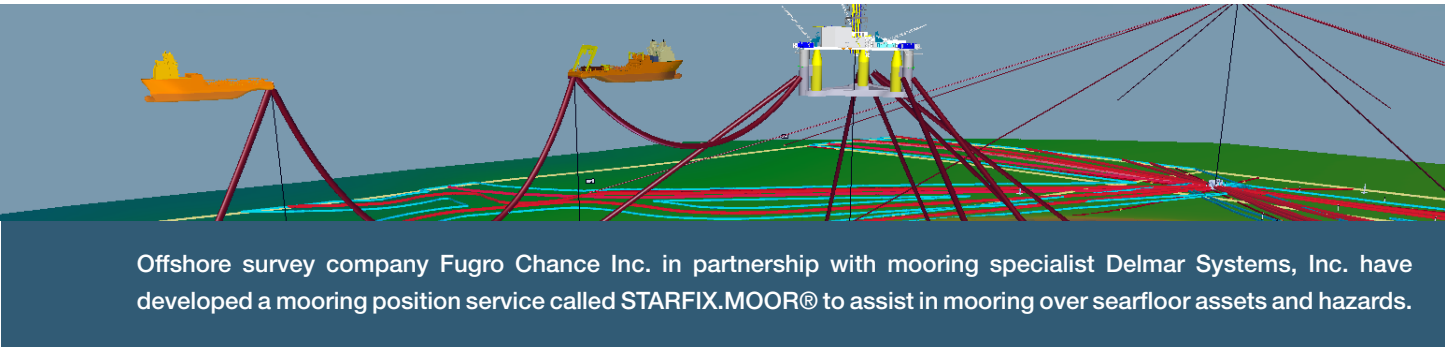


# STARFIX.MOOR®



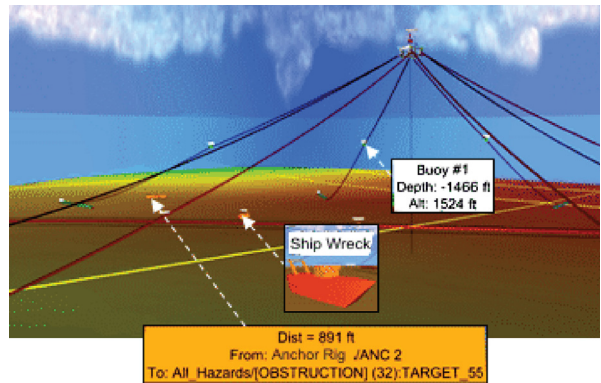
Offshore survey company Fugro Chance Inc. in partnership with mooring specialist Delmar Systems, Inc. have developed a mooring position service called STARFIX.MOOR® to assist in mooring over seafloor assets and hazards.

## Overview

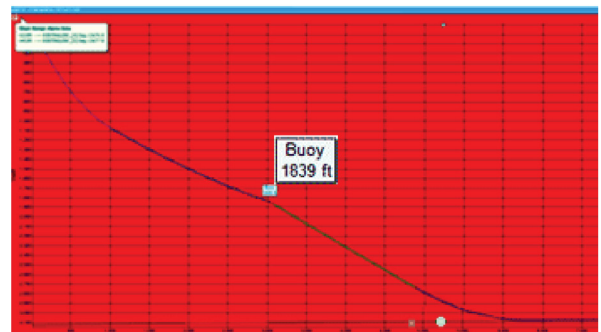
Performing safe and efficient mooring operations has become challenging as anchor rig operations continue to migrate into deeper water depths and into fields with existing seafloor assets. When seafloor hazards are within the anchor spread, it is critical to monitor the rig's mooring lines relative to these hazards for the duration of mooring operations. Offshore survey company Fugro Chance Inc. along with mooring specialist Delmar Systems, Inc. have partnered to develop a mooring position software called STARFIX.MOOR to assist the rig-mover. STARFIX.MOOR, when integrated with Fugro positioning software, is a computation engine and visualization environment. This service provides real-time in-situ positioning and monitoring of the rig, Anchor Handling Vessels (AHV's), and 3D "visualizations" of the mooring lines in relation to the seafloor and those assets that reside on it.

With the ability to compute straight line, real-time catenaries of each mooring line during deployment, STARFIX.MOOR provides information in an innovative way to assist the rig-mover. To present this information in an intuitive and comprehensible manner, STARFIX.MOOR utilizes HydroVista®, a module of Fugro's STARFIX® Suite, to provide a 3D representation of the entire subsea environment. Critical data such as clearance estimates to pipelines and other seafloor assets, along with other numerical information can be highlighted and labeled.

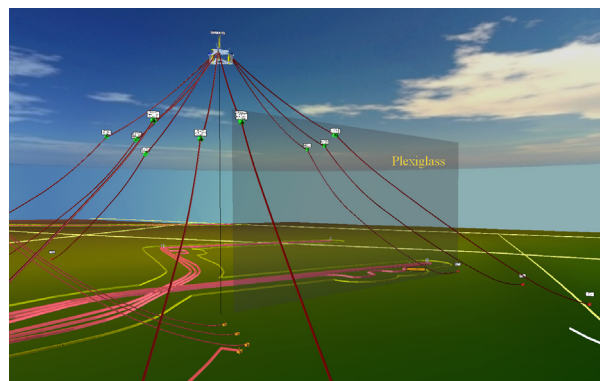
STARFIX.MOOR's computation engine utilizes the industry proven Delmar DelCat catenary algorithms to compute the straight line profiles of each mooring line. Through integration with Fugro positioning software, there are positions of each fairlead and AHV position along with each anchor's state. The software also has the ability to account for the physical properties of the mooring components, including anchors, buoys, and workwire, along with inputs of payouts of rig and AHV winches.



HydroVista Depiction. Shown Are Enlarged Billboards Identifying Objects And Alarm Message



Enlarged View Of A STARFIX.MOOR 2D Profile Window



Profile Plexiglass View To Illustrate A 3D Representation

STARFIX.MOOR is able to compute a straight line 3D profile of each mooring leg. STARFIX.MOOR also provides 2D profiles of each mooring leg along with the ability to create audible and visual alarms when predetermined minimum clearances are reached.

STARFIX.MOOR bases each mooring line computation on any two of three observables: **scope** (the horizontal distance dynamically defined by the positions of fairlead and AHV), **payouts**, and **tension**.

Payout observables are brought into the STARFIX.MOOR system by interfacing the vessel's counter system. Alternately, another option is utilizing a wireless handheld computer which is operated by the anchor handling personnel. The handheld PC's are used to provide payout information of the rig's fairlead winches and, by integrating with Fugro's DRONE® system, they also provide workwire data from the AHV's. Payout tallies can easily be seen on STARFIX.MOOR's displays, reducing a need for voice communications and providing a consolidated view of all payouts to the rig-mover.

STARFIX.MOOR acts as an information console for the rig-mover. In addition, via integration with Fugro's DRONE system, pertinent mooring information is conveyed to the AHV captains to allow them to provide safer and more efficient anchor handling operations, including those involving preset hookups.

STARFIX.MOOR can be utilized as a prejob planning and estimating tool for identifying any potential obstacles and hazards. It can be used as an aid to safely and efficiently assist a project during development and life-of-field planning. With the ability to visualize mooring systems, AUV/ROV flight plans and pipelays, STARFIX.MOOR enables everyone involved to understand the project goals and determine needed adjustments for safer operations.

## Major features of the STARFIX.MOOR computation engine:

- Full integration with existing Fugro STARFIX Suite, which provides positions and anchor states, allowing modeling of each mooring line to occur in real-time
- Typical update rate of 12 seconds for each mooring line
- Ability to place computation priority on the anchor states, allowing for the mooring lines of highest interest to be computed at rates up to once every 3 seconds (Line being deployed)
- Computation and display of tension at rig and AHV
- Support of multiple mid-line buoys
- Support of true seafloor definition
- Support of Preset anchor hookup operations
- Visual and audible alarms based on user defined predetermined clearance values to subsea assets
- 2D profile windows showing calculated catenaries with respect to seafloor and assets
- Analytical data detailing 3D positions and tensions

## Major features of STARFIX.MOOR's 3D Display—HydroVista:

- Displays and tracks complex real-time objects — rigs, mooring lines, AHV's, ROV's, etc.
- Support of true seafloor definition, along with seafloor assets
- Multiple cameras and views, allowing the operator to present simultaneous views of the rig move with the option of each, showing the scene from any desired vantage point
- Ability to fly virtual cameras and attach cameras relative to moving or static objects (i.e. view a mooring line from the vantage point of a well-head)
- Supports fast (10Hz) visualization updates
- Shows proposed and current estimates of mooring lines
- Symbolization of touchdowns, tensions, etc.
- Support of 3D alarms and billboards based on data conditions; e.g. if a numeric field is within a specified range, it can conditionally enable labels, and color certain object(s) accordingly

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