



Wind energy at height and the rise of rope access in turbine maintenance

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As wind energy becomes a cornerstone of the global clean energy transition, the demand for safe, efficient turbine maintenance is rising just as fast. Rope access has emerged as a vital solution, enabling specialists to work at extreme heights with precision, speed and safety, while shaping a unique professional culture built on trust, discipline and teamwork.

Over the past decades, the global energy sector has undergone one of the most significant transformations in modern history. Climate change, pollution caused by fossil fuels, concerns regarding energy security and the continuously growing demand for electricity have accelerated the development of renewable energy. Among the various renewable energy sources, wind energy has become one of the most important and fastest growing clean energy technologies worldwide¹.

However, the rapid expansion of wind energy has also introduced new technical and operational challenges. The construction, maintenance, diagnostics and repair of wind turbines require a high level of technical expertise, the ability to work in complex environments and advanced access solutions.

One of the most effective methods adopted within the industry is rope access, which enables safe and efficient work at significant heights.

Today, rope access is no longer viewed solely as a technical working method. For many specialists, it has become a way of life built on discipline, responsibility, teamwork, trust and continuous professional development.

Wind energy: the foundation of clean power

Wind energy is a technology that converts the kinetic energy of wind into electrical energy through the use of wind turbines. Modern wind farms are capable of generating large amounts of electricity both onshore and offshore, while technological efficiency has improved significantly over the past three decades.

According to the International Renewable Energy Agency (IRENA), wind energy is one of the key solutions in achieving global climate neutrality goals². The expansion of renewable energy sources helps reduce greenhouse gas emissions and dependence on fossil fuels. Scientific research demonstrates that the energy sector accounts for a substantial share of global CO₂ emissions, making the transformation of electricity generation essential in mitigating climate change.

The importance of wind energy is also closely linked to energy security. Unlike oil or natural gas, wind is a local and inexhaustible energy resource³. This enables countries to reduce their dependence on imported energy sources and strengthen their energy independence.

Beyond environmental benefits, wind energy also has major economic significance. The industry creates jobs across engineering, manufacturing, logistics, construction and technical maintenance sectors⁴. The growing number of wind turbines throughout Europe and the rest of the world continues to drive increasing demand for qualified specialists.

Operational challenges in wind turbine maintenance

Although wind energy is considered one of the most advanced energy sectors, the

infrastructure itself operates under extremely demanding conditions. Wind turbines are continuously exposed to rain, ultraviolet radiation, temperature fluctuations, ice, humidity and mechanical stress.

Wind turbine blades experience the greatest structural loads. Studies indicate that blade surface erosion can reduce aerodynamic efficiency and significantly affect electricity generation performance⁵. For this reason, regular diagnostics, maintenance and repair are essential for ensuring the long-term efficiency of wind farms.

As technology advances, turbine dimensions continue to increase. Modern wind turbines can exceed heights of 150 meters, while blade lengths frequently surpass 80 meters. Such structures require highly advanced work-at-height solutions.

The origins and development of rope access

The origins of rope access can be traced back to mountaineering and caving. During the mid-20th century, mountain rescue teams and cave explorers began using specialized rope systems to safely navigate vertical structures.

Industrial rope access development began during the 1980s, particularly on North Sea oil platforms. In such environments, traditional scaffolding and heavy machinery were expensive, complex and inefficient, leading the industry to search for more flexible alternatives.

This marked the beginning of rope access as an industrial working method. One of the most important milestones was the establishment of the International Rope Access Trade Association (IRATA) in the United Kingdom in 1987⁶. The organization developed strict international safety

standards and training systems that are now regarded as among the highest safety standards within work-at-height industries.

Scientific and industrial studies demonstrate that rope access maintains an exceptionally high level of safety compared to other work-at-height methods. IRATA statistics have consistently shown remarkably low rates of serious accidents over many years.

The application of rope access in wind energy

As the wind energy sector expanded, rope access naturally became one of the primary access methods for wind turbine maintenance.

One of the greatest advantages of rope access in wind energy is the ability to quickly and safely reach complex structural areas without the need for cranes or extensive scaffolding systems. This significantly reduces both repair costs and turbine downtime.

Rope access specialists within the wind industry perform blade inspections and diagnostics. They also carry out composite material repairs and surface preparation and coating work. Their role includes structural inspections as well as lightning protection system inspections. In addition, they conduct internal tower and nacelle inspections, along with rescue and safety procedures.

Flexibility remains one of the key strengths of rope access. Technicians can be mobilized rapidly and maintenance activities can often be performed with minimal disruption to turbine operations.

In recent years, rope access methods have increasingly been integrated with drone technologies and digital diagnostic systems. Drones enable rapid identification of potential





damage, while rope access specialists perform detailed assessments and repairs.

The human element at height: more than a profession

Although rope access requires extensive technical knowledge and physical capability, the essence of this profession extends far beyond technology alone.

Working at height demands exceptional discipline, emotional stability, trust in teammates and the ability to make decisions under challenging conditions. As a result, the rope access community has developed a strong professional culture based on mutual responsibility and continuous improvement.

For many specialists, rope access becomes a lifestyle. Long international assignments, work across multiple countries, ongoing training and exposure to extreme environments shape a unique professional identity.

Scientific research emphasizes that in high-risk professions, technical competence alone is not sufficient. Psychological preparedness, teamwork and a strong safety culture are equally essential.

The human factor is regarded as one of the most critical elements in ensuring safe work at height. Consequently, significant attention is devoted to continuous training, practical skill development and emergency response exercises.

Within the wind energy sector, rope access specialists have become an integral part of infrastructure reliability. They operate in locations often inaccessible through

conventional access methods and help ensure that modern renewable energy systems remain safe, efficient and operational.

Future perspectives

The wind energy sector is expected to continue experiencing rapid growth over the coming decades. Alongside this growth, the demand for highly qualified rope access specialists will continue to increase.

Particular focus in the future will be placed on advanced diagnostic technologies and artificial intelligence solutions. There will also be an emphasis on automated defect analysis and the continued expansion of offshore wind farms. Improvements in rescue systems will be important, along with strengthening worker safety standards.

As wind turbines become larger and more technically complex, the competence of qualified specialists becomes increasingly important. In this field, rope access remains one of the most efficient and economically practical access solutions available.

Conclusion

Today, wind energy represents one of the most important directions in the global energy transition, contributing to climate change mitigation, improved energy security, and the development of a sustainable economy.

Alongside the rapid expansion of the sector, the need for professional technical maintenance has also grown significantly. Rope access has become an essential part of this infrastructure, enabling complex work at

height to be performed safely, efficiently and economically.

Today, rope access is more than a technical solution. It is a discipline, a professional culture, and a way of life built on responsibility, trust and the constant pursuit of improvement.

Modern wind energy would not be possible without the people who work at height every day, ensuring that renewable energy remains reliable, safe and accessible for future generations.

[dzp.eu](https://www.dzp.eu)

References

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⁴ International Rope Access Trade Association (IRATA). IRATA International Code of Practice.

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⁶ Global Wind Energy Council (GWEC). Global Wind Report.