

Study seeks to revolutionize wind turbine design

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A study carried out by researchers at the Universitat Politècnica de València (UPV), belonging to the Institute of Science and Technology of Concrete (ICITECH), in collaboration with Chalmers University of Technology in Gothenburg (Sweden), promises to revolutionize the structural design of wind turbines. Their work offers solutions that are 8%–15% more sustainable than traditional wind turbine designs.

This study presents an innovative and efficient method for optimizing the design of wind [turbine](#) foundations, thus improving [energy efficiency](#) in their construction. The results obtained in the study, published in the journal *Structural and Multidisciplinary Optimization*, demonstrate its applicability in large and complex projects and its potential for use in other civil structures.

"Our method makes it possible to design structures more sustainably and facilitate their construction through software that can analyze different conditions and thus optimize the final product. It uses metamodels, such as Kriging, to improve efficiency and reduce the computational cost of the design optimization process," explains Víctor Yepes, a researcher at the ICITECH Institute of the Universitat Politècnica de València.

In their study, the Universitat Politècnica de València and Chalmers University of Technology team applied the method to a real example of wind turbine foundations in Sweden. "We found that with our approach, it is possible to obtain better designs by analyzing only twenty instead of a thousand different designs. We also found that these designs are more sustainable than conventional designs," says Víctor Yepes, a researcher at the ICITECH Institute at the UPV.

The advantages of this "revolutionary method" also include a significant reduction in costs—both financial and computational—and time when designing wind turbine foundations.

Other applications

Although this study focuses on the design of [wind](#) turbine foundations, the method proposed by the Spanish and Swedish researchers can be applied to other structures used in [civil engineering](#) or building construction. Furthermore, the Kriging metamodeling technique is widely used in industry and can be applied to a wide variety of structural

design projects.

"Our work can be useful for optimizing other civil engineering structures such as bridges or buildings. In addition, the proposed method could be applied in other fields, such as optimizing manufacturing processes or developing new materials. In short, it is a novel technique with great potential for tackling and solving a wide variety of engineering design problems," concludes Víctor Yepes.

More information: Alexandre Mathern et al, Practical metamodel-assisted multi-objective design optimization for improved sustainability and buildability of wind turbine foundations, *Structural and Multidisciplinary Optimization* (2022). [DOI: 10.1007/s00158-021-03154-0](https://doi.org/10.1007/s00158-021-03154-0)

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