SAMPLING SOLUTIONS



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Proserv is the fresh alternative in global energy services. We are a technology-driven company providing products, services and bespoke solutions to clients across the drilling, production and decommissioning market sectors.

Combining technical ingenuity with design, engineering, manufacturing and field services expertise, we support clients throughout the lifecycle of their assets with a focus on maximising operational performance and efficiency.

In our ongoing pursuit for excellence, we are not afraid to challenge the conventional. Ingenious Simplicity is at our core and we are committed to helping clients produce more for less. Partnering with progressive, like-minded companies, we cut out unnecessary complexity to provide appropriate, yet ingenious solutions delivered simply.

Introduction

The Proserv approach Reservoir evaluation and appraisal Production optimisation Decommissioning Market challenges

Case study: production optimisation Case study: decommissioning



Fully flexible sampling solutions.

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Proserv specialises in the provision of sampling equipment, systems and bespoke solutions throughout the life of the reservoir from evaluation and appraisal through to decommissioning. Our expertise is founded on our broad technical knowledge, extensive in-house engineering capability combined with a track record spanning 40 years.

We are here to support our clients throughout all stages of the sampling process:

- R&D and manufacturing
 - Equipment sale and rental
 - Operation and manpower support
 - Aftermarket services
 - Training (off or on site)
 - Logistical support
 - Testing
 - Recertification
 - Quality assurance



THE PROSERV **APPROACH**

Proserv delivers a fully flexible sampling solution to our clients that is fit for purpose. This could range from a standard off the shelf product to a fully customised and integrated sampling solution. Based on this approach, Proserv partners with clients, and through detailed discussion we can explore the options and propose appropriate technical solutions.





Access to our wider technology portfolio.

We understand that no project is the same. Proserv partners with clients and through detailed discussion we explore the options and propose the most appropriate technical solutions.

Through our global Proserv team, we can leverage the capabilities from our wider offering by gaining access to expertise from other parts of the business, such as subsea hardware, positioning systems, control systems and ROV tooling.

Create your own solution

In line with our flexible approach, our technical and training services can be carried out at any of our global facilities or at a client's site. Similarly, should clients wish to purchase or rent equipment or have it repaired or refurbished, we can provide a solution best suited to their needs.

Global brand, local partner

In all our major operating locations, we aim to build local businesses founded on local leadership, high quality in-country personnel and support for regional supply chains. Core to the Proserv offering is our ability to manufacture, deliver and support our fully accredited sampling solutions locally by our highly experienced technicians.

5 regions 25 facilities

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11 countries



RESERVOIR **EVALUATION** AND APPRAISAL



obtained.

Once captured, the samples are transported to a laboratory where chemical composition and physical properties are measured. This process needs careful management throughout to ensure sample integrity, operator safety and legal compliance.

We specialise in solutions for:

Wellhead sampling is used to obtain PVT quality samples directly from the wellhead when conditions are such that the collected fluid is still in single phase.

Surface sampling provides back up quality PVT samples from surface separators to complement downhole reservoir samples.

High integrity sampling.

To accurately evaluate and appraise a reservoir, high quality pressure volume temperature (PVT) fluid samples have to be captured at the wellsite. These samples must be representative of the produced reservoir fluid as decisions on future field development will be made based on the analysis results

Downhole reservoir sampling allows for the capture of high quality, representative samples from within the reservoir for PVT analysis. This involves tools being deployed by wireline, drill stem test (DST) or coil tubing.

Sample handling equipment and transportation

Proserv's sample heating and transfer equipment ensures that sample quality is not compromised during transfer. Our shipping cylinders transport samples from the field to a laboratory of choice with the correct shipping certification for their destination countries.

We can offer a full range of sampling solutions from sample cylinders to transfer benches to heating jackets and all of our proprietary equipment can be purchased, rented or operated by our expert technicians.



PRODUCTION OPTIMISATION





To optimise field performance, produced fluids must be monitored to allow operators to make informed decisions on how best to manage their reservoirs.

Production Monitoring

field.

by the operator.

and analysed.

Production from subsea wells is often measured using multi-phase flow meters, which need to be calibrated as a function of the produced fluid characteristics. These fluid characteristics will change over the life of the well and therefore

Enhanced sampling performance throughout the production process.

Proserv specialises in the provision of custom-made sampling systems, which are used to help monitor production and maximise hydrocarbon recoveries throughout the lifetime of the

In addition to our custom-made sampling systems, we also have an extensive range of sample conditioning systems such as the Proserv ProMix system which can be provided independently or custom built into a dedicated sampling system if required.

Manual production sampling systems allow produced fluid (normally gas) to be sampled into appropriate shipping cylinders using suitable valves and manifolds that are manually activated

Automated production sampling systems allow produced fluid (normally liquid) to be sampled without operator intervention.

Sample conditioning systems are required when large volume samples have been collected over a long period of time and contents need to be homogeneous before being sub-sampled

Multi-Phase Flow Meter Calibration





necessitates the recalibration of the flow meter.

Proserv works with clients to design, build, maintain and operate subsea sampling systems, capturing samples to allow the necessary fluid characteristics to be identified.

Subsea sampling systems are used throughout the producing life of a subsea well to monitor changes in produced fluids and ensure accurate meter calibration accordingly.

Flow Assurance

To optimise the efficient flow of fluids from the reservoir to the

point of sale, operators use a number of analytical techniques broadly referred to as flow assurance. This involves the accurate characterisation of the fluid at discrete points in the production process. Fluid sampling is essential for such characterisation, which then allows for fluid modelling and prediction of potential issues such as waxes, asphaltenes, hydrates or scale.

Proserv works with clients to identify and deliver accurate fluid sampling programmes to allow production chemists to obtain the necessary fluid properties to manage flow







assurance issues in a cost effective manner.

Proserv can also design, manufacture and install chemical injection solutions, where appropriate. This ensures that any identified issues can be controlled, maximising production and reducing costly intervention.

Sand Management

When hydrocarbons are produced from unconsolidated reservoirs, sand production can create erosion and blockages in flowlines and other production equipment. Sand management techniques allow the operator to maximise and maintain production while managing sand at acceptable rates.

Proserv can design, manufacture and supply a range of tools and equipment to monitor and quantify the level of sand being produced at given production conditions. This allows the operator to enhance their



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production while maintaining the integrity of their assets.

Reservoir Optimisation

In order to optimise reservoir production, other fluids can be injected to help maintain reservoir pressure and therefore increase hydrocarbon recovery. Over time these injected fluids can break through and begin to be produced, which is something the operator wants to avoid at all costs. Sometimes tracer fluids are added to the injected fluid to allow the source of the produced tracer to be established. With this known, the system can be adjusted to maximise hydrocarbon recovery whilst minimising production of injected fluids.

To support this process, Proserv can provide a wide range of sampling solutions ranging from rental of our proprietary downhole sampling tools through to the provision of a custom made subsea sampling system.

DECOM-MISSIONING



Many global assets are reaching the end of their life and retiring these assets can sometimes be challenging. Steel jackets, storage tanks and gravity based structures used to support topside production facilities all have the capacity to contain production fluids and therefore contaminants to the environment.

We provide bespoke engineering solutions for:

Pre-decommissioning

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- Wells •

Renewables

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Preparing for the unexpected.

These structures need to be sampled to confirm fluid contents so a plan can be put in place for their safe disposal.

• Survey and sampling services

Severance and recovery

• Topside and jackets Subsea Infrastructure

• Full structure decommissioning



OVERCOMING MARKET CHALLENGES



In an environment of sustained low prices, high costs and increasing complexity, the need to overcome known market challenges to provide efficient sampling solutions has never been so pressing for our industry.



Proserv has a great deal of experience overcoming the challenges inherent to sampling. At the core of our offering, is our passion for solving problems and finding new, more efficient and more effective ways for our clients to operate.

Industry leading portfolio of products with expert bespoke design capability

Proserv offers a large range of standard products to meet our client's needs. We can also customise our standard products to meet particular project requirements.

Innovative solutions to meet any budget

Proserv can offer solutions for making the best use of the equipment clients already have or provide access to additional equipment without the need to procure additional capex.

Ongoing R&D: Taking on the challenge of preserving low levels of H2S or Hg

Proserv works with several different vendors to provide non-reactive coatings. Coatings can be applied to our tools and cylinders to reduce any losses of H2S or Hg until accurate analysis can be performed.

$\label{eq:Fully-knowledgeable} Fully \ {\rm knowledgeable} \ {\rm of} \ {\rm the} \ {\rm complexities} \ {\rm of} \ {\rm shipping} \ {\rm pressurised} \ {\rm samples}$

We have been in this business for over 40 years so we are very experienced in certification and recertification requirements.



sales service support for spares, servicing, re-certification and training. We also have a global network of service centres to service or re-certify equipment.

We are developing mobile re-certification systems that can be deployed anywhere in the world and are happy to work with clients to provide this service as required.

Innovative, robust and simple solutions

Proserv provides ingenious technology solutions, delivered simply. We use tried and tested technology when it will provide added value for the required application.

This approach allows us to be cost effective and quick to market with bespoke sampling solutions.

Standard and bespoke solutions for the most severe environments

We guide clients so they are using correctly certified equipment, depending on where samples are being collected and shipped to.

Sampling experts ready and available

Proserv can support clients with appropriately trained and certified personnel to complete sampling operations using our own or client owned equipment.

Fully flexible commercial model

to align with clients needs

Proserv works with clients offering a flexible business model to meet specific needs to include sale, rental, operations or anything in between.

We are also interested in pursuing new and creative methods of working with our clients

Full after sales support for the life of the asset

Proserv can offer complete after



Proserv produces standard products using specialist materials that are NACE MR-0175 approved for use in severe service environments.

We work with different elastomer manufacturers to identify appropriate sealing solutions for different environments such as high pressure, high temperature and high H2S.



Production Optimisation Case Study

Subsea sampling

Client: BP

Location: Angola

Equipment: Subsea sampling system



full and detailed factory acceptance testing under the for many years to come.

Background

BP commissioned Proserv to design, manufacture and supply a subsea sampling system capable of capturing reservoir fluid samples from subsea manifolds located in water depths of up to 2,500 metres to support their operations on the PSVM development of Block 31 in offshore Angola. This award was based on the success of the previous Block 18 subsea sampling system delivered in 2007, which is still in use today.

Project Description

The project formally kicked off in March 2013. A project delivery team was established involving design engineers, project managers, planners, buyers and technicians. They all worked closely to deliver this project to exact design specifications.

The sample cylinders for the sampling system were designed and assembled at Proserv's specialist subsea facility in

Aberdeenshire in Scotland. The system was completed, successfully tested and shipped to Luanda within one year.

Scope

The system was designed to meet the following technical parameters:

- Two 12 litre sample cylinders and two 12 litre slops cylinders
- Operating temperature between 2.9 and 88 degrees celsius
- Pressure rating of 690 bar on production side and 207 bar on control side

Conclusion

Proserv's subsea sampling system successfully completed full and detailed factory acceptance testing under the careful scrutiny of BP's QA/QC inspector. It is now awaiting first deployment in the field where it is expected to be used for many years to come.

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Benefits

- Ability to monitor water • salinity and correct multi-phase flow meter calibration
- The ability to trace water injection, optimise field production and track the flow assurance risks associated with production of asphaltenes and scale
- Easily deployable and retrievable system, which enhances reliability and reduces the need for maintenance and repair throughout field life
- Fully compliant with NACE International
- Meets engineering standards set by the American Petroleum Institute
- 20 year design life

Decommissioning Case Study

Storage Cell Sampling

Client: Major Global Operator Location: North Sea Equipment: Bespoke Proserv Positive Displacement Samplers



The successful delivery of this project will now help the client make informed decisions on how they move forward with the decommissioning of their gravity based structures.

Background

As part of the client's decommissioning plans for its offshore platform, Proserv was engaged to provide a solution to allow them to sample their gravity based structures (GBSs), which support the topside structure. This was required as the GBSs had been used to store attic oil and water during production and therefore the quantities and compositions of these fluids needed to be understood to aid environmentally friendly disposal.

Project Description

In discussions with the client and their chosen contractors, it was clear that Proserv's standard downhole sampling technology offerings were not suitable for this particular project. This was due to the limitations of the subsea deployment equipment being used and the sampling conditions likely to be encountered.

Proserv therefore offered a customised solution by

engineering, manufacturing, assembling and testing bespoke Proserv positive displacement samplers (PDS) to suit their needs.

Scope

Proserv completed a rapid response project to manufacture, build and test bespoke PDS sampling tools within six days, which were then immediately mobilised for offshore operations. Two offshore technicians were dispatched who successfully completed five sampling operations across three storage cells.

Once recovered at the surface, samples were transferred into Proserv ProLight sample cylinders ready for transportation to the analysis laboratory onshore.

Conclusion

Proserv worked closely with the client and their contractor to find an ingeniously simple, cost effective and rapid solution to their very specific sampling

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requirements. The successful delivery of this project will now help the client make informed decisions on how they move forward with the decommissioning of their gravity based structures.

Benefits

- Rapid response project requiring customised solution delivered within several weeks
- Quality samples captured allowing detailed analysis of cell contents
- Environmental disposal requirements of fluids now better understood for future decommissioning needs of GBSs

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