

# AQUASPHERE

The Global Subsea Services Publication of the Fugro Group

## In this issue...

### 02 New Brazilian Facilities

Fugro Subsea Services opens new facility in Rio das Ostras.

### 03 Fugro Symphony Update

New preview.

### 04 New vehicle joins FCV family

The all new FCV 2000 completes its build in Singapore.

### 11 New "Dog House" Tooling System

Taking a look at Fugro ImpROVs new running tool.

### 12 Skandi Carla's Caribbean Adventure

The Skandi Carla handles a variety of projects through the winter months.

### 15 Safety Award for ROV Team

A proactive approach to safety onboard the Kan Tan IV in Australia.

▶▶ **AQUASPHERE**  
is also available online at  
[www.fugro.com](http://www.fugro.com)



Skandi Olympia goes from strength to strength ▶▶ 08

**Fugro Subsea Services awarded ROV and vessel contracts in the Offshore Renewables Market**

▶▶ 06



# Fugro's New Brazilian Facility Opens



Fugro has sent a clear message that it is fully committed to the Brazilian market and is strategically thinking about the long term! Fugro Brasil's new site was officially opened on the 22nd of June in the presence of CEO Klaas Wester, and COOs Jim Sommerville and Kobi Ruegg. The new site was built at Rio das Ostras ZEN (special business zone), bordering Macaé.

With a building area of approx. 10,000m<sup>2</sup> on 23,000m<sup>2</sup> of land, the new site has a two story administrative building, with comfortable offices and several conference rooms.

At the rear, there is a warehouse facility of 3000m<sup>2</sup> with a 10Ton overhead crane and plenty of storage space, together with a big training room and electrical and hydraulic labs for equipment test and maintenance, including a dedicated room for ROV simulation and training.

Outside the building there is a large fabrication & welding area and also an 8m deep test tank.



▲ Fugro CEO Klaas Wester (right) opens the new Brazilian facility in Rio das Ostras, watched by Mathilde Scholtes, Managing Director of Fugro Brasil and Carlos Augusto Balthazar Carvalho the Mayor of Rio das Ostras

The Fugro Brasil site was designed to accommodate the needs of the booming Brazilian market, not only for today, but also for the years to come!

## Fugro North Sea Drill Support Contract

Through 2010 Fugro-Rovtech have continued to support drilling operations on the Sedco 704 for Shell Exploration and Production in Aberdeen. Fugro are providing the work-class ROV, Spartan 7. The system has just completed a major refurbishment and upgrade and was mobilised onboard, replacing the smaller Fugro Panther Plus ROV.

So far the program has included work on Stavros, Bittern, Pierce A10, Gannet Geo2 and Starling infill all in the Northern and

Central North Sea. We are currently working on Pierce B5 and are programmed to move on to further prospects later in the year.

Tasks so far have included Tool Deployment Unit (TDU) operations as well as operating the complete range of intervention Tools, including Torque tools, Hot Stabs and the standard range of Rig tools, such as guide wire tools and gasket / seal replacement tools. This has also involved shore side work conducting System Integration Tests (SITs) at several locations in the UK

Project Manager Alistair McKee said "this is a difficult and demanding program but with a good regular crew and the technical back up offered from our base here in Aberdeen we have so far managed all the tasks asked of us.



▲ Spartan 7 ROV system onboard the Sedco 704

# Fugro Multipurpose Tooling Skid

Fugro's Engineering department recently completed the design and build of their 2nd Multipurpose Tooling Skid.



The Multipurpose Tooling Skid is designed to fit an FCV3000 ROV. It is an under slung aluminium unit with overall dimensions of 3000mm x 1700mm x 500mm. A single buoyancy block assembly is fitted into the centre of the Skid to allow the skid, complete with any mounted tooling, to be neutrally buoyant in sea water. The Skid contains various reservoirs, pumps and sensors to allow multiple fluid interventions on subsea equipment.

The skid is controlled by an intelligent valve pack that allows variable control of the Torque tool and Fluid injection system and offers hydraulic functions for operation of additional hydraulic tooling. The skid also has functions for two tooling cameras and two lights in addition to the mother ROV's cameras and lights.

The key features of this device are:

- Dual 67 Litre Trans Aqua Reservoirs
- 10,000 psi variable pressure & Flow Trans Aqua Pump
- Qty 3 Bi-Directional Trans Aqua Outputs (10,000 psi)
- Qty 2 Bi-Directional Proportional Hydraulic Outputs (3,000 psi) connected to allow dual variable pressure and Flow control of two rotary tools or single tool and pump operation without the need to recover to surface to reconfigure
- Sensors to record pressures, flows and volumes of all system fluids
- Jupiter 2 Intelligent Control System allowing simple ROV interfacing with Laptop operating system
- Integral Flow meters to give flow rate and volume of fluid transferred in and out of the system reservoir and fluid volume in reservoir with constant measuring
- Dummy Stab receptacle to allow pressure testing of dual port hot stabs up to 10,000 PSI



▲ Fugro's Tooling Skid under fabrication, showing tooling basket at front

- Hydraulically operated Tool basket with internal dimensions of 720mm Length x 920mm Width x 285mm Height.
- The Tool basket can be removed by releasing 2 bolts and replaced with a Pitch & Roll Flying Lead Orientation Tool and API17D torque tool fitted in its place.

# Fugro Symphony Update

Fugro's new DP2, Construction Support Vessel, the Fugro Symphony on schedule for March 2011 arrival.



▲ 3-D image of Fugro Symphony

The construction of Fugro's Newbuild vessel, the Fugro Symphony is well under way in Gdansk, Poland. The vessel will be launched at the end of July and will then move to Bergen for final outfitting and delivery in March 2011.

The vessel is fitted with Kongsberg's K-Master DP systems and is similar in design to Fugro's other construction support vessel, the Fugro Saltire, with a few modifications. The main difference is the addition of a 19m hull section bringing the overall vessel length up to 130m. Other features include a 1,300m<sup>2</sup>, 22m thick steel deck, rated to 10T/m<sup>2</sup> loading and having no 'No Weld' zones over the entire deck area. There is a large, below deck storage capacity and also MEG tanks capable of carrying 340m<sup>3</sup> of product.

The vessel is fitted with a 150Te Active Heave Compensated Crane (with a 250Te crane pedestal) and as the Fugro Saltire, is fitted with 2 FCV 3000 Fugro ROVs deployed from overhead Launch and Recovery Systems, built in to their own hangar area and controlled from a central Control room.

Designed and built to Comfort and Vibration Class 3 and providing accommodation for 105 persons, the Fugro Symphony is fitted out to an extremely high standard and features a 50 seat Auditorium (Cinema and Project briefing room), fully networked accommodation, with TV and DVD in all cabins. In addition to the plentiful lounge areas there is a well equipped gymnasium and 2 saunas.

# The FCV Family Continues to Grow

**Having successfully introduced the high specification FCV 1000 and flagship FCV 3000 ROV Systems, it was determined that we needed to develop an intermediate depth solution for 2,000msw, but within a tighter, more compact package and so we went to the drawing board with a clean sheet of paper and target weights and dimensions for the FCV 2000 System.**

The challenges were to develop a 2,000msw rated vehicle that had all of the capabilities that are now a trademark of the FCV, but to comply with a substantially smaller space envelope; plus design and build an armoured umbilical LARS (Launch and Recovery System) that would offer a neater footprint aboard the support platform AND provide a spacious working arrangement for the ROV Crew. These challenges have been successfully met, largely due to the total design control philosophy that Fugro adopted for the FCV Program, whereby we are able to develop the interdependent design solutions wholly in-house. The Design and Build Team at Fugro Subsea Technologies in Singapore were up to the challenge and by the time you read this article, at least 3 x FCV 2000D will be delivered and in-service.

## The vehicle

The FCV 2000D started from the premise that it had to deliver the performance and capabilities that are synonymous with its larger brothers, the FCV 1000 and FCV 3000, but within an envelope that was substantially tighter and still be accessible for maintenance. It also had to be outfitted with the “best in class” sensors and peripherals so as to be a capable work solution to the rigours of Drilling and Completion operations which was its main target market – although those same specification attributes would allow it to work in all of the Fugro Subsea Services Core Market areas of Construction Support, Drill Support and IRM.

Firstly the core frame of the FCV 2000D was reconfigured in a manner that would allow the vehicle to shrink its external dimensions

but retain the full 3,000Kg through frame lift plus 1,000Kg backpack payload capability, and be substantially more rigid to better withstand the “grunt” work aboard a drilling rig. It should be noted that the mechanical interface for the underslung modules on the FCV 2000D was retained, ensuring full compatibility between all of the FCV in regard to the fitting of these large work packages. The hydraulic power pack was rated to deliver 125HP, which allows the 7 x 300mm Sub Atlantic thrusters to deliver a >600Kg bollard pull in all directions, whilst the buoyancy specification provided a minimum of 200Kg of ballast / payload on the core vehicle when outfitted with all of its base-case tools and sensors. Manipulators from Schilling Robotics, cameras, altimeter and sonar from Kongsberg Maritime, Octans Gyro from IXSEA, depth sensor from Digiquartz and a DVL from RDI ensured that we would have the standardisation we were seeking across the full FCV Program. These latter sensors also combine to provide inputs to the Fugro proprietary control system, which includes for 4DP – three dimensional Dynamic Positioning, which has received very favourable responses from those crews who have experienced this supervisory control solution. The FCV servo valve pack provides for 1 spare outlet, whilst the general purpose solenoid valve pack has a minimum of 6 spare outlets, plus a high flow solution for standard consumers such as “Zip Pump”. The spare hydraulic functions can be further enhanced by the fitment of a Fugro IVP (Intelligent Valve Pack), designed in conjunction with Wandfluh, and which has the full functionality to support a backpack mounted TDU that can, in turn, be relatively “dumb”.

Installing all of this equipment on such a compact frame was obviously going to compromise accessibility for maintenance, which was a core demand of the design brief. The Team took their cues from the ubiquitous “Swiss Army Knife” and built-in the ability to swing out parts of the periphery mounted equipment, e.g. the general purpose valve pack, so as to allow access to the parts that were mounted within the central core. This was achieved with no requirement to disconnect any base hydraulic functions, or break any connectors, plus be accomplished in less than 1 minute – quite a feat. Overall, the developments incorporated to the FCV 2000D vehicle will be able to feed back into the other parts of the FCV Program and the initial feedback from the crews would indicate that we have another “winner”.

## The LARS

Developing a telescoping A-Frame plus umbilical winch holding 2,400m of 37mm diameter armoured umbilical to meet the design brief was another challenge set to the in-house engineers in Singapore and, as can be seen in the illustration and photograph accompanying this article; the result is quite an achievement. Working with our fabricator and suppliers, we were able to use height to compensate for the restricted plan view (footprint) of the umbilical winch, resulting in a compact winch design that uses the advances in armoured cable design / specification to increase the number of layers on the winch drum, yet still remain within the design parameters. By using a duplex ram arrangement, the A-Frame has a very minimalist pedestal / fulcrum, which allows the landing area for the ROV + TMS



▲ FCV 2000D prior to delivery to first client

to be clear of intrusions and therefore offer a clear working environment for the ROV crew. Flexibility in terms of the area required by the structural base of the A-Frame is provided by the use of a non structural "pup piece" that can be used to install a package LARS, or allow alternative separation solutions should the host platform not be able to provide the area to site the package. Remote control capability to operate the LARS functions are incorporated; with all of the "smarts" fitted to the umbilical winch, where the reasoning is that in many

mobilisations, the A-Frame or the deck HPU may not be required, but the umbilical winch will always be needed.

The FCV 2000 ROV System is completed by incorporating the Type 4 TMS from PSSL, fitted as standard with 200m of tether but with the option to increase this to the standard FCV length of 600m and by the provision of the Fugro FCV style Workshop and Control Cabins. The full System is finished to be Zone 2 Hazardous Area / ATEX compliant.



▲ FCV 2000 Launch and Recovery System

## Fugro Academy begins Train the Trainer..

### and starts testing of Fugro Academy Mobile

The Fugro Academy has had a busy 12 months developing and publishing HSE & technical e-learning and classroom courses. The Academy also initiated a series of presentations to promote greater awareness of the Academy's services within the Subsea Services Division (SSD). So far there have been presentations to Fugro Subsea Services and Fugro Subsea Technologies in Singapore and to Fugro-Rovtech and Fugro ImpROV in Aberdeen with a visit planned to Fugro in Macae, Brazil in August. Visits to other Opcos are planned for later in 2010.

During these visits electrical and electronic classroom courses and "Train the Trainer" courses and coaching sessions have been carried out to improve the presentational skills of local Operating Company trainers so that they too can conduct these classroom courses locally.

The Academy has also carried out training and coaching sessions on the use of "Mohive" its chosen e-learning software package. This initiative is to encourage and enable local subject experts to develop e-learning courses for their own Opcos on a wide range of topics including, Technical, Administrative, Logistics and IMS subjects. The Academy will provide further help with developing these local courses by giving assistance when required by producing interactive graphics and 3D models to accompany these courses.

Earlier in the year the Academy completed and presented a new ROV Supervisors Course to Fugro-Rovtech in Aberdeen and this was well received by all participants. It is planned to schedule more of these at the end of Quarter 3 through Quarter 4 and on into 2011.



▲ SM4 Motor Maintenance Course to launch in Q3 2010

Fugro Subsea Technologies have produced a revised FCV 3000 course and the first of these, organised by the Academy, was presented in Aberdeen in



February. The 6 day course consisted of modules on the electronics and control systems, the electrical systems, the hydraulics systems and a one day hands-on session on operations.

The Academy Subsea Services Group have completed the first 3 modules of the 'Introduction to Hydraulics Course' and these have been published on the Academy's website. The group is currently working on the 4th module titled, "An Introduction to Hydraulic Fault Finding" and this should be available in the next few months.

The use of interactive animations to explain the technical concepts in a simplified and easy manner has been well received and course uptake has increased across all Subsea Services Operating Companies as awareness of these courses grows.

The first of a series of SAAB Seaeeye Motor Maintenance e-learning courses is in production. The course on the SM4 motor will be published in Quarter 3 2010.

The Academy is to introduce a system called "Mobile Fugro Academy". This will allow students to gain access to courses which could not otherwise be delivered due to lack of a reliable internet connection. Academy students will, in future, be able to download, onto a memory stick, courses from the Academy Learning Management System (LMS) website at [www.fugroacademy.com](http://www.fugroacademy.com). They only need reliable access to the website, e.g. from the office server, or at home, for the few minutes it would normally take to download the courses onto a memory stick. Students can then complete the courses at their own convenience and location on any available computer. Results of any courses taken and completed remotely would then be uploaded whenever a student is next connected to the LMS website. New courses can then be downloaded from the LMS to continue the learning process. Tests of the system are underway and, if all goes well, the system will be introduced later in 2010.

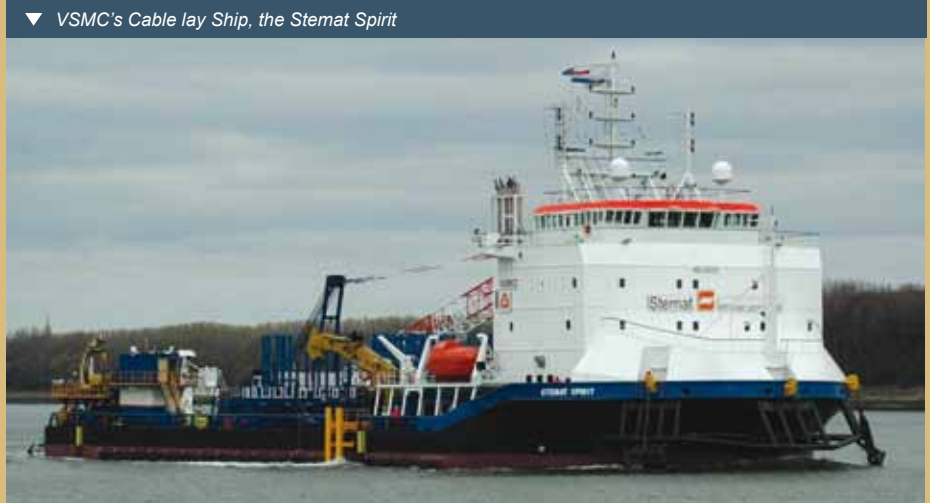
# ROVs and ROV Support Vessels go to work on Offshore Renewables Projects

**Over the winter months Fugro-Rovtech was successful in winning several projects in the emerging offshore marine renewable market.**

## Client: VSMC

We were awarded a contract by Visser & Smit Marine Contracting (VSMC) for the provision of work-class ROV services in support of offshore wind farm installation projects. The work involved mobilising a Sealion work-class ROV system onboard the CLS Stemat Spirit, which is a unique cable lay ship 90 m in length and 29 m beam and was specifically built to be able to lay high-voltage cable. She is a fully equipped, dynamically positioned ship which also utilises anchors to provide forward motion for plough operations. The unique design makes her suitable for both off-shore (deep water) and near-shore (shallow water) work.

The Stemat Spirit is also equipped with a plough for cable burial and the Sealion work-class ROV supports these operations. The ROV has been adapted and fitted with extra sensors to allow operations in the challenging conditions the vessel experiences



▼ VSMC's Cable lay Ship, the Stemat Spirit

during cable installation projects. The ROV provides the eyes for the project by working ahead of the plough looking for obstructions, monitoring the cable touch down area and assisting during cable installation and pull-in to the 'J'-tubes at the foundation of each wind turbine structure.

In July Fugro mobilised a Sealion work-class ROV onto the Lay and Pull-in Barge; the Stemat 82 which will be used to deploy in-field cables to link the various wind turbines back to a central interconnect hub unit. The work class ROV will assist with

operations such as Pre-Lay Grapnel Runs (PLGR) where the seabed is surveyed and physically cleared of obstructions and Post Lay Inspection & Burial (PLIB).

Towards the end of summer we will mobilise a 3rd system onto the Team Oman and carrying out similar support operations as the Stemat 82.

VSMC commented at the time of award that a key factor in their decision to award the ROV contract to Fugro was our ability to provide 3 ROV systems of the same type to support their projects. In the coming months the vessels will be used on offshore Windfarm projects in the East and West coasts of Scotland, with further deployments expected in European countries.

## Client: SubOcean

At the beginning of 2010, Fugro-Rovtech were awarded a contract by SubOcean to provide work-class ROV services onboard the Construction Support Vessel, the Normand Mermaid. The work was to support ongoing installation support on the Thanet Windfarm. We supplied Sealion 40 and since our mobilisation we have carried out an export power cable inspection and supported cable installations. The low profile, compact design and high power of the Sealion work-class ROV has helped offer as wide an operating envelope as possible in the high water currents and low visibility. The ROVs advanced communications modules and fiber optic communications allowed the simultaneous operation of multi-beam



▲ Fugro Seacore's jack-up barge, Excalibur at Thanet

▼ *Fugro Sealion ROV being launched from the Normand Mermaid*



echo-sounders (MBES), 2-D sonars and a Cable Tracker Unit. Our offshore crew also commented that the visibility was so bad, they could not understand why they had bothered fitting the ROV with lights and cameras!

The Thanet wind farm is completing its construction phase about 7 miles (11 km) off the coast of Kent in southern England. The complete project will cover an area of 35 km<sup>2</sup>. When it is complete this will be one of the largest operational offshore wind farms in the World. The Thanet project is expected to have a total capacity of up to 300 MW which is sufficient to supply approximately 240,000 homes. The project will make a significant contribution to the UK Government's national and regional renewable energy targets.

Several other Fugro companies have been involved in this project including Fugro Seacore who used their jack-up barge, the Excalibur to install the offshore Met mast.

Additional work with Subocean on the Greater Gabbard field has been won and in July Fugro mobilised another Sealion onboard the cable installation barge UR101.

**Client: Scaldis**

Fugro-Rovtech were awarded a contract to provide ROV services to Dutch marine Contractor, Scaldis. The work involved supplying a total of 4 ROV systems onto 2 vessels, the heavy lift installation vessel, the Rambiz and the support vessel, Swiber Ellse Marie.

▼ *The Scaldis Heavy Lift vessel, Rambiz*



The projects they will be working on are the Walney and Ormonde Wind farms in the Irish Sea. The ROVs will be working on all phases of the installation and performing pre and post-installation surveys, monitoring piling operations and valve operations during grouting.

The Irish Sea is characterised by high tides, waves and windy weather. The tidal range can be as much as 8 metres and combined with low visibility this has provided a challenging environment for the ROVs. Fugro-Rovtech have supplied a combination of work-class and observation class ROVs each equipped with high resolution sonar systems and other sensors to help operate in the area.

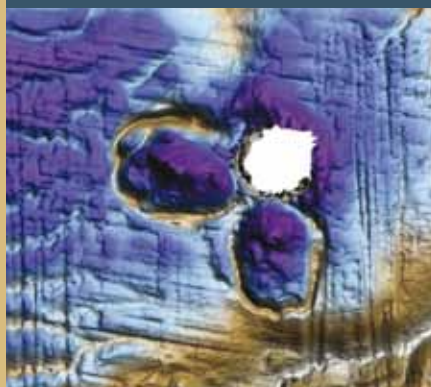
Walney is located approximately 15km from the coastline of Walney Island in Cumbria. In the first phase a total of 51 turbines will be installed. The Ormonde Wind Farm is 10km off Barrow-In-Furness covering an area of nearly 9km<sup>2</sup>. When construction is complete there will be 30 turbines each with a capacity of 150 megawatts.

**Client: Fluor**

At the end of May the Skandi Inspector successfully completed her first venture into the sustainable energy market. The vessel has been working on a large wind-farm project off Harwich, an area renowned for its operational difficulties. The location suffers from high currents and very poor visibility, but we like a challenge!

The work scope for the vessel was to excavate soil and clay at the base of wind turbine mono-piles. The mono-piles had been installed earlier in the project and were ready to receive their top-side turbine mast and their infield (or inter array) cables. The excavation work was required to ensure that these inert array cables could be pulled into two guide tubes (known as J-Tubes).

▼ *Multibeam Echosounder imagery of the dredged locations (white circle is the actual tower pile)*



The excavation tooling and personnel for this equipment was supplied by Fugro's alliance partner, Marin Subsea Ltd. The specific tool used for the project was the 'SV Vortex' and a mono-jet to facilitate in the breakup of the clay soils. On completion of the excavation phase Fugro deployed one of the Triton work-class ROVs to verify that the excavated areas had reached the required depths>this was conducted using an ROV mounted Reson 8125 multibeam system and the data received was processed onboard.

During the project Fugro trialed various new sensors on the market. We used several sonars (both pole mounted from the vessel and ROV mounted) to provide assistance with positioning equipment and to provide real time monitoring of the excavation depth.

The overall project lasted some 2 months and all-in-all it has been an interesting and challenging time for everyone involved. We have increased our experience of working in these conditions and of the technology that is available in the market place.

▼ *Back Deck of Skandi Inspector during dredging operations*



▼ *Marin Subsea's Vortex Dredge tool being deployed from the Skandi Inspector*



▼ *Marin Subsea Vortex tool fitted with mono-jet to facilitate clay soil break up*



# Fugro's New Inspection Vessel Goes from Strength to Strength

At the beginning of March 2010, Fugro-Rovtech took delivery of the new build multipurpose ROV (remotely operated vehicle) support vessel, the Skandi Olympia. The ship takes over from the highly successful Highland Eagle, which has been reassigned to the offshore renewable energy market, working for sister company Fugro SeaCore.

The Skandi Olympia offers Fugro-Rovtech's clients a first-class and cost-effective solution to their inspection and light intervention requirements. The vessel is being used to perform platform, subsea-structures and pipeline-inspection programmes for client companies that primarily operate in the North Sea. Gordon Kennedy, IRM business line manager for Fugro-

Rovtech, says: "We have a long, excellent and proud track record performing inspection programmes and this new addition to our fleet shows Fugro's commitment to this core business area for the years ahead."

The Skandi Olympia was built by the Norwegian yard, Fitjar Mekaniske Verksted, in 2009 and is classified to "comfort class" and provides all crew with a high level of off-

duty relaxation. All areas of accommodation are very quiet, with little engine noise reaching the cabins, lounges or galley areas. There is also satellite TV and internet available in all cabins, which accommodate 40 crew in either one or two-berth configurations. For the health conscious, there is a fully equipped gymnasium.

Close attention has been paid to Skandi Olympia's environmental footprint. Crucially, she is powered by a fuel-efficient diesel-electric propulsion system. The engines are fitted with urea catalytic converters that play a key role in reducing emissions.

Operationally, the vessel has been set up to optimise inspection and survey performance. She is larger than her predecessor, measuring 79.6m overall by 16.4m breadth. This provides more back deck area and allows Fugro-Rovtech to mobilise additional and third-party equipment as and when required. A purpose-built module with a floor area of 75 square metres provides linked offices for the offshore vessel manager and both the on-line survey and off-line survey teams.

For the acquisition of client inspection data, Fugro-Rovtech has installed three ROV

▼ the Skandi Olympia with 3 ROVs being deployed over the starboard side of the vessel





▲ The FCV 3000 being deployed from the Skandi Olympia viewed from the Bridge

systems. Pipeline inspection and remote intervention is carried out by one of Fugro's own 150bhp. This state-of-the-art vehicle is capable of performing at depths to 3,000m and is fitted with the latest data-acquisition sensors including Reson 7125 multi-beam echosounders, bathymetric unit, combined pipe and cable tracker and Doppler velocity log.

The ROV is deployed from its own "A" Frame launch and recovery system and is fitted with a Top-Hat tether management system (TMS) for both safe operations and improved weather launch capability. The vehicle uses best-in-class components, including the propulsion units, the manipulators, sonar and camera systems.

*"A successful project for Apache made possible by a very cooperative, skilled and knowledgeable ROV crew, well led by a disciplined and highly motivated OVM. No task, whether Fugro directly or a sub contractors, was too much effort or involved for the Fugro people to assist and direct in."*

**Apache Oil,  
Onboard Client Representative**

For platform and subsea structures inspection, there are two Fugro Tiger ROV systems. Both are deployed from their garage Tether Management Systems (TMS). These ROVs are fitted with dual camera systems and sonar and can also host a

range of specialist inspection equipment depending on individual client requirements.

As always, the success of a vessel and equipment is only as good as the people involved. The team that manage and operate the Skandi Olympia, both onshore and offshore, are experienced in inspection operations, know their client requirements and always aim to deliver the results safely, efficiently and ahead of time. Skills are continually being enhanced via the company's in-house training unit – the Fugro Academy. This provides all Fugro personnel with continuous educational and technical training throughout their careers and helps safeguard the company's access to knowledge and expertise.

Of course the client's main interest is not the technology or skilled people, but the quality of the delivered data in the form of the final report. Fugro-Rovtech delivers all such reports in digital format. This is done using a format developed in-house utilising web-based technology and all inspection reports are now issued in this digital HTML format. Our clients now receive an anomaly-based report that auto-starts on insertion into a PC. Not only are all the inspection results easily accessible, but video clips, digital photographs and charts are all embedded in the report. Any project documentation relating to the job can also be included.

Another major benefit of this type of report is that, once uploaded on to a client server, it can be accessed by multiple users simultaneously.

In addition to the HTML report, all digital data is delivered on a stand-alone hard-disk drive. For pipeline reporting, Fugro-Rovtech provides the Starfix DV application, which is fully featured and integrated digital video and eventing system for data acquisition, processing and reporting. This allows the client the ability to quickly access and review data.

Upon completion of the mobilisation and offshore trials the vessel immediately went to work for its first client and so far this year has successfully performed a range of inspection, intervention and repair projects. Our clients have commented that the vessel is a great improvement on the Highland Eagle allowing with the added benefit of having the same team of experienced offshore personnel onboard.

*"A challenging work-scope. Every goal set was achieved with enthusiasm and professionalism. Very impressed with crew flexibility."*

**Chevron,  
Onboard Client Representative**

▼ view showing, the Crane deployed Tiger inspection ROV at the aft end, the 'A' Frame deployed FCV 3000 Work-class ROV centre and the beam deployed Tiger nearest



# Technologies for subsea simulation and visualisation

**Fugro General Robotics Limited is the leading European producer of subsea visualisation and ROV simulators. Founded in 1988 and based in Milton Keynes, it joined the Fugro Group in September 2009.**

FGRL's core product is DeepWorks which provides visualisation, simulation, training and live monitoring capabilities. DeepTouch is the name given to the pilot training simulator which comprises DeepWorks using three of the core libraries; simulation, hydraulics and electrical. Along with its ROVolution predecessor, DeepTouch reproduces the actual subsea conditions that an ROV pilot must work with. An important feature is the hydrodynamic modelling of objects in the water, so that the ROV simulator responds to the controls just like its real counterpart, with behaviour based on actual physical properties: mass, density, drag, taking account of currents and ROV speed and the resultant forces acting on the tether and the ROV.

Different visibility conditions can also be simulated, with varying light levels, water fogging and suspended particles together with an accurate sonar system to provide realistic support data. DeepTouch adds fully force-modelled physics simulation to subsea and ROV simulators, so that any object in the world model both feels and behaves like the real thing. For the first time, DeepTouch brings "touch and feel" interactive simulation tools that

give the simulator pilot the same graduated tactile response as if he were actually using a tool, like a manipulator, to move or adjust a subsea component in the field.

Customisation is straightforward and programming skills are not required. DeepTouch allows an engineer to drag and drop objects from the extensive libraries to build subsea worlds containing items such as vessels, pipes, cables and ROVs. DeepTouch can also show electrical and hydraulic circuits in complex subsea machinery, modelling down to great detail within the ROV itself, which makes it quick and easy to change, or even create a new vehicle design. DeepTouch simulation makes it simple to evaluate and change designs prior to manufacture and reduces reliance on expensive and time consuming prototypes. FGRL is aiming DeepTouch at companies within the Fugro Group and also third party subsea services providers.

FGRL's core product is DeepWorks based on a suite of libraries for the simulation of all aspects of underwater systems using a fully force-modelled approach.

DeepWorks' advanced user interface makes it simple to operate in the office or the field, using drag and drop technology to build up models quickly and easily. With automatic data collection, display and saving, it allows multiple simultaneous views of the subsea world to be replayed at any point for live monitoring, peer review by engineers or showing to clients.

Fugro GRL has now delivered the first order for its DeepTouch simulator to Fugro-Rovtech, which is using it for the rapid evaluation of subsea engineering designs.



▲ Vessel and ROV in WorldBuilder View

Fugro-Rovtech bought DeepTouch due to its ease of use, specifically because a subsea engineer can readily customise it for a particular task whereas competitive systems require a programmer to make the changes. The company also liked the fact that FGRL writes all its own software and does not rely on third-party applications it doesn't control.

"We are talking about bespoke equipment we make for our clients such as tooling, control

▼ FCV approaching crossing



systems and other kit for the ROV," said Nick Alvarado, Subsea Engineer, Fugro-Rovtech. "When clients encounter a problem subsea we occasionally have to design a set of tools specific to that job and sometimes the ideas and mechanisms have never been used before subsea, so being able to test before we actually start manufacturing is of great value."

▼ DeepTouch in use



## Fugro completes India project

Fugro have completed a construction support project in India for Leighton International onboard their construction barge the Eclipse and the installation barge the Smit Borneo. For the work Fugro provided 2 Sealion work-class ROV systems (pictured right).

The work lasted for 8 months and involved support for Pipelay, cable lay support and riser installations. The work was carried out at the Mumbai High Field in the harsh environmental conditions of low visibility and high currents.



# New Fugro “Dog House” Tooling System

**Fugro-ImpROV of Aberdeen specialise in subsea intervention tooling. They have recently developed a new tooling system for Total. The Insulation Doghouse Running Tool (IDRT). The system was built to be used on the deepwater Akpo development offshore Nigeria.**

The “dog house” title simply comes from the shape of the pipe door on the front of the tool, making it look a little like a doghouse or kennel.

The Akpo field in block OML 130, 200 km offshore Nigeria is in 1400m of water. It is a gas/condensate field with high pressures and high temperatures. One of their greatest challenges is to ensure that condensate and gas in multiphase flow reaches the production facilities without being stopped by hydrates and wax and scale deposition. These can occur if there is a reduction in temperature of the Gas/condensate in the flow-lines while the system is being commissioned. All of the component parts were insulated prior to deployment on the seabed leaving only the connector of the flow-line exposed. The Fugro IDRT completes the installation.

The IDRT was described by Total as the most complex off all the tools in a group of tools used to complete the flow-line connections.

The Fugro tool proved itself first time, and has so far successfully completed over 140 connections and to date there have been no failures or refusals to mate. Although these were “firsts” for the engineers, Total said “it bears testimony to their approach that the tools worked so well”. Other operators have now shown interest in the tool for similar operations in other deepwater developments.



# Fugro Awarded Long Term Contract in Brazil

**Fugro Brasil – Serviços Submarinos e Levantamentos Ltda. has been awarded a long term saturation diving contract by Otto Candies for Petrobras. The tri-partite contract has a value for Fugro of approximately USD 100 million, involving ROV and diving services. Otto Candies is providing the Diving Support Vessel (DSV) and the contract will be managed conjointly. It is a 5-year contract with an additional 5-year option, with operations commencing early in 2011.**

The brand new vessel Kelly Ann is being mobilized at Candies shipyard with a 14 man - 300m rated saturation system, and will work for Petrobras offshore Brazil 24 hours, 7 days a week. This project will consolidate Fugro Brasil's position as the largest diving operator in country.

Fugro has supported Otto Candies in the procurement of the sat system and will also support them on its installation, commissioning and final trials. Fugro will not only operate but also maintain the system throughout the contract. In addition to this Fugro will also provide an FCV 3000 work-class ROV and a Lynx observation class ROV on the vessel.

# FSME SSD – ROV Operation in Indian Region

Fugro Subsea Services (Middle East) continues to support drilling operations for ONGC (Oil and Natural Gas Corporation; India's National Oil Company) in India. The operations are taking place in waters off both the east and west coasts of India.

Fugro are providing 2 Panther Plus ROV systems. One system is installed onboard the ONGC owned drill-ship, the Sagar Vijay and the other is onboard the Northern Offshore owned semi-submersible, the Energy Driller.

The contracts have been running for over 2 years and during this time Fugro has operated in water-depths up to 1,000m and carried out BOP Inspections, AX gasket ring change-outs (using Fugro's own ring change-out tool, specifically designed for the Panther Plus), Bulls Eye Inspections, Guide Wire Cutting, Debris Clearance and various other intervention tasks. Over the course of the contract the overall performance of both ROV systems has been excellent.



# Skandi Carla's Caribbean Adventure



## The Skandi Carla mobilised in Aberdeen during September 2009 for a pipeline crossing and mattress installation project in the Caribbean for BP Trinidad and Tobago.

Thirteen concrete supports (manufactured in Dundee) and twelve concrete mattresses were mobilised in Aberdeen, to be transported to Trinidad for their subsequent installation. The Transit time to Trinidad was 14 days with the work planned to take 10 days on location. Opportunities for further work with both BP and other clients were possible once we had completed the firm work.

The Skandi Carla arrived in the port of Chaguaramas, located 10 miles west of the island's capital of Port of Spain, on the 25th of September. Fugro-Rovtech organised an 'off-site' induction and risk assessment for the project. The Fugro team, the marine crew, our subcontractors and our client's key personnel used a nearby conference facility to conduct the meeting without interruptions. The time was used very productively and resulted in several changes being made to the work procedures and processes in order to further reduce risk to the deck personnel and ROV systems.

The crossing location was on the east side of the island and once on location and after the initial DP checks and USBL calibrations the installation phase commenced. Mattresses were installed near the Serrette and Red Mango Platforms for the future pipeline lay-down heads. Once this was completed we moved to the crossing location where the 2 existing lines were firstly protected by mattresses. Next we installed the large concrete supports. The supports were positioned along a 250m length of the proposed route at 20m intervals with the closest support being 5m from the existing pipelines and having a support height of 1.52m. The furthest supports had a support height of 0.65m. Once in place the 13 supports would ensure that the new pipeline would be safely carried over the existing pipeline. Finally, we used the ROV mounted Dual head Multi-beam Echosounder to carry out an as-built survey. This data was processed onboard and a digital terrain model of the installation area was produced.



▲ The Skandi Carla back deck during crossing support installations

Initially scheduled for 12 days, the Skandi Carla completed the installations from port to port in 8 days. Throughout this short campaign the vessel received extremely positive comments from the clients referring to the very proactive safety culture from all personnel on board, the general high level of cleanliness and house-keeping and the standard of food.

While the first phase was underway, we were fortunate to secure several additional work-scopes with BP and 2 other clients. These work-scopes included; remote intervention, pipeline inspection, platform inspection, free span rectification using cement filled grout bags and salvage recovery. For these projects we mobilised the required equipment and personnel out of Chaguaramas. From our initial commitment of less than 15 days, we ended up achieving more than 100 days of operations.

# Fugro System Mirrors Reality

**ONE of the greatest challenges that traditionally faces the subsea contractor is unequivocally convincing the client that he has the solution to the challenge.**

It may be a new project – installing and commissioning subsea hardware – or it may be a repair to existing production infrastructure that must be done expeditiously. Either way, the work has to be executed in an accurate and timely manner.

Simulating a task is commonplace and the degree of sophistication of that modelling process has increased over the years. It is an aspect in which Fugro has a deep interest – witness the development of the Eng-Sim solution.

Three years of work have gone into Eng-Sim which, in a nutshell, provides Fugro with the ability to take a construction or repair concept to a client and provide him with an ability to quickly understand that concept by demonstrating it onscreen in a manner that takes into account actual onsite conditions – perhaps in several thousand metres of water.

The Fugro Eng-Sim is an engineering tool that accurately simulates the hostile underwater environment and brings that to bear from the conceptual design stage through to procedural development.

Depending on data feeds used, it will take into account the full range of conditions that might prevail in a particular location and for a specific task – tidal and current velocities and direction, sea-floor characteristics, geophysical and geotechnical conditions, relevant engineering design drawings, and so forth. Even bolt torques can be replicated.

Fugro Eng-Sim is designed to use real-world data on top of FEAs (Finite Element Analysis), CFDs (Computational Fluid Dynamics) and RAOs (Response Amplitude Operator) to produce 3D models with real-world physical characteristics. It combines this with electrical

and hydraulic circuit simulation for an unparalleled level of realism.

In essence, every step of the task can be tested against such parameters as it is being progressed. It means that, by the time the proposed solution developed reaches the client, it possesses a powerful reality – mirroring the real world.

That way, it becomes possible to maximise the time available to carry out front-end engineering design.

Fugro Eng-Sim is compatible with every mainstream CAD package, survey suite and tracking system used by the subsea industry to precisely represent the job site and every onsite asset with a navigable 3D representation.

It then allows the addition of ROVs, ships and any other functional equipment required for an operation to simulate this job-specific scenario in real time.

In the early stages of a new or brownfield development, the Fugro Eng-Sim allows engineers to rapidly assess new ideas without ever cutting metal. Later in development, it is used for clash checks and accessibility studies, essentially a virtual SIT in a situation representative of actual environmental conditions.

Nearer completion, it can be used to help develop and refine procedures; further, the navigable 3D replay can be integrated into the procedural documents for distribution.

This comprehensive digital deliverable is unmatched in familiarising crew with the work site and equipment, as well as historic and impending works.



In addition, the Fugro Eng-Sim can be used onsite with the use of GPS, DVL, Inertial Nav, USBL and ROV telemetry strings. This data is used to display, in real time, an accurate representation of the scene subsea, to be used as a piloting aid or streamed, along with video, over the internet to onshore experts.

The Fugro Eng-Sim aids in every aspect of the engineering process; it clarifies every facet of a job; it mitigates risk at a fraction of the cost, and is invaluable in the training of ROV pilots.

## Fugro Recovers Broken Drill String

In June 2010 Fugro SSD Middle East mobilized FCV 1030 onboard the Adams Surveyor to aid in the recovery of a drill string which was stuck in the seabed offshore Qatar. After mobilization in FSME's yard the vessel proceeded to location which had previously been surveyed by Panther Plus 926 onboard the Siem Carrier.

After an initial inspection of the area FCV 1030 was deployed and aided in the landing of the fishing/recovery tool by use of the Shilling Rig-master arm. The drill string was successfully recovered back to deck and seabed clearance survey was completed prior to arrival of a Jack Up rig on location.



# Fugro Norway completes varied work-scopes with new Panther XT

**Fugro Norway mobilised Panther XT 935 on board the Normand Ferking in June 2009. The vehicle replaced Panther 919 which had been onboard since late 2008. The new Panther XT features upgraded hydraulic and electronic systems and allows Fugro to integrate more survey sensors and remote tooling to the vehicle, providing a broader range of capabilities to our clients.**



▲ Class DP1 vessel, the Birkeland

The Normand Ferking is an AHV (Anchor Handling Vessel) owned by Solstad and currently on hire to Statoil. During our time on board the main scope of work for the ROV was to confirm the penetration and position of the mooring points of the drilling rigs operated by Statoil. The ROV also assisted during pre-laying of anchors for arriving rigs. In addition to this, Statoil used the ROV on board for inspection work on their subsea installations in the North Sea.

The ROV was de-mobilised from the Normand Ferking at the end of May this year and immediately mobilised on board the Birkeland for another Statoil project in the Barents Sea conducting an environmental research survey at potential oil fields. The scope was to photograph any marine life that was found during the survey.

Following on from Statoil, the Birkeland and the Panther XT has performed several projects including a survey for the Police Force of Salten (a region on Northern Norway) which successfully located a sunken fishing vessel. After that we carried out an environmental survey for Det Norske Oljeselskap (DNO). This involved taking stills photographs of any coral or boulders found on potential oil fields. Finally the Panther XT conducted several projects for Talisman. The first project was to perform an as-left survey for Talisman following the departure of a jack-up drilling rig. The scope included a visual survey of the spud-can prints and a debris survey, including recovery of any debris found. We then performed a conductor survey at Varg and the vessel performed a multi beam survey at both locations. During all these projects the ROV has performed faultlessly.

▼ The Panther XT medium work-class ROV prior to load-out to Client



# Micro ROV Operations in Harsh Conditions

When Fugro was called to inspect the internal structures of a platform leg through an open access hole, there was only one type of ROV that could do the job, and that was the group of ROVs designated as 'Micro' ROVs. Unfortunately, the platform leg and its access hatch were located in 60m of water with substantial currents present throughout the water column. This was outside the operating envelope of the Micro ROV, so Fugro had to come up with a solution to deliver the ROV to the work-site.

The answer was to use a suitable 'mother ship' ROV to deliver the micro ROV to the work-site. Fugro decided on the Panther XT as the best candidate for this maternal role.

The Panther XT was fitted with an under slung skid containing a retractable basket. This provided a safe garage for the transportation of the Micro ROV from the rig deck to the work-site location.

To avoid having to contend with 2 ROV umbilicals in the water column the Panther XT provided electrical power and telemetry via it's onboard Multiplexer and power supplies, tether and main umbilical. The Micro ROV was fitted with a 25m tether, which gave it sufficient travel to perform the internal inspections. The topside control

console was installed in the Panther XT Control Cabin meaning that the ROV Pilots of both vehicles were working side by side during all phases of the inspection work-scope.

The method has proven itself to be a great success time and again and further developments of the system are planned to allow additional sensors to be deployed with the Micro ROV (VideoRays can take Blue View sonar, CP, wall thickness measurement and can be fitted with a single function manipulator). Fugro own and operate a fleet of Panther ROV systems which are strategically placed around the world. Currently we have 3 Videoray PRO 4 Micro ROVs which are based in Europe and can be air freighted to any region at short notice.



Image Captions:

- 01 Micro ROV in its parent ROV garage
- 02 Micro ROV arriving at access hatch
- 03 Micro ROV entering platform

## Fugro ROV Team win Safety Award

The ROV Team onboard the Kan Tan IV have picked up a Safety Award for their proactive approach to the safety programme onboard the rig.



▲ Receiving the award from left to right are Pilot Technicians Toby Harvey, Ian Cunningham and ROV Supervisor Bob Griffiths

Fugro is contracted to ADA (Australian Drilling Associates) who have been engaged by a consortium of Operating Companies to drill a sequence of wells in both Australia and New Zealand for a period in excess of 12 months, the operating companies comprise:-

- Anzon Australia Limited
- Australian Worldwide Exploration
- Nexus Energy Services Pty Limited
- Origin Energy Resources Limited
- Tap Oil Limited

At the time of the award the rig was working for AWE in NZ drilling the Hoki-1 prospect, thereafter 2 wells in the Tui field, and is currently working on Kahu-1 well with a further well at Tuatara before transferring to Origin Energy for 2 wells also in New Zealand in the North Taranaki Bight before returning to Australia later in the year.

The AWE Representative commented that since the beginning of Fugro ROV's involvement with KT 4 in the Geelong Shipyard Phase, they have been outstanding contributors to the Safety Observation Programs (ACTIVE). The ROV crew have consistently offered their assistance with rig projects eg. Setting up the gymnasium with equipment kindly donated by AWE / ADA, and by offering technical advice and assistance when required.

# Fugro Subsea Services Australia move into new premises

On the 1st of June 2010, Fugro Subsea Services moved into new premises in Canning Vale, 15 kilometres East of Fremantle. The facilities comprise of 805m<sup>2</sup> of Office, 1,409m<sup>2</sup> warehouse and an external hard stand area of 2,500m<sup>2</sup>.

The move means that the ROV, Inspection, Engineering and Tooling departments of the company will all be under the one roof. Fugro Subsea Services employs 50 personnel in Australia.



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