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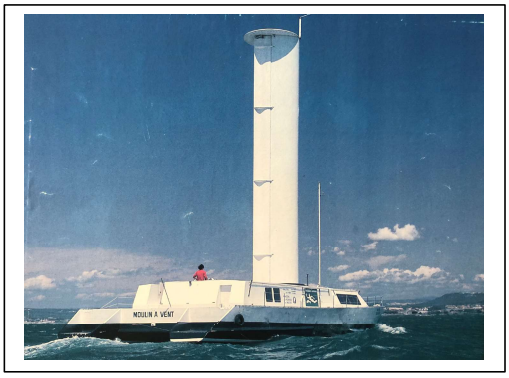


CONSULTANT : SCIENCES AND ENVIROMENTAL POLICY

Even though I was born in the middle of France, at more than 400 kms from any salt water, for as far as I can remember, I have always been fascinated by the ocean, the sea, and travels around the world. Of course, like many others, I watched Jacques Cousteau movies, which aired on the television every Sunday afternoon. By chance, my parents bought us a sailing dinghy, starting with a 4.20 followed by a 4.70. In the early 70's, with one of my seven brothers, Gilles, we participated in the French and European 4.70 Championship.

Then, when getting ready to go to university, I chose Mathematics and Physics with Oceanography and Aerodynamic-Hydrodynamic as specialties. Captain Cousteau was never very far from my mind, as I continued to be attracted by wind and sailboats.

Pr. Lucien Malavard, professor of Aerodynamic and member of the French Science Academy, proposed that I study, as part of my doctorat thesis, the Magnus effect and Flettner Rotor adapted to the Windship propulsion. It was in 1977, after the first oil crisis and before the second one of 1979. At that time, one of the priorities was to reduce our dependence to fossil fuels, which was mobilizing research teams around the world. I accepted with enthusiasm as the subject reconciled my passion for the Ocean, Wind and Ecology.

In parallel to my thesis work, I obtained a Certificate of Naval Engineering from the École Nationale Supérieure des Techniques Avancées in Paris, a prestigious graduate school of engineering and the only one in France delivering training on Naval Architecture.

After my doctorat thesis, I worked for one year as Research Engineer at La Manche Shipyards, in France. I was responsible for wind propulsion adaptation on fishing boats and oceanographic vessels.

In the early 80's, chance and opportunity were at a crossroad. Captain Jacques Cousteau needed to replace his emblematic vessel Calypso with a new expedition and oceanographic vessel. He wanted an ecological boat with wind propulsion, a clean, free and renewable energy source, in order to reduce the fossil fuel consumption of the ship. I was immediately integrated to a working group dedicated to developing a proposal for this new vessel. The Rotating Sail, subject of my thesis seemed the most adapted device for the wind propulsion. However, Captain Cousteau said to the group: "I am fascinated by the aerodynamic performances of the rotating sail but I am concerned by the fact that these towers (30 meters high, 5 meters of diameter) are rotating. It could be very dangerous for the crew and manoeuvring". These most relevant remarks led to a rupture in the scientific and technical approach to windship propulsion. With Pr. Lucien Malavard, we revisited our knowledge of aerodynamics. We developed a new device for windship propulsion, the Suction Sail, based on the control on the boundary layer transition by aspiration on very thick profile.

It was the beginning of an amazing scientific and technical adventure. After two years of wind tunnel testing, the new device was qualified. The aerodynamic performances of the Suction Sail were generally equivalent to those of the Rotating Sail and, in some cases, superior. In 1983, a full scale prototype was tested on the catamaran Moulin à Vent. And, in 1985, the expedition ship Alcyone was built with two Suction Sails renamed Turbosail. Alcyone went on to sail for many years around the world, in support of scientific and filming missions. As Director of Programs for the Cousteau Foundation, I was in charge of maintenance of Calypso and Alcyone. During those fifteen years at the Foundation, I participated in 23 expeditions on these vessels, including 11 on Alcyone.

In 1986, the price of oil dramatically decreased and, as a result, most if not all oil savings initiatives and research was abandoned.

I then joined Green Cross International, as Vice-President, where I worked tirelessly to prevent conflicts over energy and water. In addition, I became responsible for innovation at the Agence Française de Développement (AFD), where I developed several projects in support of sustainable development goals.

And then what? After decades of immobilism regarding fossil fuel savings, and under pressure from the human and ecological impacts of climate change, the time for windship propulsion is back.

Over the last few years, I have gone back to my early interest for wind as the propellant for the shipping industry. I would be most happy to share, exchange and work alongside other professionals whose desire is to contribute to a better world for generations to come.

DIANE GILPIN

Diane is the founder and CEO of the Smart Green Shipping Alliance that aims to make UK shipping more sustainable through using renewable energy for propulsion. She has previously worked in marketing and technology transfer in telecoms, banking and motor sport.

Since around 2009, Diane has been involved with making shipping more sustainable since founding and being a director of B9 Shipping while acting as a consultant to B9 Energy. The company designed vessels that were powered by a mixture of sails and biogas engines. Gilpin founded the Smart Green Shipping Alliance in 2014 has brought together experts from 170 countries with the aim for all shipping reaching the UK to be powered by renewable energy by 2030, ahead of the shipping industry's target of 50% by 2050.

Gilpin is a member of the Clean Maritime Council that advises the UK government on strategy to reduce carbon dioxide, particulates and other emissions from the sector.

Smart Green Shipping (SGS) is a purpose-driven for-profit systems design house working to drive immediate, scalable, positive change in the global shipping fleet.

SGS works collaboratively across the shipping eco-system and brings-in adjacent technologies and industries. Together they co-create commercially, technically and environmentally superior solutions specifically to reduce near-term emissions that will create new green jobs and reduced GHGs by 0.5gt per annum by 2045

During her 30+ years developing and leading dynamic business systems solutions for innovation, technology, renewables she has become a thought leader in these sectors and has brought that expertise and understanding to the wind propulsion sector specifically and the shipping sector in general.

She presented B9/SGS COP15 to the UK PM at No 10; regularly appears on live and recorded TV, radio and in print media. Spoke at Paris COP21 and led the 'Ambition 1.5: Global Shipping's Action Plan' initiative at COP23 in Bonn. Regularly speaks, presents and Chairs events at European Commission, UN/IMO, international shipping/innovation conferences, renewable energy and eco-design events. Invited moderator/panellist arguing for clean shipping at high-level international shipping and climate change debates. Commissioned by KoganPage to write an academic book on decarbonising interconnected shipping. Regular contributor to international maritime news magazines. Advised European Climate Foundation.

'Woman of Power', BBC Woman's Hour 2020. Holder of InnovateUK's Women in Innovation Award. Founder & Executive Committee member of International Windship Association. Advisory Board: 'SEDNA' – an EU funded Arctic Shipping project; NorShipping – Oslo maritime conference.

Collaborators include academics, naval architects in offshore yacht racing and merchant marine, marine engineers from oil and gas, classification societies, financiers, insurers, ship owners, cargo owners, ports, crew, European Space Agency, Institution of Mechanical Engineers.

Diane states "By working closely with industry we understand their needs. Our FastRigs can be made available as 'sail as a service' – that is: leasing, operation and maintenance, insurance, route optimisation and tech upgrades as standard to overcome the market fear of being first-mover. This proposition is specifically designed to give the market easy-access to the technology to drive down near-term GHG emissions and enabling SGS to improve solutions by 'learning-by-doing'. "

Smart Green Shipping

WIND PROPULSION INNOVATION AWARDS

Category: Outstanding contribution to the wind propulsion sector	**Individual:** Lauren Eatwell, Head of Engineering, BAR Technologies https://www.bartechnologies.uk/	**Contact:** John Cooper, CEO John.Cooper@bartechnologies.uk

Lauren Eatwell, BAR Technologies; engineering success for the sector

The success of the wind propulsion sector is entirely dependent on the strength of its technologies. As Head of Engineering at BAR Technologies (BarTech), Lauren Eatwell's leadership has been instrumental in bringing our pioneering wind propulsion solution to the market, and proving to the global shipping industry both the importance of wind propulsion in meeting the International Maritime Organisation's (IMO) 2050 GHG reduction targets, and the significant energy saving potential that the best-in-class wind propulsion engineering can provide.

BarTech WindWings by Yara Marine Technologies (WindWings) combines wind propulsion with route optimization to offer up to a 30% reduction in fuel consumption for bulk carriers, tankers, and other large shipping vessels. The product features large solid wing sails of up to 40 meters in height fitted to the deck. This original size will be one of three specifications to be brought to market. The technology has been awarded Approval in Principle by leading class society DNV.

Lauren joined BarTech shortly after its establishment in 2016 by Olympic and World Champion sailor Sir Ben Ainslie, former McLaren Racing CEO Martin Whitmarsh and its CTO Simon Schofield, to translate the cutting-edge speed, ambition, and technological prowess of yacht and motor racing into tangible efficiency improvements for commercial shipping. She leads a diverse engineering team combining expertise from F1 racing, Americas Cup, aerospace engineering, and beyond, and channels these strikingly different skillsets to bring our innovations to reality.

WindWings not only speaks within the industry to the deep need for decarbonisation, but communicates the low-carbon movement of the shipping sector to the rest of the business world and general public. WindWings is an adaptable product applicable for both retrofit, and incorporation into newbuilds; Lauren has shaped the design of the product for deployment across varying vessel specifications, with different sizes and numbers of wings recommended for optimum efficiency realisation.

Commercial validation by world-leading bulk carrier Cargill, providing a pathway for the world's first company WindWings retrofit onto a Kamsarmax bulker, and our subsequent partnership with Yara Marine Technologies (Yara) as a licensed manufacturer of WindWings, are testament to her team's focus on fulfilling the global opportunity for improved efficiency through wind propulsion. Lauren also guides the deployment of WindWings as part of the EU-funded Horizon 2020 (H2020) research project *CHEK - deCarbonizing sHipping by Enabling Key technology symbiosis on real vessel concept designs*, where it will be installed on one of two vessels to assess the symbiotic energy saving potential of multiple technologies.

With several features in the worlds most well-respected news publications, such as the New York Times, CNN, and The Times, BarTech has shown millions of people the positive initiative that is being taken within the industry, creating demand and interest for investors and key business professionals worldwide.

Professor Kazuyuki Ouchi

Professor Ouchi has been a driving force behind many of the recent wind propulsion developments in Japan and has contributed to the overall increased efficiency and decarbonisation of the industry over his many years of involvement in the sector.

He has been the lead on two major wind propulsion projects; the Wind Challenger and Wind Hunter projects in his roles as Professor of the Graduate School of Engineering and the University of Tokyo, also more recently as R&D Advisor to Mitsui O.S.K. Lines, and as a visiting Researcher at the University of Tokyo and visiting Professor at Kanazawa Institute of Technology.

The Wind Challenger Project (from fossil fuel ships to wind propulsion ships) was a joint Industrial project led by the University of Tokyo. The project aims to save up to 50% of energy by installing large extendable hard-wing sails on large cargo ships. The first vessel of the Wind Challenger Project is currently under construction by Mitsui O.S.K. Lines, Oshima Shipbuilding Co., Ltd. It is scheduled to be launched in the second half of 2022.

The Wind Hunter Project (development of Hydrogen producing ships and Zero-Emission ships) - Creating affordable and stable supply system for CO2-free hydrogen - hard-wing sails (Wind Challenger Sails) provide propulsion for the ship, as well as power by an underwater turbine to generate electricity and hydrogen (gas) through water electrolysis. The Wind Hunter can collect wind energy and then use it to hydrogenate toluene and generate methylcyclohexane (MCH). Research and development is being carried out for technologies to embark and supply to consumers, as well as route selection technologies to help maximize the ship productivity by finding optimal wind conditions.

He is now the CEO of Ouchi Ocean Consultant, Inc. which proposes creative ideas and systems to capture the ocean's energy and use it to support the sustainable development of human society. The company works in Hydrodynamic Engineering, Marine Engineering, and Ocean Energy Engineering engaging with The University of Tokyo, Saga University, Kanazawa Institute of Technology, National Maritime Research Institute, ClassNK, Japan Ship Machinery and Equipment Association, Mitsui O.S.K. Lines, MOL Techno-Trade, Nakashima Propeller, West Japan Fluid Engineering Laboratory, Akishima Laboratories, Fluid Techno., Marino-Forum 21, Xenesys Inc., Miraiene Planning, Smart design, ACT, IHI Corporation, Japan Marine United Corporation, Oshima Shipbuilding, Mitsubishi Shipbuilding and Nippon Salvage. https://ooci.co.jp/en/

During his many faceted career he joined Mitsui O.S.K.Lines in 1971 and in 1990/1 received awards from the Society of Naval Architects of Japan (SNAJ) for inventing the PBCF Propeller Energy Saving Device. Later he also won accolades from the Japan Solar Energy Society for the development of the Solar J Box and from the Society of Naval Architects of Japan (SNAJ) for development of the Ocean Nutrient Enhancer TAKUMI

Professor Ouchi is affiliated with: The Japan Society of Naval Architects and Ocean Engineers, The Japan Institute of Marine Engineering, The Japan Voyage Society, The Japan Society of Mechanical Engineers, The Oceanographic Society of Japan, The Japan Deep Ocean Water Applications Society, The Japan Fisheries Engineering Society, The Japan Solar Energy Society, The Japan Association for Coastal Zone Studies & the International Wind Ship Association (UK)

Marc VAN PETEGHEM

Les Echos

Multicoque Voiles

Designer and chairman at Ayro

Owner at VPLP Design

World renowned sailing architect and designer

Southampton Institute of Technology

« ONE MAN, ONE VISION, ONE PROTOTYPE, ONE PROOF OF CONCEPT, ONE INDUSTRIAL CONTRACT »

2010
America's cup Winner

- Wingsail designed for **BMW Oracle Racing**, Winner of the 33rd America's Cup in 2010

2016
Prototype

- Development in collaboration with **Ademe**
- Extensive testing in 2017

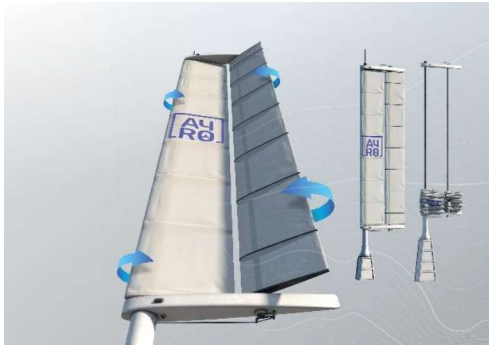
2018-2019
Industrial Demonstrator

- 2 Oceanwings equip **Energy Observer**, a Zero CO2 emission ship, sailing successfully for more than 2 years across the seas

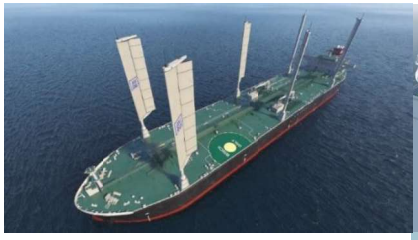
2020+
Decarbonation of Maritime Transport

- **Canopee**, the 1st modern wind powered ship dedicated to Ariane 6.
- 121m long ship equipped with 4 Oceanwings

THE MOST EFFICIENT & VERSATILE WINGSAIL



- Twice as performant as conventional sail
- Light & compact
- Propulsive power from 5° apparent wind angle
- Flexibility with routing
- Up to 45% of fuel savings



- **APPROVAL IN PRINCIPAL BY DNV (OCEANWINGS363®) & BV (TRADEWINGS 2500)**
- **10.5 M€ FUND RAISING ACHIEVED AND ANNOUNCED SEPT, 13 2021**
- **MANUFACTURING STARTING IN Q1 2022**

AYRO

VPLP design

HTTPS://AYRO.FR/ COMMUNICATION@AYRO.FR

Wind Propulsion Innovation Awards 2021

CATEGORY: Outstanding Contribution to the Wind Propulsion Sector Award

Individual's name: Tuomas Riski, CEO and co-founder
Company name: Norsepower
Company website: www.norsepower.com
Contact person: Kerry Marshall, BLUE Communications, Kerry.marshall@blue-comms.com

TUOMAS RISKI PROFILE: Combining passion and purpose to make wind power a viable choice for fuel and emissions reduction in shipping

Serial entrepreneur, Tuomas Riski had a successful career as partner and Vice President in Innofactor Plc, the largest Finnish IT service provider. He played a significant role in growing the company from five people to a publicly listed company and exited to start a clean tech company with the purpose of reducing global carbon emissions. Tuomas has combined his commercial acumen with a background in physics and a passion for sailing to put a new spin on rotor sail technology and bring sailing back to shipping.

Norsepower was co-founded by Tuomas in 2012 and is the first company in the world to modernise and convert the near-hundred year old sailing principles of the original Flettner rotor into a commercially viable product. The business was founded on the mission to reduce the environmental impact of shipping by providing efficient, easy to use, and reliable auxiliary wind propulsion for ships through its Rotor Sail Solution technology. This was developed by Tuomas alongside the famous naval architect, Professor, Dr. H.C Kai Levander. Norsepower's Rotor Sails can typically reduce fuel consumption, fuel costs, carbon, and other harmful emissions by over 5% and up to 25% - depending on vessel and voyage conditions. To enable taking Rotor Sail technology to the global market, Tuomas Riski has raised more than €20m of financing to Norsepower to date.

To date, Norsepower's Rotor Sail installations have demonstrated that wind propulsion can make a significant difference to the propulsion dynamics of large commercial vessels. If the solution is combined with other measures, vessels can be extremely cost-effective and environmentally friendly, meeting regulation but also providing financial benefits to the ship owner, operator and cargo owner with significant fuel reduction costs.

The successful installations Norsepower has completed to date have built confidence in the value in utilising Rotor Sails - not only cutting emissions but also reducing fuel costs. By 2021, across projects with six ship owners including Viking Line's cruise ferry *Viking Grace* and the 245-meter-long crude oil tanker *Maersk Pelican (*now *Timberwolf)*, their combined units have realised nearly 150,000 hours of successful operation, with a combined saving of over 3,300 tonnes of fuel and a reduction in CO2 emissions of around 10,000 tonnes. Other notable installations include the successful application of a tilting Rotor Sail onboard the logistics provider, SeaCargo's 12,251 gross tonne (GT) Ro-Ro cargo vessel, *SC Connector* and the installation of a rotor sail on Scandlines' *M/V Copenhagen*, which operates as a RoPax ferry (passenger and freight transport).

Riski is also focused on making the uptake of Rotor Sails commercially scalable and developed a number of collaborative agreements with companies to make accessing the technology and planning the installation process – particularly retrofits – much easier. One significant agreement is with Keppel Offshore and Marine's technology division to deliver a global installation capability across its shipyards. To help develop confidence and scalability in the market, Tuomas is a founding member and director of the International Windship Association, who regularly contributes to industry discussions to tackle the many questions around the implementation of the technology and what it means for ship operators. He believes that education and transparency is key to bringing wind from the periphery and into the mainstream for maritime.

As pressure mounts from regulators, cargo owners and shippers, and the public for the shipping industry to drive towards decarbonisation, many companies are moving to make environmentally sustainable decisions in their vessel operations. The Rotor Sail technology shows that wind has the potential, as part of a collective of innovative clean technology, to enable the reductions needed on the pathway to zero emissions in shipping. From Tuomas' perspective on a broader scale, he sees the growth of Norsepower as an example to the world economy that transitioning to cleaner power can be a multi-faceted opportunity rather than a challenge providing companies have the right motivation, innovation and strategy in place.