Minimising Offshore Survey Product Liability

In this article, offshore survey products are meant in the broadest sense. Not just survey, navigation and positioning, but the purpose or project that the dependent results are used for. No work in the offshore industry can proceed efficiently without good positioning data and survey information. From the initial 2D and eventual 3D surveys, through to the commissioning of the offshore installation and pipelines, offshore survey is the link between the various pieces of the complex puzzle.

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Although survey, navigation and positioning is critical to these operations, it is used to derive specific ends. In site surveys, the positioning of a source and receivers to eventually define near surface strata, and the positioning of echo sounder, side-scan sonar, sub-bottom profiler, Remotely Operated Vehicle (ROV) and other tools to be able to map the surface features and hazards. In rig positioning, the placement of the sub-sea tree over the chosen location, and ensuring appropriate anchor placement when required; and if the drilling is successful, the positioning required for the installation of platforms, seabed structures and pipelines to exploit the oil and gas resources. Whatever offshore survey product is required, necessitates that both the client and contractor should know what are the achievable results in the expected environmental and site conditions. However, there are many instances where the final outcome is not known or appreciated until the survey product has been delivered. Consequently there are occasions where it is not possible to provide the required survey product because a survey is needed beforehand in order to help complete a proper set of specifications. It would be a rare situation where it would be cost effective to allow this to occur. How then to help avoid situations where there are differences between the client and contractor with respect to the offshore survey product contracted and delivered, which could lead to possible claims or legal action? Some current best practices are discussed to hopefully provide a means to avoid such confrontations. In addition some general comments are provided on situations within and outwith specifications that could be borne in mind by both parties to ameliorate possible claims or legal action should the offshore survey product contracted and delivered be different.

Seismic Acquisition

At the start of a fieldâ€™s development the use of remote sensing leading to 2D regional and more focused 3D seismic surveys are the elements which allow the client to identify the prospectivity of any geological leads. Depending on the area there may be wildcat wells drilled in the prospect to aid in the modelling of the seismic data. However, because the development is only in its early stages, the client may have only an imprecise image of the geology.

To allow for this uncertainty the general industry approach has been for 3D surveys to acquire the geophysical and positioning data to a good standard. For instance, with respect to survey, navigation and positioning as detailed in Calderbank, Survey, Navigation and Positioning Guidelines for 3D Marine Seismic Survey Specifications, The Hydro-graphic Journal, No. 90, October, 1998, pp. 11-20, which is achievable and practicable. These guidelines invariably ensure good positioning, and good streamer control with subsequent low streamer noise seismic data (other variables such as ship and tow noise being favourable).

Of particular importance is that the datum, spheroid and projection information from the 3D survey is correctly input into the seismic interpretation software. As is true throughout the exploration and exploitation phases, this critical process needs to be paid close attention least inappropriate combinations and values are used, and hence the survey and all of its results are unintentionally relocated. For seismic data the UKOOA P6/98 format could be used to transfer bin data information and coverage parameters along with the correct geodetic information to facilitate this process.

In addition, poor or marginal positioning data, particularly that caused by poor or marginal weather, is generally excluded from the dataset. The various navigation post-processing models used in the seismic industry expect that good data will be input into the model to derive the positioning solution. If the observables are filtered and smoothed beyond the standard diagnostic filters, then there is understood to be a level of uncertainty in the derived positions. None of these systems generate information that can be used in real time to derive the expected accuracy in marginal or poor weather. Consequently, unless reprocessed and analysed, it is not known with any certainty how the relaxation of navigation specifications in such situations, will affect the final positioning data or consequently the final seismic interpretation.

As an aid, when considering exploration drilling, the seafloor morphologic renders from the 3D seismic survey can be compiled from the seafloor picks of the 3D seismic dataset, and used in geohazard and environmental assessments to characterise the seafloor. In deep water, the coverage of depth soundings by 3D seismic and multibeam sonar are at a similar scale. In theory, the best water pick achievable is probably within Â± 1.5 metres of the actual bottom. See Mosher et. al., Theoretical Comparison of Seafloor Surface Renders from Multibeam Sonar and 3D Seismic Exploration Data, OTC 14272, May 2002, pp. 1 and 8. In practice, depending on the geomorphology and sediments, large errors may occur, especially in areas where there have been recent active flows. Even so, using water depth picks from the seismic data could help alleviate unwelcome surprises when the hazard site survey is conducted, and could be used to good advantage in the right area.

Site Surveys

Once a prospective drilling target has been identified, a hazard site survey will be used to map any geohazards in the local area, both on

the seafloor and near surface. If allowance has not been made in the specifications it is possible that hazards or potential hazards may not be surveyed appropriately due to the lack of onboard equipment that was not known would be needed. In remote locations where logistic constraints would hamper ready access to needed equipment, this could impose a severe handicap on the site survey operation. Retaining consultants who have worked in the prospect area previously would help to ensure these factors are taken into consideration when preparing the bid package. In addition, such experience can be helpful in identifying local geohazards, such as shallow gas and boulder fields.
The development of Autonomous Underwater Vehicle (AUV) survey platforms for deep water applications has provided considerable improvement in the survey product capabilities in this area. The high resolution survey data that can be acquired to a maximum depth of 3,000 metres with an AUV in a matter of hours, would have taken conventional deep towed systems several days. Critically, the AUV positioning accuracy achievable has improved to Â± 5 metres for post-processed data which makes the acquired deep water geophysical data very easy to process and interpret. See George et. al., High-Resolution AUV Surveys of the Eastern Sigsbee Escarpment, OTC 14139, May 2002, pp. 1 and 2.

Rig Positioning
With the advent of GPS the potential for incorrect positioning of the drilling rig has been reduced. However, it is still essential that the client, or their consultants, and the contractor are fully aware of the datum, spheroid and projection to be used. Generally, a host country will require the final well co-ordinates to be in the legal datum of that country, while the seismic acquisition may have been acquired on the WGS84 datum.
The geodetic transformation of offshore positioning data from WGS84 datum, may not be a simple process if the host countryâ€™s geodetic network has not been extended offshore or there are no legally recognised transformation parameters available. The client may independently, or in conjunction with other offshore operators, undertake the necessary geodetic survey in order to define appropriate multi-parameter transformation values, as opposed to the more limited three parameter Molodensky shift. This may generate goodwill with the host country and allow offshore survey positioning data to be reliably exchanged as required.
In developed areas, the requirement to avoid damage to structures and pipelines on the seabed will be paramount. For previously installed features, the positioning methods and when installed could be researched. This will allow decisions on whether the positioning would be acceptable to the current needs. Possibly during the site survey important items could be mapped to ensure positioning accuracy compliance. Situations where co-ordinates are defined for fixed structures for legal or political reasons, which are not the actual co-ordinates, need to be identified and dealt with appropriately.

Installation and Construction Support
Once a field has been proven, the client will need to install structures and pipelines to get the oil and gas to market. Desk studies, possibly using satellite imagery, will help identify possible locations and routes, not only onshore but offshore as well. The availability and quality of satellite imagery has improved markedly over the last few years, and should be used to full advantage. Site and route surveys will be required in order to choose the optimum location(s).
Installation and construction survey support should be aware of the potential for acoustic interference which needs to be examined closely to ensure that nothing untoward occurs related to the positioning of various drillships, lay vessels and survey vessels when operating in close proximity. Appropriate frequency allocations for the ultra short (USBL) and short baseline (SBL) systems and priority of use standards, should be addressed and understood by the client and the various contractors.
The software and hardware for survey supporting dredging, installation and construction needs to be appropriate to the environmental and site conditions. The correct speed of sound in water needs to be obtained via regular periodic casts, particularly in deep water. Survey offsets and gyrocompass corrections should be accurately attained and monitored as required.
Having looked at some best practices to ensure good quality survey products, steps to minimise offshore survey product liability will be discussed.

Performance within Specifications
In order to understand the issues necessitating the required survey product a detailed desktop study prior to the commissioning of the survey can alleviate many uncertainties, and lead to adequate specifications and inclusion of optional extras. Both the client and contractor need to be able to adapt and be responsive to situations and results obtained while a survey is in progress. Generally survey specifications should be used as a guideline to ensure quality survey data and an achievable survey product. This will require, at times, a flexible attitude by both the client and contractor to the survey objectives. To achieve this, the client and contractor lead personnel need to have a certain level of shared confidence in the capabilities of the survey platform and equipment to achieve the aims of the survey.
The client and the contractor should have confidence in the client representatives so that while in pursuit of the survey objectives, sufficient provision and decision-making latitude is allowed and acceptable. For example, the role, responsibilities and benefits of the Client Navigation Representative have been discussed in Calderbank, Navigation Representativeâ€™s Roles, Responsibilities and Benefits, The Hydrographic Journal, No. 101, July 2001, pp. 11-15.
Good communication with the client ashore, including the availability of adequate access to email and voice communication systems, is necessary in order to be able to inform, discuss and act on daily offshore activities and data results. It is important that decisions referred ashore, are made in a timely fashion so that potential delays are avoided, and the project is completed efficiently to everyoneâ€™s satisfaction.

Performance Outwith Specifications
Consideration may be appropriate that to some extent the specifications provided and the deliverables required, may be capable of adapting to technological and reporting advances due to delays between the contract award and execution. Poorly worded or limited scope specifications may not protect the interests of either the client or the contractor. A healthy positive attitude to the process is needed to ensure that the client achieves the objectives of the offshore survey and the contractor is compensated fairly under the contract.
Due diligence by the client to ensure that the contractor to be engaged will be capable, has the proper equipment, and the necessary trained and experienced personnel are essential. By the same token, the contractor via its own processes must be informed about the clientâ€™s business culture and practices with respect to survey services provided and payment received, and make appropriate preparations and allocations.
During offshore surveys, blunders and errors can happen which can have environmental, safety and cost implications. These can be minimised by the contractor having procedures and standards in place that are understood and acted upon by the contractorâ€™s personnel and third party suppliers. Such situation can also be minimised by the client through the use of qualified and experienced client representative consultants.
An arbitration or mediation process should be agreed beforehand as part of the contract, as should all other liability and insurance issues. Such a process could be used in situations where the client may have been provided with services and product that are outwith the

contract specifications and a claim or legal action is contemplated. Alternatively, in situations where the contractor does not believe it has been adequately compensated under the contract and legal action would be the only remedy. Arbitration or mediation would ensure a fair and speedy settlement of any dispute arising from the provision of the survey services or product. The liability of the individual offshore surveyor in such cases has been discussed in Calderbank, Legal Responsibilities and Liabilities of the Offshore Surveyor, The Hydrographic Journal, No. 64, April, 1992, pp. 25-32.