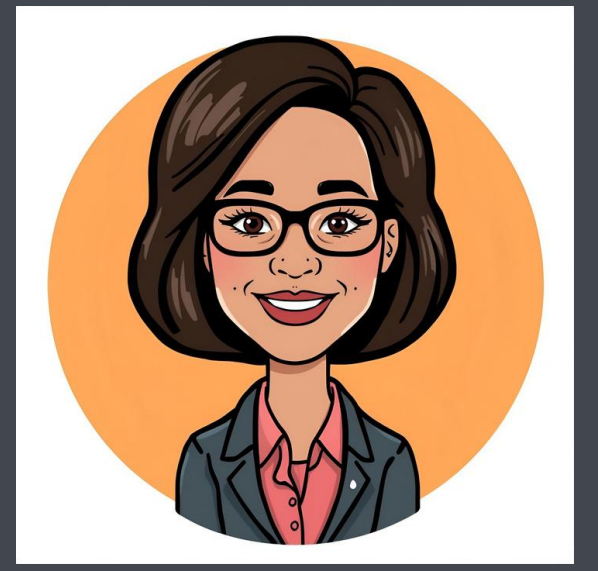


Multiphysics Systems Modeling and Simulation

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Research Overview

Product development often encounters challenges related to design failures caused by unforeseen system performance issues. Modelling and simulation offer a powerful approach to address these challenges by enabling the design and evaluation of system processes and performance through the creation of digital prototypes. These virtual models allow for testing scenarios that may be impractical or impossible to implement using traditional methods, ultimately reducing design time and lowering product development costs.

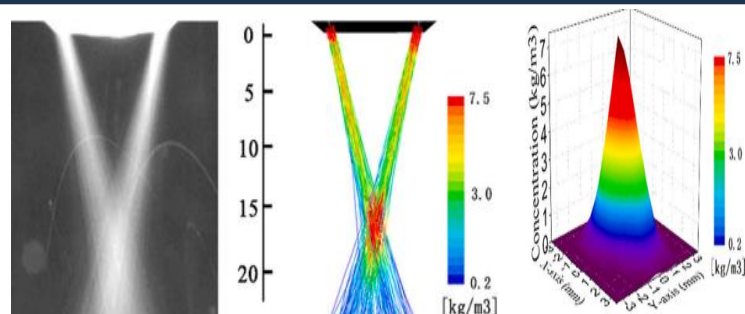
Industry Relevance

- Green energy (wind turbines, hydrogen storage, fuel cells), and complex systems (flow analysis, jet engine combustion, gas turbine cooling, heat exchangers).
- Shortens the product design cycle and reduces overall development costs.
- Solves practical design challenges safely and efficiently, minimizes environmental impact, and enhances communication through data-driven insights.

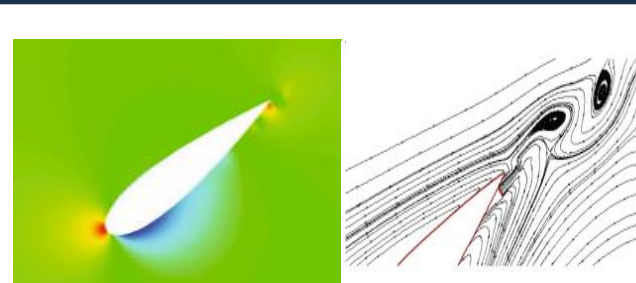
Methods & Technologies

- Digital twin method by integrating Computer-Aided Design (CAD), Computational Fluid Dynamics (CFD), Finite Element Methods (FEM), and experimental testing with data validation and evaluation, enabling the simulation and analysis of complex engineering problems, including fluid-structure interaction, conjugate heat transfer, multiphase and two-phase flow modelling, combustion processes, and advanced flow modelling and control.
- Licensed commercial software, computer facility and staffs with rich knowledge and research experience.

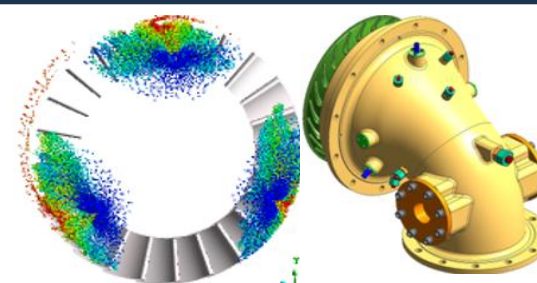
Innovations and Representative Results



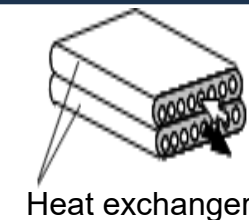
(a) Laser cladding of gas Powder flow Exp. Vs CFD



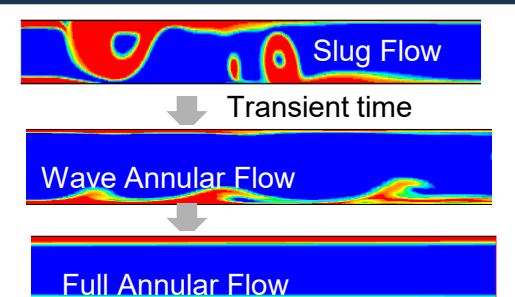
(b) Velocity distribution of Vertical-axis wind turbine



(c) Water drop temperature distribution on turbine blade



(d) Two-phase flow transition for air –water heat pump



Opportunities

If you are interested in collaborating on the development of a digital twin platform for product design and development, we would love to hear from you. EMSG group at UWE brings extensive research expertise and knowledge to support your design process, helping to enhance product development efficiency and significantly reduce design costs.

