

PRODUCTION CHEMISTRY

proserv

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.

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Fully flexible production chemistry solutions

Production Chemistry is the management of the chemical reaction of produced phases from reservoir to refinery that has the potential to impact numerous different departments and disciplines including HSE, process, integrity, commercial and operations. Indeed, there is potential to reduce the impact of production chemistry issues with an infrastructure that is well designed and allows for representative sampling.

At Proserv, we offer a unique vision and range of support services and solutions to production chemists across the entire oilfield lifecycle. We have an in-house Chartered Production Chemist with over 15 years of oil and gas industry experience. This highly experienced specialist provides a technical focal point and expertise to support your production chemistry projects, from design through to delivery.

We also have a pool of highly skilled personnel that can travel offshore to commission, maintain and service equipment, and conduct technical audits and health checks.

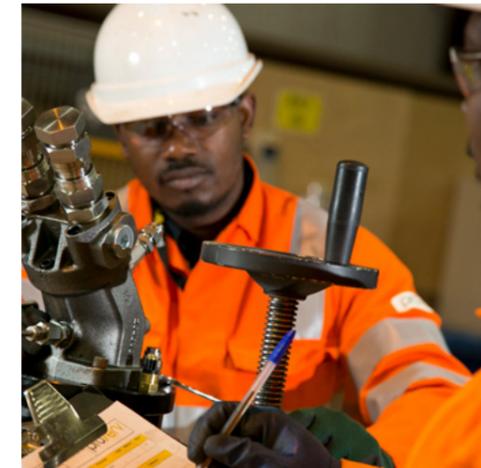
Proserv's production chemistry offerings include:

- Chemical delivery
- Downhole sampling tools
- Subsea and topside sampling systems
- Sand sampling equipment and sample cylinders
- Flushing rigs, and particle cleanliness monitoring

Proserv are able to support our clients through all stages, including:

- Testing and training
- Operational support
- R&D and manufacturing
- Equipment sale and rental
- Recertification and quality assurance

THE PROSERV APPROACH



Proserv's approach to production chemistry is to provide a solution to our clients that is fit for purpose. From a standard off the shelf product to a fully customised and integrated chemical assurance dosing system, Proserv partners with clients to explore the options and propose appropriate technical and commercial solutions.

At the forefront of technology advancement.

For over 45 years, our engineering teams around the world have been at the forefront of new technology advancements, delivering ingeniously simple and fit for purpose technology solutions that increase the performance and reliability of our clients' assets.

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.

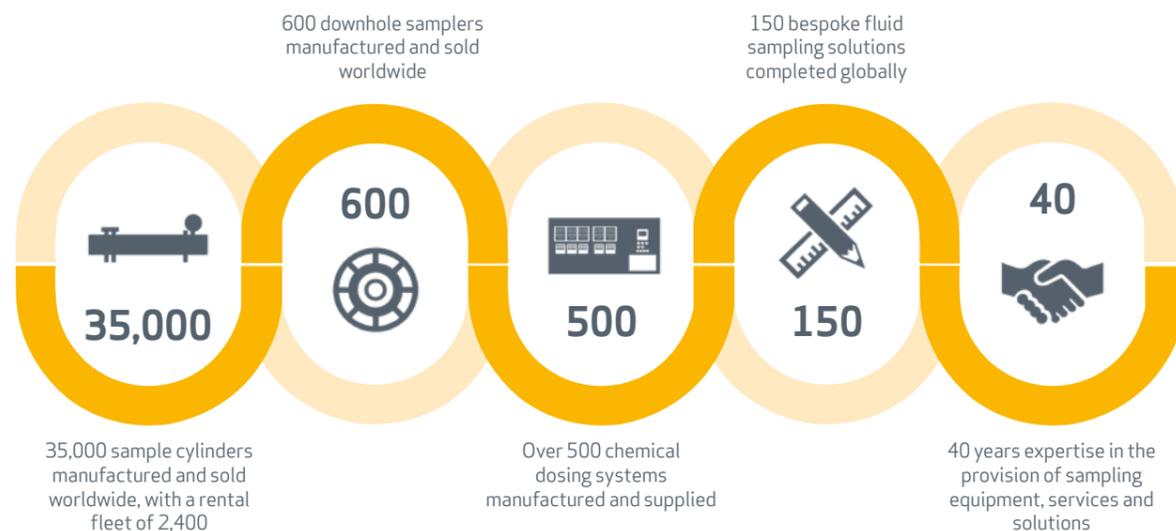
Create your own solution

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 production chemistry solutions locally by our highly experienced technicians.

6 regions 22 facilities 12 countries 24/7 local support



CHEMICAL DELIVERY ASSURANCE

Bridging the gap between production and safety.

Chemicals are used in the oil and gas industry to optimise performance, reduce capital cost and improve the longevity of facilities, infrastructure and the reservoir. By controlling undesirable chemical and microbial reactions, process and flow assurance issues are reduced, and production and operational efficiency is increased.

Proserv's chemical delivery assurance solutions have been developed to provide the design, engineering, manufacture and service of chemical dosing systems, metering and transfer pump equipment. Working in collaboration with operators up front in the early design phase and anticipating flow assurance problems over the life of the production asset, Proserv can provide bespoke solutions that enhance field safety, increase production levels and reduce operating expenses.

Each of our systems are custom tailored to suit various applications, with consideration given to environmental conditions, hazardous area location, performance requirements, equipment design standards and other regulatory requirements.

Proserv also has a vast fleet of portable dosing units available for rent and has been supplying the to oil and gas industry for over 30 years.



DOWNHOLE SAMPLING

Enhanced sampling performance throughout.

Proserv provides specialised solutions for downhole reservoir sampling, allowing for the capture of high quality, fully representative samples from within the reservoir for pressure volume temperature (PVT) and compositional analysis. This involves deploying tools for wireline, drill stem test, or coil tubing.

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

Proserv designs, manufactures and supplies a range of downhole sampling systems that ensure that the samples captured are fully representative of the chemistry in the reservoir, so that decisions on future field development can be made based on the true results obtained.



PDS & SPS SAMPLING SYSTEMS

The Proserv positive displacement sampler (PDS) allows for the capture of representative downhole reservoir fluid samples. The sampler can also be used to take single phase samples (SPS) and maintain them at a pressure above reservoir conditions, for analysis back at the laboratory. Samples, when analysed, provide data vital for the economic and technical evaluation of the reservoir.

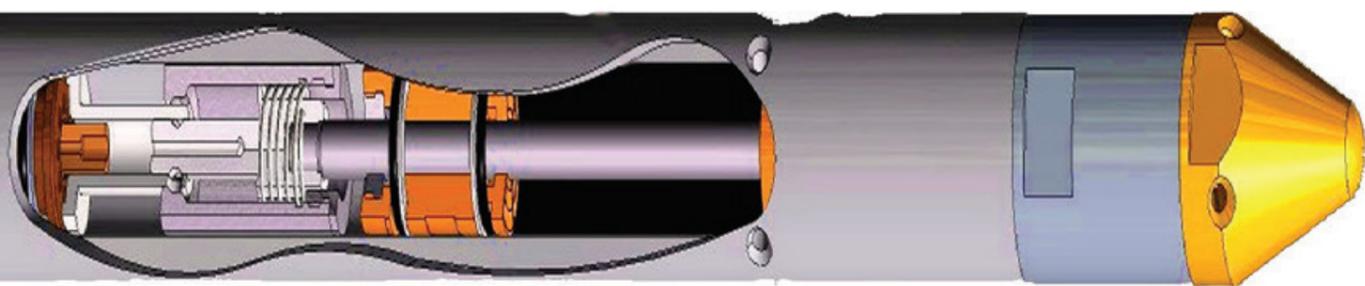


A proven downhole sampling solution.

Sampler conveyance is run on slickline, wireline, coil tubing or pipe and is operated via traditional mechanical clock or third party acoustic triggers when run as part of a drill stem test string.

For the transportation of samples, a range of cylinders (700 millilitres as standard) can be supplied with pressure ratings of 10,000 and 15,000 psi. Our cylinders are supplied with transportation boxes for shipment complete with European, United States DOT and Canadian TC certification, where applicable.

- Mercury-free sample transfer
- Controlled sampling by positive displacement
- Samples can be retrieved and transferred in single phase
- Available in Inconel for hostile environments
- Positive locking and operation indicator
- Proven design with many years of successful operation
- Fast sample transfer
- Multiple samplers can be run simultaneously
- Sample validation on site
- Fast re-dress of sampler
- Non reactive coating available to minimise H₂S losses



SUBSEA SAMPLING

High quality, representative subsea sampling.

Proserv specialises in delivering solutions for subsea sampling systems, allowing for the capture of high quality, representative samples from the subsea well, or manifold, for compositional analysis. This allows for accurate phase behaviour modelling and the prediction of potential issues such as wax, scale and process upsets, and recalibration of subsea flowmeters. This involves a module being deployed from a field support vessel, which can be either ROV or diver operated.

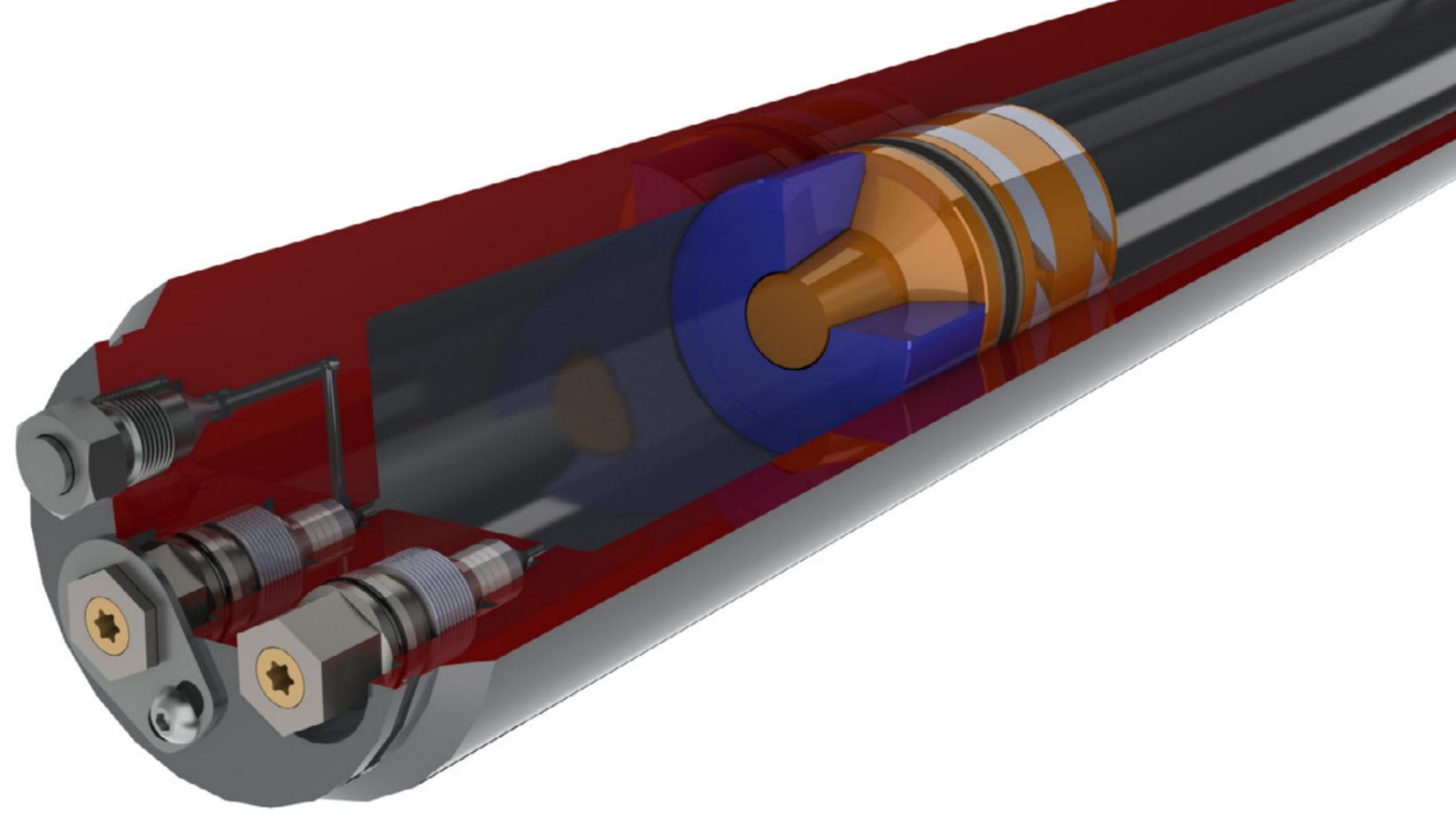
Once captured, the samples are transported to a laboratory where composition and physical properties are measured. This process needs careful management throughout to ensure safety, sample integrity and compliance. Proserv's unique sampling cylinders are compliant for transportation and therefore removes any risk of sample integrity being lost during transfer that otherwise would be required. These samples must be representative of the chemistry in the system as decisions on flow assurance, and metering will be made based on the results obtained.

Proserv works in partnership with clients to design, build, maintain and operate a range of subsea sampling systems to allow for representative subsea sampling. Designed to meet the stringent requirements of NACE, TPED, API-6A and API-17D, the system specification can also be customised as required to meet the user's needs.



SUBSEA SAMPLING CYLINDER

Operators face increased challenges in maximising production from geographically complex, high pressure and temperature and often remote and inhospitable fields. The Proserv subsea sampling cylinder (SSC) is the world's first fully qualified and certified 'for shipping' sample cylinder for use in a subsea environment.



The world's first for shipping sample cylinder.

An industry first, the Proserv SSC allows operators to take a representative sample from a subsea system for direct transfer to the laboratory. By doing so, the SSC eliminates the risks associated with handling and transferring samples on the surface, reducing the risk of containment loss and exposure to H₂S/CO₂, which can present a danger to people and the environment.

Based on market-leading sampling technology, this cylinder has been designed specifically for use in the subsea environment. With unique coatings and sealing solutions to reduce risk of exposure of hydrocarbons or H₂S, the cylinder will accurately capture well properties throughout the lifetime of a field.



- TPED / DOT certification eliminates the need to transfer fluids to smaller cylinders for transportation to lab
- Hyperbarically tested to insure subsea integrity during sampling phase
- Large volume capacity (500 cc / 1,000 cc / 2,000 cc)
- Assembled for single phase / conventional (multiphase) samples
- Designed in accordance with PED 2014/68/EU
- Valves qualified to API 6A-PR2
- Materials compliant to ANSI / NACE MR0175 / ISO 15156
- Inconel construction (standard), suitable for severe service with alternative materials available on request
- Eliminates need for transfer fluid in field

TOPSIDE SAMPLING

Tailored solutions for topside sampling.

Proserv's tailored solutions for topside sampling allows for the capture of high quality, representative samples from throughout the process train for compositional analysis. This allows for accurate phase behaviour modelling and the prediction of potential issues including wax, scale and sand, and process upsets.

Proserv designs, manufactures, supplies and services a range of systems to allow for representative topside sampling. This includes both manual and automated sampling systems, as well as conditioning units, storage tank sampling and sand sampling.

No matter the sampling source, once captured, the samples are transported to a laboratory where composition and physical properties are measured. This process needs careful management throughout to ensure safety, sample integrity and compliance. These samples must be representative of the chemistry in the system as decisions on how best to manage the reservoir, production and process will be made on the analysis results obtained.





Manual production sampling

Manual production sampling systems allow process samples to be extracted into appropriate shipping cylinders using suitable valves and manifolds that are manually activated by the operator.

Spot sampling stations are manually operated systems, which represent a safe, reliable,

and cost effective means for sampling at various locations throughout the process.

Spot sampling panels are normally found on oil, gas and condensate producing pipelines either as independent systems or as back-up to automatic sampling systems. When compared to handheld sampling tools, a fixed spot sampling station with an

associated sample probe will enhance safety, repeatability, and increase the quality of the sample.

In addition to production pipeline sampling, Proserv's spot sample stations are beneficial for other process locations too. For example, pipelines for produced/injected water must be sampled prior to re-injection/discharge, as well as fuel gas systems where, in addition to quantify metering, samples for analysis are required for environmental regulations.

Automated production sampling

Automated production sampling systems allow for process samples to be taken without operator intervention.

Proserv has developed a number of systems that allow for representative automated

topside sampling, including fast-loop and in-line systems.

The fast-loop sampling method is the most versatile solution as its design and working principle allows for the installation of other instruments, including flow meters, densitometers etc. The Proserv fast-loop sampling system continuously extracts a stream from a flowing pipeline into an external bypass loop using a sampling probe mounted in a pipeline location, where the fluid is representative of the complete batch being transferred. A pump circulates the extracted stream through a sampler mounted in the loop and back into the main pipeline. The sampler then separates small samples from the stream at a flow-proportional frequency and stores them in a sample receiver.

Proserv's in-line sampling systems offer a cost effective

and reliable means of sampling suitable for a broad variety of applications where the installation of analysis instruments is not required.

The in-line sampling systems automatically extract and transfer samples from the process using a probe sampler mounted at a location where the sample is representative. The probe sampler then separates small samples from the stream, normally at a flow-proportional frequency and stores them in sample receivers.





Sample conditioning

Sample conditioning systems are used when samples have been collected over a period of time and contents need to be homogenised before being subsampled and analysed.

Proserv can design, manufacture, supply and service a range of systems to allow for representative conditioning of topside samples and includes the ProMix bench and system. The Proserv ProMix bench (one to four litres) and ProMix system (12 to 15 litres) are

designed for mixing and homogenising hydrocarbon samples prior to analysis e.g. water in oil.

The system allows the contents of the sample cylinder to be mixed at the sample collection line pressure, thus ensuring analysis sub sample representativity and retention of light ends.

After the mixing process has taken place, a small sub sample can be taken out for analysis using the Proserv high pressure ProSyringe and injected directly



into the analysis equipment without further mixing in the laboratory.

Both systems ensure the high degree of repeatability required for Karl Fischer analysis and complies with the Institute of Petroleum Standard - IP386, British Petroleum's homogenisation standard, ISO standard 3171 and API MPMS 8.3.

Storage tank sampling

Proserv's provides specialised sampling solutions for storage tank sampling, allowing for the capture of high quality, representative samples from throughout a closed system for compositional and integrity analysis.

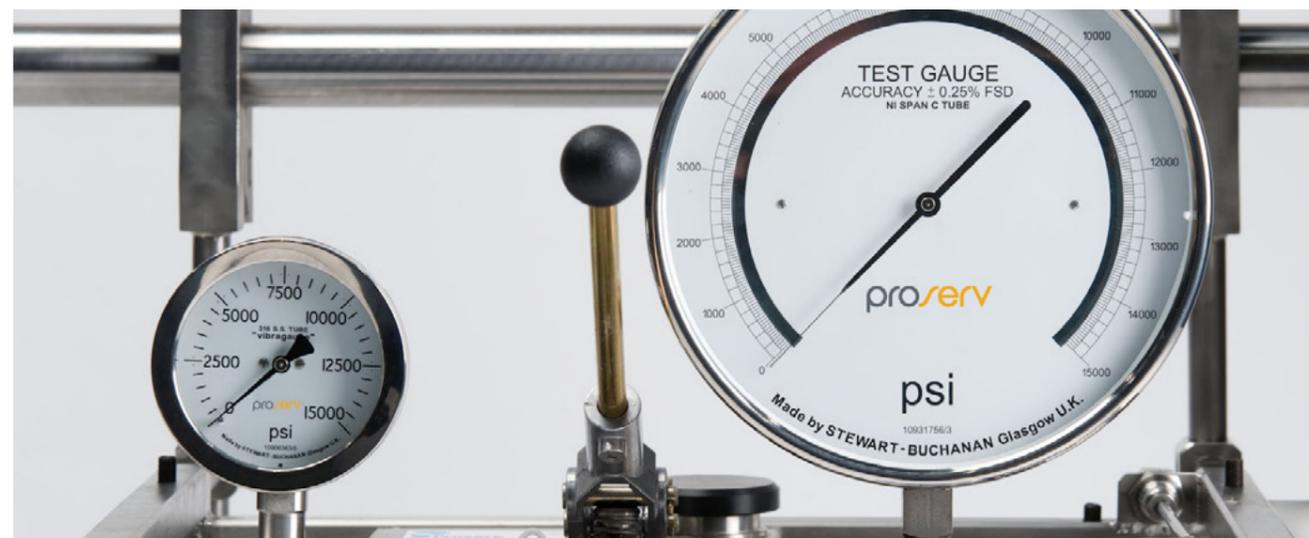
This allows for accurate fluid composition to be determined, providing an understanding of any integrity concerns. A sample tool is deployed through an access point located on top of the tank, with the operator

controlling the depth at which the sample is taken.

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 provides specialised sampling solutions for sand management, allowing for the capture of high quality, representative samples from throughout the process train for compositional analysis. This allows for the accurate understanding of potential sand quantity and quality. This involves a portable sampling device being attached to the process train.



TOPSIDE SAMPLING CYLINDERS

Proserv specialises in providing topside sampling cylinders that includes the sale, rental and maintenance of pressure related sampling equipment to the onshore and offshore industries, in both exploration and production.



Safe and reliable containment.

Our sampling cylinders and systems are all leading edge technologies with proven capabilities that have contributed to our reputation and success in this niche area. With over 35 years of experience in the field, our clients include a large number of multinational operators, service companies, state owned companies and laboratories.

We pride ourselves on our ability to design and engineer sample cylinders for the safe and reliable containment of pressurised samples. Our cylinders are supplied with transportation boxes for shipment complete with European PED and TPED, United States DOT or Canadian TC certification where applicable.

As a UKAS approved inspection body, Proserv has highly skilled technicians available for the service, repair and recertification of oil and gas sampling equipment, and ensure all out work is carried out in accordance with the recognised international standard ISO / IEC 17020:2004.

Proserv can design, manufacture, supply and service a range of tools and equipment to allow for containment of samples.



FLUSHING UNITS AND CLEANLINESS MONITORING

Peak performance flushing operations.

Many equipment failures are as a result of oil or lube system contamination, and the elimination of these contaminants is possible with the use of specialist equipment.

Proserv offers trained field technicians to perform a variety of filtration and flushing services. Our services are applicable to the pre-commissioning of new equipment as well as the maintenance or refurbishment of existing equipment that will keep topside and subsea equipment operating at peak performance, reducing the potential for premature failure.

We provide a variety of diesel engine drive and electrical drive hydraulic and water based flushing units for long or short term hire. We also provide mobile, general service or zone rated hydraulic flushing and test rigs applicable for use in offshore installations, petrochemical plants, defence establishments, railways and shipping.

Our flushing rigs have been specifically developed for use with mineral and synthetic oils as well as water based glycol fluids for subsea hydraulic control applications with flow rates from five to 400 litres per minute. Integral test pumps can be provided so clients can pressure test these systems, assuring integrity.

Proserv also specialises in manufacturing HPUs / flushing units which can be tailored to our client's needs, if a more permanent solution is desired.



SUPPORT SERVICES



Supply Chain

At Proserv, we have developed strategic relationships with many suppliers to ensure we provide exceptional supply chain integration and service. We believe the capability and reliability of our supply chain integration is as important as the in house facilities. We monitor the service and business levels of key suppliers to ensure that excellent service is delivered to our customers.

Project Management

Our teams leverage their years of expertise to manage the risks, costs and safety of our clients' projects. No typical project is the same. We provide a tailored and integrated set of project management processes and systems for consistent and rigorous project delivery. We appoint an experienced person to be the single point of contact for each client project. This individual is then responsible for ensuring the project is completed on time, on budget and to the agreed quality.

Local Content

Core to the Proserv offering is our ability to manufacture, deliver and support solutions locally, by local and highly experienced technicians. For us, local content is not just about meeting legislative requirements or ticking a box. We do it because we have a responsibility. It creates a positive social and economic impact and makes good business sense. To ensure this is sustained, we recognise the need to support, train and build local expertise, which we do through our skills development programmes.

Operational Excellence

Operational excellence is an essential component of Proserv's continuous improvement efforts, helping to deliver world-class performance and drive business results. For Proserv, operational excellence is not something separate from our business; it is how we run our business to achieve our vision of success. Proserv's operational excellence is about ensuring that every product, service and solution is delivered on time and right first time in the safest and most efficient way. This is our personal commitment and it is applied in the delivery of all our client projects.



Subsea Sampling Case Study

Subsea Sampling System

Client: Leading operator

Location: North Sea

Equipment: Subsea sampling system



The completed subsea sampling system was fabricated, assembled, tested and shipped from our flagship subsea test facility in Aberdeenshire within eleven days of official call off.

Background

A leading operator commissioned Proserv to design, manufacture and supply a subsea sampling system capable of capturing reservoir fluid samples at temperature from subsea christmas trees to support operations on a North Sea development.

This award was based on the launch of Proserv's new and fully certified subsea sample cylinder, our ability to provide a bespoke solution within a short time frame and a long standing relationship with the client.

Project Description

Upon award, a project delivery team was established involving design engineers, project managers, buyers and technicians, who all worked closely together to deliver this project within an extremely tight schedule. A conceptual review was quickly held with participants from several Proserv business units, all of which contributed to the design.

The completed subsea sampling system was fabricated,

assembled, tested and shipped from our flagship subsea test facility in Aberdeenshire within eleven days of official call off.

Scope

The diver operated system was designed to meet the following requirements:

- Six x two litre sample cylinders
- Two x two litre slops cylinders
- Water depth of 100 meters and a pressure rating of 1,000 psi minimum
- Isothermal sampling - circulation of hot water within skid to reduce risk of wax and hydrate formation
- Compact design to interface with XT

Conclusion

The full sampling process was completed within 24 hours. Subsea verification confirmed estimated sample volumes and allowed the client to sign off prior to equipment removal from subsea. Once the skid was returned to land the sample

cylinders were isolated, removed from the skid and sent to a laboratory for analysis.

Benefits

- Direct from tree sampling
- Single or multi phase configuration
- Easy to use diver interface
- Subsea cylinder heating
- Variable sample and slops capacity
- Closed loop design for zero discharge
- No need to defer production
- Accurate chemistry taken upstream in process
- At source sample, ideal if cleanliness required during decommissioning

Production Optimisation Case Study

Sand Management

Client: Major global operator

Location: Caspian Sea

Equipment: Sand sampling system



Proserv worked closely with the client to find a simple, cost effective and rapid solution for their specific sampling requirements. The successful delivery of this project will help the client make informed decisions on how they move forward with the production optimisation of the field.

Background

In order to optimise platform production, Proserv was awarded a contract to supply a sampling solution to provide gas and liquid samples as well as having the ability to quantify sand production during various production stages.

Solution

Proserv provided the client with a customised solution by modifying an existing sand sampling system design. With the client's objectives being at the forefront, the system was designed to include:

- High gas/oil ratio (GOR) fluid
- Zero atmospheric venting
- Reduced foaming
- Reduced sampling times

Scope

Proserv designed a bespoke sand sampling system that could cope with production conditions

whilst providing samples of gas and liquid and measuring the sand produced. The system was built, tested and proven to reduce foaming and offered considerable time savings during sampling operations.

Conclusion

Proserv worked closely with the client to find a simple, cost effective and rapid solution for their specific sampling requirements. The successful delivery of this project will help the client make informed decisions on how they move forward with the production optimisation of the field.

Benefits

- Overall project time reduced
- Safe sampling operation with no gas released into the atmosphere
- Both gas and liquid samples were collected from one skid
- Accurate measurement of sand production allowing

optimisation of well flow rates

- Removes the need for full breathing apparatus during sampling operations
- Customised solution suitable for high GOR application based on proven technology

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

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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