Supporting the shift: ensuring ROV buoyancy keeps pace with offshore renewables expansion

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As the global energy mix tilts toward renewables, offshore wind is becoming central to sustainable power generation. Behind the turbines and vast offshore arrays lies a largely invisible support network now under strain as demand for subsea equipment, especially remotely operated vehicles (ROVs), outpaces supply.

ROVs, vital for installation, inspection, maintenance and repair of offshore wind assets, are in short supply. Many originally built for oil and gas are being repurposed, offering short-term relief but not a lasting answer. The scale of upcoming offshore wind projects, particularly in deeper waters, is widening the availability gap and driving both refurbishment and new-build programmes.

As new ROVs enter service and older ones are upgraded or retired, attention must focus on mission-critical components, including buoyancy modules. These ensure stability and performance at depth, allowing ROVs to work efficiently, safely and reliably.

Driving demand: renewables, deeper waters and electrification

Several trends are reshaping subsea operations. Alongside rapid offshore wind growth, including floating wind in deeper waters, oil and gas operators are expanding, revisiting brownfield sites and moving into depths once considered unviable.

This activity has placed greater strain on the global ROV fleet. Renewables alone drive much of the demand, accelerating ROV construction. The industry is also shifting from hydraulic to lighter, more efficient and environmentally sustainable electric-powered systems.

Whether building new or upgrading legacy units, priorities remain improved efficiency, enhanced durability and verified performance at depth. Certification and testing are key to achieving this.

Why buoyancy modules must be tested and certified

As offshore renewables expand into deeper, harsher and more remote environments, buoyancy materials must match the demands of modern ROV missions. These modules are engineered to withstand extreme pressures for prolonged periods. If they fail, ROVs can lose their ability to maintain stable positioning, risking collisions, mission failures or even total loss. In remote locations, minor issues can lead to major delays with financial and environmental consequences.

Essential tests include:

- **Water absorption:** Excess absorption reduces buoyancy and compromises performance.
- **Hydrostatic crush pressure:** Establishes the maximum depth at which the material remains structurally sound.
- **Density and compressive strength:** Influence buoyant force and resistance to stresses during deployment and immersion.

Modules are also tested for weight in air and weight-in-water to verify the precise buoyancy, enabling ROVs to hover and manoeuvre effectively without wasting energy. Dimensional inspections, often using laser scanning, confirm compliance with design specifications, as even small deviations can impair performance.

Despite these requirements, many manufacturers still test in-house without independent oversight, creating potential inconsistencies. With no universal mandate for third-party verification or audited equipment, this practice leaves room for risk. Independent, standardised testing helps remove uncertainty and ensures components perform reliably in demanding offshore conditions.

DNV type approval: a benchmark for confidence

Although not mandatory, DNV type approval is a recognised benchmark for subsea buoyancy quality, durability and performance. As the leading classification society for maritime and offshore sectors, DNV offers independent validation of materials for challenging subsea environments, an important safeguard as ROV operations push farther offshore and into deeper waters.

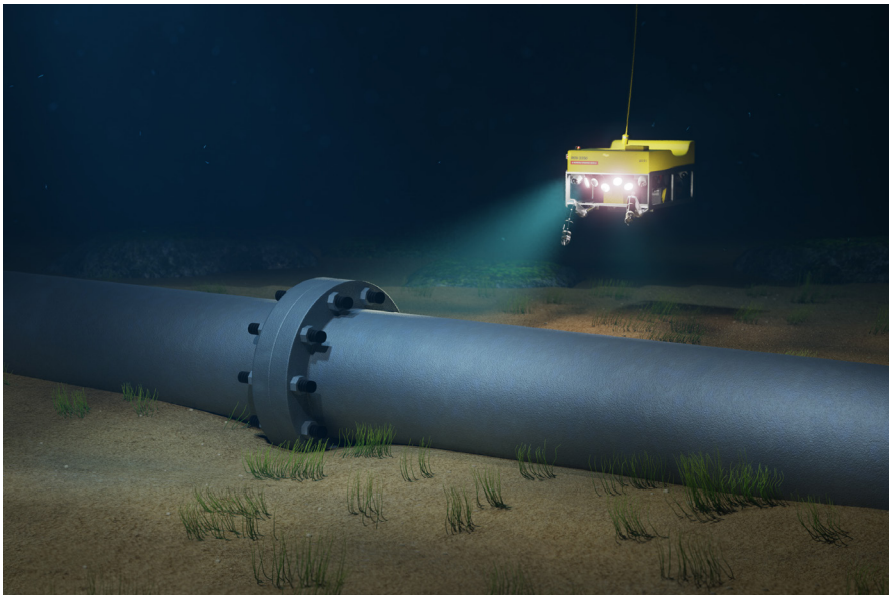
The process subjects buoyancy materials to comprehensive laboratory tests and quality audits, examining key properties such as mechanical strength, water absorption, density and hydrostatic pressure resistance. Certification helps designers, operators and end users reduce risk, improve reliability and support long-term performance. For offshore renewables, DNV approval is a valuable differentiator in high-cost, high-risk operations.

Case study: maintaining DNV classification of DSV Bakunawa

Inkfish, a marine research organisation exploring the ocean's deepest areas, enlisted Base Materials to replace the buoyancy modules on its full ocean depth-rated submersible.

Formerly DSV Limiting Factor, the two-person, 12-tonne vessel was used for The Five Deeps Expedition, the first successful manned descent to the deepest point of each of the world's five oceans. As one of only a handful of submersibles DNV-certified for extensive repeated dives to full ocean depth, it required DNV-approved materials for its new buoyancy system.

Base Materials, the first syntactic subsea buoyancy materials manufacturer to achieve full DNV type approval and DNV Approval of Manufacture across its entire Subtec® portfolio, will supply Subtec® 11500, a low-density, high-performance syntactic buoyancy material rated for 11,500 metres. With densities from 400–650 kg/m³ and grades suited to depths from 2,000 to 11,500 metres, Subtec® buoyancy materials comprise high-grade hollow glass microspheres with a novel thermoset polymer matrix to deliver ultra-high strength-to-weight characteristics and water ingress resistance.



Preparing for a deeper, busier, greener future

The transition to renewables is transforming subsea operations. Offshore wind is moving into deeper waters, electric ROVs are replacing hydraulics and older fields are being revisited with upgraded technology.

In this environment, quality and certification of buoyancy materials are not just routine checks but strategic necessities. As offshore infrastructure grows more ambitious, only proven, independently verified components will meet the demands of a deeper, greener future.

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