

# Effective solutions for marine and subsea industries through simulation software, engineering services and R&D.

## Engineering Services

Dynamic Systems Analysis, Ltd. (DSA) provides engineering services and advanced simulation software to the marine, offshore and subsea industries. DSA applies its advanced engineering tools and expertise to protect projects and technologies from the risks inherent in marine environments. DSA's core expertise is the ability to assess the motions and loads on offshore structures, and marine and subsea technologies using advanced dynamics analysis techniques. DSA has expertise and experience in the tidal energy, wave energy, aquaculture, offshore oil & gas, defence and subsea vehicle industries. Visit <http://dsa-ltd.ca/engineering-services> for more information.

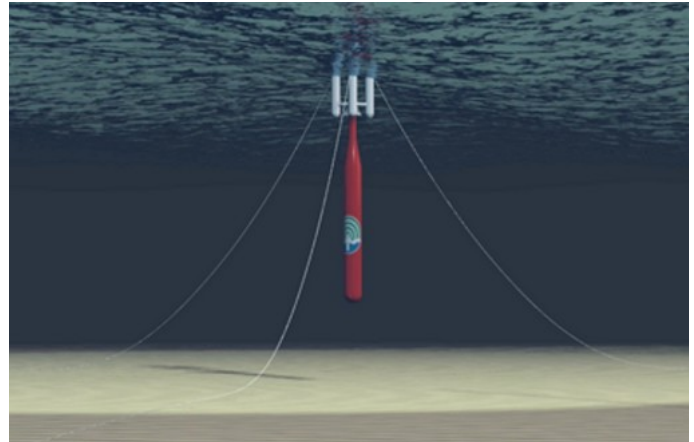


Figure 2: SyncWave systems WEC simulation using ProteusDS.

## ProteusDS Software

ProteusDS® is an innovative dynamics analysis software package that is used to test virtual prototypes of marine technologies. ProteusDS enables nonlinear time-domain simulations of many applications, including:

- moorings, risers, pipelines
- fish farms / aquaculture sites
- towed bodies, subsea equipment
- ROVs / AUVs
- wave and tidal energy converters
- cranes, winches
- deployment and recovery operations

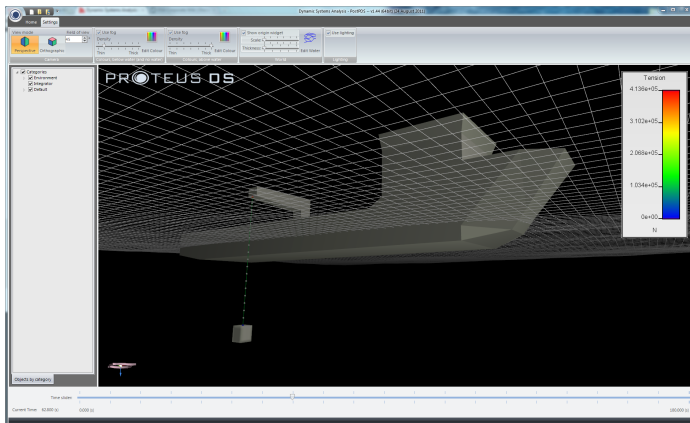


Figure 1: Assessment of deployment and recovery operations of a tidal energy platform using ProteusDS.

ProteusDS makes use of advanced hydrodynamic, environmental and finite-element models to achieve accurate results. Key models in ProteusDS include:

- Cubic finite-element cable model (risers, moorings, pipelines, etc.)
- Cubic finite-element net model (fish farms)
- 6DOF rigid body (towed bodies, ROVs, buoys)
- 3DOF point mass model (subsurface floats, anchors)
- Rigid body controllers (towed body controller)
- Winch and winch control (tugboat winch)
- Articulated body algorithm (WECs, cranes)
- Nonlinear and linear seabed contact models
- AIRY, JONSWAP, Pierson-Moskowitz wave models
- Ochi-Shin and Froya wind models and wind profile models
- Ship motion RAO import capability
- Custom current profiles

Several licensing options are available for ProteusDS, including perpetual, project and academic licences. Visit <http://dsa-ltd.ca/proteusds> for more information.

# PROTEUS DS®

## R&D

DSA's team has the expertise to lead applied research projects in ocean engineering. DSA has a strong track record of successfully completing both internal and external research and development projects on time and on budget. DSA stays on top of engineering analysis and software development research by collaborating with world-class universities and participating in conferences such as OMAE, OTC, and ISOPE. Visit <http://dsa-ltd.ca/rd> more information.

## Projects

### Offshore oil & gas

DSA partnered with GRI Simulations to develop an advanced real-time ROV simulator that accurately assessed the bending radii and stresses present in a flexible during pull-in operations.

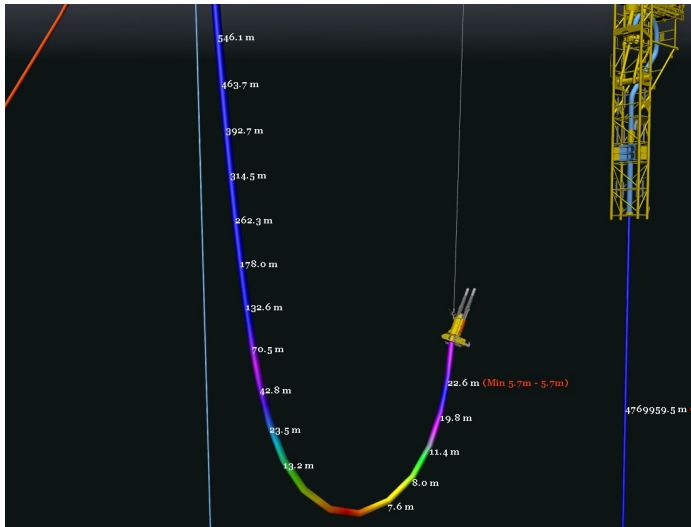


Figure 3: Simulation of pull-in operations in VROV using ProteusDS real-time FEA

### Marine Renewable Energy

DSA has completed performance evaluations for several early stage ocean wave and marine current tidal energy converter technologies. This includes quantifying stability and power capture as well as mooring performance in extreme sea states.

### Aquaculture

Shellfish cultivation rafts and fish farms sometimes fail due to degraded materials and inadequate design. In the aquaculture sector, DSA has worked with its clients to reduce failure rates and prevent environmental damage.

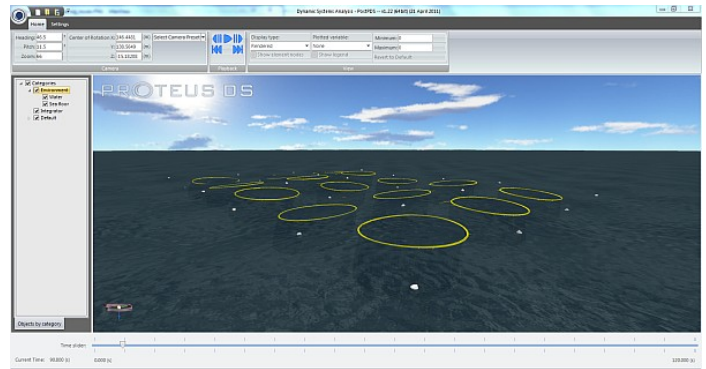


Figure 4: ProteusDS simulation of a fish farm at a high energy site

### Defence

Support for critical naval operations, such as the launch and recover of a small craft, requires knowledge of the dynamics of cranes, vessels and cables. DSA has provided support in the defence sector for analyzing these scenarios.

### ROV Operations

DSA has assessed remote operated vehicle operations in various water depths and currents. The analysis allowed the client to work at 2500m without a tether management system.

## Key Personnel

### Dean Steinke, MASc - Director of Operations

DSA co-founder Dean Steinke relies on his extensive offshore engineering and software development experience to guide DSA. His ability to connect industry's needs, cutting edge engineering methodologies, and reliable software provides customers with effective solutions to their challenges.



### Ryan Nicoll, MASc - Director of Engineering



DSA co-founder Ryan Nicoll leads DSA's talented engineering team. His capacity to see complex engineering and R&D projects through to completion has enabled DSA to push the boundaries of dynamics systems analysis in the ocean engineering industry.

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