UNIVERSITY OF Southampton

Power your business. Marine expertise & innovation

About us

The Southampton Marine and Maritime Institute (SMMI) is a unique internationally recognised centre of excellence where experts from all disciplines come together to tackle global maritime challenges, in partnership with business, civic and industrial societies. We have 1000+ researchers working on cutting edge maritime projects, all with a passion to change the world through their research collaborations with global partners.

The University of Southampton has a rich history of marine research and innovation. With over 60 years of maritime experience behind us, the SMMI was officially launched in 2012, in collaboration with Lloyd's Register. We are establishing a wide network to benefit the local, national, and international maritime economy. We support research collaboration and knowledge partnerships, providing access to expertise, laboratories and test facilities contributing to a growing maritime innovation cluster.

Working with you

We seek industry partners to come forward with research proposals. Whether it's for accessing new skills, assistance with research and development or an immediate business-critical consultancy need, our expertise and facilities are accessible to the world's business community and all charities and heritage-based organisations with a maritime focus.

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Global Technology Centre

At Southampton our excellence in marine and maritime research is anchored in the port heritage of our city. Our world-leading research forges business partnerships across the globe. A significant feature of our work is the linkage of fundamental research with potential application. This is embodied by Lloyd's Register's involvement with Southampton in its largest collaboration with any single university anywhere in the world, and will see the company locating its Global Technology Centre on the University's new Boldrewood Campus.

"The opportunities for collaboration that Southampton offers within the UK are really attractive" says Tim Kent, Marine Technical Director at Lloyd's Register. "We develop technical standards called Classification Rules that are built on engineering technical capability, underpinned by our research programme and delivered by highly-experienced engineers of all disciplines. In order to keep up with the fast paced industry and the increase in the range of technologies available on ships, it is really important that we work closer with academic institutions so we have the edge over our competitors."

"The SMMI is a ground-breaking collaboration with the ambition to become a world-leading centre for innovation, business and education - providing a focal point for organisations from around the world to conduct leading-edge research and application of technology on a collaborative basis"

Tim Kent
Marine Technical Director, LLoyd's Register

The Wolfson Unit is one of the most respected marine design consultancies in the world. Its many high profile clients include the designer of yachts for the Vendée Globe, as well as America's Cup teams and the designer of Puma. The Unit is an Innovation Partner for UK Sport.

"The Wolfson Unit are connected with most of the high quality shipyards and design studios all over the world and have now become an essential part of the process of yacht design and performance. Wolfson are one of the premier tank test units in the world".

Ron Holland
Ron Holland Design

Marine research expertise

We aim to link fundamental research with potential real world applications. We have forged strategic partnerships with leading organisations, including Lloyd's Register, RNLI, BAE Systems Maritime, Shell Shipping and Rolls Royce. Our 60-year history of industrial research collaboration makes us an ideal research and innovation partner for the marine industry.

Around 40 per cent of UK-funded research at Southampton is financed by industry and public sector organisations.

Researchers work with all types of businesses to support the development of new products and innovative processes and our partners can gain access to government and European Union (EU) research funding.

Facilities

3D Chirp
Surface-towed sub-bottom profiling system capable of imaging the sea bed in 3D

Computer science facilities
Most powerful academic supercomputer in England, world-leading computational fluid dynamics excellence, plus software and hardware capabilities

Experimental fluid mechanics
Towing tanks and largest wind tunnel complex within any UK university available for commercial use. New facilities under development include: boundary layer wind tunnel, matched refractive index tunnel, anechoic wind tunnel and the largest academic hydroscience towing tank in the UK

Human factors
Motion simulators and human–machine interfaces

Imaging
Largest high-energy micro-CT scanner in Europe, world's first commercial helium microscope, scanning electron microscopy and X-ray diffraction

Laboratories
Coral reef laboratory, pressure laboratory, research aquaria and mesocosms, plus others

Marine core scanning
Home to the UK's national deep-sea core repository

Ocean chemistry
Elemental analysis and stable, organic and radiogenic isotope mass spectrometry facilities

Operational research
Logistics optimisation and supply chain management

Research vessels
Variety for commercial hire

Reverberation and anechoic chambers
World leading facilities for noise testing

Seafloor controlled source electromagnetic prospecting

Tribology and materials
High-speed erosion and wear testing

Marine research expertise

Key research areas
Coastal and shelf seas processes
Concurrent engineering and supply chain efficiency
Condition monitoring
Efficient and novel propulsion for maritime vessels
Environmental monitoring, surveillance and sensor development
Geochemistry and radiochemistry
Human factors
Marine and offshore renewables
Marine autonomy and control
Marine ecosystems and biodiversity
Marine geology and geophysics
Maritime archaeology and heritage preservation
Maritime law
Oil and gas
Ocean biogeochemical cycles
Palaeoceanography and palaeoclimate
Physical oceanography and climate modelling
Ship design and naval architecture
Structures, materials and coatings
Marine resources and sustainable resource development

Working with SME's

KTP with CJR Ltd
CJR Propulsion is a world leader in the design and manufacture of shafts, propellers, rudders and other associated stern gear for a variety of marine vessels, such as larger pleasure boats, ferries and other working boats. CJR worked with us to produce a propeller and associated stern gear package for boats that can be manufactured within a commercially viable cost and time frame, effecting a significant step change in the company's business processes.

KTP with Geotek
Geotek specialises in the analysis of geological cores. We worked with Geotek to develop new pressure core handling and analysis apparatus, exploring methods for the analysis of the engineering properties of marine sediments at high pressure. These developments provided Geotek with a significant and exclusive strategic advantage in marine sediment core analysis and help facilitate the company's plan for growth in the marine sector.

KTPs and sponsored PhDs with TSL
TSL Technologies provides market-leading electomechanical, instrumentation and microhydraulics equipment, power electronics and motors for the energy and marine industries. They are working with us to investigate and develop new power electronic converters for electric motor drives and interfacing of renewable energy sources, including wave and marine turbines, to the grid.

"The technical reputation we gained working with the University of Southampton allowed us to win customers as diverse as the Indian Navy and Blohm + Voss, builders of some of the largest super yachts in the world"

James Grazebrook
Founder, Halyard Marine

Key challenges

Trade and transport

Trade and transport is transforming the safety of ships, the goods they transport, and for crew and passengers too. Our work encompasses technological aspects,working towards safe shipping and ship designs, legal instruments governing shipping management, logistics and supply chain management and the underlying impact of the maritime trade driven economics on the nation states' welfare.

Areas include:
- Autonomous underwater vehicles
- 3D ship hydrodynamic modelling
- Anti-fouling coatings
- Cable system testing
- Damage and corrosion assessment
- Design testing
- Lightweight and high performance marine structures
- Low carbon and energy efficient shipping
- Noise and vibration
- Ship safety
- Supply chain management
- Tribology

Society and government

Society and government focuses on understanding and preserving cultural heritage, and homes and communities around coastlines. Our expertise in this domain includes issues relating to governance and planning in coastal regions owing to climate change patterns, technological innovations to ensure the safety of people, tourism and leisure activities, to the historical evolution of societies in port cities.

Areas include:
- Heritage management
- Human factors
- Information technologies
- Logistics
- Maritime archaeology
- Maritime history
- Maritime law
- Maritime sport performance enhancement
- Port development
- Risk research
- Transportation infrastructure

Energy and resources

Energy and resources is developing ways to utilise the ocean to provide us with new forms of energy, mineral resources, food and even medicine. Our interests range from understanding of the basic sciences influencing the search for energy and seabed resources, the technology for managing and extracting them and the legal instruments for exploiting such resources.

Areas include:
- Anthropogenic (man-made) noise
- Cliff and coastal erosion
- Carbon capture and storage
- Deep sea mineral resources
- Energy harvesting
- Flood modelling and defence
- Marine ecosystems
- Oil and gas
- Offshore energy systems
- Oil spill research
- Satellite oceanography
- Sea levels
- Seabed management
- Sediment dynamics
- Sonar system development
- Spatial technologies and 3D modelling
- Tidal turbines

Climate and environment

Climate and environment explores the oceans and how our environment is influenced by climate and by man's activities in the oceans. Our expertise covers the basic sciences exploring the behaviour of the ocean environment and in particular the response to climate change, to the legal instruments defining the use of the maritime and ocean space.

Areas include:
- Biogeochemical cycles and modelling
- Climate change
- Coastal oceanography
- Data capture and management
- Geochemistry
- Geographic Information Systems
- Global ocean circulation models
- Hydrographic surveys
- Marine ecosystems
- Ocean modelling and forecasting
- Underwater acoustics
- Waste management

National Oceanography Centre Southampton (NOCS)

NOCS is a collaboration between the University of Southampton and the Natural Environment Research Council's National Oceanography Centre. It is one of the world's leading centres devoted to research and technology development in ocean and earth sciences. NOCS also provides large-scale infrastructure and support for the UK marine research community.

Facilities for hire
A range of state-of-the-art marine facilities on-site are available for hire:
- pressure testing facilities including two pressure tanks
- acoustic test tank
- calibration facilities including temperature and pressure calibration equipment
- research vessels
- direct access to Southampton's Empress Dock providing opportunities for sea-water testing

A range of other specialised equipment covering functions as diverse as sensors and moorings, deep platforms, base engineering, ship scientific systems and marine autonomous robotic systems are available in the National Marine Equipment Pool, the largest centralised marine scientific equipment pool in Europe with a replacement value of around £20M.

Research vessels
Used by staff for a range of fieldwork and research, our purpose built vessels include R.V. Callista, a 19.75m catamaran designed and equipped for a range of coastal and shelf research and a 12m research vessel, R.V. Bill Conway for use in local waters. Other nearshore work can be conducted from our RIB. All vessels are available for hire.

Accessing our expertise

With over 40% of our annual research conducted with industry and being the top UK University for working with SMEs, industrial partnerships are strategically very important to the University of Southampton. Whether you are a large, world-leading company or a more local smaller firm, we are keen to develop long-term, mutually beneficial relationships with you.

Institute of Maritime Law
The Institute of Maritime Law is the leading UK centre for research, professional training and consultancy in maritime and shipping law. Its members, all with considerable practical experience, are regularly involved in law reform with national, regional and international agencies, as well as acting as legal advisers to governments and other public and private organisations.

Institute of Sound and Vibration Research
ISVR provides world-class consultancy in the field of sound and vibration. The Unit provides a range of services for the marine industry, including measurement and analysis of noise emissions, low-noise design, noise and vibration control, plus measurement and modelling. Projects range from work on small craft for the leisure sector through to very large ships and warships.

Research Institute for Industry (RIfI)
RIfI provides consultancy and applied research to support industry in specialist fields of engineering. We can assemble bespoke teams of experts for projects in order to meet the needs of industry. We can provide technical advice, assess, model, test and analysis.

National Centre for Advanced Tribology at Southampton (nCATS)
nCATS provides research and consultancy on marine corrosion and erosion to help solve a wide range of industry problems, including desalination plants, oil and gas valves, pipe systems loss of contaminant, pump impellers and coatings. Test materials include: diamond like coatings, polymeric coatings, high velocity oxy fuel and plasma electrolytic oxidation coatings, nickel aluminium bronze and tungsten carbide based hard metals.

Centre for Complex Autonomous Systems Engineering
We facilitate collaboration between ship scientists, oceanographers, life scientists, cypernetists, space scientists, electronic engineers, computer scientists, control scientists and engineers who develop deployable systems.

GeoData Institute
The GeoData Institute specialises in environmental data management, analysis and processing. Through our in-house specialists, associated academics and range of consultant specialists, backed by leading technologies and resources, GeoData offers wide-ranging, solutions-based services.

Accessing our expertise

The Wolfson Unit
The world-renowned Wolfson Unit operates a consultancy service in ship, yacht and small craft design, naval architecture, marine technology and industrial aerodynamics. The Unit employs a team of full-time professional engineers.

We can provide marine testing services, full scale trials, radio controlled model tests and other specialist services.

We have a developed a suite of marine design software programmes used in offices worldwide. We also design, construct and sell dynamometry tailored to the towing tank and wind tunnel environment.

Centre of Maritime Archaeology
Our Centre of Maritime Archaeology is embedded in one of the largest and most successful archaeology departments in Europe. Integrating cutting-edge science with archaeological and historical investigation, it provides a detailed window to past societies. Researchers at the Centre also work in partnership with industry and government, including the Royal Navy, to develop underwater technologies.

Wind tunnels
Our wind tunnels, including the largest wind tunnel available in the UK University sector, are used for yacht design, sail design and aerodynamics testing. Recent commercial work has included America's Cup yachts, British Olympic athletes and Aston Martin. This work was recognised in 2012 with a Queen's Anniversary Prize for innovation and world-leading expertise in performance sports engineering. It has also featured recently in ITV4Ds coverage of the Tour de France.

Microsoft Institute for High Performance Computing
Simulation and modelling are vital for creating virtual designs of ships and engineering products. The Institute, the only of of its kind in the UK, works closely with industry partners such as BAE Systems, Rolls-Royce and F1 teams to make IT work for them in smarter ways.

Accessing innovative research

Working alongside world-leading academics, with access to cutting edge facilities and global collaborations, our research students are changing our world through innovative research. Just a few examples include:

Developing new materials
Davide Ansovini has a background in Chemical Engineering and is working across faculties with Chemistry and Engineering. The research is mainly focused on the development of new materials for sustainable fuel production using sunlight. Water splitting for the hydrogen production using the solar light is a challenging process that could take an important role in the long term future as a clever way to make energy, diminishing the dependence from a strict centralized energy production and delivery system based on oil and gas. Davide is also strengthening our international research objectives with overseas partner, A*STAR (Singapore).

Improving shipping regulations and ship design to aid sustainability
With a background in Law, Adebowale Awofeso is concentrating her research on the subject of shipping regulation for a blue/green economy. Collaborating with Law and Engineering, she is looking at sustainable development in the shipping industry, legally and technically. This could potentially strengthen the SMMI's link with organisations such as Lloyd's Register, with a keen interest in such developments.

Social aspects of maritime technology: Reverse engineering ancient innovations
Peter Campbell's research examines innovation and technological change by reverse engineering ancient artefacts from archaeological record, such as warships rams recently discovered underwater at a 3rd century BC naval battlefield. Working with Engineering, the National Oceanography Centre, the Winchester School of Art and industry partners like Breuckmann GmbH, this research conducts quantitative analysis of reconstructed technologies in controlled environments.

Predicting future environmental change
Frances Dunn's research focuses on analysing how future environmental changes may affect the delivery of fluvial sediment to a selection of the world's deltas. Sediment retention influences relative sea level change, an important predictor of land loss. Models of sediment flux include factors across multiple disciplines, bridging expertise within geology, hydrology, economics, and computing for geoscience.

Solving short-term problems for industry

We offer a number of ways for companies to access the skills of our scientists, engineers and students to help achieve their business goals and leverage funding. Businesses can access cutting-edge knowledge, technology and skills by working with us on small, short-term projects to solve a particular problem through to multi-million pound research programmes.

Student projects
Sponsoring a student project can benefit your company in a number of ways. Overseen by one of our experienced academics, an industry-sponsored project provides you with high quality specialist input without a large financial burden.

Determining the future of marine composites
Research projects undertaken by Ship Science students for a company specialising in castor oil based products, Bioresin Pty Ltd, Australia, have shown that castor oil could be used for marine structural composite resin systems. Castor oil has a significant environmental advantage over conventional toxic man-made composite resin systems like polyester and epoxy. The student project led to a £250k grant application to the Engineering and Physical Sciences Research Council with added support from industry award winners Ecocats Ltd and the British Marine Federation to accelerate the research.

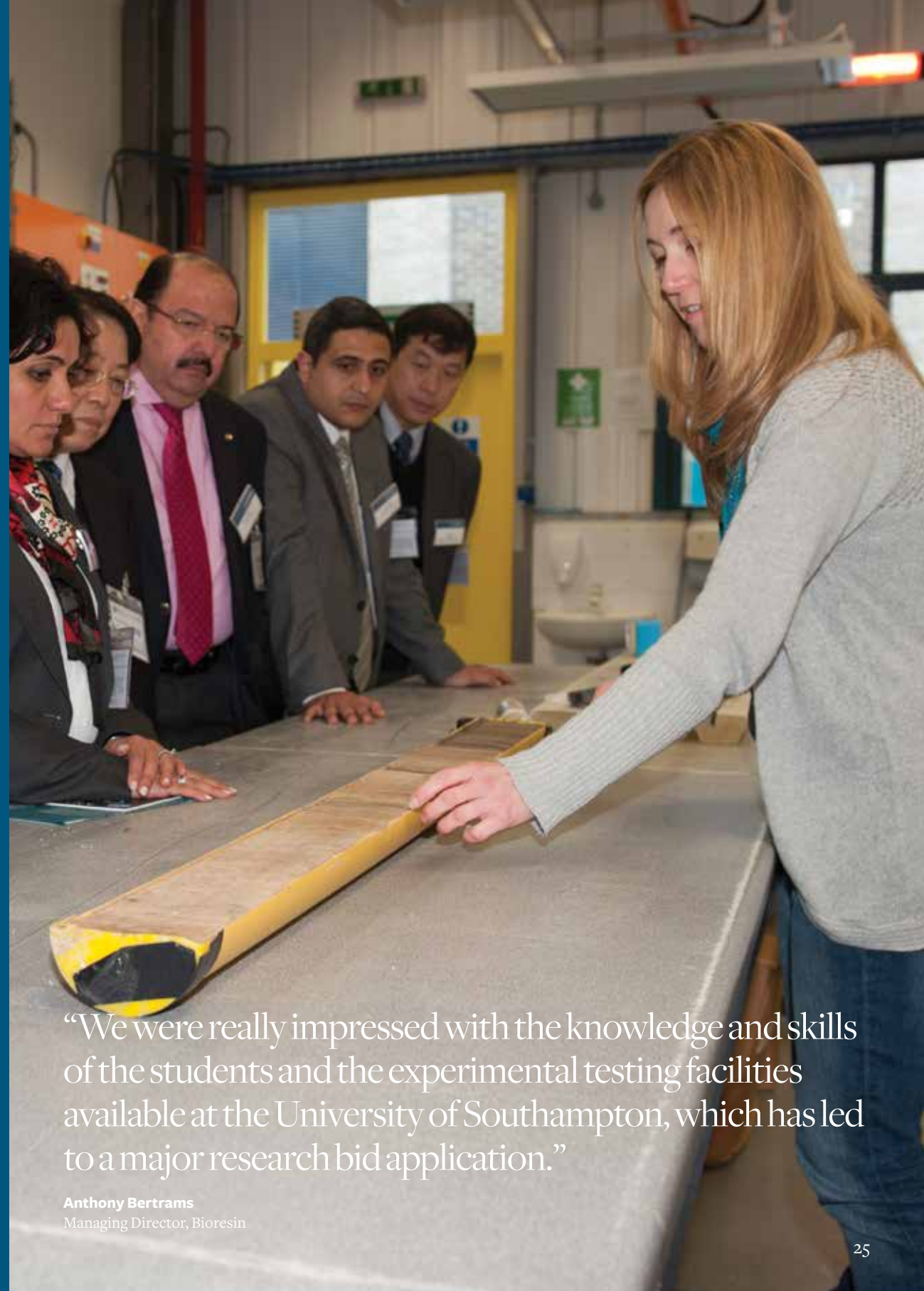
Knowledge Transfer Partnerships (KTP) Scheme
KTP is a UK-wide programme that helps businesses and organisations to improve their competitiveness and/or productivity through the use of the knowledge, technology and skills that reside within universities. Our KTP portfolio is worth over £1.7m. The scheme facilitates direct collaboration between the company and the University via programmes ranging from 6 months to 3-years, enabling businesses to draw on our expertise, facilities and research base.

Product development and improved sales through KTP
Pelamis Wave Power (PWP) Ltd is the manufacturer of a leading technology to generate renewable electricity from ocean waves. A KTP over two and a half years succeeded in developing a unique wave climatology package to facilitate the economic assessment of Pelamis wave energy farms, which led to a direct increase in the profile of the company and sales.

"The innovative results of the KTP have helped put us further ahead of our competitors."
Chris Retzler
Principal Scientist, Pelamis Wave Power

Accessing postgraduate skills and knowledge
There are a number of sponsored programmes in place to allow companies to secure funding to support research, enabling the employment of skilled people in any company which might benefit from the research. Research Councils provides funding through research programmes such as secondments, studentships and our Engineering Doctorate. The industrial sponsor usually funds part of the project and the Research Councils fund the rest.

Helping RNLI to improve lifeboat safety and comfort
Research projects through the Advanced Technology Partnership with the RNLI in Maritime and Engineering are varied. The partnership conducts collaborative research and education and applies this knowledge to solve practical problems in lifeboat design, fabrication and operation. A PhD student undertook a project researching RIB motions, in particular the role of the RIB tube and human factor considerations, to enable the RNLI to look to improve the comfort and safety of the lifeboats for the charity's volunteer crews.



"We were really impressed with the knowledge and skills of the students and the experimental testing facilities available at the University of Southampton, which has led to a major research bid application."

Anthony Bertrams
Managing Director, Bioresin

Maritime courses and professional education

We are at the leading edge of new ideas and forward-thinking research. By sharing the latest knowledge and techniques, we can help develop your skills and strengths based on the latest developments in the maritime field.

Educating future generations of maritime professionals
We offer a highly regarded marine and maritime portfolio - covering everything from marine biology, oceanography and water resource management through to maritime archaeology, maritime law, and ship science.

Professional Development
We have a range of set and bespoke marine related short courses which could cover your staff's professional development and training requirements.

Marine Technology Education Consortium
We offer a number of courses for the marine industry that are coordinated through mtec@work. The Consortium comprises four UK universities that are recognised for their excellence in marine technology education and research - Newcastle, Strathclyde Glasgow, Southampton and University College London. These part-time courses provide graduates with the advanced technical and managerial skills needed to enhance innovation and business competitiveness. www.mtec.ac.uk

"The University's standing in the marine sector is equal to its excellent reputation throughout academia. The Ship Science course is rigorous and demanding, equipping the individual with an unequalled understanding and comprehensive toolset for a successful career".

Dr Stephen M. Payne OBE RDI Principal Consultant PFJ-Maritime Consulting and former VP Chief Naval Architect, Carnival Corporate Shipbuilding

Having graduated in 1984 with a BSc in Ship Science, Stephen began his career at Carnival in 1985 before going on to become the Chief Designer of Queen Mary 2. In 2007 he was awarded an Honorary Doctorate of Science from the University.

Work with the best

Here are some of our people who are changing the world through innovative research.

Ultrasonics and Underwater Acoustics
Professor Timothy Leighton
Research by Tim delivers world-leading engineering advances in acoustics; his pioneering research in bubble acoustics is developing exciting applications in several fields.

Coastal Engineering
Professor Robert Nicholls
Robert's main technical areas of interest are long-term coastal engineering and management, especially the issues of coastal impacts and adaptation to climate change and sea-level rise.

Classical and Historical Archaeology
Professor Simon Keay
Simon specialises in the archaeology of the Roman Empire. He directs the 'Portus Project', answering major research questions around the port of imperial Rome.

Logistics Management
Professor Tolga Bektas
Tolga's research focuses on the modelling and optimisation of distribution logistics with the aim of reducing cost, energy requirements and CO_2 emissions.

Maritime Law
Professor Mikis Tsimplis
Mikis' research covers marine environmental law as well as commercial aspects of shipping law. He is also head of the Institute of Maritime Law.

Human - Computer Interaction
Professor Monica Schraefel
Monica's work explores how and where interactive technologies can support wellbeing for optimal performance and life quality at home, school and work.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1. Professor Timothy Leighton
2. Professor Robert Nicholls
3. Professor Simon Keay
4. Professor Tolga Bektas
5. Professor Mikis Tsimplis

Current maritime research

Helping save lives at sea
Management scientists and engineers joined forces with the Royal National Lifeboat Institution (RNLI) to reduce the operational costs of its fleet. The RNLI is wholly dependent on charitable giving; saving money on operational working means the donations can be used more effectively to save more lives.

A Knowledge Transfer Partnership was agreed between the two organisation. Two recent and talented graduates were recruited to work at RNLI headquarters for two years. The Management graduate was employed to develop computer models to capture the commercial and logistics issues around the costs of building and maintaining the lifeboat fleet. An Engineering graduate explored the technical design issues involved in deciding how frequently boats and their equipment need maintenance, to best manage costs.

"Saving lives at sea costs us £270,000 a day. We wanted to develop ways of delivering the same quality of service at reduced costs."

Daniel Rolfe
RNLI Through Life Manager

Computational fluid dynamics in the marine industry

With one of the most technically advanced facilities in Europe, CJR Propulsion is a world leader in the design and manufacture of shafts, propellers, rudders and other associated stern gear for a variety of marine vessels, such as larger pleasure boats, ferries and other working boats.

Our expert knowledge in CFD modelling gave CJR the capability to produce bespoke, optimal propeller and associated stern gear packages manufactured within a commercially viable cost and time frame. These packages led to reduced noise, vibration, harshness and increased fuel-efficiency, significantly reducing the potential for cavitation erosion at high speed, all giving the company a unique design capability for this industry segment in Europe. The tool is a unique product with respect to its targeted market (small marine/pleasure craft), and CJR has since facilitated its entry into new markets as the modelling processes can be adapted to a new line of products (rudders, shafts, brackets etc).

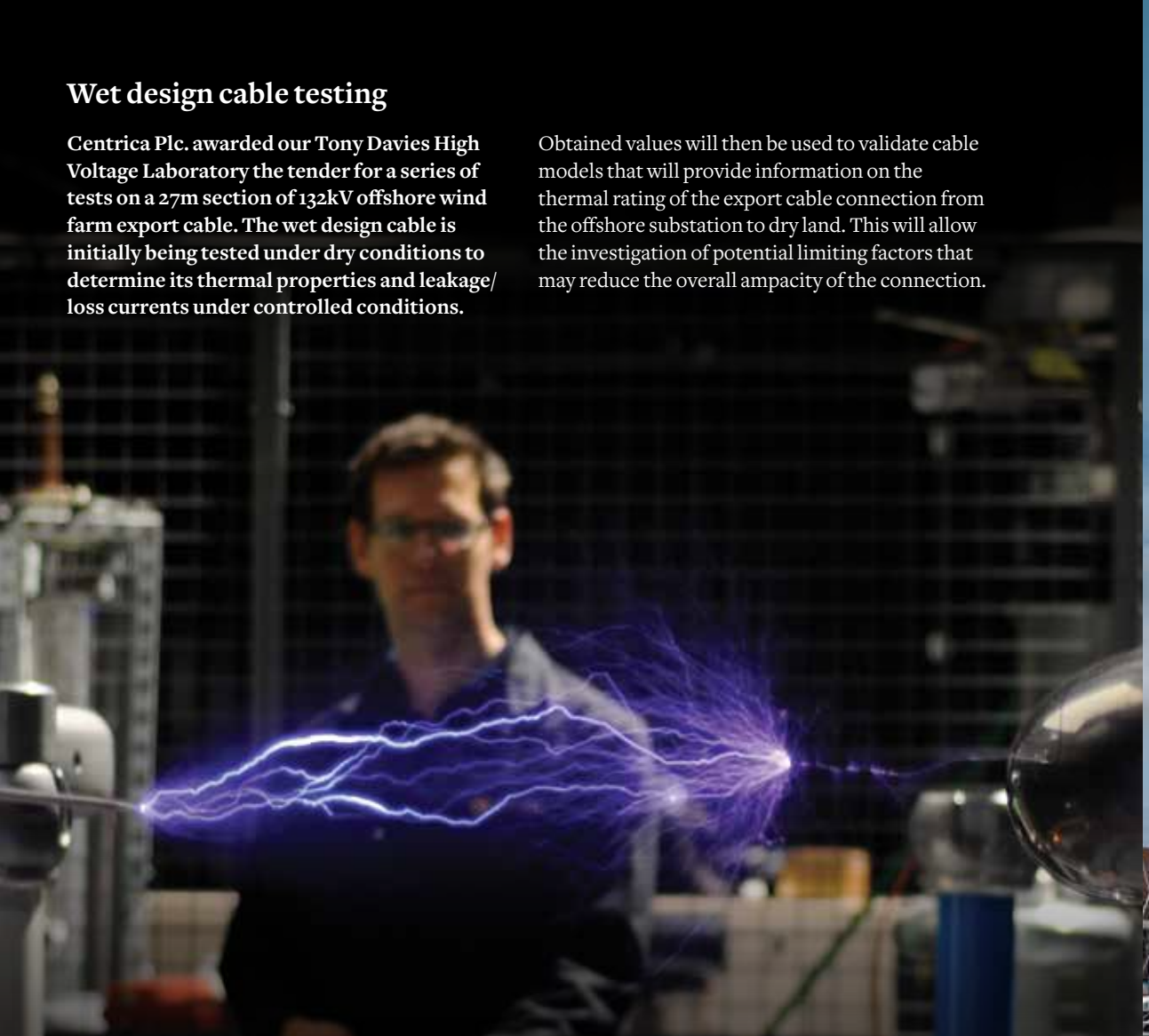
Southampton partnership to secure future maritime success

We led research into ships of the future, in partnership with BAE Systems Maritime. Projects focused on improving and enhancing the design and construction of ships, including the next generation of warships. Southampton researchers and engineering students developed new methods to ensure that ships are safer, more economical and more sustainable. The partnership involved reciprocal secondments between the company and university staff, industrial placements for Masters students and long-term collaborative research.

Wet design cable testing

Centrica Plc. awarded our Tony Davies High Voltage Laboratory the tender for a series of tests on a 27m section of 132kV offshore wind farm export cable. The wet design cable is initially being tested under dry conditions to determine its thermal properties and leakage/ loss currents under controlled conditions.

Obtained values will then be used to validate cable models that will provide information on the thermal rating of the export cable connection from the offshore substation to dry land. This will allow the investigation of potential limiting factors that may reduce the overall ampacity of the connection.



"The expertise of the University of Southampton in terms of high voltage cable ratings is well known and the results and analysis of the testing programme may lead to a reduction in the required number of export cables in the seabed. This could significantly reduce the costs associated with construction of offshore wind farms, a vital contribution to the viability of future projects."

Simon Catmull
Project Engineer, Centrica

Reducing water pollution in the sailing industry

Standard practice in the sailing industry is to keep boats moored in individual berths in marinas. This means that sailing boats are constantly submerged in water and antifouling paint is needed to prevent micro-organisms growing on the boat's hull. This bio-fouling poses many problems in the sailing industry. Not only does it reduce the performance of boats, it requires time and money to remove, a process which often includes use of toxic antifouling paint.

With the help of Tek-Tanks, a leading supplier of water, waste and diesel fuel tanks to the marine and vehicle industries, students designed and built a prototype lifting mechanism for sailing yachts to reduce the amount of time boats need to be submerged. It is the hope to develop the model for general use in floating berth marinas to reduce the need for toxic antifouling paint, saving time and money whilst preventing water pollution and reducing the impact on the fragile environment surrounding marinas.

"It's always refreshing to meet enthusiastic and innovative students and to work with them in developing their ideas and technology, especially where the environment is concerned, as we see marine regulations ever-tightening."

Hampshire based company Tek Tanks

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