







Marine-i MARINE TECHNOLOGY AND INNOVATION SHOWCASE

Discover the impact of the Marine-i project

Accelerating innovation in marine technology in Cornwall and the Isles of Scilly 2017- 2023















×, HM Government



CONTENTS:

- 04 INTRODUCTION By Professor Lars Johanning, University of Exeter 06 ABOUT THE PROJECT The story of the Marine-i project 12 MARINE ENERGY Building the marine energy industries of the future 20 MARITIME OPERATIONS Maritime operations at the cutting edge 26 MARINE MANUFACTURING New advances in marine manufacturing
- 30 MARINE ENVIRONMENTAL TECHNOLOGIES A vision of a more sustainable future
- 36 THE FUTURE Foundations for the future
- 39 LIST OF BUSINESSES The innovative businesses supported by Marine-i

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INTRODUCTION

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MARINE-I HAS TRANSFORMED MARINE TECH COMPANIES IN CORNWALL AND LAID THE FOUNDATIONS FOR FUTURE GROWTH, DRIVING INNOVATION AND SUPPORTING COMMERCIALISATION.

BY **PROFESSOR** LARS JOHANNING, UNIVERSITY OF EXETER



Part funded by the European Regional Development Fund, Marine-i has been a pioneering scheme designed to foster research, development and innovation in the marine technology sector in Cornwall and the Isles of Scilly. Over the last six years, the project has accelerated the growth of nearly 200 businesses, supporting them on their journey towards commercialisation of their innovative products and services.

The marine tech sector has very high growth potential and is a key priority for the region.

Four sectors in particular have been identified as ripe for growth: marine energy, marine manufacturing, maritime operations and marine environmental technologies. Across all these sectors Cornwall is rich in both talent and ingenuity. The businesses supported by Marine-i include some that are now pioneers on the world stage, and are reaching out to global markets from their base in Cornwall and the Isles of Scilly.

SIGNIFICANT NEW OPPORTUNITIES EMERGING

Meanwhile, over the six years of the Marine-i programme, significant new economic, market and technical opportunities have emerged in the region related to the development of Floating Offshore Wind (FLOW) deployment in the Celtic Sea. Our region is now poised to become a world leader in this important new source of renewable energy. Cornish businesses are rising to the challenges and opportunities this creates, with many inventing new products and services to meet the emerging needs of the FLOW industry.

Cornwall is fast becoming the location of choice for businesses engaged in marine renewables technologies and the associated supply chain. Through a combination of academic research support, testing facilities, and financial investment, Marine-i has helped accelerate this and enabled our local businesses to gear up to enter the fast-growing renewable industries of tomorrow.

UNPRECEDENTED SUPPORT AND ACCESS TO TEST FACILITIES

From the outset of the project in 2017, Marine-i has helped businesses embrace the emerging opportunities that will define the global marine sector to 2050 and beyond. Support has included market analysis, technology assessment, leading-edge research expertise, grant funding, subsidised graduate staff and access to outstanding world class test facilities. These include University of Plymouth's COAST Lab, University of Exeter's DMaC and FaBTest, and the Offshore Renewable Energy Catapult engineering expertise and marine and offshore renewables test facilities.

The many projects that we have supported now have high growth potential for the future, ability to support new job creation in the Cornwall supply chain, and potential to build new global markets for Cornwall's unique marine technology expertise. Businesses have received the vital help they need to bring their innovations to market more quickly and with a greater chance of success. The quality and quantity of innovation support has been unprecedented.

A PROJECT IN TWO PHASES

In the first phase of Marine-i (2017- end 2019) to support the broader strategic development of key new technologies in Cornwall and the Isles of Scilly, two major funding calls were launched. A fund of up to £1 million was made available to support research, development and innovation in marine robotics and autonomous vessels, while a fund of up to £500,000 was designated for innovative marine data technologies and applications. The first phase also included Rapid Innovation Grants.

In the second phase of the Marine-i programme, (2020 - June 2023), there has been a change of emphasis and an increased focus on our expert team of academic and research staff working closely with businesses over an extended period to take their products to the next stage of commercialisation. In many cases, businesses have received support from more than one partner through the collaboration.

This collaborative approach to RD&I has opened new doors for many businesses, bringing a level of focused expert support to small and medium sized businesses in Cornwall that we believe has been unparalleled anywhere in the world.

INSPIRING EVENTS

The Marine-i project has delivered regular Discovery Room sessions on a wide range of marine technology topics. These have given businesses an opportunity to get up to speed on the latest thinking on a specialist aspect of marine technology, to talk to experts in the field and to meet related businesses who may wish to collaborate on bringing new technologies to market. The topics have included robotics and AI, hybrid propulsion, composite materials, improving wave energy technology, surveying and marine data, drone technology, wave to grid systems, floating offshore wind, high frequency radar, emissions reduction technology and green hydrogen, to name but a few. During the COVID pandemic, Discovery Room events were hosted online, but quickly returned to 'in person' events as soon as they could.

Marine-i also sponsored valuable visits for Cornish marine businesses. A group were taken on a tour of the Offshore Renewable Energy Catapult testing facilities at Blyth in Northumberland. This gave them unique insights into how innovative renewable energy products and services are tested and developed, providing performance confidence to investors and owner operators. The group also had the opportunity to talk directly to some of the leading experts in this field who work at Offshore Renewable Energy Catapult.

The Marine-i Innovation Tour took businesses on a two-day visit to hear from some of the most successful and innovative technology businesses in the South West (Thales, Babcock International, SC Innovation and the National Composites Centre), so they could learn how leading companies manage and implement innovation projects.

New collaborations and supplier networks have been created as a result of these networking opportunities.

MARINE-I HAS MADE NEWS AROUND THE WORLD

The initiatives taken by the Marine-i project have been reported by industry titles all over the globe, including in Europe, the USA, Asia and Australia. This has raised the profile of Cornwall as a world leader in marine technology innovation, as well showcasing the ingenuity of individual Cornish businesses. Marine-i has helped to create an environment where innovative marine businesses based in Cornwall and the Isles of Scilly now have a much greater chance of achieving long-term success.

The vital support that has been provided to pioneering companies in the industry has helped to ensure that marine innovation is being built on solid foundations, enabling Cornwall to grasp strategic growth opportunities for the future.

That is our legacy and we look forward to seeing these foundations being built upon in the years ahead, as marine tech businesses in Cornwall continue to innovate and shape the future.



Below: Isles of Scilly

MARINE-I HAS BEEN A CHAMPION OF MARINE TECH IN CORNWALL AND SCILLY, SPANNING AUTONOMOUS VESSELS TO ENVIRONMENTAL PROTECTION AND CLEAN GROWTH. WE ARE PARTICULARLY INDEBTED FOR THEIR SUPPORT IN DEVELOPING THE POTENTIAL FOR FLOATING OFFSHORE WIND TECHNOLOGY IN OUR REGION, WHICH WE BELIEVE COULD BE TRANSFORMATIVE FOR COASTAL COMMUNITIES IN OUR AREA AND MAKE A HUGE CONTRIBUTION TO



ACHIEVING OUR GOAL OF A NET ZERO CARBON ECONOMY BY 2030.

Mark Duddridge, Chair, Cornwall and Isles of Scilly Local Enterprise Partnership

A NEW COLLABORATIVE APPROACH

Marine-i has been an ambitious £13.4m collaboration between University of Exeter, University of Plymouth, Cornwall College Group, Cornwall Marine Network, Cornwall Council (Cornwall Development Company) and the Offshore Renewable Energy Catapult.

The programme has brought together key infrastructure and expertise to enable technology innovation in Cornwall and Isles of Scilly's marine sector

Marine-i pioneered a new collaborative approach to accelerate research, development and innovation within marine tech businesses. providing access to world class expertise and test facilities.

This collaborative approach was vital because over the next decade and beyond, marine technology is set to be transformed as a new wave of innovation allows us to exploit the full potential of our oceans in ways that were previously not possible.

Getting the most from these new technologies will demand new ways of thinking and new levels of collaboration across different scientific and



















Right: Levenmouth Demonstration Turbine ORE Catapult





A UNIOUE AND POWERFUL PARTNERSHIP

Marine-i created a unique network of six key partners, all with outstanding expertise in the marine industry.

University of Exeter was the project lead partner. They provided Ocean Technology research support, including Research Fellows with electrical, mechanical, ocean science and technology expertise. In addition, the University of Exeter's research capabilities include a range of field testing, hydrodynamic analysis and deployment expertise including the Dynamic Marine Component Test Facility (DMaC) and South West Mooring Test Facility (SWMTF) and the Falmouth Bay test site (FaBTest) during Phase One of Marine-i. They also provided business assistance and knowledge exchange support.

University of Plymouth provided marine and maritime research support, including Research Fellows with hydrodynamics, control systems, materials, manufacturing, circular economy, and ocean science research experience. They also provided access to their COAST (Coastal, Ocean and Sediment Transport) Laboratory for physical model testing with combined waves, current and wind offered at scales appropriate for device testing, array testing, environmental modelling and coastal engineering. In addition, they provided business assistance and knowledge exchange support.

Cornwall Council (Cornwall Development Company) managed the Marine Challenge Fund which offered grants for marine innovation projects. In addition, they provided the core team to the Hayle project office and were available to support businesses throughout the grant process from initial project shaping right through to claim.

Offshore Renewable Energy (ORE) Catapult

provided specialist sector knowledge around marine renewable energy technologies. They also provided access to national risk/cost reducing test facilities and specialist engineering and market analysis services.

The Cornwall College Group/Falmouth Marine

School used their industry links to develop relationships with marine SMEs and provided a marine technology focussed graduate placement scheme, with mentoring support, working with Unlocking Potential.

Cornwall Marine Network (CMN) used their extensive marine business relationships to create engagement opportunities. They also used their expertise to deliver bespoke business innovation guidance and facilitate collaboration to help marine businesses develop their innovation projects.



Above: ORE Catapult

SIGNIFICANT FUNDING

For the first phase of the project (2017 - end 2019) Marine-i received £5,707,671 of funding from the European Regional Development Fund as part of the European Structural and Investment Funds Growth Programme 2014-2020. For the second phase of the project (2020 - June 2023) the project was awarded a further £4,146,161 from the European Regional Development Fund.

The Ministry of Housing, Communities is the Managing Authority for European Regional Development Fund. Established by the European Union, the European Regional Development Fund helps local areas stimulate their economic development by investing in projects which will support innovation, businesses, create jobs and local community regenerations.

Below: COAST Lab University of Plymouth

EXCEPTIONAL INNOVATION SUPPORT

With the goal of helping marine businesses reach their full potential, Marine-i has provided an outstanding range of RD&I support. Businesses could benefit from:

- Marine innovation support through RD&I feasibility studies, including from Research Business Fellows with cutting-edge marine technology expertise
- Ongoing collaborative support for their RD&I projects
- Reimbursable grants of up to £150,000 from the Marine Challenge Fund to provide vital technology funding; 100% Rapid Innovation Grants of £2,000 to accelerate projects and significant matched funding support for strategic projects.
- Access to University of Plymouth's COAST Lab and University of Exeter DMaC facility and FabTest facility (during Phase One of Marine-i).
- Access to engineering and market analysis expertise and risk/cost reducing test facilities for new technology development including Floating Offshore Wind, via the Offshore Renewable Energy Catapult
- Graduate staff at a subsidised cost
- 'Discovery Room' events programme covering a wide range of topics and providing industry networking opportunities
- Innovation Masterclass series and Growth Kickstarter consultancy support
- Business assistance and knowledge exchange support



MARINE-I OUTPUTS

Marine-i has accelerated innovation across the marine technology sector in Cornwall, achieving a great number of outputs that lay the foundations for future growth in the sector.



45

PIECES OF MEDIA COVERAGE IN INDUSTRY MEDIA AROUND THE GLOBE, RAISING THE PROFILE OF

MARINE TECH IN CORNWALL











HAVE BEEN SUPPORTED IN MARKET LED RD&I

BUSINESSES TOOK PART IN THE INNOVATION MASTERCLASS SERIES







COLLABORATIVE RD&I PROJECTS INVOLVING UNIVERSITY OF EXETER, UNIVERSITY OF PLYMOUTH AND ORE CATAPULT

GRADUATES





THIS IS A VERY EXCITING TIME FOR THE COMPANY. THE HELP WE HAVE RECEIVED FROM MARINE-I IS ALLOWING US TO ACCELERATE TO THE NEXT STAGE OF DEVELOPMENT FOR THE ULTRA-USV.

Gabriel Walton, Director, Ultrabeam Hydrographic

THE WIDER IMPACT OF MARINE-I

As well as these direct outputs, Marine-i has pioneered and laid the foundations for a new kind of collaborative business support for the sector.

Marine-i has brought together an unprecedented partnership, combining existing infrastructure, research expertise, knowledge transfer and grant funding in a way that has been entirely business focused. It has worked collaboratively

across project partners and also within the wider business support community.

This acceleration of RD&I activity has resulted in increased economic activity, with a number of key contracts being placed with marine supply chain companies in Cornwall. This has enhanced the capabilities and track records of these companies, as it has introduced new products and started to create new high value jobs.

For example, in the first phase, Marine-i worked collaboratively with Cornwall Marine Network's Propel project and 29 businesses received complementary support which enhanced the benefits of Marine-i. Ongoing relationships between businesses and academic institutions have also led to applications to national government funds like Innovate UK, the UK's innovation agency. This is unlikely to have occurred without the RD&I work supported by the Marine-i project.

Marine-i has also demonstrated the immense long-term potential of the marine technology sector in Cornwall, in line with the economic growth ambitions of Cornwall and Isles of Scilly Local Enterprise Partnership.

MARINE-I AS A CATALYST

Marine-i has been a catalyst for powerful and lasting change in the sector on the ground. The networking and collaborative elements of the project have led to the emergence of vibrant business clusters. These are now growing across a wide number of fields, including floating offshore wind, naval architecture and subsea engineering, geotechnical and sub-sea mining, autonomy for hydrographic surveying and more.

Marine-i has supported the MOR Group (Marine Offshore Resources) a special interest group which is part of the CMN Group. With funding support from Marine-i for facilitation staff time, the MOR Group was relaunched and rebranded in 2022 to meet new opportunities within the offshore renewables sector. MOR Group will build the local supply chain, develop new technologies and train the skilled people needed to meet current and future requirements across marine offshore opportunities. This has achieved one of Marine-i's key aims, which was to develop an Innovation Cluster Network, enabling innovation communities in Cornwall and throughout the UK to collaborate on new opportunities around renewable energy.

Marine-i has also helped accelerate the growth of businesses which have then gone on to win significant national industry awards, raising the profile for themselves and also for the marine tech sector in Cornwall and the Isles of Scilly.

- Triskel Marine won the DAME Overall Winner award in 2019.
- WorkFloat won the 'Spirit of Innovation' Award at the European Commercial Marine Awards 2019.
- ARC Marine won the award for start-up of the year at the UK Maritime Awards 2019 and went on to win the Innovation Award and Marine Tech Award at Tech South West 2021. They also won the RWE Innovation Ecology award in 2022.
- Ultrabeam Hydrographic won Innovative Business of the Year and Best Business Start Up at the Western Morning News Business Awards 2019 and High Growth Business of the Year at the FSB Awards 2020.
- Biome Algae won Green Start Up of the Year 2022 for South West England.
- Feritech Global won the International Success Award 2021 at Tech South West, Exporter of the Year 2022 at Cornwall Business Awards, and SME Business of the Year 2022 at the Western Morning News Business Awards.

The project has led to the delivery of new products, services and high value jobs, creating new momentum and profile for businesses across a number of specialist fields.

• Autonomous vessels now being designed and

manufactured in Hayle (Unmanned Survey Solutions, Ultrabeam Hydrographic)

- Intelligence)
- Consultancy)





 New marine tech software brought to market (Wave Venture, Navimeteo, Touch Byte, 4 Earth

• Fresh impetus for Cornwall's world-leading subsea geotechnics specialists (Armada Engineering, Subsea Minerals, Feritech, Ocean Hydraulics)

• Environmental goods and services for global markets (Triskel Marine, Kiote, Buoyant Works, WorkFloat, Reflex Marine, Perpetual Research

 A new focus on hydrographic survey services; design, training and consultancy (Unmanned Survey Solutions, Ultrabeam Hydrographic)

 Marine renewables taken to the next level (Inyanga-Tech, AMOG, Global OTEC, Wave Venture)

 New forms of low-emission marine propulsion (Triskel Marine, RAD Propulsion, Bio Engine Technology, Whiskerstay)

• Imaginative new approaches to vessel and marine equipment design (Solis Marine, Toniq, Reflex Marine, Rush Yachts, Tom White Composites)

• Advances in marine conservation and aquaculture (ARC Marine, Cleaner Seas Group, Evidence Plastic, Cornish Seaweed Company, Holdfast Seaweed, National Lobster Hatchery).

MARINE-I HAS PROVIDED A CRUCIAL AND TIME-CRITICAL BOOST TO THE INNOVATION CAPABILITIES OF EXISTING AND EMERGING MARINE TECHNOLOGY **BUSINESSES ACROSS CORNWALL**, HELPING THEM DEVELOP AND TEST NEW PRODUCTS AND PROCESSES AND JUSTIFYING THIS INNOVATIVE PRIVATE-PUBLIC-ACADEMIC PROJECT



COLLABORATION WHICH CORNWALL MARINE NETWORK IS DELIGHTED TO HAVE SUPPORTED.

Paul Wickes MBE, CEO, Cornwall Marine Network

MARINE ENERGY

BUILDING THE MARINE ENERGY INDUSTRIES OF THE FUTURE

Marine-i has supported local companies working in wind, ocean thermal, wave and tidal power generation, helping to pioneer new ways of delivering the green energy of the future. The next ten years will see the most exciting development yet in our area - the building of floating offshore windfarms in the Celtic Sea.

FLOATING OFFSHORE WIND: A HUGE NEW OPPORTUNITY FOR CORNWALL

With floating windfarms, instead of attaching the turbine to a fixed foundation, the turbine is supported by a structure that floats on the surface of the sea. The floating platform is then tethered to the seabed. This technology means that turbines can be located over the horizon in very deep waters, with access to the most consistent and powerful winds. The only British waters deep enough for large scale FLOW deployment are off

Scotland and in the Celtic Sea (which is an area off the coast of Cornwall, South Wales and the southern coast of Ireland). The Celtic Sea has some of the best wind resources in Europe, so this fast-growing industry is a huge opportunity for Cornwall. The Crown Estate (seabed landlord) is issuing leasing rounds in 2023 for up to 4 GW of electrical energy to be deployed by 2035 with a follow on 20GW anticipated by 2045.

The UK Government believes this technology will play a crucial role in delivering our country's goal of safe and secure energy to achieve a Net Zero economy by 2050. The International Energy Agency predicts that offshore wind generation will grow 15-fold over the next 20 years and will prove to be the next great energy revolution. Floating offshore wind will be the fastest growing sector.

Cornwall will be right at the forefront of this new industry, one in which it has the potential to become a world leader.



MARINE-I SUPPORT FOR FLOATING OFFSHORE WIND

Marine-i has worked with a wide range of Cornish innovators who are developing new solutions to the many technical challenges of floating offshore wind.

Tugdock has created an innovative floating platform for offshore wind construction projects. This is designed to be used at smaller ports, making it ideal for Cornwall. The Tugdock platform is modular, easy to erect, and reusable.

Falco Drone Technologies is developing a long-range drone that can be used for surveying offshore windfarms. With floating windfarms being many miles out at sea, drones and autonomous vehicles will play a vital role in surveys and maintenance.

Reflex Marine has invented the JAVELIN system for anchoring mooring cables for floating platforms. Unlike conventional drag anchors, JAVELIN is secured to a borehole drilled into rock, making it much more suited to seabed conditions in the Celtic Sea.

Mor Engineering is working on new data sensing technologies specifically designed for marine applications and floating offshore wind. They have developed a robust, modular data logging system capable of exceeding the performance of most commercial systems currently available

Trivane has created a unique trimaran design to be used as a floating platform for wind turbines. It comprises three barges, each of simple construction and low cost, enabling them to be built almost anywhere. Trivane has now received £3.2 million of Government funding to develop its technology.

MARINE-I SUPPORT FOR WAVE, TIDAL AND THERMAL ENERGY

AMOG: This company has created a revolutionary wave energy converter that is robust enough to withstand harsh sea conditions. The rocking movement of the waves causes a 'pendulum' within the device to swing and generate energy. This highly innovative device has the potential to make a real impact in the wave energy marketplace worldwide.

Inyanga Tech: One of the big challenges in harnessing tidal power is the cost and complexity of installation, operation and maintenance. Inyanga Tech has created the HydroWing, a multiturbine tidal energy generator that is modular in design, lighter in weight and much cheaper to install and maintain than conventional tidal energy devices. It provides the necessary cost reductions and reliability to make large scale tidal energy projects commercially viable. The HydroWing can also be used in more remote locations, where specialist construction vessels are not available.



THE FUTURE

technology firms.

These challenges include site surveys in coastal and deep waters; carrying out repairs and maintenance on offshore wind structures; improved components, more efficient manufacturing, and designs that make installation easier for floating offshore wind; new types of mooring systems; electrical infrastructure to deliver highly efficient power transmission from floating offshore wind; and sensors and data communications, including asset monitoring.

Marine energy will experience rapid growth over the next decade, and Cornwall has demonstrated that it can play a world-leading role in its future development.

Below: Principle Power

Global OTEC: Ocean Thermal Energy Conversion (OTEC) is a process where solar heat energy stored in our oceans is extracted and turned into useful energy, such as electricity. Global OTEC plans to use OTEC technology to provide green energy to 'off-grid' islands across the tropics. The company has now entered into a partnership for the deployment of the world's first commercial floating OTEC platform in 2024, which will be located in the Democratic Republic of São Tomé and Príncipe, in West Africa. In November 2022, a proposal led by Global OTEC was awarded €3.5m from Horizon Europe and UKRI. This will be used to support 'PLOTEC', a consortium formed by industry and research institutions that aims to design an OTEC system that is capable of surviving extreme environmental conditions.

FLOATING OFFSHORE WIND IN THE CELTIC SEA IS A HUGE AND EXCITING OPPORTUNITY FOR THE REGION. MARINE-I HAS SUCCESSFULLY ACCELERATED INNOVATION IN THE SUPPLY CHAIN, SUPPORTING OUR TALENTED LOCAL BUSINESSES AS THEY

RISE TO THE CHALLENGES AND INVENT INGENIOUS SOLUTIONS.

Steve Jermy, CEO, Celtic Sea Power

As these industries continue to develop, they will have a ripple effect that will create new opportunities across the supply chain in Cornwall and the Isles of Scilly. The rapid growth of floating offshore wind will generate new challenges to be solved by ingenious local engineering and

CASE STUDY: INYANGA TECH

AT THE CUTTING EDGE OF TIDAL ENERGY TECHNOLOGY



HvdroWina turbines

THE INNOVATION

Inyanga Tech has launched an innovative tidal energy project called HydroWing, which is based on a full-systems approach targeted at subsea tidal energy arrays. Richard Parkinson, Managing Director of Inyanga Tech explains:

"The HydroWing technology greatly reduces the dependency on offshore construction vessels during the construction phases and eliminates the need for these vessels during the O&M phase.

"This is achieved through focus on weight reduction and modularisation, using tried and tested subsea construction methods. This also makes the technology more viable for remote areas where specialised vessels are not available."

THE IMPACT OF MARINE-I

The project has received grant support from Marine-i which has enabled the recruitment of two specialised research project engineers. Invanga Tech has also gained additional support from University of Exeter, who undertook research looking at operations, maintenance, reliability and yield analysis. Richard Parkinson says:

"This exciting project is right at the cutting edge of innovation in tidal energy technology. This research work will help build the business case and accelerate commercialisation of the technology.

"The HydroWing project is the realisation of

years of experience within our team to develop a collaborative solution to commercial exploitation of tidal energy. Our work with Marine-i helped us to rapidly develop towards first demonstrator status."

FURTHER DEVELOPMENTS

Since working with Marine-i the HydroWing technology has gained widespread attention within the industry. In September 2022, the company signed a Memorandum of Understanding with the state-owned company, Indonesia Power, to support and develop tidal energy projects in Indonesia.

With increasing cost of fossil fuels, energy transition from diesel generators and coal power plants to renewable energies is vital for lots of remote islands in the eastern Indonesian archipelago. Both teams will jointly study selected sites to build a first of a kind business case and pilot project. Together with solar energy and battery storage, tidal energy will provide the baseload of a reliant and clean energy system.

Commenting on this latest development, Richard Parkinson says:

"We view Indonesia as a prime market for our technology with an excellent resource and increasing demand for clean and reliable energy. This MOU with Indonesia Power, is pivotal for us and our local partners to move rapidly towards significant commercial scale projects in the Archipelago."

CASE STUDY: MARINE POWER SYSTEMS

DEVELOPING NEW MARINE ENERGY TECHNOLOGY

Marine Power Systems (MPS) is revolutionising the way in which we harvest energy from the world's oceans.

Their flexible technology is the only solution of its type that can be configured to harness wind and wave energy, either as a combined solution or on their own, in deep water. Built on a common platform their devices deliver both cost efficiency and performance throughout the entire product lifecycle.

Their structurally efficient floating platform, PelaFlex, brings excellent stability and straightforward deployment and maintenance. Their PelaGen wave energy converter represents advanced technology and generates energy at an extremely competitive cost.

WORKING WITH MARINE-I

MPS engaged with the Marine-i team which, as well as providing access to the testing facilities and research expertise at University of Plymouth's COAST Lab, helped source an office location to support sea-trials of their medium scale prototype at University of Exeter's FaBTest site and provided introductions to the Cornish marine energy supply chain for help with deployment and maintenance work.

Testing and development went through a number of key stages:

• Scale model testing at Coast Lab, which showed how these devices would perform in typical ocean conditions and examined their performance on key aspects such as stability, survivability and power output. This testing also validated the



MPS in-house computer simulations

 Supporting sea-trials of the medium scale prototype at FaBTest. These trials successfully demonstrated functionality and the ability to successfully generate zero-carbon electricity.

• Further COAST Lab tests. These allowed the team to fine-tune their technology and also explore the potential use of the device as a floating platform for wind turbines.

ONWARD TESTING

In May 2021, MPS announced that the Biscay Marine Energy Platform, in Northern Spain, has been chosen for the deployment of a grid-connected megawatt scale commercial demonstrator.

The site offers ideal deep water testing conditions and a direct connection into the electricity grid. This project will prove the reliability and effectiveness of their technology at scale as well as support the certification process.

THE IMPACT OF MARINE-I

Craig Whitlam, Lead Engineer for MPS, says: "We are delighted with the support that we have received through the ongoing relationship with University of Plymouth and the team at COAST Lab as well as from Marine-i, the University of Exeter FaBTest team and the local supply chain. The success that we have achieved with these trials has enabled MPS to take significant steps towards commercialisation of our new technologies."

Left: Marine Power Systems

CASE STUDY: MOR ENGINEERING

HEI PING MOR ENGINEERING DEVELOP NEW MOORING LINE SOLUTIONS FOR FLOATING OFFSHORE WIND

THE CHALLENGE

Offshore Renewable Energy Catapult estimates that if 95GW FLOW turbine capacity was installed by 2050, this would require 23,223 mooring lines. There is a real need to understand the performance and integrity of the flexible materials that would be used for some of these lines, and how they react to the harsh conditions that they will be used in.

Below: DMaC Test Facility



Dr Sam Weller of Mor Engineering explains:

"The technologies which are currently employed for measuring strain and displacement tend to be generic equipment which require marinization, can be unreliable in hostile environments, or have limited operational lifetimes. Therefore, we wanted to develop a new approach to condition monitoring systems - one that is specifically designed for the marine environment."

TESTING THE NEW CONCEPT

The business engaged with the Marine-i project for support in testing their new concept. This was carried out at the DMaC testing facility run by University of Exeter, with the research overseen by Jonathan Maiden, who says:

"DMaC was the perfect test facility for this project. The rig is capable of replicating dynamic tensile forces up to 20 tonnes, static tensile forces up to 40 tonnes, and displacements up to 1m. Our team worked closely with Mor Engineering to ensure that the testing regime yielded the exact data that they needed."

MOVING THE INNOVATION FORWARD

Dr Sam Weller says:

"We were really pleased to have this expert testing support from the Marine-i project, which enabled us to fully assess the performance of this new concept.

"Marine-i funding has enabled Mor Engineering to carry out proof of concept work on two mooring line condition monitoring approaches by subjecting fabricated prototypes to a series of quasi-static and dynamic tests using DMaC"

Prof Lars Johanning, Programme Director for Marine-i says:

"The work being carried out by innovative Cornish companies such as Mor Engineering will be crucial in enabling us to realise the full potential of Floating Offshore Wind in the Celtic Sea and beyond. These pioneering businesses are advancing our knowledge and understanding in ways which will have worldwide implications for the marine renewable energy industry."

CASE STUDY: **REFLEX MARINE**

AN INNOVATIVE ANCHORING SOLUTION FOR FLOATING OFFSHORE WIND

Building on their experience in marine and offshore engineering sector, Reflex Marine has now turned its attention to developing a new system for anchoring floating offshore wind (FLOW) installations. Their Chief Executive Officer, Philip Strong, explains:

"Mooring FLOW turbines cost-effectively and reliably presents a considerable challenge and one of significant commercial importance to the sector. The design of the anchor is key to developing cost effective moorings."

THE INNOVATION

JAVELIN is an innovative concept which changes the paradigm for high performance moorings for floating offshore wind applications. It is differentiated from existing mooring solutions in that the anchor is installed in a borehole deep below the seabed, in higher strength geological formations. It is then locked into the borehole using a novel technical solution.

The JAVELIN concept makes use of established offshore drilling techniques to economically drill boreholes for the anchors. Special deployment methodologies are also under development to reduce installation costs.

Philip Strong says: "JAVELIN is particularly well suited for high angle loadings required for tautline mooring systems. This will be key to allowing denser spacing of wind turbine generators, which is critical to field economics. This means JAVELIN will offer a reliable, low-cost anchor solution suitable for a wide range of water depths, seabed geologies and mooring system designs."

WORKING WITH MARINE-I

Reflex Marine engaged with the Marine-i project to gain valuable RD&I support in developing JAVELIN. They were supported by Marine-i partners, Offshore Renewable Energy Catapult and University of Exeter. A structured research programme covered design and modelling, materials selection, component testing at DMaC, and anchor performance testing.



TECHNOLOGY

Simon Cheeseman of Marine-i partner, Offshore Renewable Energy Catapult, says: "The JAVELIN system could have significant impact on FLOW development by providing a low-cost option for multiple installations in 'traditional' target FLOW locations. It would also deliver a solution for taut leg moorings supporting high-density turbine deployment."

Prof Lars Johanning, Programme Director for Marine-i, says: "Most rival technologies were developed 30 years ago for the oil and gas sector, which was far less sensitive to the system costs, since moorings were deployed at a scale far smaller than will be required for FLOW. Reflex Marine have come up with a new solution that is geared to the specific needs of today's FLOW operators."

possible."



THE POTENTIAL OF THE NEW

Philip Strong adds: "It is great having access to the specialist RD&I expertise that is available to us through the Marine-i project. This is helping us develop and commercialise the JAVELIN concept at a much faster rate than might otherwise be

Reflex Marine avelin trial

CASE STUDY: TUGDOCK

A REVOLUTIONARY PLATFORM FOR FLOATING **OFFSHORE WIND** CONSTRUCTION

A platform designed to aid in the building and launching of floating wind turbines has been researched with support from Marine-i.

The innovative design has been created by Tugdock Ltd, which is based in Falmouth, Cornwall. The company has patented and produced a novel floating solution to lift structures for various uses.

THE INNOVATION

Lucas Lowe-Houghton, Director of Business Development for Tugdock, explains:

"The Floating Offshore Wind sector is growing fast worldwide, with enormous opportunities now emerging in the Celtic Sea and beyond. However, very few ports have sufficient water depth and assembly space to enable the commercialisation of these huge turbine floaters.

"Tugdock solves this problem. Our submersible platforms can operate in as little as 5 metres draft, enabling a more efficient construction. The platform is then towed to deeper water for launching of the turbines. Our platform is modular, easy to erect, and reusable.

"The Tugdock solution potentially means that a much larger number of UK ports could be involved in the fabrication of these structures, creating many new jobs."

More than 8% of the total cost of a Floating Offshore Wind farm is accounted for by assembly and installation. Therefore, any innovation that allows this process to be carried out more efficiently and quickly would have a big impact on profitability for developers.

Marine-i partner Offshore Renewable Energy Catapult carried out significant desk research for Tugdock, helping them to define the market potential. The company also received grant support from Marine-i.

Simon Cheeseman of Offshore Renewable Energy Catapult said: "The development of floating offshore wind energy in the Celtic Sea



is a huge opportunity for Cornwall and the South West. Enabling this technology to reach its full potential will require new thinking and innovative solutions from potential suppliers, just like those being proposed by Tugdock. The Tugdock innovation also has global potential."

Lucas Lowe-Houghton adds:

"We are very grateful for this support from Marine-i. Having access to this level of research

expertise really helped to accelerate the development of our unique technology, opening up a fast growing global market for us. We are now looking forward to launching our first commercial product on the water in 2023."

Above: Tugdock, Falmouth Harbour

MARITIME OPERATIONS AT THE CUTTING EDGE

THE SUPPORT THAT WE HAVE WE RECEIVED FROM MARINE-I HAS ENABLED US TO PROGRESS WITH OUR PROJECT. IT IS BREAKING COMPLETELY NEW GROUND FOR MOORING SYSTEMS, SO HAVING ACCESS TO THE WORLD-CLASS RESEARCH EXPERTISE AVAILABLE FROM THE MARINE-I PARTNERS HAS BEEN CRITICAL IN PROGRESSING THE MODELLING OF THE NEW DESIGN. IF SUCCESSFUL, THE IMPACT OF THIS NEW MOORING SYSTEM ON FALMOUTH HARBOUR OPERATIONS WOULD BE FELT FOR MANY YEARS TO COME.

Miles Carden, Chief Executive of Falmouth Harbour

New technology is transforming the world of maritime operations, and innovative businesses are rising to the challenge. However, many of these innovators are SMEs with limited R&D resources.

Through working with Marine-i, these businesses could gain access to researchers, scientists and engineers right at the cutting edge of marine technology. Our experts worked alongside their teams to help identify opportunities for new products or services, then helped devise a development plan to bring the innovation to market more quickly and with a greater chance of long-term success. To help in this process, Marine-i could arrange trials at a range of worldclass testing facilities.

Marine-i also encouraged businesses that are new to marine technology to use their expertise to diversify into the sector, in fields such as software, sensor technology and advanced engineering.

INFORMATION TECHNOLOGY

4 Earth Intelligence is planning to use space data to aid in the development of floating offshore

windfarms. Satellite Earth Observation can provide data on a range of indicators, including weather and sea state, environmental impacts, vessel activity and thermal signatures.

3DMSI has created technology that provides a 3D scan of the interior and exterior of a ship, including its systems, and synchronises this with the data provided by the ship's own onboard sensors. Once this total scan package is completed, it can be used by design engineers and shipyards to offer a superior service of care to vessels wherever they are in the world.

Navimeteo has developed the first weather forecasting system that will capture real-time marine weather data from vessels, and then share that 'live' data with other vessels. This is a worldfirst that will help ship captains make better, safer and more cost-effective operational decisions.

TouchByte has invented a face recognition security system for the marine industry. Using biometric technology, an image is taken of a user, which is converted irreversibly to a series of numbers that details measurements between the eyes, nose, and face shape. This information is then used to either grant or deny access to a particular part of a ship and is incredibly secure.

OCEAN SURVEY

Feritech Global has designed the world's first autonomous subsea vehicle specially designed for geotechnical survey work. Such a design will result in safer, more efficient and cost-effective seabed survey operations and revolutionise the geotechnical survey industry.

Unmanned Survey Solutions is a leader in smart hydrographic survey technology. Their latest generation of Unmanned Surface Vessels, the Accession class, is designed for the open sea and could play a valuable role in surveying offshore assets such as floating windfarms. It also has the potential to launch and recover autonomous aerial survey drones.

Ultrabeam Hydrographic is an award-winning business specialising in high quality hydrographic and geophysical surveys – using autonomous survey vehicles that they have designed themselves. Their clients include ports and harbours, utilities, offshore renewable energy, oil and gas companies, and public sector. In 2021, Ultrabeam received a £500,000 grant from the MOD to develop a semi-autonomous reconnaissance and survey system to help the military cross obstacles such as rivers, streams, bogs and other so-called 'wet gaps'.

Carrick Engineering is a precision engineering company that makes specialist equipment for the marine industry. They are developing an improved thermal probe for a cone penetration test to be used in subsea geotechnical surveys.

OPERATIONAL SOLUTIONS

WorkFloat has created a unique 'foldable' floating work platform that can be towed behind a 4x4 or shipped in a standard container. This awardwinning product has been supplied to the Bahrain Defence Force and is now in its second phase of design.

Submarine Technology Limited has designed a ship-based multi-axis robotic arm for autonomous operations. It will form part of a new Autonomous Synchronised Stabilised Platform to enable intervention tasks to be carried from Autonomous Surface Vessels. Typical tasks will include equipment transfer and payload management, survey and inspection, launch and recovery.

Bisen Technology Investment has developed a global transport and delivery system for hovercraft, which are widely used in search and rescue operations and for humanitarian aid. These activities often take place in difficult to reach locations. Their system works with existing air transport systems while allowing space for a 26foot hovercraft.

Morek Engineering identified an opportunity to create an innovative software tool that will allow

PORTS AND HARBOURS

Falmouth Harbour is developing a pioneering new mooring system to meet the challenge of anchoring very large vessels or platforms without the requirement of very large capacity lifting vessels. It is a modular system which would help to increase the operating capacity of the harbour, without the need for large-scale infrastructure development.

Hayle Harbour has been working on a project to develop small scale tidal ranges for power generation and prove their economic viability. This could open up new markets and clear opportunities to exploit the tidal range, physical conditions and utilisation of existing infrastructure available across much of the UK and beyond.

Mevagissey Harbour is under pressure from global warming and the increased threat of flooding. The trustees carried out a project with Marine-i to see how new technology and information systems could help with their long-term planning. They also explored green technologies, which led to the implementation of solar panels in the harbour, as part of their drive to Net Zero.



their engineers to optimise sea-fastening designs quickly and accurately. One of the key new features in the new tool is the ability to accurately predict project costs, including estimates of labour, materials and mobilisation durations, all of which are often overlooked in the design phase.

The breadth and ingenuity of innovation in maritime operations is really impressive. Not only does this strengthen the supply chain and skills base within Cornwall, it also generates many new commercial ideas with potential global impact in the sector.

Ultrabeam Hydrographic high resolution 3D view of Mevagissey Harbou

CASE STUDY: FERITECH GLOBAL

DEVELOPING THE WORLD'S FIRST GEOTECHNICAL SUBSEA VEHICLE



e: Feritech Global

Marine-i has supported advanced engineering specialist, Feritech Global, in its plan to create the world's first autonomous subsea vehicle specially designed for geotechnical survey work. Such a design will result in safer, more efficient and costeffective seabed survey operations.

THE INNOVATION

Feritech's Managing Director, Rob Ferris, explains more about their new concept:

"Globally, offshore assets require an increasing number of detailed subsea surveys, which often have to be carried out in extremely challenging sea conditions. This is particularly true for the growing floating offshore wind sector, where installation has to take place in very deep waters.

"Using autonomous vessels to carry out geophysical survey work is becoming common place. We now want to design an autonomous solution for geotechnical surveys. Such a vessel needs to be larger than most existing geophysical AUV's in size to accommodate the equipment requirements. But a key part of the project is to investigate completely new methods to obtain the same data as a standard survey but with less (or no) physical sample being required to be taken off the survey site. Once developed, this new solution will have a global impact in reducing the risks and costs associated with geotechnical seabed surveys."

A STRUCTURED RESEARCH PROGRAMME

Feritech engaged with the Marine-i project to get expert help in researching and designing the new vehicle with the following key outputs:

- · To characterise the industry requirements, industry standards and environmental impact assessment (EIA) required for geotechnical subsea surveys
- Specify the physical subsea geotechnical operations needs and corresponding tool requirements
- Design a modular GSV with umbilical to use with modified existing tools
- Research new tools that provide quality geotechnical results without sample transportation off site
- Build a pre-commercial demonstrator

THE OPPORTUNITY

Marine-i Programme Director, Prof Lars Johanning, savs:

"This is exactly the kind of innovative, disruptive technology that Marine-i was set up to support. Feritech's concept could revolutionise the way in which geotechnical survey work is carried out. By reducing risk and costs for developers, it will help accelerate the growth of floating offshore wind in the Celtic Sea, generating a positive economic impact on the local supply chain."

Rob Ferris adds:

"We are very grateful for the support being provided by the industry experts at Marine-i. Their team understand the challenges that we face in creating this pioneering new technology, and they have helped us to develop it at a faster pace than would otherwise be possible."

CASE STUDY: SUBMARINE TECHNOLOGY LIMITED

THE INNOVATIVE ROBOTIC ARM THAT COULD TRANSFORM AUTONOMOUS MARINE OPERATIONS

Submarine Technology Limited (STL) is a consultancy, design, development and 'one-off' project implementation group, specialising in the subsea and offshore industries.

THE INNOVATION

During the first phase of the Marine-i project, STL received support and grant funding for the development of a futuristic robotic arm. The innovation is a ship-based multi-axis robotic arm for autonomous operations. It will enable tasks to be carried from Autonomous Surface Vessels (ASVs). These will include equipment transfer and payload management, survey and inspection, launch and recovery. In the future, ASVs will play an important role in the inspection, servicing and repair of offshore wind farms and other renewable energy technologies.

The purpose was to develop a "synchronousstabilisation" capability whereby the motion of the tool-end of a robotic arm can be synchronised with a moving target. The motion sensing, control system, and construction of a small-scale ASSP arm to demonstrate synchronous stabilisation were successfully achieved.

THE NEXT PHASE

From 2020, STL and Marine-i worked together on the next stage of development of the robotic arm. Dr Sanjay Sharma, Associate Professor in Intelligent Autonomous Control Systems at University of Plymouth, explains:

"The aim of this next stage was to develop a Remote Sensing System to allow STL's hydraulically actuated robotic systems to achieve 'Synchronous-Stabilisation' without the need for data communication between the moving target and the host vessel. Synchronous-Stabilisation will help improve the reliability, success and safety of ship based tasks such as Launch-and-Recovery and cargo/equipment transfer between two floating platforms or vessels.

"The Remote Sensing System adds Machine Vision to STL's sophisticated robotic control systems. This will enable the movement of objects of interest to be tracked relative to a known datum. Movement data will be fed back into the control

planned.

THE IMPACT OF MARINE-I

As well as grant funding, the Marine-i team created a bespoke RD&I programme for STL's new technology. Peter Back, Technical Director for STL, says: "We're really grateful to have had the expert support of the Marine-i team in developing our new technology. The structured RD&I programme that they have worked on with us is helping us bring our pioneering innovation to market quicker than might otherwise be possible. It's also fantastic to have access to world-class testing facilities here in the South West to help us refine and test our approach."

Prof Lars Johanning, Programme Director for Marine-i, says: "Our work with STL is helping to put Cornwall at the forefront of developing a new marine technology for the international offshore energy sector, as well as offering functions in a number of other offshore sectors, including oil and gas and aquaculture."



system allowing robotic arms to synchronise with the object. Typical 'objects of interest' include Autonomous Underwater Vehicles, Remote Operated Vehicles, and Floating Wind Turbines."

This work was completed in 2022 and tested at COAST Lab at University of Plymouth and in Falmouth harbour. Further enhancements are



Left: Submarine Technoloav Limited. RSS Falmouth Sea Trial



Above: Morek Engineering

CASE STUDY: MOREK ENGINEERING

PIONEERING A NEW APPROACH TO SEAFASTENING

Morek Engineering is a specialist offshore operations and technical service provider, focused on innovation and sustainable solutions for the marine industry. The services that Morek Engineering provides span naval architecture, structural engineering, marine operation simulation, project engineering and seafastening.

THE CHALLENGE

Founder Bob Colclough explains: "Morek Engineering has significant expertise in seafastening design for offshore renewable energy projects. This involves detailed engineering design to make sure that components are safely secured to the deck of a ship for offshore operations. Seafastening has a big impact on the speed and effectiveness of deployment - and is a critical factor in ensuring safety at sea.

"As you can imagine, the growth of the offshore market has created some big new challenges in the field of seafastening. Loads are becoming larger, heavier and more difficult to handle. There is also much more variety in size and shape – from turbine blades, to monopiles and towers – each of which require a tailored approach.

THE OPPORTUNITY

"Current seafastening designs go through a multi-stage process with many individual 'manual' calculations. We identified an opportunity to create an innovative software tool that will allow our engineers to optimise seafastening designs quickly and accurately. We engaged with the Marine-i project to support us in the development of this pioneering new approach.

"One of the key new features we have in the new tool is the ability to accurately predict project costs, including estimates of labour, materials and mobilisation durations, all of which are often overlooked during design. This means project costs will be minimised whilst ensuring robust systems are designed that meet stringent client safety demands."

THE IMPACT OF MARINE-I

Morek Engineering was supported by Dr Tessa Gordelier, Business Research Fellow at Marine-i partner, University of Exeter. Tessa explains:

"The software development was broken down into four key stages. First, we needed to collect data on the current design process and its decision pathways, as a foundation for the creation of the software algorithms. Secondly, we took these data sets and developed a process hierarchy. The third stage involved the development of specific modules such as the cost elements. The final stage was the creation of preliminary programming algorithms. These were then tested against the existing 'manual' approach so that we could validate the new methodology and evaluate the cost/time benefits of the new software tool. The result is an innovation that can provide an important step forward for the offshore industry."

Bob Colclough adds:

"We are really grateful to the Marine-i project for their support in helping make our vision a reality. It will be exciting to see our new approach deliver significant improvements for our customers, as the offshore renewables market continues to grow."

CASE STUDY: WORKFLOAT

THE WORLD'S FIRST FOLDING WORKBOAT

THE INNOVATION

WorkFloat has been designed to bridge a gap in the market between small workboats and larger, more expensive workboats and multicats. These larger vessels can only be moved on the road using costly low loaders and then need a crane or hoist for launching and recovery.

Toby Budd, founder and Managing Director of WorkFloat, which is based in Penryn in Cornwall, explains:

"WorkFloat 'folds' up to tow behind a 4x4 on the road or to slide into a standard shipping container. Once afloat, the 8m x 5m 'mini multicat' can lift, pull and carry an impressive deadweight.

"This innovative product has a wide range of applications, including commercial diving, aquaculture, light dredging, oil response, disaster and flood relief, ferry, survey work, sampling, drilling and superyacht support."

THE IMPACT OF MARINE-I

The company received grant support from Marine-i for the initial design work as well as for building a prototype and carrying out full-scale physical testing. Marine-i partner University of Plymouth supported prototype trials for buoyancy and stability. Cornwall Marine Network's Propel project also supported WorkFloat with marketing advice and a grant towards exhibition costs.

WorkFloat went on to be awarded the overall 'Spirit of Innovation' Award at the European Commercial Marine Awards, held at Seawork 2019. The award judges commented:

"WorkFloat exemplifies the innovative ethos and practical value which is at the heart of Seawork. It is exactly the kind of forward-thinking product that people who attend shows such as this are interested in, and it ingeniously fills a gap in the market".

FURTHER DEVELOPMENTS

In March 2022, this unique, foldable 'workboat in a box' was supplied to the Bahrain Defence Force (BDF). Commenting on this important new business win, Toby Budd said:

"It is a massive milestone for the business to design, build, deliver and then commission this

WorkFloat is already designing the next evolution of the system. Dubbed WF1200, it is a modular system that continues to use the benefits of a space frame structure with plastic floats. It has a higher payload capacity, much bigger crane options, larger engines, and can scale to sizes of over 24m. Toby Budd adds:

"Interest in WorkFloat has been significant and we are now costing the new WF1200 system so we can provide quotes to all the enquiries we have had. The new design builds upon what we made for the BDF. It's really simple, and being modular it moves closer in concept to our other product, ScaffFloat, that has become so popular due to its simplicity, low cost and versatility.'

Alex Whatley of University of Plymouth said:

"The WorkFloat team should be congratulated for their ground-breaking innovation, which has such a diverse range of applications in the marine industry and has attracted a huge amount of interest. The level and diversity of contracts and the further product developments in progress show there is massive scope for this product to grow over the coming years."

WorkFloat for the BDF. They have been a fantastic client. I can see how useful it will be for them and look forward to working with them on other projects in the future."

Relow: WorkFloat



MARINE MANUFACTURING

NEW ADVANCES IN MARINE MANUFACTURING

SUPPORT FROM THE MARINE-I TEAM HAS ADDED MASSIVE MOMENTUM TO THIS EXCITING PROJECT AND GIVEN US THE OPPORTUNITY TO ACHIEVE FIRST MOVER ADVANTAGE IN A HIGHLY COMPETITIVE MARKET.

Jackson Fearns, Managing Director, Jaxon Surfboards and Workshops

Cornish marine businesses are using the latest technologies to deliver new solutions across the field of marine manufacturing. In many cases, there are rewriting the rules of what can be achieved with these technologies. The innovations supported by Marine-i span improvements in propulsion, performance and efficiency.

SPECIALIST MARINE COMPONENTS

Openarc Marine has developed a revolutionary hydroelectric generator for use when cruising under sail. The Openarc system has an intelligent coupling system able to control drag and open up a wider range of operation with higher energy yields compared to conventional systems.

Tom White Composites has designed an innovative Loopeye component, which is designed to be used in rigging for highperformance yachts. The new product is designed so that Dyneema rope is embedded within a carbon fibre composite baseplate, creating the lightest and strongest product on the market.

Ripl has developed a Rotary Internal Combustion Engine designed to deliver improvements in power, efficiency, and noise output. It is especially targeted at the marine and aviation industries where electric power capacity, distribution, and weight limitations are likely to be an ongoing blocker for adoption of purely electric vehicles.

Triskel Marine was one of the very first businesses supported by Marine-i. The company created its unique Integrel technology which collects excess energy from a boat's inboard engine and stores it in batteries for later use. The system replaces the need for a standalone generator without compromising engine performance. Stored energy can be used to power equipment such as lights, air conditioning, and refrigerators, thus reducing marina hook-up costs.

LEISURE MARINE

Rush Yachts is designing a 39 foot luxury powered tender (a 'day boat' that would be used by a superyacht.) By considering all aspects of the boat with regard to the use of more sustainable materials, they are aiming to achieve a holistic solution that offers significantly reduced environmental impact, whilst not compromising style or functionality.

Jaxon Surfboards is exploring new ways of producing sustainable surfboards, using new materials combined with innovative methodologies and manufacturing techniques. The way in which many boards are currently produced can be harmful to the environment and to the health of the workforce that makes them. Their process is designed to generate less waste material and also to allow off-cuts to be recycled.

Ratsey Marine Services is developing new, lightweight marine products using advanced materials and 3D-printed parts. The first is a Roto Moulded Light Trailer Board which would be ideal for sailing dinghies and smaller tenders or fishing boats. The second product is a carbon tiller extension which is telescopic and lightweight, easy to use and highly durable.

All of these businesses have identified important commercial opportunities and designed highly innovative ways of meeting their customers' needs. Each of these innovations could generate real international interest. By introducing new thinking and new ways of operating, businesses like these are continually strengthening the marine supply chain in Cornwall.





Above: Rush Yachts



CASE STUDY: OPENARC MARINE

A PIONEERING HYDROELECTRIC GENERATOR FOR CRUISING UNDER SAIL

Openarc Marine is focused on developing smart marine energy systems. They develop technologies which reduce and eliminate dependence on diesel and petrol fuelled electric generators, control energy collection and consumption, and harvest free energy from the sea.

Openarc Marine set out to overcome a number of key drawbacks with existing technologies. Conventional systems couple the turbine directly to the generator, making them drag sensitive and limited in range and output. The Openarc system has an intelligent coupling system able to control drag and open up a wider range of operation with higher energy yields.

THE NEW APPROACH

Openarc Marine Director, Jim Shields, explains: "Our innovative system introduces a completely novel approach to hydro generation, where power transfer between the turbine and the electrical generator is controlled to meet load and drag requirements. The control is fully automated, but the user can set the system to perform along a scale ranging from drag optimised trickle charging, to charge optimised at higher drag

"The new system has a much wider operating range than conventional systems. Most importantly, it provides useful power output at hull speeds well below conventional hydrogeneration systems. The low speed performance, absolute capacity at high speed, and the user control of drag/charge characteristics, make our product unique in the marketplace, creating a significant step forward for our industry."

DEVELOPMENT SUPPORT FROM MARINE-I

Openarc Marine engaged with Marine-i to get support in developing an operational prototype of the new system, including the build of a full size turbine. Marine-i worked with Openarc Marine to develop a programme of activity covering design review, systems design and verification, and prototype testing and analysis.

Prof Lars Johanning, Programme Director for Marine-i, says: "This is a really exciting innovation from Openarc Marine which will have global applications in the leisure sailing industry. This project has the potential to make Openarc Marine a world leader with its pioneering approach to hydroelectric generation."

Openarc Marine Director, Mark Basham, adds: "Support from Marine-i has given us the opportunity to bring this new technology to market at a much faster rate than would otherwise be possible."

Openarc Marine's new product is expected to be launched in 2023.

CASE STUDY: TOM WHITE COMPOSITES

DEVELOPING AN INNOVATIVE PRODUCT FOR HIGH-PERFORMANCE SAIL RIGGING

ABOUT THE INNOVATION

Tom White Composites (TWC) specialises in developing top quality composite components for yachts and superyachts. TWC has been working on an innovative Loopeye product, which is designed to be used with high-performance yachts.

TWC Director, Tom White, explains: "We have developed a unique 'Loopeye' component for high performance sailing applications. In high performance sailing, it is vital that all components on the yacht are as lightweight as possible, as this makes all the difference to performance. Our ambition is to create a next generation Loopeye product for sail rigging, which is the lightest and strongest product available in the market. The new product is designed so that Dyneema rope is embedded within a carbon fibre composite baseplate. This unique product is both lightweight and exceptionally strong.

"The product has been developed at three different scales: 30mm, 40mmm and 50mm. Having developed prototypes for each of the sizes, we needed to carry out some exhaustive testing to ascertain the ultimate tensile strength of each size of prototype. This required us to seek out some specialist research support."

A STRUCTURED TESTING PROGRAMME

TWC engaged with the Marine-i project to get help with this testing and, through Marine-i, were able to gain access to state of the art test facilities. The Loopeye prototypes were independently tested by Research Engineers from the University of Exeter at the Dynamic Marine Component Test Facility, Falmouth Docks, Cornwall.

Dr Tessa Gordelier, from Marine-i partner University of Exeter, says: "We put together a structured testing programme for the three different sizes of Loopeye prototypes. The equipment at DMaC allows us to apply high tensions to these components in a controlled environment, so that we can carefully assess their performance. These tests allowed us to accurately measure the ultimate tensile strength of each size of prototype. The Loopeye products performed extremely well in these tests, and the consistency of their performance is an indication of the high quality materials and manufacturing processes that have been developed by TWC."

Tom White adds: "Toes a huge boost

28 Marine-i

MOVING FORWARD WITH CONFIDENCE

Tom White adds: "The expertise of Marine-i has been a huge boost for this project. It is great to have access to these outstanding test facilities in our local area, and the research support that we have received is invaluable. This testing has confirmed that the product performs as expected and has allowed us to move to the next stage of the project with confidence."

Prof Lars Johanning, Programme Director for Marine-i, says: "It is excellent to see companies like TWC who are innovating and pushing the boundaries of what is possible within their particular field. We are delighted to be able to help them pioneer new product solutions - ones which could have worldwide applications in the high performance sailing industry."

Below: DMaC





MARINE ENVIRONMENTAL TECHNOLOGIES

A VISION OF A MORE SUSTAINABLE FUTURE

Marine technology is a vital industry for Cornwall, and one with excellent growth potential for the future. It will have a huge influence on the economic prospects of the county and will be vital in creating the high value jobs we need.

But growth needs to be built on solid foundations. And smart businesses know that their future will only be sustainable if their businesses work in harmony with the natural environment, while also doing all that they can to protect one of our most precious natural resources – our oceans.

Below is a snapshot of the many projects that Marine-i has supported in this sector, each of which has the potential to make a valuable contribution to the health of our planet.

ELECTRIC PROPULSION

Perpetual Research Consultancy is developing a game-changing technology for charging electric vessels. Wireless charging is already employed for electric vessels, but the company believes this technology could be greatly improved by devising a way of using VHF frequencies for wireless charging. Such a technology could deliver order of

magnitude increases in power transfer, and lead to vastly reduced charging times.

PROTECTING OUR OCEANS

Cleaner Seas Group has set out to tackle the estimated 700,000 microplastic fibres that are shed by our clothes every time we use our washing machines, ultimately finding their way into our rivers and oceans. They have designed a revolutionary washing machine filter to solve this problem.

Evidence Plastic CIC has developed the Tidal Revival mobile app, which enables groups and individuals to evidence the waste they have collected during beach cleans. This creates a database which is made available to academic researchers and policy makers to help bring about positive change.

MARINE CONSERVATION AND AQUACULTURE

ARC Marine is the first eco-engineering company in the UK to specialise in building artificial reefs

to provide a new home for endangered marine life. Their patented invention, Reef Cubes, is a simple interlocking modular system that is straightforward to install on the seabed and is ideal for restoring complex marine environments. Sediment naturally collects in the chambers within the cubes, and provides an excellent new habitat for threatened species.

Research Development UK gathers data from inshore waters to better understand the effect of increasing human commercial and leisure activities in UK coastal waters. They are developing an acoustic monitoring system that could be used to monitor and assess the impact of new activities, such as floating offshore wind, on marine life. This data will be valuable in helping mitigate the impact of these activities on marine ecosystems.

The Cornish Seaweed Company harvests high quality seaweeds from the Cornish coast. Now they are developing a new approach to land-based cultivation, which enables the environmental regimes to be changed to suit the needs of the species being cultured. Potentially, this represents the first commercially viable method to grow high-demand and high-value intertidal seaweeds such as Dulse, Sea lettuce and Nori in Europe, using a modular and scalable system.

Holdfast Seaweed is aiming to create an offshore facility for the cultivation of seaweed. This would require the creation of a new type of seaweed farm infrastructure and innovative approaches to production. They also want to investigate the possibility of using remote offshore energy systems to help support this operation.

Biome Algae is sustainably farming native seaweed in the clean offshore waters of Cornwall. They are researching the possibility of extracting a range of compounds from Biome seaweeds that can be used for substitution of plastics and plastic polymers. The extracts could be applied to produce bio-textiles, packaging and 3D printing.

The National Lobster Hatchery is a marine conservation charity focused on one commercial species – the European Lobster. A vital element of their work is the larval stage of the lobster lifecycle. The National Lobster Hatchery seeks to improve survival at this early, vulnerable stage of the lobster's life and release them back into the wild at an age where they are more able to fend for themselves. The charity is working to develop an improved larval vessel that will help further enhance the survival rates of young lobsters.

As can be seen, this is a very dynamic sector. The Cornish innovators in this sector are highly committed businesses who are leading the way in finding new ways to protect the health of our precious oceans, as well as creating new commercial opportunities.



CASE STUDY: ARC MARINE

PROVIDING VITAL NEW HABITATS FOR MARINE LIFE

THE INNOVATION

ARC Marine is the first eco-engineering company in the UK specialising in nature-based solutions and accelerating reef creation. Their patented invention, reef cubes, is a robust and simple interlocking modular system that is ideal for restoring complex marine environments. Founder & CEO Tom Birbeck says:



ARC Marine reef cubes

"Pretty much all of our world's fisheries are now over exploited, but our reefs can protect the habitat which many of our most precious species rely on.

"Our patented design for each cube features an integral chamber and six passageways which marine creatures can access in the structure. Sediment collects naturally inside the cube and this chamber also provides an excellent habitat for many diverse species."

THE IMPACT OF MARINE-I

Through Marine-i they received grant funding, technical advice, and access to University of Plymouth's

COAST Lab facilities, where they could carry out an exhaustive range of tests that closely mirror real-life ocean conditions. Proving the performance of reef cubes was a vital step in gaining the confidence of customers and helping the product to fulfil its global potential.

A Rapid Innovation Grant was used to purchase diving equipment for conducting vital sea trials, while Marine-i events have provided valuable new learning for their team. Tom says:

"This grant enabled us to carry out extended surveys and eco-mooring installation trials in preparation for a full commercial launch."

INDUSTRY RECOGNITION

In the 2019 Maritime UK Awards, ARC Marine was named Best Start-up of the Year. In 2020, reef cubes

were presented by the World Economic Forum as a sustainable way of repairing some of the damage done to marine habitats by human activities at sea. In his presentation, Tom Birbeck said:

"Reef cubes accelerate reef creation and help repair ecosystems that have been destroyed from centuries of bottom trawling and dredging. The global increase in offshore wind demand provides an unprecedented opportunity to rebuild rocky reef habitats around offshore construction projects which historically have caused damage and often deploy toxic and plastic-laden materials."

The company has now secured investment totalling £2.5m, appointed additional board members with track records in scaling and exiting businesses and received grants from DEFRA and Innovate UK for aquaculture related pilot-projects. It also won recognition at the Rich North Sea Innovation Competition for Oyster Restoration in the depleted Dutch Sector.

ARC Marine won the Innovation Award and Marine Tech Award at Tech South West 2021 as well as the Offshore Achievement award for emerging technology. They also won the RWE Innovation Ecology award in 2022.

Tom Birbeck says: "ARC Marine has developed such a depth of expertise that we now have ambitions to become a global leader in marine eco-engineering and conservation projects. We also believe that, as well as being a huge commercial opportunity, reef cubes will deliver a lasting benefit for the world's marine ecosystems. Our goal is to create the largest man-made reef network throughout the world."

In December 2022, the company announced that the first batch of ARC Marine's intertidal reef cubes had been installed at a breakwater in Newlyn, as part of an Environment Agency trial project. They will protect the coastline and local community from powerful breaking waves, whilst providing habitats for marine life in the intertidal zone, with a design that mimics the natural complexities found at the shoreline.

Alex Whatley of University of Plymouth said:

"Reef cubes is a unique product that could reach a massive global market. Marine-i has been proud to help ARC Marine develop and test their amazing new approach to marine conservation and in particular, its application to marine renewable energy. Their pioneering products have the potential to improve the health of our oceans for generations to come."



Right: ARC Marine reef cubes





CASE STUDY: THE CORNISH SEAWEED COMPANY

CREATING AN INNOVATIVE APPROACH TO SEAWEED CULTIVATION

A LOCALLY HARVESTED SUPERFOOD

The Cornish Seaweed Company (CSC) searches the Cornish coast for the highest quality seaweeds. These are then harvested, washed, dried and packaged by hand, ensuring the highest quality using artisanal practices.

Their aim is to provide consumers with an honest superfood; sustainably harvested, local, edible seaweeds and to introduce these as an alternative food source that is healthy, nutritional, tasty and good for the environment.

Demand for seaweed is growing rapidly. Globally, 96% of seaweed production originates from cultivated sources. In contrast, 99% of seaweed production in Europe originates from wild harvest. Increasingly, the cultivation of seaweed across Europe is seen as a more stable and sustainable supply option.

RISING TO THE CHALLENGE

Environmental, social and regulatory constraints limit the scope for large-scale seaweed farming in coastal waters of England. However, there are also challenges associated with land-based cultivation in water tanks, such as high energy demand and slow growth rates.

CSC have used their experience to develop a completely new system which takes an innovative approach to land-based cultivation and aims to overcome these challenges. CSC Director, Tim van Berkel, explains:

"This form of cultivation that we have developed provides various possibilities for changing environmental regimes to suit the needs of the species being cultured. Potentially, this represents the first commercially viable method to grow highdemand and high-value intertidal seaweeds such as Dulse, Sea lettuce and Nori in Europe, using a modular and scalable system."

explains:

"We worked alongside the CSC team to carry out initial pilot trials and research. These covered key development areas such as system technology and specification; costing of the system components; examining the effect of light quality and intensity on seaweed growth; piloting and testing of the system using a range of different set-ups; and highlighting ways in which the system could be refined and developed.

adds:

"We are really grateful for the support that we have had from the Marine-i team. The research programme that they developed gave us exactly the feedback and information that we needed, and it has taken us a big step forward in our mission to introduce this new technology."



PROVING ITS POTENTIAL

In order to help advance their concept, CSC engaged with the Marine-i project to get support with research and testing. Dr Carly Daniels, Business Research Fellow at University of Exeter,

"Overall, the CSC system prototype showed great potential as an alternative form of land-based cultivation and was shown to reduce some of the shortfalls of more traditional forms of land-based culture that make them costly."

Tim van Berkel of The Cornish Seaweed Company,

Left and below: The Cornish Seaweed Company



THE FUTURE

FOUNDATIONS FOR THE FUTURE

As the Marine-i project draws to a close, it's time to stand back and survey the horizon, reflecting on what we have learnt about the future for marine tech in the region.

We believe that the opportunity is immense.

NOT ONLY HAS MARINE-I HELPED BOOST LOCAL MARINE TECH BUSINESSES, IT HAS ALSO ATTRACTED INWARD INVESTMENT TO



CORNWALL. THE COUNTY IS NOW RECOGNISED AS A WORLD PLAYER IN MARINE <u>TECHNOLOGY</u>

Kate Kennally, CEO, Cornwall Council

FLOATING OFFSHORE WIND – A FAST-GROWING INDUSTRY FOR THE FUTURE

Six years ago, we could not have predicted that floating offshore wind in the Celtic Sea would emerge as the huge opportunity it has. Climate change and the energy crisis created by the Ukraine war have combined to accelerate this opportunity. In response to the energy crisis, the UK British Energy Security Strategy has increased its focus on offshore wind energy.

In April 2022, UK Government increased the target for offshore wind to 50 GW by 2030, of which 5 GW will be floating wind.

The ambition is to establish our region as a world leader in floating offshore wind by 2030, laying the foundations for a new sustainable long-term industry. This will help the UK to be at the forefront of the green industrial revolution as it accelerates its progress towards net zero emissions by 2050.

This has changed the landscape for our marine tech businesses. The opportunities are now even greater. Many of the businesses we have supported are rising to the challenge and coming up with ingenious solutions to the many emerging challenges. In order to scale up to deliver global energy needs, the floating offshore wind industry will need innovative thinking and breakthrough technical solutions around fabrication, installation, operations and maintenance. All of these are areas where the Cornish marine industry excels. It will also open up important new opportunities for our ports and harbours.

As well as providing solutions for the Celtic Sea supply chain, the innovations emerging will have global market potential.

SHINING A SPOTLIGHT ON **BUSINESS POTENTIAL AND HOW IT CAN BE UNLEASHED**

Marine-i has demonstrated how much SMEs can achieve when they receive vital RD&I support.

We are pushing at an open door when it comes to unleashing innovation in the Cornish marine tech

sector. The sector is bursting with engineering talent, imagination and energy. As well as funding, we have been able to give these pioneering businesses access to expert support, world class testing facilities and the opportunity to network and share knowledge. We should not underestimate the importance of having created a platform and a culture where the industry can work together and collaborate to come up with solutions.

Marine-i was important because local innovators often lack the resources to research and commercialise their excellent ideas. As well as expert advice, they benefit greatly from support in areas such as the design and testing of prototypes, to prove the market potential of their innovations. When these barriers are overcome, they are able to generate interest from potential customers and from investors, and their journey towards product launch is accelerated.

Our experience has demonstrated that SMEs benefit from help to understand how to innovate, to interpret the market and to assess the commercial potential of their innovation. They also need support in order to successfully bid for national grants and to gain access to test facilities that are often unaffordable and out of reach.

With the UK Government setting ambitious new targets for the energy sector, it is even more important to accelerate the release of high-end research to SMEs, to help them develop marketleading products and services.



development. Looking forward, it is vital that these pioneering businesses continue to receive the support they need so that Cornish marine technology, which is a vital industry for the county, is allowed to grow to its full potential.

CORNWALL'S FUTURE IS AS A GLOBAL PLAYER IN **MARINE TECHNOLOGY**

Working alongside so many pioneering marine technology businesses over the past six years has made us optimistic and excited about the longterm prospects for the industry in Cornwall.

The breadth of innovation that has taken place is helping to build global awareness of Cornwall as a place that has exceptional investment potential, along with world-class expertise and facilities that can help ambitious marine businesses to expand. All of this bodes really well for the future.

Across the full range of marine energy, maritime operations, marine manufacturing and marine environmental technology, Cornwall is pioneering innovative products and services, including many 'world firsts'.



Marine-i has demonstrated the huge potential that can be released when these businesses are given assistance in the early stages of

The marine technology sector in Cornwall and the Isles of Scilly is on the verge of an amazing new era.

Below: Principle Power



Above: ARC Marine reef cubes



Above: Composite Integration Ltd.



Above: Tugdock Limited



Above: HydroWing



Above: Falmouth Harbour



Above: The Cornish Seaweed Company

LIST OF BUSINESSES

THE INNOVATIVE BUSINESSES SUPPORTED BY MARINE-I

3D Kernow CIC	
3deep Media	
3DMSI	
4 Earth Intelligence	
Acadmy	
Altum Green Energy	
AMOG Consulting	
ARC Marine	
Armada Engineering	
Ben Harris & Co	
Bennamann	
BG Renewables	
Bildr	
Bio Engine Technology	
Biome Algae	
Bisen Technology Investments	
Bluefruit Software	
Buoyant Works	
Butler Yachts	
Camel Fish	
Carnegie Wave Energy UK	
Carrick UK Engineering	
Claxton Composites UK	
Cleaner Seas Group	
Cockwells Modern & Classic Boatbuilding	
Community Energy Plus	
Composite Integration	
Cornish Crabbers	
Cornish Seaweed Company	
Cornwall Ferries	
Cornwall Offshore Renewable Energy Ventu	ures
Cullum Bespoke	
Dick Pearce & Friends	
DigiFab	
Duchy Marine	
Dynamic Edge	
EnSep	
Evidence Plastic CIC	
Fal Energy Partnership	
Fal Fishery Coop	
Fal Oyster	
Falco Drone Technologies	
Falmouth Divers	
Falmouth Harbour Commissioners	
Feritech Global	
Fernfuels	



Fishy Filan Floodmati Fowey Har Frontier Te Fumiguard





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bour Commissioners
echnology Limited
1

Above: Marine-i workshop

THIS IS CUTTING EDGE RESEARCH THAT IS GENERATING ROBUST DATA THAT VERIFIES THE ENVIRONMENTAL IMPROVEMENTS. AS WELL AS HELPING US DEVELOP THE BEST POSSIBLE PRODUCT, WE EXPECT THAT THIS DATA WILL ALSO HELP INSPIRE TRUST WITHIN OUR CUSTOMER BASE, ONCE WE ARE AT THE STAGE OF MARKETING THE NEW DAY BOAT. WE ARE DELIGHTED TO HAVE BEEN ABLE TO WORK WITH THE EXPERT TEAM AT UNIVERSITY OF PLYMOUTH THROUGH THE MARINE-I PROJECT. THIS COLLABORATION IS MAKING A HUGE DIFFERENCE AND ALLOWING US TO FULFIL OUR AMBITION.

WE CONSIDERED OTHER POTENTIAL TESTING LOCATIONS, INCLUDING IN AUSTRALIA, BUT CORNWALL STOOD OUT AS HAVING A NUMBER OF CLEAR ADVANTAGES FOR US. THE INFRASTRUCTURE IN CORNWALL FOR MARINE TESTING IS HIGHLY DEVELOPED AND ADVANCED – THE COUNTY OFFERS

FIRST CLASS TESTING FACILITIES THAT ARE ALREADY PROVEN, AS WELL AS A SUPERB SUPPLY CHAIN IN THE MARINE TECHNOLOGY SECTOR. AND LASTLY, THE AVAILABILITY OF GRANT FUNDING AND OTHER SUPPORT THROUGH MARINE-I HAS ENABLED US TO ACCELERATE THE PROJECT.

David Rowley, Director, AMOG



Gaisford Marine
Global OTEC
Grosvenor Pumps
Gydeline
H&H Power and Control
Harbourside Physiotherapy
Holdfast Seaweed
Hooperberg Creative Collective
iJo Power
Imetrum
Inductive Power Projection
Inyanga Maritime
Inyanga Tech / HydroWing
Isles of Scilly Community Venture CIC
Jack Gifford Naval Architects

Below: ORE Catapult visit



J-Supplied
Keynvor MorLift
Kiote
Kittiwake Labs
KMEx
Lin Gallos
Linked Solutions SW
Lizard Yacht Services
LM Handling
Lutra Marine
Lynher River Barge CIC
Marine Hardwoods
Marine Lab
Marine Minerals
Marine Power Systems
Marine Protective Films
Marine Resource Management
Mevagissey Harbour Trustees
MintMech
ML Engineering Design
Mor Engineering
Morek
Morwind
Mylor Sailing School
National Lobster Hatchery
Navimeteo
Ocean Hydraulics (UK)
Openarc Marine
Otter Surfboards
Oxi-Tech Solutions
Paddle Logger
Palmer Fabrications
Pangeotek
Pelagic Design
Perpetual Research Consultancy
Peter Child Associates
Piran Composites
Planet A
Predn Surf Co
Pro-Foam
Progress Engineering Limited
Protectology
Pump International
RAD Propulsion
Ratsey Marine
Rebel-Tech
Reflex Marine
Research Development UK
Resilient Coasts
Riggers UK
Ripl
River Boatyard

Jaxon Surfboards and Workshops



Rock Pool Project	Ultrabeam
Rooted Ocean	Ulu Adver
Rush Yachts	Unmanne
Sailors Creek	Ver Facil
Seareaper	Water Pov
Sellectronics	Wave Ven
Shane Carr	Waveblad
Skratch	Waves4Pc
Solis Marine Engineering	Whiskerst
St Aubyn Estates	Wills Ridle
Submarine Technology Limited	Windrace
Subsea Minerals	WITT
Subterandt	Wolfram N
Swathe Sales and Support	WorkFloat
Tide Mills	Zero Carb
To The Sea Falmouth	
Tocardo	
Tom White Composites	
Toniq Composites	The Mari
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TouchByte	breaking
Tradewind Cargo	becomin
Triskel Marine	Their tal
Trivane	creating
Truro Boat Services	tech sect
Tugdock	
Turbulent Simulations	A big tha
Tyn X	of the Ma
Uali Drones	

Ultrabeam Hydrographic
Ulu Adventure
Unmanned Survey Solutions
Ver Facil
Water Power Technologies
Wave Venture
Waveblades
Waves4Power UK
Whiskerstay
Wills Ridley
Windracers
WITT
Wolfram Marine
WorkFloat
Zero Carbon O&M Services

The Marine-i team feels privileged to have worked with these ambitious, groundbreaking businesses, many of which are becoming world leaders in their field.

Their talent, energy and innovation are creating a bright future for the marine tech sector in our region.

A big thank you to all for having been part of the Marine-i programme.

Above: Morek Engineering

66

FOR A NEW BUSINESS LIKE OURS, HAVING ACCESS TO THE WORLD-CLASS RESEARCH SUPPORT THAT IS AVAILABLE THROUGH MARINE-I HAS BEEN A HUGE BOOST. IT IS HELPING US MOVE OUR NEW TECHNOLOGY TOWARDS COMMERCIALISATION AT A MUCH FASTER PACE THAN WOULD OTHERWISE BE POSSIBLE.

Patrick Maletz, Falco Drone Technologies





www.marine-i.co.uk