

# **A *Simulation App* based on reduced order modeling for manufacturing optimization of composite outlet guide vanes**

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## **ABSTRACT**

Composites manufacturing processes usually involve multi-scale models in both space and time, highly non-linear and anisotropic behaviors, strongly coupled multi-physics and complex geometries [1]. In this framework, the use of simulation for real-time decision making directly in the manufacturing facility is still precluded nowadays [2]. In this work, a process-specific simulation tool based on reduced order modeling [3,4] is introduced, the *Simulation App*. This concept is presented through a multi-physics and coupled non-linear problem describing the manufacturing process of a composite outlet guide vane. A segregated approach is preferred over a monolithic one, thus allowing to combine parametric solutions and reduced basis depending on the physics being solved. We show that several manufacturing settings can be simulated in few seconds with the *Simulation App*, thus enabling fast process optimization. In addition to the computational time reduction, the process specificity of the *Simulation App* makes it possible to conceive simple yet functional graphic interfaces, for both data input and visualization. The process designer is asked to enter only process parameters while the simulation parameters are limited to the bare minimum. Similarly, the visualization module was designed so as to display only the relevant information, mainly the process indicators upon which decisions are made. Therefore, the *Simulation App* allows to truly simulate the entire manufacturing process, including the control loop. Finally, the advantages over general-purpose simulation software, in the context of process simulation, are discussed.

## **REFERENCES**

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