Abstract for the general public

Machado,M.R.; Dutkiewicz, M.,**Design and optimisation of smart metastructures to control and attenuate vibration and structural monitoring-SWinT**. Polonez BIS 2 call, Poland, 2022.

The renewable energy sector has a global burst, motivated by the shortage of fossil energy production crises and climate change. The wind industry is one of the existing technology resources that would reduce our dependence on coal, oil, and gas and unlock huge amounts of investment in short a period. Developing the renewable energy industry may lead to the most high-performance processes to decarbonize the economy, generate employment, and improve energy generation sustainability, to benefit better conditions of the planet and people's health. Up to date, wind energy production comprises 837 GW worldwide, and by 2030 it is expected an increase by 66% of power generation. Despite numerous control strategies installed on wind turbines(WT), vibration is still a real problem in those structures. This research project proposes techniques for designing and optimizing WT using metamaterials and smart metastructures. The advantage of the proposed smart-wind turbine is enhancing the vibration control, attenuation and mitigation, besides promoting the monitoring of the turbines. A reliable turbine represents effective energy production and economy. This research fulfils the gap in using and developing these smart metastructures applied to the turbine design. In addition, a multidisciplinary research group was created to develop the next generation of smart-wind turbines designed to perform better its dynamic feature and control reflecting the economic and industrial sectors.

***Keywords*:** Functional material, programmable meta-structure, metamaterial, vibration and structure monitoring, smart material.