase* fluid sampling and analysis service
- PVT* pressure-volume-temperature software
- PVT Express* onsite well fluid analysis service
- Subsea Monitoring and Control (SMC) module
- REDA* electrical submersible pumping (ESP) systems
- Camco* gas lift and subsurface safety systems
- XLift* high-pressure gas lift system
- Vx* multiphase well testing
- Framo® multiphase pumps, wet-gas compressions, and water injection
- InterACT* real-time monitoring and data delivery
- PIPESIM® and FieldView® modeling and field data management software
- dbrHydrate®, dbrSOLIDS®, and PVT ReCORD® engineering software

Benefits
- Enables full production and reservoir management functionalities in intelligent subsea wells
- Allows substantial cost savings through the elimination of overdesigned well and subsea infrastructures
- Reduces interface engineering efforts and costs
- Enhances system reliability through monitoring and diagnostics
- Minimizes the need for intervention
- Allows revitalization of existing systems, as well as commercialization of deeper, more-distant, and more-marginal opportunities
- Helps delay abandonment of subsea wells through improved pressure management
- Optimizes the flow assurance loop and leads to reduced costs for prevention and remediation
- Identifies potential production problems using distributed sensors in the well and on the flowlines and risers

Features
- Open, scalable subsea local area network (LAN)
- Customized flow-boosting solutions
- Integrated flow sampling, laboratory analysis, and predictive modeling
- Real-time monitoring and control of subsurface and seafloor assets
- Event detection and alarm notification
- Flexible design with retrievable, upgradeable systems
- Compatibility with any type of subsea hosting structure
- Seamless handling of reservoir, wellbore, and seabed data at required transmission rates
The most efficient interface for reducing risk and maximizing production

Securing and optimizing production is crucial for any subsea development. The Schlumberger subsea Production Assurance service for optimizing and assuring hydrocarbon production from subsea fields is the answer. It provides a suite of expert services designed to safeguard and optimize the subsea productivity chain from the reservoir to production facilities. This total, modular approach reduces development risks and yields substantial cost savings and operational efficiencies.

Key components are flow surveillance, flow boosting, and flow assurance—all enabled by the SMC platform.

What sets the subsea Production Assurance service apart is a unique combination of discipline- and data-driven decision systems, using proven oilfield technologies and an integrated project management process.

The Production Assurance service is applicable from front-end engineering and design through all subsequent subsea development stages. It is fully supported by Schlumberger project managers and systems engineers.

Realizing the asset’s productivity potential

Because of cost and risk, intervention is not routinely performed on subsea wells. This is one of the reasons that the production performance of subsea wells is only 75% that of comparable land and platform wells. It is estimated that this 25% subsea performance gap costs our industry USD 10 billion per year.

Subsea Production Assurance service >>

Subsea productivity chain

The subsea Production Assurance service offers flow-surveillance, flow-boosting, and flow-assurance technologies to optimize production.
The low-risk way to close the productivity gap is to base the decision-making process on greater access to system data. Subsea Production Assurance measurements, monitoring, and production services provide the most efficient interface to obtain the information that will help you realize the full potential of your subsea asset.

**Factual data are key to subsea productivity**

As field productivity and process optimization continue to lower the risks of subsea developments and enhance production, data play a pivotal role in driving the subsea productivity process.

The answer to increased subsea productivity is real-time data combined with scalable, integrated, pore-to-process systems. Data-rich solutions offer a better understanding of hydrocarbon flow from the pore space, into the borehole, through subsurface and subsea hardware, to the processing facilities.

Greater value is realized when real-time data are part of a closed continuous surveillance loop that includes analysis, decision making, and reservoir drainage control. This is total management of the reservoir-to-production system.

Total surveillance can be achieved with a combination of multiple acquisition sensors and control devices in the wellbore, on the seabed, and along the flowlines.

The key is to establish connectivity among these various measurement devices so they are a part of a complete subsea enterprise, rather than isolated and discrete components.

While surface-based systems deliver large, secure volumes of data around the world, the conventional seafloor infrastructure remains a bottleneck, slowing the flow of data. Eliminating this bottleneck opens the subsea domain and improves an operator's ability to make informed productivity decisions. What is needed is a high-bandwidth seafloor data acquisition system.

**Data are also important for subsea system reliability**

Subsea Production Assurance data and services enable information-based decision processes that lead to maximum production while substantially reducing the need for costly interventions. These benefits are enabled through continuous monitoring and diagnosis of key production devices in the wellbore and on the seabed, and they support the application of advanced technologies that cannot be deployed through conventional systems.

More than ever, diagnostics are limiting and preventing catastrophic failures. The increased availability of detailed data helps prevent equipment failure and provides alerts that can prevent human errors.
Monitor and control all performance aspects of your subsea infrastructure

Flow surveillance enables key services in the productivity chain, such as flow boosting and flow assurance services.

The ideal system for measuring, analyzing, and monitoring the productivity of a subsea field starts in the wellbore and continues through the subsea installations and piping to the processing facilities. It includes an extended LAN, conforming to industry-adopted standards, that gathers and transmits accurate data reliably so that the various subsea systems can interact seamlessly at optimal transmission rates. The ideal flow-surveillance system incorporates an open, scalable communications network that enables advanced monitoring and control of your system and reduces risk by allowing decisions to be based on knowledge gained from actual measurements.

The ideal flow-surveillance system delivers measurements—including pressure, fiber-optic distributed temperature, downhole or seabed multiphase flow, and fluid properties—to support decisions that maximize production, such as opening or closing wellbore valves, boosting pump output, or controlling flowline methanol injection during hydrates treatment.

The SMC module—the ideal system for subsea monitoring and control

The Schlumberger SMC platform is a next-generation seabed network for downhole and subsea devices. It can be mounted on any seabed structure, and it uses field power and communication lines to transmit data to surface. State-of-the-art communications allow flexible use of whatever transmission mode is available, from high-speed optics to standard copper lines.

The SMC platform is
■ open architecture, designed with plug-and-play capabilities
■ enabled for fiber-optic communication and measurements and distributed temperature sensors (DTS)
■ complementary to other subsea control systems
■ compliant with the Intelligent Well Interface Standardization (IWIS) initiative
■ flexible and retrievable using workclass remotely operated vehicle (ROVs)
■ designed by Schlumberger domain experts in reservoir evaluation, well completions, subsea controls, and ROV tooling.

The SMC platform enables connectivity with the reservoir.
Communications

Central to the SMC system is the subsea data hub, which channels both communications and power for subsea and downhole devices. It also allows third-party interface cards and input/output devices to communicate with the subsea LAN.

The subsea data hub communicates with the topside data hub via a dedicated copper or fiber-optic line or locally over a serial link with the production tree subsea control module.

When there is a dedicated fiber-optic link between the surface and subsea SMC system, dual optical modems in the surface rack and in the subsea module provide redundant, dedicated, high-speed communications. The fiber-optic modem is linked to Ethernet switches on both data hub systems—creating a surface-to-subsea LAN. The bandwidth provided by the optical modems is adaptable and self-optimizing. It selects either 10 or 100 MB/s or serial communications as a function of the inverse relationship between data rate and distance. This adaptable data-rate system permits communication over distances exceeding 95 miles [150 km] without the use of repeaters.

A subsea system can be monitored and controlled from anywhere in the world through a communications link between the SMC module and the InterACT real-time monitoring and data delivery system.
Flow assurance and flow boosting >>

Move hydrocarbons to the production facility with confidence

Flow assurance tasks, which include fluid sampling, laboratory analysis, and predictive modeling, are the building blocks for production system selection and the design of prevention and remediation strategies. A closed optimization loop uses monitoring, measurements, and system modeling to achieve improvements and control.

Schlumberger offers Oilphase fluid sampling and laboratory analyses and world-class fluid predictive modeling techniques to minimize treatment and remediation costs. Enhancing the predictive process with real-time data delivered by the surveillance system improves the accuracy of flow-predictive models and closes the loop on the total system monitoring and control process.

Proper flow-assurance practices and advanced fluid-property data solutions can eliminate the overtreatment caused by designing chemical applications for worst-case scenarios. The frequency of remedial techniques using thermal, chemical, or mechanical methods can be reduced, and catastrophic problems, such as plugging, can be avoided.

A Sensa DTS system can be deployed to acquire temperature measurements along a seabed pipeline, and the data can be modeled frequently for dynamic temperature control to prevent the formation of wax and hydrate deposits.
Apply pressure at the right time, in the right place

As our industry responds to demand for economic development of smaller fields and those distant from existing infrastructures, production from subsea systems often requires lifting and pressure-boosting techniques. The cost-effectiveness of such systems is greatly improved by optimal deployment of flow-boosting technology throughout the wellbore, subsea, and tieback system.

The flow-boosting process begins in engineering design and continues through installation and operation of a boosting system that can include established ESP and artificial lift technologies combined with reliable Framo multiphase pumps.

Flow boosting enhances field productivity through custom solutions to specific subsea situations. It allows revitalization of existing systems, as well as commercialization of deeper, more-distant, and more-marginal opportunities.

Flow-boosting technologies help maintain production plateaus as reservoirs mature, and they allow marginal fields to be developed economically using tiebacks to the existing infrastructure.

Long tiebacks from satellites can result in higher backpressures—up to 2,000 psi at the wellhead—that prevent wells from flowing naturally. Flow boosting improves natural production rates and extends well life by decreasing those wellhead pressures to as little as 50 psi. The number of early well abandonments can thus be reduced.

Pressure management using subsea multiphase pumping systems can deliver significant additional production.

The SMC module interfaces to multiple pressure-boosting devices downhole, on the seafloor, and at surface.
Frequently asked questions about subsea Production Assurance services

Q: Why would I need subsea Production Assurance services?
A: The typical subsea well produces 25% less than a comparable land or platform well. Critical information from the subsurface and seafloor processes can be used to manage wellbore production and seafloor transfer of hydrocarbons. Conventional subsea control pods lack the ability to move data to the surface at rates sufficient for timely and accurate analysis. Subsea Production Assurance services enable better utilization of existing technology and help operators overcome factors that have been responsible for the productivity shortfall in subsea wells.

Q: At what stage should I consider subsea Production Assurance services in my project planning?
A: The services are adapted to subsea developments on a case-by-case basis. This is best done in the design stage when all the pressure-management, flow-assurance, and field-surveillance strategy issues are defined and addressed. In most cases a surveillance system with high-speed networking features is required to enable these services.

Q: What makes the SMC platform different from the existing production control system?
A: At the heart of the SMC platform is an IWIS Level 3 connectivity network. The SMC system is complementary to, but independent of, the production control system. It provides the functionalities needed to monitor and control devices beyond the safety-critical production control devices on the tree. SMC deployment and operations are performed without interrupting or deferring production.

In addition the SMC platform is scalable, allowing for increased data transmission on the seabed when needed (e.g., fiber-optic communication), but it can be reduced to simply communicate on power lines in less-demanding situations. Flexibility and scalability are such that the SMC platform is suited for any size job and should be able to deliver the value for which it has been designed.

SMC design, including high bandwidth, self-redundancy, and agile networking capabilities, represents a quantum leap in subsea communications capability.

Q: Why should I consider flow-boosting services from Schlumberger?
A: Flow boosting can be critical to subsea production, especially when tieback distances are long. Monitoring and controlling both flowline pressure and multiphase pump performance ensures the efficient movement of hydrocarbons in the flowline and helps to extend the operating lives of the pumps. Improved production can be achieved at lower operating costs.

Q: Why should I depend on Schlumberger for flow assurance?
A: Incorporating a monitoring and control strategy in the flow assurance design has two main benefits.

- It reduces capital expense during the design phase.
- It maintains the optimum level of chemicals injection, or application of mechanical and thermal methodologies, for prevention and treatment programs over the life of the field.

An optimized subsea flow-assurance system enables elimination of chemical overtreatment and overdimensioned designs for worst-case scenarios.

Q: I run a 1,200-baud system and seem to get by. Why do I need real-time data?
A: Real-time data are important for managing dynamic events, such as well startup and reservoir buildup during well shut-ins. They are also essential for managing processes or fast-loop applications like flow boosting, flow-assurance monitoring during dynamic events, flow assurance for slug management, subsea well allocation, other dynamic reservoir events, and protection of subsea system components.

Q: How do I deal with large amounts of data?
A: Production Assurance services and subsea monitoring provide data for making decisions, and they provide the ability to separate insignificant data from noteworthy data.

A number of products have been developed by Schlumberger to provide data validation and screening functionality. Schlumberger Data & Consulting Services is available to assist with data delivery, screening, and visualization needs. We can also ensure that any new functionality is integrated with your existing systems.
To learn more about the subsea Production Assurance service, visit www.slb.com/oilfield or e-mail wcp@slb.com.
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Optimizing and assuring hydrocarbon production in subsea wells

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