Svitzer Ltd

With 13 years of acoustic inspections behind them (the last nine utilising the Focus 400 ROTV), Svitzer has, arguably, become a leader in ROTV pipeline inspections. With a highly skilled team of operators and data analysts at hand, Svitzer has the ability to carry out high resolution acoustic inspections and surveys with the Focus 400 ROTV anywhere in the world.

Svitzer has been involved in the inspection of pipeline systems using side-scan sonar since 1989, when the company first carried out the inspection of Shell UK Exproâ€™s southern North Sea pipeline system. Since 1993, the company has been operating Focus 400 Remotely Operated Towed Vehicles (ROTVs), offering this as a high quality alternative to standard towed-fish side-scan sonar for acoustic pipeline inspection surveys. The high quality of acoustic data from an ROTV, its speed of acquisition and reliability is increasingly becoming attractive to those pipeline operators who have in the past exclusively employed ROV technology for inspection work. Svitzer has carried out inspections for several clients.
The Focus 400 ROTV is based on the Focus 300 fisheries inspection vehicle, developed and built by MacArtney A/S in co-operation with the Danish Maritime Institute for the Danish Fisheries Technology Institute. The Focus 300 system was used to observe the behaviour of fish and trawls during fishing and has operated in many countries with great success. The success of the project and the remarkable stability of the vehicle prompted MacArtney A/S to investigate the subsea pipeline and cable inspection market. The results of the survey led to a financial commitment to produce a prototype, based on the Focus 300 concept but introducing the latest control, transmission, display and software techniques. The prototype project received a Danish government grant and was developed and built by MacArtney A/S in close co-operation with the Danish Maritime Institute and Kruse Elektronik.

Design Parameters

The Focus 400 design parameters were discussed in detail with major survey and oil companies and the result was a highly stable and manoeuvrable towed platform of â€˜box-kiteâ€™ construction, with parallel vertical and horizontal control flaps mounted on the forward edge of the frame. The vehicle possesses automatic positioning and easy handling, and is able to carry a wide variety of sensors, with a large stand-off capability at towing speeds from one to five knots and at depths of up to 400m.
In order for the pilot to control the ROTV, the following standard sensors were built-in and serviced by the subsea control system to generate the necessary feedback: Mesotech 807 high accuracy depth sensor (altimeter); KVH C 100 fluxgate compass; Lucas Accustar clinometers and temperature sensors. The ROTV is â€˜flownâ€™ using a single joystick control. The pilot uses a waterfall side-scan sonar display and a vehicle status display to aid him in flying the vehicle.
The ROTV is designed to accommodate dual-frequency side-scan sonar transducers, and a number of additional sensors including scanning sonar, video cameras, laser line-scan cameras, tracking systems (responders), pingers, flashers and profilers. Due to the capacity of the fibre-optic telemetry links and the software controls, additional sensors can be added including oceanographic probes. The system can operate in automatic flight modes, maintaining a set depth/altitude and tracking exposed pipelines.

Tow Cable

The fibre-optic tow cable is constructed from four insulated copper-armoured multi-mode fibres with an overall steel contra-helical armour. The copper armour on the fibres are used to supply the vehicle with power, and the fibres themselves carry multiplexer and broadband signals. The cable has a diameter of 9.6mm and a break strength of 55kN. The cable is terminated in an underwater electronics â€˜bottleâ€™ housing the fibre-optic components. The termination includes a mechanical stress termination with a weak-link shackle which will break before the cable, should the vehicle come into contact with any underwater obstacle. The weak-link shackle causes the electrical connections to be â€˜unpluggedâ€™ thus avoiding damage and therefore reducing subsequent equipment downtime.

Operations

Svitzer currently operate four Focus 400 ROTVs. The vehicles are usually fitted with EG&G 272 dual-frequency (500kHz + 100kHz) side-scan sonar transducers, obstacle avoidance sonar and a Simrad USBL responder, along with a quick release coupling and emergency floatation device. In addition, the vehicle is frequently fitted with a Probe 5000 pinger system to carry out pipeline burial assessments. Svitzer has made a number of improvements to the basic Focus package including the introduction of fibre-optic slip rings which have improved system reliability, and the modification of the MacArtney winch to hold a second drum, allowing the rapid changeover of tow cables should this be necessary. The Focus system has a complete 100 per cent back-up, significantly reducing lost time through equipment failure. The remote control of the ROTV enables the height above the seabed and the offset from the pipeline to be maintained such that the optimum strike angle for span detection can be maintained at all times during the survey. This manoeuvrability also ensures that the Focus 400 ROTV can confidently follow pipelines in areas where contact with them may well be lost with a conventional towfish, such as bends and work close to seabed installations. This ability to maintain contact with the pipeline for longer periods in difficult conditions adds to the savings in time when compared to surveys using a standard towfish. The sonar images are recorded digitally on a CODA DA200 and displayed on an expanded display thermal recorder.
Svitzer utilise two vessels for ROTV work, the M.V. Svitzer Mercator and M.V. Tridens 1. Both vessels have stern mounted A-frames for the safe and efficient deployment of the vehicle, and spacious laboratories for online acquisition and data processing.

Interpretation

On most pipeline inspection contracts Svitzer aim to complete interpretation and processing of the data offshore. A team of geophysicists and post processors carry out a detailed interpretation of the data onboard the vessel by replaying it on CODA DA200s running CODA Pipeline Inspection software. This software enables the geophysicist to identify and log features on the on-screen waterfall display. The CODA DA200 is LINUX based and logs all features as they are identified and â€˜taggedâ€™ by the geophysicist. Svitzer has created a suite of dedicated in-house software for the processing of data and creation of event listings for a pipeline. The Features database

software is highly flexible and can be set to create listings in any format requested by a client, utilising a wide range of recorded survey parameters. In addition, the software can be programmed to create digital files to any client specific format for incorporation into in-house databases. Svitzer are utilising and actively developing GIS technology to edit and QC pipeline inspection data. Using ESRI ArcView as a platform, Svitzer has designed a package which allows the processor and geophysicist to view graphically, spatially referenced features as found along a pipeline. They can then use this software to edit and QC pipeline data prior to creating final event listings to a clientâ€™s chosen format.

With over 12,500km of pipelines in the North Sea alone, and countless more in the Gulf of Mexico and other offshore regions, operators need to find a more cost-effective method to carry out regular checks of pipeline integrity. Although legislation has resulted in the preferential burial of recently laid pipelines, much of the existing networks have been laid directly on the seabed or in shallow trenches. Operators are required to carry out frequent inspections of these pipelines and with a system capable of achieving production rates of up to 200km a day, the ROTV must be seen as a realistic alternative to ROVs.

Whilst the Focus 400 ROTV has made its name in the pipeline inspection market, the system is just as at home conducting route surveys for pipelines and cables. Along with the Focus 1000 deep water vehicle, these systems are capable of operating not only in shallow continental shelf areas but also in deep-sea environments (up to 3500m). With a range of survey sensors capable of being fitted to the vehicle, the Focus ROTV can follow and map silt levels (for dredging purposes), perform mineral searches, detect stuck â€˜pigsâ€™ in pipelines and perform environmental monitoring. The flexibility of the system and its ease of use make it a valuable asset to a wide variety of offshore survey work.

Bibliography

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