Van Oord's precision focus on marine infrastructure construction

CUSTOMER PROFILE:

Global marine contractor Van Oord is a Dutch family-owned company with over 155 years of experience. They focus on dredging, infrastructure and offshore energy.

BUSINESS CHALLENGE:

Continually advance its precision engineering expertise to dredging, offshore wind and marine contracting projects with speed and accuracy.

SOLUTIONS:

- Trimble R750 modular GNSS receiver
- Trimble BX992 Dual Antenna receiver
- Trimble MPS566 Marine Positioning System
- Trimble CenterPoint® RTX Marine
- Trimble Applanix POS MV WaveMaster II
- Trimble Applanix POSPac™ MMS post processing software

For many, the name Van Oord is synonymous with complex marine construction. From coastal protection and land reclamation in the Maldives to an offshore wind energy system for the state of New York, this Dutch-based company is a global pioneer in dredging and marine construction, offshore infrastructure and offshore wind farm construction.

Key to its longevity and first-rate reputation is a continuous improvement mentality that is evident from its impressive fleet of high powered vessels to the tools, technologies and techniques applied by its 5,800-plus employees.

Whether dredging a port or constructing an offshore wind farm, Van Oord's workflows increasingly demand more accuracy and efficiency. Its success in meeting those goals is in part due to its clear expectation of continuing innovation from its solution providers.

Where the wind blows

A study by WindEurope, the association of wind energy in Europe, indicates the globally installed capacity of offshore wind farms is going to increase from the 2021 figure of just over 57 gigawatts (GW) to 159 GW by 2026 and to nearly double to 316 GW by 2030.

Van Oord is an integral part of that growth. As the number and complexity of offshore wind projects continues to expand, so does Van Oord's need for assured positioning of its vessels, as well as the monopiles, foundations, turbines and other components. GNSS positioning has long been a major piece of these projects, helping to precisely align the various pieces in the x-y-z axis.

Installing the first monopile is always the trickiest in terms of positioning accuracy, according to Wim Balvert, survey operations manager at Van Oord, because of the lack of a GNSS reference network such as a land-based continuously operating reference station (CORS) network or similar.

"We have to make sure the monopiles are vertical before people start jacking into the seabed," Balvert said. "The tolerance has to be met, otherwise the turbine manufacturer will not guarantee the turbine effectiveness. Until we get a GNSS base station set up on the first monopile, accurate positioning has long been a challenge."

Van Oord looked to Trimble for an answer.

A Trimble RTX adjustment

As part of its quest to test the boundaries of current advances in GNSS, Van Oord was part of the early market acceptance testing for Trimble CenterPoint RTX for marine applications. Trimble RTX® technology is a family of real-time GNSS correction services available via satellite delivery or IP/cellular worldwide. It enables position accuracy anywhere, even offshore where there are no base stations.

Van Oord put Trimble RTX technology through an extensive technical and scientific evaluation, comparing it to other GNSS correction services on the market in applications some distance from the shoreline. The technology exceeded Van Oord's requirements with 2 cm horizontal and 5 cm vertical accuracy within 100 nautical miles from a given coastline, even in deepwater.

> **"Balvert said, "CenterPoint RTX is the best [real-time correction] currently available because the vertical is so accurate."**

With positive results, Van Oord put the technology into production. The CenterPoint RTX solution was field tested on Van Oord's highly automated offshore installation vessel Aeolus. Purpose-built to transport and install offshore wind turbine tower foundations and turbines, this vessel includes an advanced jacking system that allows it to work in waters up to 45 meters deep. Once the GNSS correction service assessments were complete, Van Oord crews put the technology to work at sea.

Last year, construction of a wind farm off Germany's coast began. For this project, the foundations were floated out to the offshore wind farm site where Van Oord's heavy lift installation vessel Svanen lifted them upright. These monopiles are about 9 meters in diameter and 75–90 meters in length depending on water depth, and need to be installed to less than one-tenth of a degree out of vertical per specifications.

Van Oord installed the first 50 monopile foundations by August 2023.

But offshore wind farm installation positioning is just one of the familiar challenges Van Oord faces in its marine activities. The firm's vessels must always be equipped with position and orientation capabilities.

In motion accuracy

Van Oord's fleet of vessels is extensive, from offshore wind installation vessels to dredgers with all manner of capabilities. However, one commonality among most of them is the combination of GNSS receivers and inertial sensors. Van Oord's shallow water pipelay barge Stingray is one example. The barge, ideal for working in water depths of up to 28 meters, is equipped with a Trimble BX992 GNSS receiver as well as Van Oord's custom 3D dredge visualization/sonar software.

The Applanix POS MV WaveMaster II provides the robust position and orientation solution required to accurately georeference sonar reflections from the seabed and other subsurface objects. POSPac MMS affords the ability to further improve on the georeferencing data when the ultimate accuracy is required, mitigating outages in GNSS base station data, or correcting errors in the real-time configuration.

Typical positioning accuracy from POS MV is on the order of a few centimeters when using RTK or more recently, Trimble CenterPoint RTX real time corrections. This, together with roll and pitch accuracy of up to 0.02 degrees rms ensures accurate and reliable results.

"We always know the exact position and orientation of our platform or vessel," said Balvert.

A similar combination of GNSS, motion sensors and visualization software will be put to work on a U.S. offshore wind project in the northeast.

Van Oord's scope involves preparing the seabed with the placement of filter rock prior to the installation of monopile foundations. This will be executed by the flexible fallpipe vessel Stornes, which includes a DP2 dynamic positioning system, utilizing Trimble GNSS solutions, for extra redundancy.

Performance driven relationship

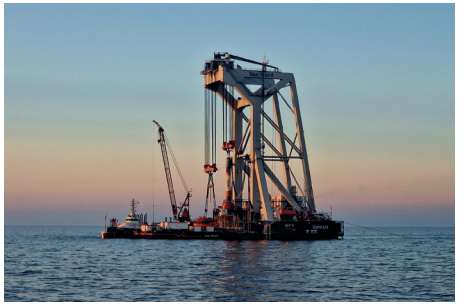
Whether it's an offshore wind farm installation vessel or a dredging project, GNSS positioning is essential to safe, accurate and efficient underwater activities—and increasingly difficult when GNSS jamming and spoofing come into play.

For instance, Van Oord is working on several projects at Romanian seaside resorts, located on the shore of the Black Sea. The projects are largely focused on climate adaptation and improving sustainability.

Balvert explained, "We've had problems with a lot of interference and GNSS jamming. To make sure to complete the underwater work with accuracy, we had to put in place localized systems that were not dependent on GNSS. That's fine for a small site, but would get very clumsy on bigger sites."

Van Oord is one of the first to evaluate Trimble's next generation MPS566 GNSS receivers. The firm is particularly excited about this technology because of its improved RTK engine and anti-jamming/anti-spoofing technology.

"We depend on our relationship with Trimble to continuously improve our means and methods. Access to new solutions–particularly in the design, verification and testing phases of a product–is especially beneficial, as we can provide input about capabilities as well as features and functionality that would help us. Our relationship is essential to our ability to respond to our client's needs with speed, accuracy and efficiency, while improving our performance along the way."



Van Oord
Marine ingenuity