# RIDE THE WIND Round and round we go

Often the best new ideas have the longest history. Norsepower's Rotor Sail Solution fits that bill, an intriguing new application of an idea dating back thousands of years: using wind to propel ships.



Even the idea of a rotor sail goes back almost one hundred years. Exploiting the Magnus effect, the Flettner rotor was proven viable by its inventor Anton Flettner in 1925, when the first ship outfitted with Flettner rotors made the North Sea crossing from Danzig to Scotland.

JUKKA KUUSKOSKI Senior Vice President for sales and marketing, Norsepower

Rotor sail power alone proved to be less energy efficient than propeller technology, and the idea lay dormant for decades. Now, the Finnish clean technology company Norsepower has brought it back to the market in a refined version designed to supply auxiliary power to motor ships, providing fuel savings of up to 20 per cent.

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Founded in 2012, Norsepower saw a growing market demand for green marine technology and found potential in the rotor sail concept. Jukka Kuuskoski, Senior Vice President for sales and marketing, believes the idea is deserving of another look: "Both environmental regulations and fuel prices are drivers for auxiliary propulsion technologies. Even with the price of fuel as low as it is today, fuel is still the biggest operating expense by far."

Norsepower's first commercial installation was on Finnish shipping company Bore's 9,700 deadweight tonne (DWT) RoRo vessel Estraden in 2014. "It was important to get that first contract," Kuuskoski acknowledges. "With that we could perform tests and provide verification. References mean so much more than marketing." It didn't hurt either that Bore was so happy with the results from the first rotor that they soon ordered installation of a second on the Estraden.

But what made Bore take the leap in the first place? "Building confidence with owners and investors often starts with contacts," Kuuskoski says, "and the relationship between our founder Tuomas Riski and Bore was good, with both technical and management personnel."

That same sound relationship exists between Norsepower and Viking Line, leading to the signing of a contract for outfitting the Viking Grace, their flagship, with a 24-metre high rotor in 2018. "Companies have to be willing to spend time and effort in order to see the benefits of new technologies, and Viking has historically invested a lot in clean tech."

Like the Estraden, the Viking Grace project will be a retrofit. But unlike other, more invasive technologies, Rotor Sail installation requires only a minimum of modification. "Because the Rotor Sail is mounted on deck, the mounting block is the only modification required besides the low-voltage electrical connection," Kuuskoski says.



Estraden with dual Norsepower Rotor Sails

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The sail is rotated using electric power, but energy consumption is low, enabling the sail to provide a propulsive thrust in favourable wind conditions equivalent to more than 10 times the propulsion shaft power than it consumes. With the addition of Norsepower's technology, the LNG-fuelled Viking Grace will further reduce its emissions, fuel burn, and fuel costs, reducing carbon emissions by approximately 900 tonnes annually, or the equivalent of 300 tonnes of LNG fuel each year.

### Simplicity is the key, from design, to installation, to operation.

Digital technology also figures prominently in the overall efficiency of the Rotor Sail. "Modern digital design tools were important in achieving optimal design," Kuuskoski relates. But the main benefit of digital technology is in operations, where control systems tune the rotor sails in response to wind strength, direction, and ship speed. Sensors and automation systems combine to optimise rotational speed and direction, ensuring maximum forward thrust.

Digital technology also makes it easy for the crew to operate the Power Sail within maximum performance parameters, without lifting more than a finger: "There is push-button activation from the bridge. Ease of operation is one key difference from conventional sails. There is no physical trimming, and the rotors can be switched off to avoid unwanted thrust when manoeuvring."

In addition, the units are highly robust, requiring virtually no maintenance. "Simplicity is the key," says Jukka, "from design, to installation, to operation."

As with all new technology, or in this case a new application of old technology, there will be resistance, particularly in the highly conservative shipping industry. So how is Norsepower winning over sceptics?

"The best way is for us to prove the value of the technology, and to work with customers who have high standing in the industry." Certainly they have accomplished that in their latest project, a pilot to test wind propulsion technology with Shell, Maersk, and the Energy Technologies Institute of the UK. "We are very happy to be working with these big players. This marks an important milestone for Norsepower, and it builds our confidence when we can learn from the companies with the resources to really evaluate results."

All the right pieces fell into place with the deal, Kuuskoski says: "First, the installation will be on a large ocean-going ship. This holds potential to lead to installation on many ships, and many different ship types. It can also serve as a good example for other shipowners."

The project will be the first installation of auxiliary wind propulsion technology on a product tanker, and aims to provide insights into fuel savings and operational experience. The rotor sails will be fitted during the first half of 2018, before undergoing testing and data analysis at sea until the end of 2019.

Maersk Tankers will supply a 109,647 DWT Long Range 2 product tanker which will be retrofitted with two 30m tall by 5m diameter Rotor Sails. Combined, these are expected to reduce average fuel consumption on typical global shipping routes by 7-10 per cent.

Any other market barriers to be broken down? "We have managed guite well to communicate and convince the public about the physics. What remains now is for owners to see it working within their business model." In order to help shipowners understand whether Rotor Sails are for them, Norsepower can perform detailed studies on specific ships, routes, weather patterns, simulating potential savings.

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"But it is an emotional issue as well, for both owners and passengers," Jukka wisely observes. "It makes the ship look different, and that impacts customer choices. The green tech element is usually an advantage, because it improves the operating profile, and there is no added noise to speak of. Cruise passengers are showing increasing environmental awareness, and they might even see it as a reason to choose one cruise line over another. We are also seeing that the more advanced customers in the freight segment share these views."



- A Flettner rotor is a smooth cylinder with disc end plates which is spun along its long axis and, as air passes at right angles across it, the Magnus effect causes an aerodynamic force to be generated.
- The Magnus effect is a force acting on a spinning body in a moving airstream, which produces a force perpendicular to the direction of the airstream. This is used in backspin to increase range in ball sports. Rotor ships take advantage of this same effect by spinning a large vertical cylinder, typically using an electric motor, and using the resulting force for propulsion.

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Norsepower is also looking to strengthen its relationships with equipment suppliers like ABB, who develop automation and control systems. "It's good if they recognise that our Rotor Sail solution is an integrated part of machinery systems. With the proper exchange of information onboard and integrated automation, we can work together to optimise the entire system for energy efficiency."

On their website, Norsepower lists a formidable string of awards, the latest of which honours founder Tuomas Riski with the Nor-Shipping Young Entrepreneur 2017 award. "We are very happy for these displays of appreciation," Jukka Kuuskoski assures. "We are especially proud of Tuomas receiving the Nor-Shipping award. It confirms not only that we have a good system, but that the idea to invest in Rotor Sails was a good one."

That should provide Norsepower with plenty of motivation to keep moving forward - going round and round.