HydroPACT 350 Cable Tracker Works on Fully Operational Live Sub-Sea Power Cables

Field tests have proved that it is no longer necessary to take sub-sea cables out of service to carry out annual surveys of buried depth. This is a huge step forward, and brings the added benefit of greatly increased service reliability for millions of household and business consumers in remote locations, where there is heavy reliance on sub-sea cables for AC supplies.

**HOW DOES THE HYDROPACT 350 SYSTEM NORMALLY WORK?**

The task is to measure, in real time, the buried depth, or covered height, of sub-sea cables, to ensure they are safe, and secure.

Under normal circumstances the power cable is disconnected from the live power grid and a tone is injected into the cable via a tone generator. The frequency or tone, can be adjusted to suit the local surroundings, especially if the area is polluted with external electrical noise caused by other cables or subsea structures such as pipes and oil rigs. The HydroPACT 350, mounted on a ROV, detects the power cable via this tone emission. An array of coils – think of them as sensors – measures the strength of the tone, and because the coils are spread apart on the ROV, the precise vertical and horizontal distance to the cable is calculated.

The magnetic field radiated by the cable varies with distance, so an array of six sensors can tell not only height and lateral offset from the cable, but also the skew angle of the ROV, floating a metre or so above the seabed, for maximum accuracy.

The system incorporates a precision altimeter, to measure the ROV’s height above the sea bed, so the covered height of the cable is then calculated.
HydroPACT 350 Cable Tracker Works on Fully Operational Live Sub-Sea Power Cables CONTINUED

FUKANG SUB-SEA CABLE LINE

Where a sub-sea cable line carries AC power to communities on an island, it has traditionally been a requirement to take the line out of service annually, in order to survey the buried depth of the cables. During that time there are potentially massive staged power outages, as multiple cables are laid together, so they all need to be simultaneously powered down for surveying, leading to complete loss of redundancy.

The seabed is constantly changing, and a cable buried a metre or more down can easily be exposed on the seabed after some time, where it is then liable to be damaged.

The 32km Fukang cable line connects Hainan Island to mainland China and supplies the only backup to the island’s primary generating station. If at any time the cable is out of action, the entire island has no backup power at all.

Highlights:

- ‘The new 350 system worked well. It was able to lock onto the live (500kv power supply) cables and surveyed depth of burial within the specified accuracies.’
- After completing a number of test phases, the 350 proved that it can successfully detect and monitor the electromagnetic field generated by the cable.
Put simply, a way had to be found – and tested comprehensively – to survey the Fukang Line in a live and operational state without taking it out of service, as the cost to the growing community in terms of power-outage risk was just too great.

A rigorous testing regime was therefore devised to demonstrate the ability of the HydroPACT 350 to carry out the survey with the cable powered up and emitting its normal / natural pre-set tone – or frequency.

The Fukang Line of cables is owned and operated by EHV Power Transmission Company. Qingdao Ocean Research Equipment Service Co. (China ORE) is a long-standing partner of Teledyne TSS in the region, and procured the HydroPACT 350 system to perform the live cable tests. The tests were in effect a Factory Acceptance Test (FAT), in that if they were successful, EHV would buy the product. The test was carried out in three phases:

Test Phase 1, On-land. The task was to survey a live cable buried under a road at a known depth. After initial issues were experienced due to interference caused by nearby onshore wind turbines, the team eliminated this spurious noise through tuning the 350 processor to focus on the main frequency only, thus filtering out the unwanted frequencies. As a result, a clean tone could be detected and this meant that, the test was a great success and that the 350 operated within the required design parameters.

Highlights:

• The trial was deemed a great success as the system attained the necessary data from the cable assets.
• The device can normally receive the electromagnetic field generated by the submarine cable under charged state.
• The 350’s response to high sensitivity and ability to detect in such conditions meant that it met the requirements for surveying the Fukang Line.

Whilst China ORE were conducting the test operations, they utilised the SDC for displaying the DeepView software. This shows the various types of location, skew angle and depth of burial data that the system records.

After a number of phases of testing, including land and offshore environments, the HydroPACT 350 passed the acceptance standards.
Test Phase 2, Shallow Water. Using the filter and frequency settings gained from the previous on land test, the HydroPACT 350 successfully located a cable in the intertidal zone, on the seabed, and switched mode to successfully detect the burial depth of the cable.

Test Phase 3, Deeper Water. This test was carried out in the open sea. Though the HydroPACT 350 was installed on a surface craft and not a ROV, it again performed faultlessly, and with a number of passes built up precise data on the sub-sea cable without any additional noise or performance issues.

**SUMMARY**

After successful completion of the three test phases, EHV Power Transmission Company decided to go ahead and purchase the HydroPACT 350 system. This means that, they can now regularly survey the sub-sea cables in a ‘live’ state whilst the cable line is still protecting the island community and its inhabitants from any potential power failure from their primary generating station.

‘This new cable tracking system brings us so many benefits and it will be integrated onto our new SMD ROV system’, said Mr Zhoujing, Chief Engineer of Operation and Maintenance Department, EHV Power Transmission Company. ‘This means we can now do the route survey according to our own schedule by ourselves, this saves us a lot of money and a lot of time, enabling us to ensure the health and safety of the submarine cable operation.’