

ESPs ready to unleash even more subsea potential

By Andrew Henderson, Centrilift strategic account manager

It is now thirteen years since the first subsea deployment of an electrical submersible pump (ESP) took place offshore Brazil. Since then subsea ESP deployment has moved on significantly, with innovations such as the use of dual ESPs, large capacity pumps and high power motors, resulting in ESPs which are now operating in tie-backs of up to 22km. The latest subsea innovation is the deployment of ESPs on the seabed, instead of downhole, to boost flow in deep water offshore projects.

The latest subsea application for Centrilift ESP technology is seabed mounted boosting stations for Shell fields in the Gulf of Mexico and Brazil.

The Shell Peridido Regional Development project in the Gulf includes five enhanced run life ESP vertical booster stations, which will serve its Great White, Silvertip and Tobago tiebacks, and the operator's Brazil BC-10 deepwater project is to have six similar ESP vertical booster stations.

As a technology, traditionally deployed downhole, often in challenging environments, ESPs are ideally suited to deployment in deep water where pressure issues make other boosting solutions less viable.

Improvements in ESP runlife and reliability over the past twenty years have helped inspire confidence amongst operators that need artificial lift solutions for subsea projects. Many ESP systems are now achieving runlives, which in the past, many wouldn't have believed possible. In the North Sea, there are pumps running for ten years or more – a 1994 deployed Centrilift ESP system in Chevron's Alba field is a good example.

Our approach to subsea deployment of ESPs has always been to ensure that the technology we use is capable of meeting reliability expectations as we recognise the high cost implications of unplanned workovers. When Centrilift designed the artificial lift solution for Total's Otter field, the concept of subsea deployed dual ESP systems – a world first – to provide added security in terms of production and operating cost, was utilised. The Otter project also set a standing record in terms of step-out at full 22km from the host platform.

The Otter solution features two complete ESP assemblies arranged in tandem within each well. This effectively means that each production well has its own in-built backup system, to improve well availability and reduce production risk, should the primary ESP fail before a planned workover.



Centrilift dual-ESP systems are deployed in Santos' Mutineer and Exeter subsea tie-backs to an FPSO, offshore Western Australia

The success of Otter, contributed to Centrilift securing the artificial lift contract for Santos' Mutineer and Exeter subsea fields, offshore Western Australia. This project is a first in the world multiple sub-sea field development using ESP systems, with dual ESPs tie-backed to an FPSO.

The Santos work was a natural extension to what we did for Total on Otter. Similar to the Otter requirement, the Mutineer / Exeter contract includes all management of all engineering, procurement, installation and commissioning (EPIC) requirements. Indeed the largest physical parts of the whole ESP solution – the variable speed drive (VSD) halls, which between them weigh 350 tonnes – were fabricated in Aberdeen under the direct supervision of Centrilift engineers who had previously worked on the Otter project.

To meet Mutineer / Exeter project objectives, Centrilift designed and supplied a completely integrated ESP Management System (EMS) which ties back to the FPSO DCS (Distributed Control System). The EMS provides downhole monitoring and protection with control of both ESP and VSD functions. It can be operated from either the VSD hall or from the main control room of the FPSO.

The EMS incorporates real-time monitoring of downhole parameters, the data from which is used for continuous production and runlife optimisation. Factors such as flow rate, drive speed and discharge pressures can all be displayed together on a single screen, with the system analysing and adjusting each as required to ensure optimum performance.

The Mutineer / Exeter development has its own boost pumping system which although linked to the EMS, uses technology other than ESPs. But now, with ESP based boosting solutions being developed by Centrilift, future subsea projects are being extended to become total production pumping solutions. ■

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Air Power & Hydraulics Ltd are leading specialists in the design and manufacture of hydraulic cylinders actuators and power units. Our experience in hydraulic problem-solving is recognised throughout the industry and we welcome new and challenging projects.

Alderley innovative composites technology

By Kevin Firth, Alderley Materials Ltd



Alderley Materials Ltd specialises in the manufacture and supply of unique phenolic resin based syntactic foam insulation and fire protection systems.

Phenolic resins are widely used in high temperature applications such as brake lining and heat shields and are the acknowledged first choice resin system for elevated service temperature.

Alderley insulation and fire protection products are marketed under the brand name ContraTherm γ. The effective use of insulation materials on subsea pipelines and equipment assists flow assurance by maintaining flow rates which in turn optimises productivity and therefore lowers processing costs.

Insulation of subsea equipment reduces the cooling of reservoir fluids and maintains them at temperatures below which waxes and hydrates may form, thereby minimising the risk of diminished flow rates and blockages. Insulation may typically be applied to subsea equipment including but not limited to pipelines, Christmas trees, manifolds, jumper spools, pipeline end terminations and flange connections.

Alderley Materials has developed the ContraTherm γ C55 Subsea System specifically to meet the need for a resilient insulation material, capable of tolerating the temperature and pressure extremes required for high

temperature developments. The system is engineered to withstand the particular service requirements demanded by offshore oil and gas production and comes into its own where high temperature high pressure field developments are concerned.

The ContraTherm γ C55 Subsea System is a multi layer syntactic phenolic composite system with properties that can be tailored to meet specific subsea project requirements. Syntactic foams have been used in the offshore industry for more than 30 years and have become one of the key materials used in ever more demanding subsea applications.

The low coefficient of the thermal conductivity and robust mechanical structure of the ContraTherm γ C55 Subsea System are ideally suited for subsea thermal insulation applications.

The individual elements of the multi layer system provide their own particular benefit and combine to provide a value for money solution. ContraTherm γ C55 Subsea System's cold curing properties (it does not create an exothermic reaction) makes the system ideal for direct application to equipment on construction or manufacturing sites globally.

The pack in place application methodology combined with the minimum requirement for complex application equipment and the absence of mould tooling ensures ContraTherm γ is a very flexible material to apply from a scheduling perspective; a benefit where complex equipment build programmes are involved.

ContraTherm γ may also be precast to complex shapes for retrofit service. ■

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