FIBRE-TO-PLATFORM CONNECTIVITY, WORKING IN THE 500m ZONE

Andrew Lloyd (Global Marine Systems Limited)
Email: andrew.lloyd@globalmarinesystems.com

Global Marine Systems Ltd, New Saxon House, 1 Winsford Way, Chelmsford, Essex, UK CM2 5PD

Abstract: The process of connecting oil and gas platforms with fibre optic telecommunications cables is not without its challenges. Overcoming the specific and sometimes considerable issues that lie in wait demands both expertise and experience from the marine installer, particularly in the 500m zone. This paper identifies the major areas that need consideration from concept through to decommissioning.

1. INTRODUCTION

Broadband data networks are rapidly emerging as the most effective technology to support diverse advances in oil and gas field management. These help manage risk, supervise remote drilling operations and use real-time information to drive field economies.

Field information is critical intelligence because rapid sub-surface and production data analysis can lead to enhanced recovery. Furthermore, real-time communications provide benefits such as improved quality, health, safety and staff welfare in offshore facilities.

In terms of fibre connectivity, the aim should always be to deliver the customer's data network requirements in a way that ensures reliability. The importance of reliable, in-field communications is paramount for both faster data analysis and contact between destinations.

2. INITIAL PROJECT PHASE

The process for a platform-to-platform or shore-to-platform connectivity project starts at the bid phase where as much information as possible is gathered on the requirements of the platform owner and customer. This will include data on the permit to work, topside structure, routing (on the platform and seabed), pull-in arrangements, subsea structures and obstructions, cable burial, timeframes and potential work time limits, as well as other scheduled operations due to take place in the 500m zone. This data allows the proposed contractor to select the best assets for the project, thus ensuring it can be completed safely and efficiently within the prescribed requirements.

Following contract award, a DTS (desk top study) will commence which forms the foundation for the FEED (front end engineering design) study. As part of this process, the engineering team will use dedicated software that helps manage and analyse geographically referenced data, giving quick access to millions of kilometres of as-laid cable data, along with the positions of pipelines, subsea structures, fishing grounds and even must-avoid locations such as munitions dumps.

Properly executed, the DTS should detail all the influences on cable route safety and provide sound engineering solutions for the environment encountered. It should also specify the quantity of submarine cable required, along with the plant needed to install the system.

In short, the study provides a technical reference for the entire project and throughout the life of the cable system, detailing factors likely to influence all subsequent activities, from survey through to installation, and then throughout the system's operations and maintenance lifecycle. It's an extremely meticulous but essential part of all oil field connectivity projects, and can take around two months to complete with the necessary level of detail.

The proposed route is also subject to a dedicated marine hydrographic survey. Here, a survey vessel will sail the route to determine the exact nature and topology of the seabed. Geophysical survey tools will include multi-beam echo-sounders, sonar, sub-bottom profilers and magnetometers, which in combination with geotechnical sampling provide a comprehensive set of data that is charted and incorporated into the geographical information software, updating the route where required.

The survey data is also interpreted and used to perform burial assessments, which when combined with knowledge gained from the DTS study, help determine the best burial tools and cable protection measures for the system. Based on a typical cable length of 30-50 km for a platform-to-platform or shore-to-platform project, a marine survey can take around three months to complete, including all the reporting and charting.

Both during and after the marine survey it is possible to use the data collected to optimise the cable route and create key engineering documents, which form the cable installation blueprint.

3. INSTALLTION PLANNING

The purpose of the aforementioned FEED study is to further refine the installation methodology, including routing, burial, cable protection and platform operations for the cable pull-in. It should also identify any permitting requirements, J- or I-tube locations, and consider future field development and/or cable system development. For instance, it may be necessary to include a bigger J-/I-tube for future cable pull-ins or the deployment of a Branching Unit (BU) for cables to other platforms. A successful FEED study will also optimise installation timings and techniques.

Once the recommendations for the FEED study have been agreed with the customer and platform operator, the installation window (date and duration) is decided upon and front-end engineering can commence.

Front-end engineering includes lay analysis of how the cable will be deployed, as well as the design, manufacture and deployment analysis of any subsea structures (if being used), such as a Cable End Module (CEM), for example. A CEM allows subsea rather than on-platform cable termination, an increasing trend in the oil and gas industry.

Comprehensive route position lists (RPLs) and straight line diagrams (SLDs) will be generated that detail the position and all aspects of the cable route, such as the cable plant (branching units, repeaters, joints, and/or beach manholes), cable lengths, armour types, transitions, slack, water depths, cable and pipeline crossing points, and maritime boundaries.

This phase of the project will also include analysis of the burial tools to be used, such as ploughs, jetting ROVs or mechanical cutters.

4. PROCEDURES & PERMITTING

The drafting of operational procedures will start answering questions such as, how will the cable be handled, how will it be deployed over the stern, how will it be buried, and how will it be pulled on to and terminated on the platform itself? Alongside this, a procedure will be drawn up detailing how the vessel will enter the platform's 500m zone and how people will get on and off the platform – this will all be agreed with the platform owner.

On the subject of vessels, generally a vessel offering DP2 dynamic positioning will be required, along with operators who are experienced in deploying small diameter cable and subsea structures in close proximity to offshore platforms. Vessel positioning for the operations has to take into consideration not only subsea and topside structures, but also the environmental conditions and how these might affect operations, as well as what would happen in the case of an emergency.

Interface management is another important factor at this stage. All parties involved in the project need to be aware of the plans made by other parties and how they will interface together. Version control of documents to ensure all parties are working the latest revision are key to this process, along with regular meetings to keep everyone up to date on latest plans or issue resolutions.

Simultaneous operations are a further important consideration – what other vessels might be working the 500m zone at the same time, what are their operations and how might they affect the cable? Also, which vessel take priority over others and what do all these vessels do in the case of an emergency? With regard to the latter point, bridging documents between all vessel operators' emergency plans are required to ensure fast and efficient response times.

Once all of the operational procedures, documents and drawings are produced, they must be presented to the platform owner and end customer for official approval.

Another challenge is permitting. Here, the contractor's permitting department is responsible for obtaining and assisting with any consents, licences, permits or other permissions required. Such permits are subject to an array of regulatory requirements, particular to each country, which can be complicated by international, national and local legislation.

5. MOBILISATION

Only when permitting is complete can the installation vessel be mobilised. Here, specialist equipment will be loaded and the cable installation team will join the vessel, first sailing to the port of cable manufacture before heading to the work site.

Once in position, grapnels are pulled along the seabed, including the 500m zone, to ensure the route is clear of debris as it is surprising what can obstruct a route. Aside from abandoned rope and netting, downed helicopters, sea containers and even cars that have fallen off transporter vessels, have all been encountered.

During operations, constant monitoring of environmental conditions are required to ensure there is a sufficient weather window to complete all of the work within the 500m zone, as well as interfacing with other parties that might be involved to ensure they are ready and also have operable weather windows.

6. THE 500M ZONE

Entry into the 500m zone is controlled by the platform, which will operate its own permit-to-work system. This would have been agreed during the procedure-writing phase so that the installation vessel team knows what is expected of it and who can give permission to enter the restricted area. Prior to entry, a full set of systems checks are performed to confirm that all of the ship's systems are operating as expected.

Specially trained personnel are required to work on the platform during the pull-in phase to operate the pulling winch and communicate with the vessel. Once the cable end is on the platform, the team will also put the cable hang-off in place to secure the cable. The cable is then tested and terminated in accordance with requirements. After the tests are complete and cable integrity is confirmed, the vessel can begin laying operations.

Cable is laid to a typical tolerance of ±1m, along with any other cable plant such as branching units or CEMs. Where required, the cable will be buried out of the 500m zone and beyond to complete the system, which in many cases will involve laying the cable up to, and on to, another platform or platforms.

Where possible, laying and burying of the cable takes place simultaneously through the use of a subsea plough. This ensures the cable is immediately protected and deploys additional protection at cable or pipeline crossings. If the cable has to be terminated on to a platform, then the engineering documents produced at the start of the project will be used to make sure the cable can be safely pulled on to the platform, and routed to the termination location.

A typical project, including cable loading, installation and reporting will take approximately 60 days to complete, depending on weather delays, which arguably presents one of the biggest challenges of all, particularly in the North Sea where conditions can change very quickly.

Once complete, there might be the need to re-enter the 500m zone to complete additional protection of the cables at crossing locations, or at a subsea structure such as the aforementioned CEM. This additional protection could take the form of mattressing or rock dumping, for example.

7. POST INSTALLATION

When the offshore operations are finalised and accepted by the customer, final reports and charts can be produced. This is an import part of the project as the reports and charts are a record of where and how the cable was laid and buried, and where any additional protection was used. This is used to inform other seabed users of the location of the cable and how it has been protected for consideration of any potential future development.

Reports and charts also serve as vital information in the event that the cable might get damaged by a third party. These will be the reference documents for the vessel repairing the cable to help determine its location on the seabed.

The contractor's in-house reporting team should maintain the cable records for its maintenance customers. As a result, should a repair be performed on a segment of cable, the reports and charts are updated to reflect this. The maintenance vessel will subsequently be assured of having access to the latest positioning information. Should the cable develop further faults in the future, this will make the repairs efficient and help ensure the cable is returned to service as quickly as possible.

Expertise in decommissioning is also important once a cable system has reached the end of its useful life. In fact, this is sometimes part of the seabed licence. Decommissioning creates seabed space for future cable systems or other field developments.

8. CONCLUSION

Among the secrets of a successful platform-to-platform or shore-to-platform subsea cable project is the provision of a whole life solution, from initial concept with cable route planning, to project engineering, installation and comprehensive maintenance solutions. Such capability generates a position of strength when it comes to providing the oil and gas sector with a variety of innovative underwater cabling and connection services, particularly in the 500m zone.