

PARTICLE IMAGING: THE NEED FOR PARTICLE VISUALISATION IN BOTH LABORATORY AND DIGITAL MODEL DEVELOPMENT

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ABSTRACT

Particle imaging – an umbrella term incorporating techniques from microscopy and SEM to PIV, PTV, MRI, X-ray CT and other nuclear imaging techniques – is a highly valuable tool, providing a wealth of information from the micro-scale to macro-scale. Its applications can provide guidance for a large variety of experimental practices, including their design specialisation and analysis, and offers insight into a diverse range of scientific and industrial processes. Whilst particle visualization can enable researchers to harness the power of particle technology in both computational and experimental settings, it is equally known for its numerous difficulties and inconsistencies due to the vast array of imaging as well as analysis techniques available to the researcher.

Employing imaging methods efficiently facilitates a shift from heuristic, trial-and-error based methods, to adaptive refinement – thereby reducing research & development workflows. In parallel, there has been a large focus in use of simulations as a predictive tool for process design and optimisation. In this context, particle imaging provides a crucial and powerful ground truth for theoretical, numerical, and AI models.

As industry focuses on ‘digital-first’ approaches, it becomes increasingly important to create reliable and robust calibration of models and systems that are based in the fundamentals and understanding of the particle behaviours. In an age where data means power, integration of additional information sources is an attractive means for effective parametric optimisation across process scales. This comes in a variety of forms, ranging from lab-in-the-loop to Industry 4.0 workflows.

In this light, this session will centre topics in relation to particle imaging and visualisation techniques which enable the collection of more efficient, reliable, and repeatable data, as well as its use across experimental and computational environments.