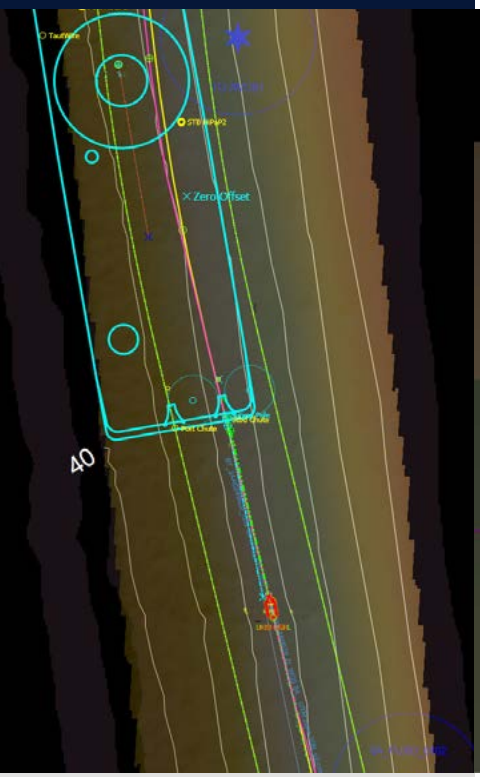
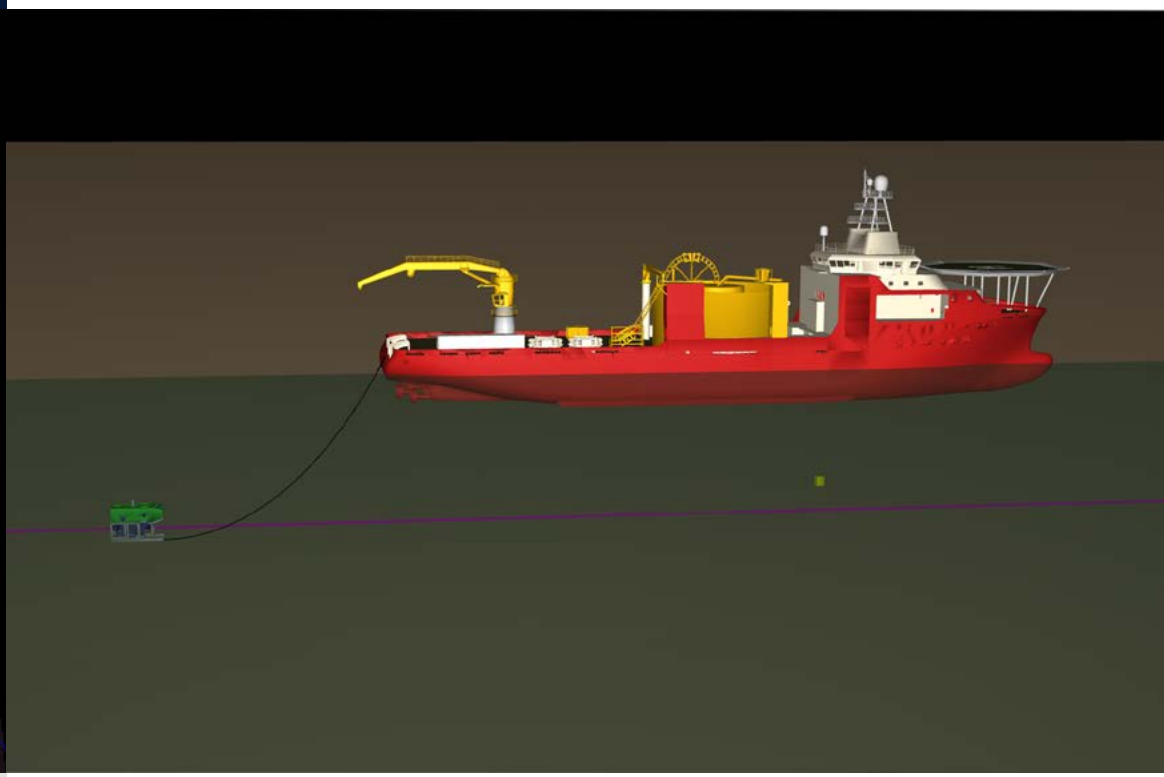
4D NAV





- Multiple options for calculated bottom tension and position
- Optional catenary models calculated by Orcaflex™
- Blueview Multibeam interface for exit angle monitoring
- Current meter interface to allow real-time water column current profiling
- Provides extended operational window in poor weather conditions
- Data logging for as-laid report generation and replay
- Integration with 4D Nav NavView software for 3D modeling of cables, associated vessels, and subsea infrastructure

# CEMS

## CABLE EXIT MONITORING SYSTEM

### VISUALIZE AND LOG CABLE POSITIONS WITH EASE

With 4D Nav's Cable Exit Monitoring System (CEMS), offshore cable lay operators can conduct cable positioning without the guesswork. As a result, deploying CEMS in offshore operations can lead to less risk, fewer mistakes, and reduced operational costs.

### PRECISION. CUSTOMIZATION. CONVENIENCE.

- Conveniently locate cables during deployment by leveraging standard survey sensors such as a Blueview Multibeam
- Ensure precision in catenary modeling with a multi-beam sensor, NavView, and Orcaflex™ integration
- Create custom corridor settings and vessel navigation adjustments for curves
- Automatically log calculated and observed cable tensions and locations for as-laid reporting and replay.

4D Nav's Cable Exit Monitoring System (CEMS) provides offshore cable lay operators with an exceptional tool for visualizing and logging the position of a cable.

Based on the NavView suite of positioning and navigation software, CEMS is an optional feature of NavView that incorporates standard survey sensors to measure the exit angle of a cable as it's being deployed from a vessel with an overall goal of determining the bottom tension of the product as it's being laid along the cable route.

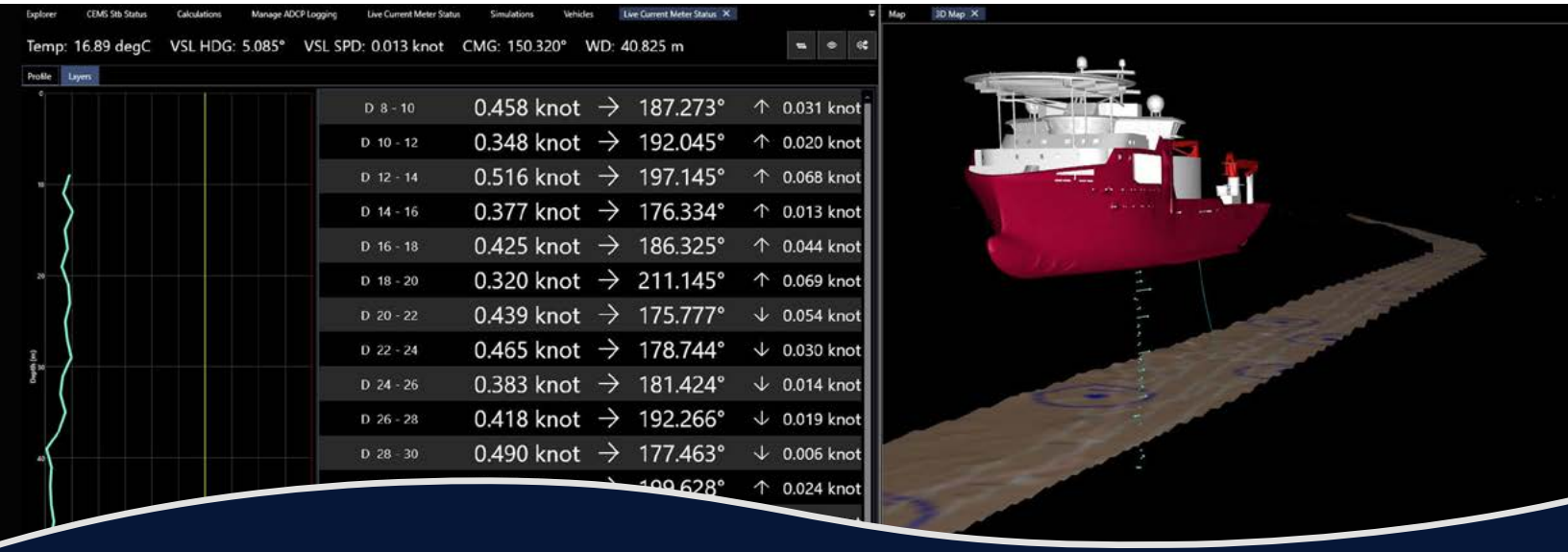
The CEMS system will pull data from a host of sensors such as:

- GNSS Positioning data to determine the vessel position in relation to the product route
- Heading and MRU data to model the motion of the vessel
- Real-time current profiler to model how the product will react to the current in the water column (when used with Orcaflex™)
- Multibeam data imaging the cable as it exits the vessel chute
- USBL position of the ROV to monitor the touchdown point of the product on the seabed
- Tension of the cable to model the catenary

There are three calculation options available with CEMS to calculate the bottom tension:

1. **ROV Touchdown Method:** This is the most accurate method since it allows for the ROV to visually witness the touchdown point on the seabed. This position, along with the position of the vessel, and top tension on the cable is used to calculate the bottom tension of the product as its being laid.
2. **Multibeam Method:** The Multibeam solution is often used in conjunction with the ROV touchdown method to offer redundancy in the calculations. The Multibeam system will detect the cable exit from the chute on the vessel. Using the position on the chute, along with the top tension and water depth, the bottom position (touchdown) and tension can be calculated. The solution extends the operational working window in poor weather conditions, or when the ROV has to return to deck, thereby reducing vessel downtime.
3. **Orcaflex™ Method:** The Orcaflex™ method is an additional calculation method used in high current scenarios. For this method, additional data is fed into the Orcaflex™ software engine (real-time current) to model the catenary in the water column. The Orcaflex™ method will also provide a calculated touchdown position and bottom tension as with the multibeam method noted above.

When using CEMS, all data is logged in the NavView software suite for as-laid reporting and replay should it be necessary. Route calculations are also created within the software and can be adjusted based on the dynamics of the cable. Custom corridor settings can also be made and vessel navigation around curves can be adjusted based on the layback.




# 4D NAV

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