STRUCTURAL DYNAMICS IN WIND TURBINES

Windleeder, led Prof. Breiffni Fitzgerald, involves a major industry collaboration focussed on addressing the challenge of aging wind turbines in Ireland. With approximately 500 onshore wind turbines reaching their end-of-life by 2025 and 1000 by 2030, there is an urgent need for sustainable solutions. This project, conducted in partnership with Bord na Móna, ÉireComposites, and GDG, aims to develop a comprehensive decision-making tool for end-of-life wind turbines in Ireland.

This project research integrates state-ofthe-art fatigue analysis methods for aging wind turbines, leveraging structural dynamics and finite element modelling. The outcomes of this project will serve as the most authoritative evidence base on end-of-life wind turbines in Ireland and establish an international benchmark for sustainable wind energy transitions.



Another current project, MeLodiC, is a

Research Ireland funded industry-academic collaboration that advances the emerging field of wind farm control by treating the wind farm as a holistic system to be optimized and controlled. This project funds two PhD students. A key aspect of this project is the partnership with Ørsted, a global leader in offshore wind, which provides real operational wind farm data to support the development of data-driven models.

This collaboration bridges the gap between academic research and industry needs, ensuring that cutting-edge methodologies, such as machine learning and advanced aerodynamic modelling, are grounded in real-world applications.

For industry, MeLodiC delivers innovative control solutions that enhance power generation efficiency while reducing fatigue loads on wind turbine blades, ultimately improving the longevity and financial viability of wind farms.

For researchers, direct access to industry data allows the development of models that go beyond theoretical assumptions, leading to breakthroughs in wind farm aerodynamics, wake modelling, and machine learning control.



SCHOOL OF ENGINEERING INDUSTRIAL ENGAGEMENT STRATEGY 2025-2030