

One of the greatest problems facing the Wind Power industry is the maintenance of the turbines themselves. Ceasing energy production and dismantling the turbines for repairs can be a costly and lengthy procedure. The average wind turbine is made up of 8000 different pieces which can experience a range of repair and maintenance issues. This can be due to environmental damage, erosion and corrosion, amongst other reasons. Offshore wind farms pose further issues; as well as the harsher environment, in-situ maintenance is also more difficult to perform.

Belzona solutions for windpower farms have shown reliability and success in the repair and protection of the three main areas:

- *Nacelle:*

The panels of the nacelle must be waterproof to prevent from the elements to penetrate inside the nacelle and to cause damage to the internal parts. Belzona waterproofing solutions, grip systems and cold applied metal repair composites can help repair and protect nacelles and maintenance crews working on nacelles

- *Blades:*

In operation, blades are subject to impact damage, leading edge wear and tip damage.

- *Tower/Transformer:*

Belzona coatings and concrete repair systems offer a number of solutions for the protection of the wind turbine tower, the tower base and transformers.



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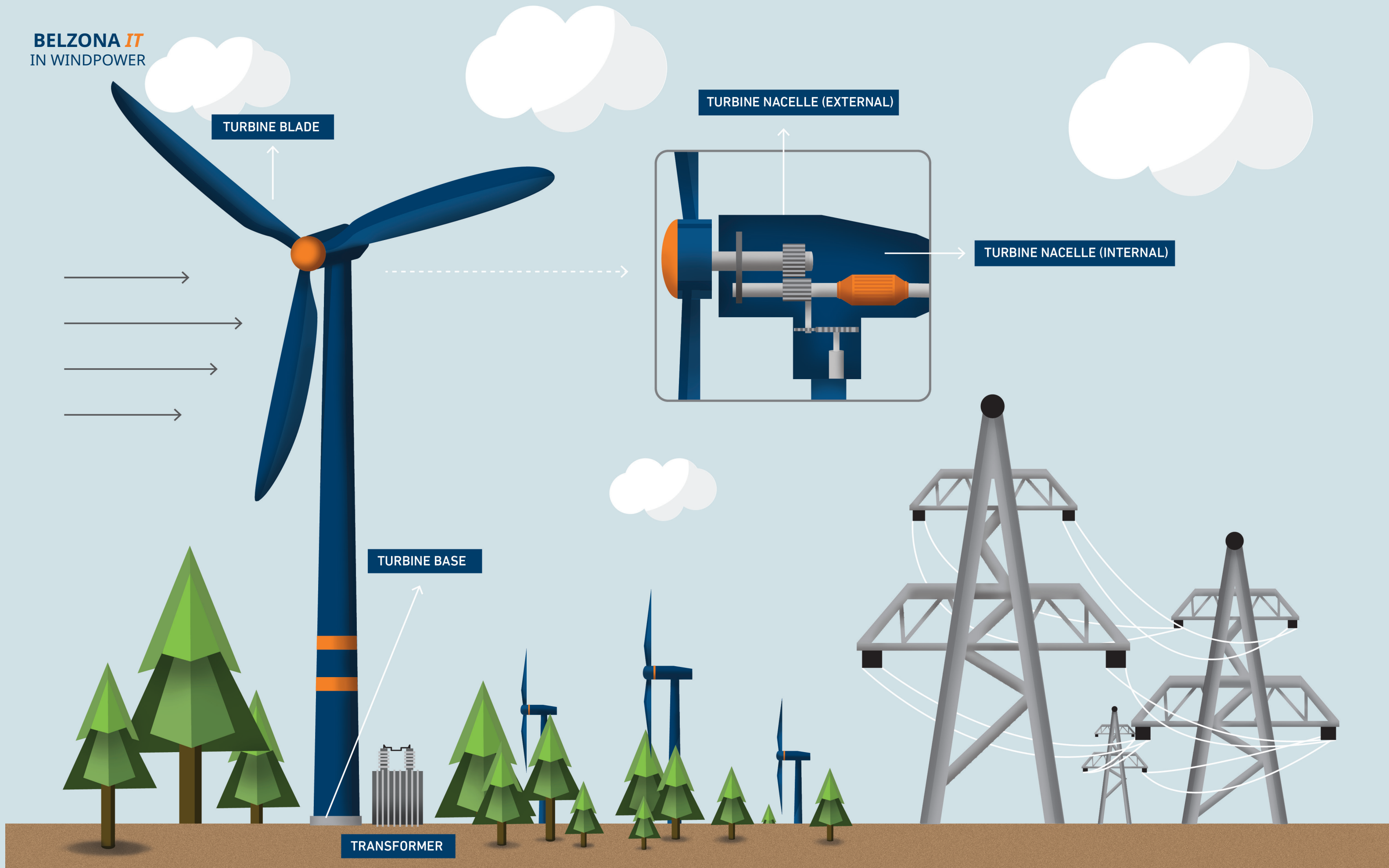
BELZONA®

Repair • Protect • Improve

ASSET INTEGRITY AND HIGH PERFORMANCE IN WINDPOWER



BELZONA IT
IN WINDPOWER



TURBINE BLADE

TYPICAL PROBLEMS: Leading edge erosion due to adverse weathering

POTENTIAL SOLUTIONS: Belzona 1000 series 100% solids paste- and fluid-grade materials for leading edge protection (LEP)

TURBINE NACELLE (EXTERNAL)

TYPICAL PROBLEMS: Airtight sealing damage

POTENTIAL SOLUTIONS: Belzona 2000 elastomeric materials for external sealing and Belzona 3000 membranes for weather proofing. Additionally, Belzona nonskid coatings can be used externally for safety during maintenance operations.

TURBINE NACELLE (INTERNAL)

TYPICAL PROBLEMS: Wear of internal components such as shaft, gear box, rotor brake, oil pump, and yaw motor among others, and leakage from lubrication reservoir

POTENTIAL SOLUTIONS: Belzona 1000 series 100% solids paste and fluid grade materials for wear protection

TURBINE BASE

TYPICAL PROBLEMS: Corrosion on bolts and concrete cracking

POTENTIAL SOLUTIONS: Belzona 3000 solutions for bolt external protection and base water proofing, Belzona 4000 magma systems for concrete repairs

TRANSFORMER

TYPICAL PROBLEMS: Leaks due to corrosion and/or accidental impact

POTENTIAL SOLUTIONS: Belzona 1000 series 100% solids paste and fluid-grade materials for corrosion protection

This process flow chart of a typical wind power facility is designed based upon data retrieved from various sources. It is to be used as general guidance only. It describes the most common repair and maintenance problems found in wind power processing together with Belzona solutions which could potentially help mitigate such problems. It does not aim to supersede any drafted process flow charts in use at these plants. It is strongly recommended that each user of this guide contact the local Belzona representative to discuss the specific needs and operation conditions of their wastewater treatment facility.