

# Essential resource management in dredging hydrographic surveying using USV & SV

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## Introduction

The last couple of years exacerbated the shortage of resources to conduct hydrographic surveys for dredging industry. At the same time the companies started to invest in USVs (Unmanned Surface Vehicles) or small SV (surface vehicles) to improve the mobilization time and reduce the overall “footprint” of the operation. In this paper, we present a paradigm change in managing the essential hydrographic surveyor resources by providing the technology to divide the dredging hydrographic survey into two parts, design and execution of the survey. The survey “design” is done by a hydrographer or survey manager operating from the remote location setting up the essential parts of the survey. Then the survey execution is done by a skipper or USV operator at the actual job site. These two are connected via a dedicated software which seamlessly combines these two functions into one consolidated efficient solution.

## The need

It is not a new discovery that the dredging industry requires more and more hydrographic surveys done to facilitate the growing needs for the market. The typical scenario to run bathymetry surveys would be a surface vessel, skipper, hydrographic equipment and hydrographic surveyor being present at the job site from the mobilization (Mob) throughout the survey until the demobilization (DeMob). To address the cost of Mob/DeMob surveying companies have started to invest into unmanned surface vessels (USV) or a surface vessels (SV) already present at the job site to run bathymetry surveys. The big need is to find a way to use the hydrographic resources more efficiently and grow their participation in areas they are essential and limit their involvement in the areas which can be performed by other personnel.

## The new paradigm

Companies have their procedures and processes to work with fine tuned over the years of operation. However, ever changing business environment and unforeseen events, such as COVID-19 pandemic, push the innovation forward and lead to inevitable changes improving the efficiency and lowering the operational cost.

The typical paradigm when considering new USV or small SV vessel is a matter of preferences of the business unit, local



Fig. 1 NORdredge dredging survey solution

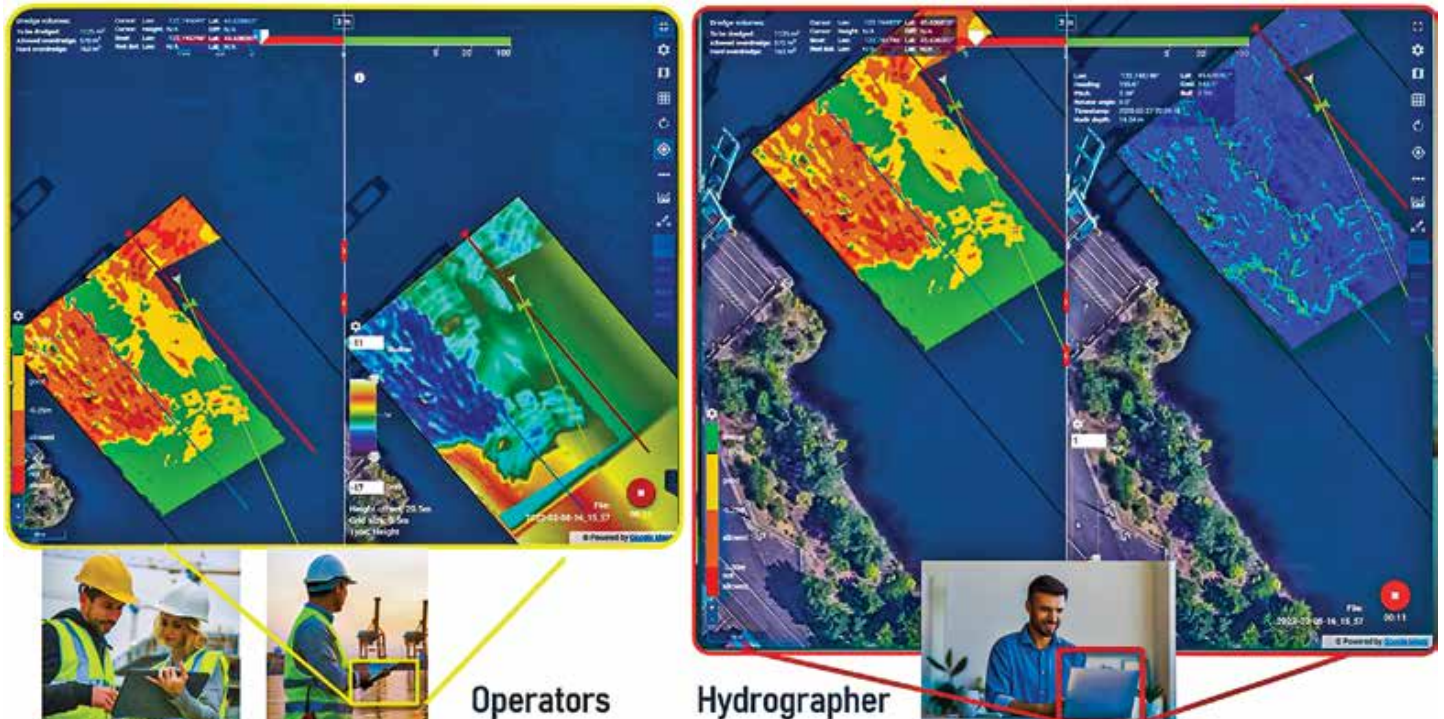


Fig. 2 NORdredge concurrent remote and local access to the survey

habituation, business networking etc. Companies will start with choosing from variety of the USVs on the market, which fits their needs, budget and feature requirements.

A solution to streamline the USV bathymetry survey is to use integrated NORBIT WINGHEAD multibeam with high grade GNSS/INS navigation, which can be easily mounted on any USV of a choice is an optimal solution to any company who wants to perform high quality bathymetric surveys. The integrated acquisition software (NORdredge) which performs the real time processing is essential for survey efficiency and ease of use. A dedicated real-time processing of the bathymetry and specialized displays allow the operator to quickly assess the required allowances for navigation safety and take a decision whether the dredging is needed or not.

NORdredge is operated from the hand-held device via web browser and contain only necessary tools to perform bathymetry surveys for dredging market. NORdredge natively supports split screen display with the real time depth display and differential depth display. The real time depth display shows the current measured depth while the operation progresses. The cursor informatics displays the needed navigation information. All necessary data are conveniently displayed on the screen and can be hidden if needed. The differential grid on the left-hand side provides immediate information on the area to be dredged by comparing the reference grid to the real time depth and showing in simple colors what and where to dredge.

#### The essential resources

There is a need to provide an efficient solution to manage the critical resources for hydrographic surveys outlined above.

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

There are two key elements to that solution. One is that repeatable operations done by the operator at the site related to the safety of survey, data collection, sound velocity casts and launching and recovery of the vessel. The second is that 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 a good quality and finally analyzing and approving the data. NORdredge has been designed to facilitate all the above efficiently and conveniently.

The hydrographer accesses the system on the USV remotely via web browser and 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. He prepares the local station offset file and loads it in the system, so the operator can easily see where to drive the boat. He draws the survey lines over for the vessel to run, which automatically populate on operator display.

He identifies the potential hazardous places by bringing in other information from other sources if needed. With that he prepared the background image overlaid on the map which loads to all connected displays. While the hydrographer sets up the system, the operator uses hand-held device and can observe the effect of that work.

When the survey is prepared, the operator starts the survey and collects the data. Concurrently, the hydrographer can independently access the data with his own displays, checks the coverage, plots and checks the profiles without disturbing the operator. Hydrographer can verify the quality of the data by examining the standard deviation of the collected data and even seamlessly transfer the data to GIS software via build 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 of the concurrent surveys via NORdredge interface allows him to improve the efficiency and lower the cost to 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.

## Conclusions

In this paper we introduce new paradigm in hydrographic surveying for dredging industry. This new approach allows fully utilize the surveyor's experience to prepare and manage the survey allowing to use the needed skills more efficiently to run concurrent remote surveys. At the same time, the solution allows the skipper or the operator to manage the execution part of the survey with simple hand-held device. 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, this technology allows the surveyors to manage more jobs from a remote location as well as optimize the cost of their service.

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