Public Report

“Unmanned Surface Vessel Solutions for Sub-Sea Inspection and Maintenance of Offshore Wind Assets”

An innovative approach to increase sustainability of offshore wind energy production by unmanned inspections and maintenance

USV-ROV

Figure 1: ”Fugro’s USV-ROV out of the Port of Rotterdam

for its first commercial project”

Project number	:	DEI118007
Project title	:	Unmanned Surface Vessel Solutions for Sub-Sea Inspection and Maintenance of Offshore Wind Assets
Status	:	Public
Applicant(s)	:	FUGRO NV (and its subsidiaries)
Funder	:	RVO Topsector Energie
Project period	:	May 2018-June 2022
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Contents

Summary of the principles and objective of the project

Given offshore wind turbines necessity to the energy creation for the Netherlands and their susceptibility to nature, a better way of inspecting and servicing them is needed. As we move towards better renewable sources of energy, better technology is needed to increase Sustainable Renewable Energy production and ensure that the power supply is not disrupted. To this end, Fugro aims to introduce a suitable solution by developing an Unmanned Surface Vessel (USV) that can deploy a Remotely Operated Vehicle (ROV) to conduct regular checks and perform small repairs and maintenance on wind farm subsea structures.

The project focuses on the Inspection, Repair and Maintenance market in the Offshore Wind Industry. It aims at developing, building, and demonstrating a solution that will contribute to a more sustainable and cost-effective inspection and repairs of objects and structures on the seabed and in the water column. Hence the development and demonstration of a USV-ROV solution to conduct regular inspections, as part of the Operations and Maintenance strategy, which will increase wind farm energy output of existing and to-be-developed offshore wind farms.

This innovation will be relevant for offshore asset developers, owners, service providers as well as legislators and international regulatory bodies. The aim is to improve efficiency throughout the entire lifecycle of offshore renewable energy assets while significant reducing costs and preventing losses.

1.1 Background/ Short Description

The project was executed in two main phases.

Phase 1 included Development & Engineering and consisted of experimental development activities broken down into the following working packages:

- WP 1: USV development
- WP 3: Remote USV development
- WP 5: Remote ROV development
- WP 8: LARS development
- WP 10: Develop personnel transfer system

Phase 2 focused on realisation and demonstration of the innovative USV-ROV concept and consisted of building and demonstration activities broken down into the following working packages:

- WP 2: USV built
- WP 4: Remote USV built
- WP 6: Remote ROV built
- WP 7: Communication system built
- WP 9: LARS built
- WP 11: Personnel transfer system built
- WP 12: FMEA

Results achieved, project learning and the perspective for application

1.1 Results achieved

The project was successful in demonstrating the efficient working of fully remotely controlled ROV operations (including automatic launch and recovery of the ROV) from a dedicated Unmanned Surface Vessel (USV) for inspection, repair and maintenance of subsea offshore wind assets with a minimum use of time and resources.

This enabled potential clients (as well as other stakeholders) to actually see this innovative product work, which helped to further market the USV-ROV services by Fugro. Frequent inspections (and repairs) by the USV-ROV stimulates renewable energy production, enables offshore wind farm owners to increase their operability and cost effectiveness, as potential failures can be prevented by early identification and repair.

1.2 Project learning

Technical issues like design plans, construction details, exact dimensions, control strategies and safety aspects were learning points. Due to these complexities, the design phase of the project took longer than anticipated to finalise.

Through the execution of this project, we were able to gain even deeper insights in actual costs, cost-reduction options, and market prices for the Fugro services. But not only this, moving to an

unmanned vessel meant that crews worked from a safer onshore environment with improved work-life balance. This newly digitized workflow means that reporting of events is near real-time which aids in better decision making. Due to the crewless vessel, it means that the vessel size could also be reduced and as such have a bigger impact on cost reductions and carbon emissions.
One of the biggest challenges was connectivity of the vessels that go to remote areas. Resolving this challenge meant partnering with technology companies to not only use satellite communications but incorporate tech into the design of the vessel to ensure that monitoring and maintenance of the USV was possible.

As with any innovative change in an industry, hesitation is sometimes felt internally within organizations and from clients. Buy in from all stakeholders is vital for a project to succeed. With the USV project this meant getting clients to understand that the project was an iterative process. This collaborative mindset from the onset allowed us to change projects needs and test and validate the technology that solved our clients' challenges.

Finally, unmanned vessels of a certain length were traditionally not legally permitted. Working groups have been formed to develop competency standards and training to ensure that regulations and regulators are kept abreast with remotely operated technology and the changes being implemented in this space. Before delivery and testing of the USV, permission was requested and obtained from the Dutch port to allow the USV to sail uncrewed in its waters. Looking forward legislative limitations will need to be clarified in the absence of international USV operations.

1.3 Perspective for application

The perspective for application is in the demonstration of technology to increase Sustainable Renewable Energy production.

Description of the project's contribution to the scheme's objectives

Offshore energy generation is an essential component for a successful transition to an affordable, reliable and sustainable energy supply in the Netherlands. The ***TKI Wind op Zee*** stimulates the development of offshore innovations through research, development and demonstration in order to enable offshore energy to make a major contribution to the energy transition. With the technology demonstrated in this project, it aids in increasing a reliable, affordable and sustainable energy production from offshore wind assets. Moreover, the USV proved to be energy efficient compared to current vessels (fuel and CO_2 reductions).

Possibilities for spin-off inside and outside the sector

In January 2022, Fugro announced the construction of a larger vessel, the 18m USV, to be named Fugro Blue Eclipse™ (18m). The new vessel is set to be delivered in 2023.

Furthermore, Fugro has already set up nine global ROCs to support our clients with their USV and ROV needs, indicating the market need for this product. Three centers are considered high bandwidth where USV operations can be performed from. These centers can transfer real time

video data and operational data. The rest are considered low bandwidth centers, which are used for different low demanding applications which do not require high amount of data transfer.

Additionally, Sea-Kit, Fugro's partner, was awarded the first-ever Unmanned Marine Systems certificate by Lloyd's Register for its USV built for Fugro. Lloyd's Register product certification helps companies prove that their products are compliant with specified regulations.

Overview of public publications about the project and where to find or obtain them

Furgo promotes the solution on their website as follows:

- https://www.fugro.com/docs/default-source/expertise-docs/fugro-blue-essence_a4.pdf?sfvrsn=401ab019_0
- https://media.fugro.com/media/docs/default-source/our-services/fugro-blue-volta-2022.pdf?sfvrsn=9862db19_8
- https://www.fugro.com/about-fugro/our-expertise/remote-and-autonomous-solutions/remote-and-autonomous-vessels
- Fugro launches its new generation of uncrewed surface vessels in the Netherlands https://www.fugro.com/media-centre/news/fulldetails/2021/11/10/fugro-launches-its-new-generation-of-uncrewed-surface-vessels-in-the-netherlands

More can be seen in the Furgo Blue Essence video - here.

The following articles have been published:

- Originally published in First Break (EAGE) Volume 40 Issue 2 February 2022 https://media.fugro.com/media/docs/default-source/published-articles/first-break-vol-40-feb-2022---making-crewless-offshore-surveys-a-reality.pdf?sfvrsn=30228619_0

Further external media/ articles where published:

- https://www.offshore-energy.biz/fugro-orders-next-gen-sea-kit-xl-usvs/
- https://www.oedigital.com/news/496026-world-s-first-fugro-personnel-certified-to-operate-uncrewed-surface-vessels
- https://www.oedigital.com/news/493653-fugro-orders-first-of-its-kind-xl-class-usv-for-north-sea-operations
- https://www.oedigital.com/news/489021-industry-first-sea-kit-s-usv-gets-lr-certificate
- https://www.oedigital.com/news/491982-fugro-deploys-uncrewed-surface-vessel-in-the-netherlands
- https://www.offshore-energy.biz/fugro-picks-team-for-next-gen-uncrewed-surface-vessel/
- https://swzmaritime.nl/news/2021/11/08/fugros-usv-blue-essence-visits-the-netherlands-for-the-first-time/
- https://smashnederland.nl/nieuws/network-partner-in-the-spotlight-fugro/
- https://smashnederland.nl/nieuws/blue-essence-usv-van-fugro-dit-najaar-naar-nederland/
- https://smashnederland.nl/nieuws/fugro-ontvangt-s-werelds-eerste-professionele-certificaat-om-onbewerkte-oppervlaktevaartuigen-te-bedienen/
- https://smashnederland.nl/nieuws/fugro-usv-project-team-wint-energy-industry-game-changer-award/

Indication where and at what price more copies of this report can be ordered

There are no copies of this report to order, but if you have any questions, please contact us:
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Veurse Achterweg 10
Leidschendam
2264 SG

Contact person: Ivar Josselin de Jong/ Jan Arvid Ingulfsen

Indication of the grant obtained in the following way

The project was carried out with subsidy from the Ministry of Economic Affairs, National EZ subsidies, Top Sector Energy performed by the Netherlands Enterprise Agency.