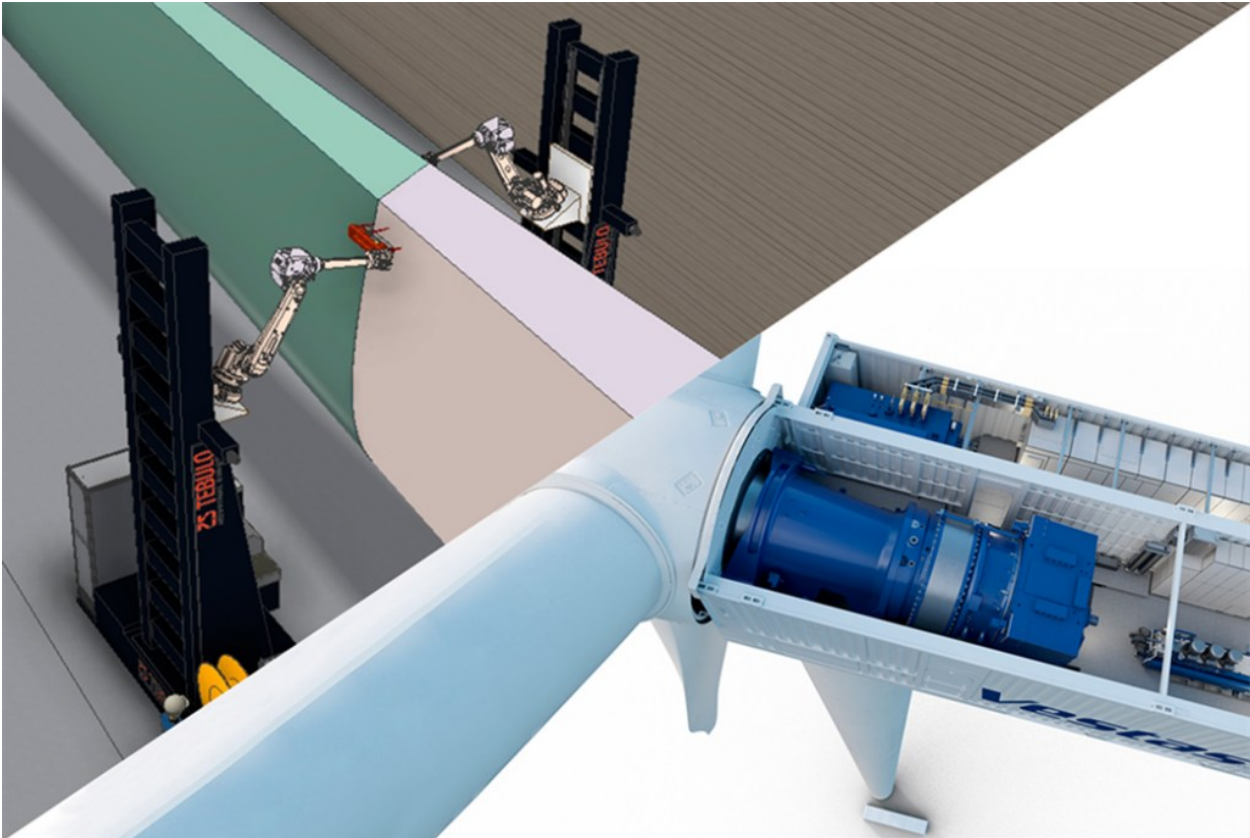


Best innovation award

This year, the best innovation award is shared by two very different ways to standardise wind turbine production for much larger volumes.



Joint innovation winners: Tebulo Robotics' automated blade production solution (top) and Vestas' modularised nacelle concept

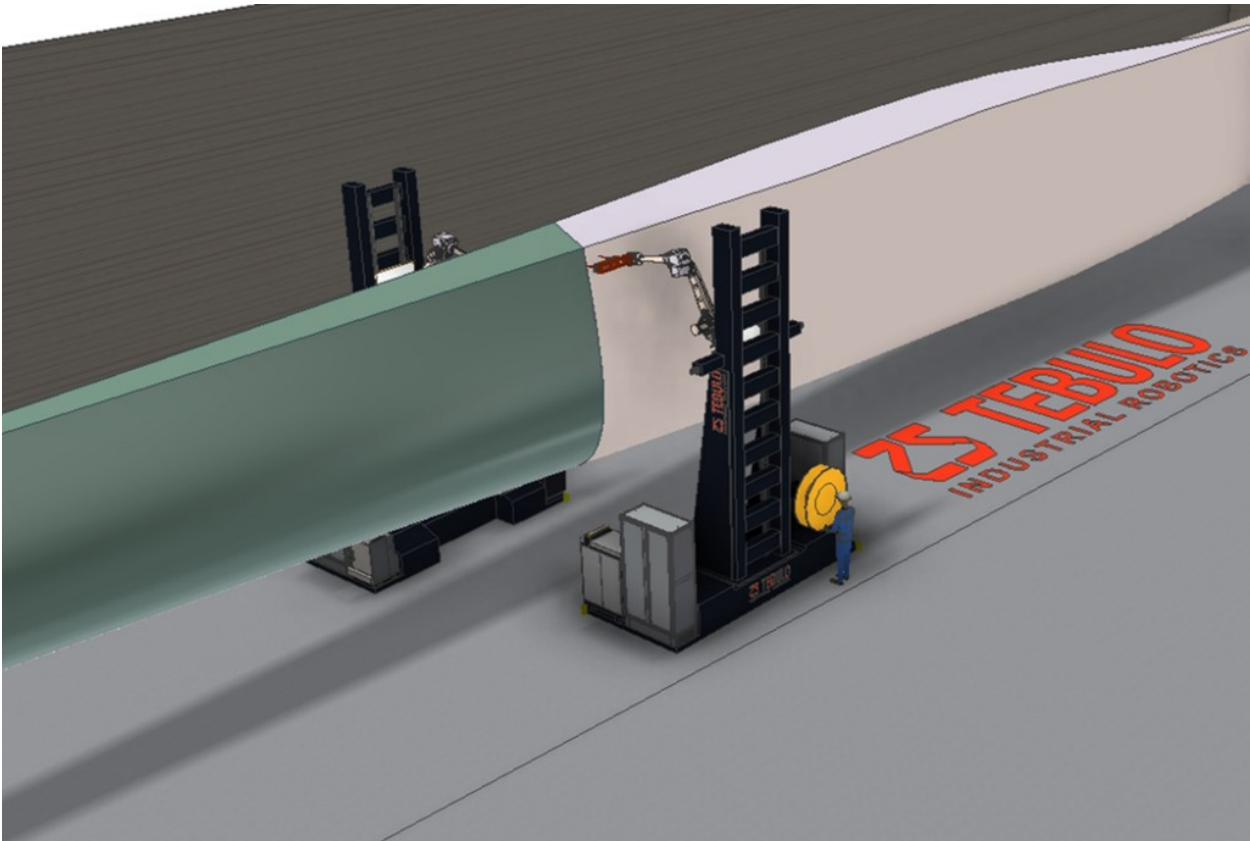
Tebulo Robotics AGV solution for the production of large blades

Dutch hi-tech industry solutions specialist Tebulo Robotics conducted its first [robotised blade-spraying](#) demonstration in early 2021, which it says generated overwhelming (wind) industry responses.

The technology concept is based on a multi-purpose in-house autonomous guided vehicle (AGV) or advanced tool carrier, deployable to autonomously perform multiple pre-determined new or repetitive sequential tasks, including during rotor blade manufacture.

This AGV has four electrically powered 360-degree rotatable wheels, allowing unrestricted precision vehicle movement in all directions, enabled by cutting-edge external guided motion technology. This allows AGVs to autonomously enter a given production hall, move towards a pre-selected blade and start performing a specific, predetermined task. It follows a blade's complex three-dimensional shapes and curvatures without requiring detailed product-specific dimensioning or hard robot programming.

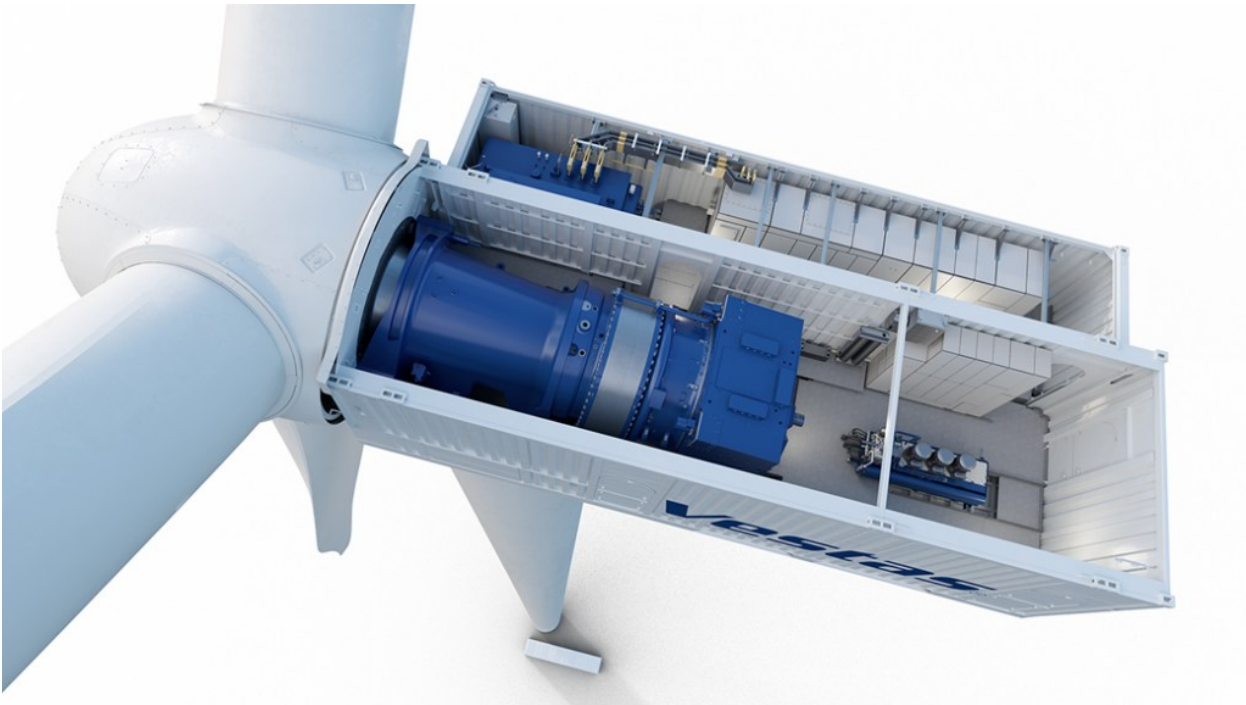
Multiple deployment opportunities explored with industry partners include blade deburring after mould removal, surface grinding and coating, vortex-generator and lighting-receptor placement, blade-root grinding and studs placement, and non-destructive digital blade-inspections including ultrasonic scanning.



With blades becoming ever longer and thus also getting wider, a specific focus area has been to develop fast, high-quality automated coating to replace increasingly time-consuming and resource-intensive current manual practices. The total blade surface area is estimated to be in the 1,000-1,400m² range for 14-15MW flagship offshore turbines with 220–236m rotors. Tebulo Robotics is working on two alternative robotised blade-coating solutions: with paint rollers and precision-spraying.

Ground-breaking Vestas modularised nacelle concept

Vestas' containerised and modularised nacelle concept is a multi-purpose structure with container-specific add-on features for lifting, transportation and storage. It also reduces the turbine's carbon footprint by turning nacelles into self-contained transportable modules. The out-of-the-box concept aims for full value chain simplification, from component sourcing to manufacture, transportation, installation and lifetime upkeep. All are challenged by growing nacelle dimensions with scale, plus envisaged huge future leaps in turbine volumes. The modularised nacelle concept [was introduced](#) with the enhanced EnVentus V162-6.8 MW, involving the switch from a single nacelle to a split compartmentalised arrangement with reduced dimensions. The main elements are the central nacelle and single "click-on" side compartment, which is effectively a modular power unit containing converters and the MW-transformer (below). A second (optional) service side-compartment incorporating a foldable crane can be hoisted up and attached to the other nacelle side, again via standardised lock-pin interface connections.



The [V236-15.0 MW](#) features two such modular power units, now permanently mounted, plus a separate service crane arrangement.

The modularised architecture creates flexible platforms from reusable building blocks with clearly defined physical boundaries, enabling platform synergies regarding design, testing, validation and long-term asset upkeep across onshore and offshore applications.

The V236-15.0 MW prototype was installed in late 2022. The EnVentus V162-6.8 MW prototype with modularised nacelle will follow in 2023, while a date for the EnVentus V172-7.2 MW has not been disclosed yet.