

# Optimizing wind-assisted propulsion

## Case Study



### The client:

Maritime Research Institute  
Netherlands (MARIN)

### Vaisala solution:

WindCube® Scan 200s

### THE CHALLENGE:

#### The first complete wind profile from a vessel

MARIN teamed up with Econowind (a ship design and engineering company dedicated to wind-assisted ship propulsion) to evaluate in-situ wind conditions on a vessel equipped with two of Econowind's VentiFoil® – aerodynamic, wingshaped elements integrated with smart suction to create a high propelling force. The VentiFoil® were installed on the forecastle of the MV Ankie, a freighter sailing the European coastal waters.

The two organizations launched this measurement campaign specifically to measure wind conditions with scanning lidar. Using scanning lidar enables an undisturbed, high-resolution 3D wind field without the use of additional wind measurement devices, and the data is essential for assessing the real-world performance of a wind propulsion

system. The results would also provide insight on the value of using lidar on shipboard measurement campaigns.

### THE APPROACH:

#### Reliable accuracy on board

MARIN selected Vaisala WindCube Scan to conduct the offshore measurement campaign. WindCube is the industry-trusted standard for accurate and reliable wind measurements, and WindCube Scan provides 3D scanning at ranges over 10 km from the shore. The organization installed the lidar along with ultrasonic anemometers, Motion Reference Units (MRU) and other instruments to verify accuracy and performance throughout testing.

*"WindCube Scan offered unique wind field measurements. Instead of one point measurement by anemometer in the ship's mast, this project's measurements yielded full undisturbed wind field ahead of the ship and wind profile over height. As we continue our research, we will be evaluating this lidar even more as a future wind measurement solution to improve performance of wind-assisted vessels."*

*Gijs Struijk  
Sr. Project Manager, MARIN*

The one-day trial was conducted on March 24, 2021, about 40 NM off the coast of Netherlands. MARIN and Econowind performed multiple runs from different wind angles with the VentiFoils in up and down positions. The researchers compared measurements from the anemometer in the forward mast against WindCube Scan at patterns including PPI: horizontal sweeps along the horizon, RHI: vertical sweeps such as between wings, and DBS: vertical upward scans.

## THE RESULTS:

### Success for continuing research

The trials were successful. By using comprehensive lidar wind data, the VentiFoil operators gained new insight about accurately optimizing power to take full advantage of wind conditions.

WindCube Scan was proven to be valuable for measuring far-field wind data. Objects such as the VentiFoils and forward mast were easy to recognize in the data, and the lidar showed a fair comparison to the wind values at the same location as the anemometer in the forward mast. Researchers were able to obtain vertical wind profiles from the DBS scan patterns and compare them to a power law assumption for wind profiles. They also successfully calculated wind vectors (magnitude and direction) from the measured radial wind speed data in the PPI horizontal scans using the recent Volume wind algorithm.

All this information is essential for understanding the complete wind profile as well as fine-tuning operation and verifying system performance.

## Why Vaisala?

Weather and environmental insights are the greatest catalysts for successful maritime operations— from sensors to systems and digital services, Vaisala provides actionable insights that empower stakeholders to confidently meet challenges and harness new opportunities.

Our globally trusted maritime weather solutions enable remarkable efficiency gains, digital transformation, the protection of people and investments while supporting sustainable and responsible operations.

We are scientists and explorers driven by passion, relentless curiosity, and the desire to create a better world. Backed by 85+ years of unmatched scientific leadership, our solutions increase maritime weather awareness and drive innovation.

