

Assessing submarine power cable installations

Laying and trenching a submarine power cable can cost hundreds of millions of dollars. During the installation process, significant volumes of installation performance data are generated and recorded. Assessing this performance data provides enhanced visibility to the status of an installed cable, helping cable developers, insurers and installation contractors to assess risk and inform future projects.

Overview

From the North Sea to the Cook Strait, submarine cables power our modern world, transporting electric current at high voltage across oceans and seas. In the offshore environment, the number of submarine cable installation projects are rapidly increasing, supporting the demand for new and larger offshore wind farms and energy trading through international and inter-regional interconnector cables.

Power cables are laid and trenched into the seabed by specialist marine contractors. Considerable engineering expertise is expertly combined with purpose-built vessels mobilised with cutting-edge lay-and-trench systems optimised for the full range of water depths, subsea environments and seabed soil conditions.

As the sector expands and the volume of installed submarine power cables steadily increases, the industry focus increasingly now includes going cable performance, operations and maintenance and fault identification and repair.

Cable fault repairs are invariably hugely expensive incorporating the repair cost itself, cable transmission downtime and the impact on insurance premiums. A number of recent industry presentations and papers report that as many as three in every four cable faults requiring repairs are attributed in some way to events that occurred during the actual cable installation (laying, trenching and protection activities), as opposed to cable manufacture.

The quality of the overall cable installation is therefore of fundamental importance when considering operations and maintenance, future investments and operational insurance premiums.

Cable faults and insurance cover

Insurance companies specialising in this sector are increasingly appreciating the magnitude, and in some cases frequency, of submarine cable faults and repairs. The cable operational insurance sector has been described as hardening, resulting in a less competitive market and increasing premium profiles. There are also industry concerns of maintaining access to suitable cover in the future

Insurance companies are required to determine an insurance premium profile for a newly installed cable. This is operational insurance. Premiums may be calculated based on average, or even maximum number of, arising fault experienced on other similar cables. This may not necessarily accommodate or reflect the experience and capability of the installation contractor, the actual quality of the installation itself and ongoing risks post-installation.

When a cable fault is identified, it will often manifest itself within the cable operational period, and once the construction and commissioning is completed and the installation vessels long since demobilised from the project. It can then take a significant period of time for loss adjusters to gather the necessary information and data to assess the validity of the claim and to consider if there is a counter claim on the construction insurance or installation warranty.

There are clear advantages to submarine cable developers, operators and their insurers to have efficient access and visibility to all installation and survey data acquired across the life of the cable to date.

This approach supports an independent assurance-based assessment of the status of the installed cable, assigning risk down to each 1m section of the cable based upon both quantitative and qualitative inputs and criteria from the available data. This approach would identify cables or cable sections that have been installed without significant issues whilst highlighting cables or cable sections that might carry higher risk due to installation related issues or post installation scouring. Consideration of this assessment may then lead to a tighter insurance profile relationship along the entire length of the cable with potential benefits to developers able to demonstrate a cable with reduced risk, directly related to higher quality levels of installation performance.

The risk profile can then be updated periodically following further survey and intervention works.

Input Data

Understanding the quality of a submarine power cable installation is achieved by assessing as much raw installation data and information as possible. A great deal of information is readily available.

Typically, a cable installation report consists of operational and technical volumes, as-built charts, data listings and supporting geospatial (GIS) data. These deliverables are provided at project completion, reflecting the final, as-installed cable position and burial depth.

This data may not alone present the full picture nor indicate relevant issues that may have occurred during cable installation entire length. Additional sources of data are available onboard the installation vessels and these can be harnessed to highlight operational issues and the performance of key vessel, lay and trench systems that may indicate areas of concern for the cable.

Cable carousel, lay and trenching systems are computer aided, producing a large range of raw sensor and parameter data that describe the second-by-second operational performance of the particular asset. Data types include loads, tensions, depths, orientations, motions, temperatures, voltages and pressures. Fibre-optics systems, bundled within the cable, may contribute data indicating excessive stress or strain. Heave, pitch and roll sensors provide valuable data describing the vessel motion at the cable departure point.

Independent Assessment

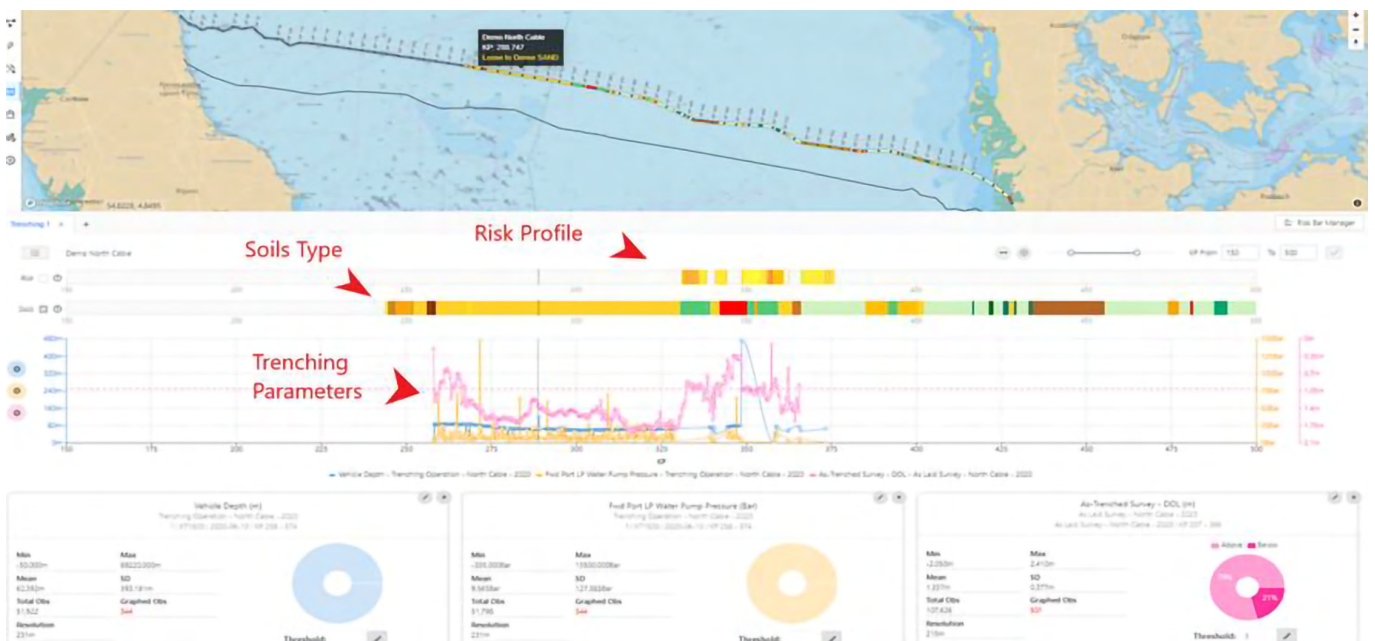
An independent cable installation specialist can review all data alongside the as-built survey listings and soils data from the burial assessment (BAS). Data should be plotted against both time and kilometre point (KP) to represent the operational record of the cable installation. Reviewing operational daily progress reports (DPR), together with other field reports including those written by the client representatives and the marine warranty surveyors (MWS) will further aid understanding.

Using this approach, it is possible to provide an independent assessment of the as-installed cable. An assessment that identifies areas of risk and concern where the integrity of the cable may be compromised, and where potentially stressed or damaged cable sections may result in cable faults manifesting over time and requiring repair.

CableQC

Vysus Group's Survey & GeoEngineering team has developed a web application called **CableQC to manage cable installation and survey data across multiple projects and assess and assign risk.**

CableQC is the latest application from within the team's existing IRIS web mapping and data framework which has been widely used in the offshore industry since 2013 to monitor the progress and status of offshore survey, construction and inspection projects.



The software has been further enhanced building upon five years' experience in providing real-time raw data telemetry and monitoring services to some of the world's leading cable installation and trenching contractors working on array cables, export cable, interconnectors and umbilical projects.

CableQC imports and collates the data from each project and presents it as a series of KP or time-based integrated profiles. These profiles are interactively linked to a web map presenting the individual cable or wider cable network.

A user-defined risk assessment of the cable is generated using tests of the raw and processed data, together with more nuanced inputs.

As new survey data becomes available, the **risk profile** is re-assessed and updated. Over time, the trends in risk along the length of the cable can be clearly tracked, assisting with determining where to allocate operations and maintenance budgets.



Informing future installation projects

Conventionally, detailed cable installation data are looked at within the context of the particular project. By incorporating multi-project data within the same database and software portal, it is possible to analyse the performance of installation vessels, lay systems and trenching systems across multiple projects, subsea environments and soils types. Cable developers and operators will become more knowledgeable about the probable performance of proposed vessels and associated assets for the next project. Experience and lessons learnt from will help shape a realistic assessment of schedule, cost and variation potential. The platform requirement for this level of insight would be to specify access to the described raw data within EPC scope of work, technical specifications and contract.

Developers will steadily accrue a significant and valuable database of cable installation data. This will inform insurance aspects and also be a live repository of accessible knowledge, minimising the potential for expensive lessons to be learnt more than once.

CableQC is provided by the Vysus Group

Our specialist Survey & GeoEngineering team provides marine geoscience consultancy and project management services across the offshore energy sectors. For submarine cable projects, solutions encompass route feasibility, design and engineering, survey project management, cable burial risk assessment and protection studies. The team also provides associated innovative web mapping and data delivery services using IRIS, together with independent quality assessment of cable installations using **CableQC**.