Enhancing wind turbine safety: The power of open innovation

Background

The Bolt Handling Innovation Challenge was initiated by Siemens Gamesa Renewable Energy (SGRE) in partnership with G+. The primary goal was to address the significant health and safety risks faced by technicians during bolt installation in wind turbine assembly.

The challenge sought innovative solutions to ease or eliminate the physical burden of lifting, positioning, and installing very heavy (>20kg) bolts in turbine hubs and tower joints. It was open to entrepreneurs, startups, SMEs, academic institutions, and innovators based in the UK, with a focus on lifting equipment and reducing musculoskeletal injuries and improving workforce wellbeing in the offshore wind sector.

Mike Newman, Director, Pelergy, said: “We spent a lot of time breaking down the challenge into its component parts like removing the need to lift, making the bolt lighter and helping improve the technician’s lifting posture. Our job is to proactively seek out solutions from other sectors. It isn’t easy going out to companies in other sectors to convince them about the opportunity in a tangential industry, but that’s why Business Connect exists – to bridge these gaps.”

Mike continued: “In the end we found a strong set of solutions in the emerging exo-skeletal suit sector, where the suits are typically used in construction and for activities like painting of ship hulls. At the end of the iX process, SGRE trialled suits from two companies and we are really impressed with the results. The trials have expanded their ideas about where else this technology can be used across their business too.”

Solution

The winning solution for the G+ challenge was provided by Gibb Group, a company recognised for its expertise in delivering innovative safety and productivity solutions for demanding industrial environments. Gibb Group presented the Hilti EXO-S assistive wearable exoskeleton specifically to address the physical challenges faced by technicians during bolt installation in wind turbine assembly.

Key features of the EXO-S solution include:

- Physical Support: EXO-S reduces stress on the body during overhead work, lowering muscle and joint fatigue, especially in the shoulders and neck.
- User-Friendly Design: Lightweight (2.4 kg), easy to wear, adjust, and clean, making it practical for all-day use in challenging jobsite conditions.
- Customisable: Optional neck support can be added for extra relief during demanding tasks.
- Productivity and Wellbeing: By reducing physical strain, EXO-S helps decrease sick leave due to physically demanding work and enhances overall workforce wellbeing.

Industry Validation: Recognition by G+ and SGRE provides credibility, and the solution is positioned for field trials and potential commercial deployment in real turbine assembly and maintenance operations.

Chris Reeder, Strategic Account Manager (Safety & Survival) for Gibb Group Limited, said: “I believe the exoskeletal suit will have a genuinely positive impact by helping wearers conserve energy when working at height and by reducing the stress and fatigue placed on their bones and muscles during manual bolt handling offshore. The iX programme is an excellent platform for innovators looking to bring new products to market, encouraging cross sector collaboration and supporting the introduction of fresh ideas into the supply chain.”

Gibb Group’s involvement brought technical expertise ensuring that the solution was engineered for robustness, manufacturability, and user ergonomics, with a strong feedback loop for continuous improvement with Hilti.

Outcome

After the implementation and testing of the EXO-S solution, both quantitative and qualitative results were observed, demonstrating the effectiveness of the exoskeleton in real-world conditions. The direct impacts on technicians and operational processes were:

- Test subjects experienced a significant reduction in muscle activity (25% to 35% lower on average).
- Participants reported increased comfort and precision while wearing EXO-S.
- The system contributed to reduced injury risk, improved safety, and increased efficiency in bolt installation cycles.

Beyond the immediate benefits to technicians, the project generated broader impacts for the industry and the organizations involved. These outcomes highlight the potential for long-term transformation in safety practices, operational efficiency, and industry standards in the following areas:

- Lower incidence of musculoskeletal disorders and manual handling injuries, with faster and more consistent installation cycles.
- Reduced rework and quality defects due to better handling control.
- SGRE and G+ demonstrated innovation leadership and a safety-first culture, enhancing their reputation and stakeholder confidence.
- The project may lead to new safety guidelines for exoskeleton use in offshore environments and inspire adoption in other industries where large fastener handling is common.
- The solution is positioned for commercial contracts with turbine manufacturers, installation contractors, and service firms.

Cross Sector Collaboration

The success of the G+ challenge not only delivered tangible improvements in technician safety and operational efficiency but also demonstrated the transformative potential of open innovation. The iX programme played a crucial role by facilitating connections between G+ and solution providers beyond their traditional supply chain, such as Gibb Group.

By leveraging the iX programme's network and outreach, G+ was able to access fresh perspectives and cutting-edge technologies that may have otherwise remained undiscovered. This approach accelerated the adoption of innovative solutions like EXO-S, strengthened industry collaboration, and set a precedent for future partnerships that drive safety, productivity, and competitiveness in the renewable energy sector.

"Over the years, we have continued to broaden our work to cover the full offshore wind supply chain. The iX process has helped us take this even further by engaging innovators from other sectors to explore new possibilities. This approach enables us to consider larger scale ideas and draw on proven solutions from different industries that could be applied to offshore wind."

Kate Harvey,
G+ Global Offshore Wind Health & Safety Organisation General Manager