

Hydrographic Surveying with USV and SV for Dredging



Figure 1: dredging

In the recent years the construction industry has seen a shortage of resources available to conduct hydrographic surveys for dredging operations, in an effort to improve the mobilization time and reduce the overall "footprint" the industry is investing in smaller and more environmentally friendly vessels – such as USVs (Unmanned Surface Vehicles) and small SVs (Surface vehicles).

In a typical dredging scenario, to run a bathymetric survey, a surface vessel, skipper, hydrographic equipment, and a hydrographic surveyor must be present at the job site from mobilization to demobilization. As the dredging industry requires more and more hydrographic surveys it has become essential to find a way for survey companies to use the hydrographic surveyors more efficiently, grow their participation in areas where they are vital, and limit their involvement in areas that can be performed by other personnel

NORBIT is introducing a new and resource-saving application providing the technology to divide the hydrographic survey into two parts: Design and Execution.

The survey design is done by a hydrographer or surveyor who can operate remotely, setting up and planning the essential part of the survey.

The actual survey is then performed by a skipper or USV operator at the job site.

A dedicated software connects the hydrographer and surveyor, and the two functions are consolidated in one solution.

A solution to streamline the USV bathymetry survey is to use the NORBIT WINGHEAD multibeam integrated with high-end GNSS/INS

Navigation, which can be mounted on any USV. The dredging solution includes NORBIT's integrated acquisition software NORdredge, which performs real-time processing and is essential for survey efficiency and ease of use.

The main difference between this solution and other dredging survey software is that NORdredge allows a concurrent operation of a remotely located hydrographer and an on-site operator who is conducting the survey. The architecture of NORdredge has been designed to facilitate remote access and perform advanced tasks by the hydrographer while, at the same time the operator uses a hand-held device to conduct the survey.

There are two critical elements to the solution.

One is the repeatable operations done by the operator at the site related to the safety of the survey, data collection, sound velocity casts, and launching and recovery of the vessel.

The second is the mission-critical skills performed by surveyors, such as preparing and loading the design templates, preparation of the survey lines, setting up the sonar system, ensuring the data is collected with good quality, and finally, analyzing and approving the data.



Figure 2: NORdredge one consolidated solution



NORdredge has been designed to facilitate all the above efficiently and conveniently.

The hydrographer accesses the system on the USV remotely via a web browser and then sets up the mission. He prepares the design template satisfying the required clearance, ensures that the proper reference system, geodesy, and other required items are chosen correctly, and then prepares the local station offset file and loads it in the system; this way, the operator can easily see where to drive the boat. Finally, the survey lines for the vessel to run, are drawn, and will, automatically populate on the operator display.

The surveyor will also identify the potentially dangerous places by bringing in other information if needed. The background image is overlaid on the map and loaded to all connected displays.

While the hydrographer sets up the system, the operator will use a hand-held device and can observe the effect of that work.

When the survey preparation is finalized, the operator starts the survey and collects the data. Concurrently, the hydrographer can independently access the data on his displays; he can check the coverage and plot and checks the profiles without disturbing the operator.

The hydrographer can verify the data's quality by examining the collected data's standard deviation and seamlessly transfer the data to GIS software via built in WMS and WFS interface for further tasks such as report generation, volume computation, and other processing tasks. When the survey is over, the collected raw data can be reprocessed for the final delivery. The hydrographer can access several other surveys in a similar manner. Remotely accessing each concurrent survey via the NORdredge interface allows him to improve his efficiency and lower the cost for the customer. His work has been optimized, and the impact of his skills maximized while, at the same time, the boat operators conduct the quality survey and perform multiple other tasks.

Dredging companies can lower operation costs by using hydrographers for the critical part of the survey and then utilizing skippers and operators to drive the vessels. At the same time, the NORdredge solution permits the skipper or the operator to manage the execution part of the survey with a simple hand-held device. This new approach allows full utilization of the surveyor's experience to prepare and manage the survey admitting the use of the needed skills more efficiently to run concurrent remote surveys. At the same time, this technology allows the surveyors to manage more jobs from a remote location and optimize the cost of their service.



Figure 3: NORBIT WINGHEAD multibeam sonar mounted on vessel of opportunity

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