

Cutterhead Dredge Guidance

November, 2003

MARINE SURVEY & CONSTRUCTION

Florida Dredge and Dock – Efficient Dredge Guidance

Florida Dredge and Dock (Don and Chet Fletcher) based in Tarpon Springs, Florida have been using Trimble equipment since 1995.

Dredging Projects include: Marinas, Channels, Passes, and Phosphate Mines.

The Equipment used for guidance on the dredge:

- Two Trimble DSM132 DGPS with integrated Beacon differential capability. The pair provide heading and the horizontal position of the dredge and cutterhead.
- Trimble Dredge head depth measurement unit (bubbler).
- Trimble HYDROpro (Dredge) software.
- Valeport Tide gauge with UHF radios for telemetry



The guidance system provides the operator with horizontal and vertical guidance for systematically and effectively dredging an area; as well as keeping track of where the dredge and cutterhead have been.

The DSM132 DGPS antennae (normally mounted fore and aft) receive GPS signals and MSK radiobeacons. Sub-meter position updates at up to 10Hz (10 per second) are fed into HYDROpro to provide heading and position. The installed *Everest* option helps to mitigate the effects of multi-path which, if ignored, will degrade the positioning accuracy of the system.

The Bubbler unit provides HYDROpro with the depth of water above the cutterhead. The bubbler unit uses a low volume air pump and sensors to measure the pressure at the end of a hose installed along the



Removing the clay slime by-product resulting from the phosphate mining process



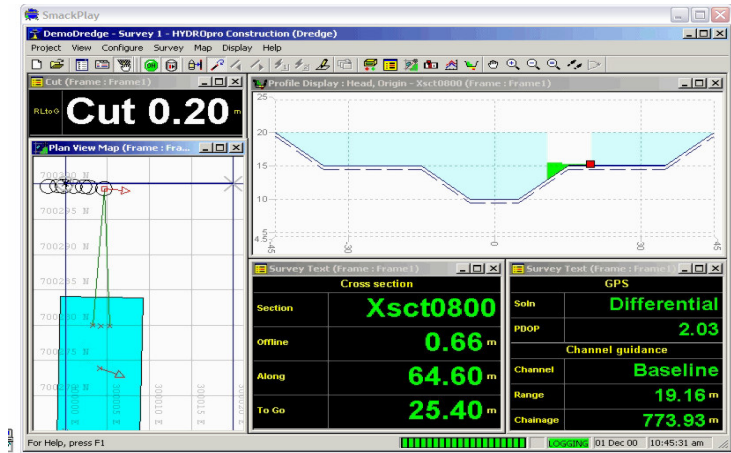
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ladder and terminated at the cutter head. The pressure translates into an accurate water depth once the unit has been calibrated.

HYDROpro is installed on a standard desktop PC running a Windows operating system to provide the dredge operator with a visually intuitive interface.

A *plan view* map dynamically displays: the dredge vessel; any background maps (.dxf format) or images; user-defined guidance lines; and events such as a “bread crumb trail” of where the cutterhead has been.

A *text display*, which is uniquely customizable, provides real time information such as: cutterhead cut/fill distances to desired grade, guidance information to line (distance left of, distance right of, distance along, distance to go), and water surface elevation.



Typical interface used by dredge operator

A *profile view* graphically, shows the cutterhead in relation to the desired elevation. The HYDROpro project file can be configured so that all position data is logged and output daily to a file for further viewing and analysis using the Trimble Terramodel software.

The Valeport pressure reading transducer, tide data logger and radios are installed near the project on a static platform, such as a dock or piling. The radio tide gauge is configured such that the actual water surface elevation is broadcast at 5 minute intervals, via line-of-sight UHF radio, to the dredge and displayed on the HYDROpro software. This provides an automated method of ensuring the dredge vessel and cutterhead elevation change proportionally to any change in the water surface level. (In areas of minimal fluctuation, a manual tide entry may be keyboard inputted as an alternative to the auto tide monitoring system).

Chet Fletcher stated *‘The system is more efficient than the old way. It saves me money and reduces the manpower required in keeping track of the position of the dredge.....we are confident with a 1'-2' accuracy of the cutterhead's horizontal position using this system’*

Measutronics Corporation represents Trimble Navigation in providing GPS hardware and software sales, installations and consulting services to the marine survey and construction industry.

For information on the products used here visit www.trimble.com/marine



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