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New autonomous systems needed to meet future demand for marine data

An article by SÖREN THEMANN

Offshore wind presents an amazing growth opportunity for marine surveying but state-of-the-art, AI-powered uncrewed surface vessels (USV) will be needed to meet demand and help to reduce operational costs and the resulting price per kWh of wind energy.

USV | integrated Hydroacoustic Survey System | mother ship concept | swarm surveying
USV | IHSS | Mutterschiffkonzept | Schwarmvermessung

Offshore-Windkraftanlagen stellen eine erstaunliche Wachstumschance für die Meeresvermessung dar, aber es werden hochmoderne, KI-gesteuerte unbemannte Überwasserfahrzeuge (USV) benötigt, um die Nachfrage zu befriedigen und die Betriebskosten und den daraus resultierenden Preis pro Kilowattstunde Windenergie zu senken.

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The use of autonomous vehicles below and on the surface continues to grow as marine surveyors and scientists embrace the efficiency and flexibility that unmanned operations can deliver. Marine robots are nothing new; autonomous underwater vehicles (AUV) have completed millions of survey line miles since the early nineties, helping to map and monitor the oceans all over the world.

Uncrewed surface vessels (USV) have not enjoyed the same levels of adoption by marine data acquisition firms or researchers for various reasons, not least the lack of commercial collision avoidance and navigation technology designed to deal with the more hazardous and unpredictable surface environment.

The situation has changed over the last decade or so as innovators from inside and outside the maritime industry have championed digitalisation for safer and more efficient operations at sea. This in turn unlocked the door for more autonomy on surface ships and boats, which has catalysed the development of a swathe of new USVs.

New generation USVs

Such a huge influx of investment would not happen if USVs were simply innovations for the sake of innovation. The rationale for removing the human from the survey platform is, however, somewhat multi-layered. Peel away the first layer and we see USVs as a way to reduce the costs of acquiring marine data. But further layers reveal the potential of uncrewed vehicles to transform the entire hydrographic survey workflow.

To get to that point, it's important to define the current approach to USV operations, where the focus is almost solely on taking crew out of the equation. Today's most advanced USVs generally reflect traditional vessel design paradigms in that they are still very much like manned vessels in shape and application potential.

Relatively speaking, many are large, slow moving and not designed for high manoeuvrability. The latter is an important factor because new AI-based data processing solutions will be able to provide a constant real-time stream of accurate data, allowing on-the-fly adjustments to original mission plan.

This leads us to looking elsewhere to find a suitable platform to really unlock the power of autonomous marine survey and the new AI and hydroacoustic technologies that enable it. The initial criteria are quite clear; the platform must be easy to deploy (small), be able to accommodate flexible survey and scientific equipment payloads and be nimble on the water.

To enable new sustainable business models and to introduce a positive transformative aspect to the very foundations of marine survey we have to add speed. When you have speed, you can save time. And when you can save time, you can save money.

And the potential isn't just transit time. When combining the attributes of a next generation USV with the power of promised new multibeam and sensor systems that will allow surveying at speed in the region of 15 to 20 knots, we might just have a game changer in the making.

The next steps

Which is something that subsea survey technology specialist Subsea Europe Services might just have on its hands. A relatively young company established early in 2020 and based just North of Hamburg, Subsea Europe Services continues to supply its clients with systems and services on a rental and sales basis, while at the same time making steps to develop simpler and more automated survey workflows for its clients.

Step one, the creation of a standardised and flexible integrated Hydroacoustic Survey System (iHSS) including everything needed to acquire data to the S-44 Exclusive Order standards is complete and proving very popular in the market, especially for ad-hoc surveys with short notice and demand for high performance.

The iHSS is a ready to mobilise system including the highest performance multibeam echo sounders, sound velocity instruments, workstations, software and inertial navigation systems. Uniquely, it features an all-in-one mount design with multibeam, inertial motion unit and GNSS antennas in a single reference frame, which simplifies installation and reduces potential errors from inconsistent or wrong offsets, ultimately enabling even better quality raw and post-processing data.

Step two, the application of the iHSS with a commercial grade USV will be completed by the start of the summer. And this is when things get really interesting. The MANTAS T12 USV has been selected as the platform for Subsea Europe Services' turnkey marine survey solution development due to its speed and agility in getting to the survey site and performing the work, as well as its highly flexible payload potential.

Enter the MANTAS

The MANTAS T12 platform (Fig. 1 and Fig. 2) is manufactured by MARTAC Systems Inc., a Florida, USA-based manufacturer of high-tech unmanned vessels with government and commercial customers globally. While tests of the MANTAS T12 as a marine survey platform have proven successful, Subsea Europe Services' solution will be the first such vehicle available as part of a rental portfolio for use in Europe and further afield if needed.

A relatively small craft at 12 ft long, the T12 is designed to provide high utility with low operational costs. Importantly, considering the somewhat lagging regulatory framework for the operation of unmanned craft offshore, the MANTAS T12 can be operated in fully autonomous, semi-autonomous or remote operator control modes.

A single MANTAS T12 is less costly than a manned vessel collecting the same data, and a multiple USV »swarm« approach to marine survey magnifies the operational advantages and the cost savings.

To overcome the current uncertainties with regards to operating an unmanned vehicle close to offshore assets, Subsea Europe Services will deploy the first USVs in conjunction with a manned »mother ship«, overseeing the autonomous operations of the USVs, while conducting survey tasks at the same time. The so-called »mother ship concept« for marine survey is expected to ultimately operate as a completely autonomous and unmanned service.

MARTAC has already successfully demonstrated hydrographic USV »swarms« in multiple exercises, showing a future where synchronised unmanned platforms can survey an area of the seafloor many times faster than a single manned platform. And



Fig. 1: The MANTAS T12 platform

Photo: Sven Bachmann, Subsea Europe Services GmbH

in the context of renewable energy, smaller USVs can operate in an offshore wind farm much faster and without the associated safety risks of normal survey vessels.

A swarm of high-speed USVs can be dispatched from shore to perform a survey job quickly – even as wind farms move further from shore – and deliver data within hours rather than days. Multipurpose USVs could also present the very attractive prospect of wind farms having a permanently resident swarm ready to go into action wherever needed – for marine surveying and other engineering, monitoring, or security applications. The advantage here is the ability to significantly reduce the cost of hiring survey vessels and vessels of opportunity to do the survey or act as a mother ship.

Autonomy meets demand

But with much of the on-water action to be carried out by autonomous solutions, where does this leave marine surveyors? Will we still have jobs when the MANTAS and other platforms like it become commonplace? The simple answer is yes, the industry still needs your expertise and always will. USVs are just another tool for the job, albeit one that may potentially lead to a change in the marine surveyor's job description.

If we take swarm surveying as an example, multiple USVs operating on a single survey mission will still need to be overseen. Expert eyes will still need to review the data stream as it is transferred

back to the mother ship or as mentioned earlier, an operations room ashore. The point is that a single marine surveyor will be able to produce so much more clean data in a single day than it was possible if simply sitting on the survey boat with just one multibeam pinging away.

It could be perceived that this will ultimately mean fewer marine surveyors are required by a company as a single professional can deliver more, but this is a highly pessimistic view simply for the fact that the objective of any company is growth. Rather than cutting staff, this should mean that marine survey firms can instead increase capacity, service more customers and always focus on expanding.

The customers will certainly be there. Just looking at offshore wind, there is a huge number of new installations coming in the North and Baltic Seas alone. Each and every one will need marine data acquisition services from the initial check out survey right through to decommissioning. That's 30 years of work per wind farm.

The question isn't, »will we lose our jobs?«, but »how can we leverage new technologies like the new MANTAS T12 solution to meet higher demand in the market?«. Getting this right will likely mean that the industry needs more experts than ever. While more of them might be working on land, one thing that improving efficiency through autonomy will ensure is a healthy outlook for the marine survey industry for decades to come. //

Photo: Sven Bachmann, Subsea Europe Services GmbH



Fig. 2: The MANTAS T12 platform