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Towards an Automated Simulation Process in Combined Thermal, Flow and Stress in Turbine Blade Cooling Analyses

In recognition of continuing difficulties that are experienced in performing computational analyses (CAE) on real turbine blades, this paper explores current developments in areas of integrated geometry handling, multi-domain meshing and multi-disciplinary analysis. The application of an integrated software framework first for CAD repair, then for surface and volume meshing, and finally for combined fluid, thermal and stress analysis can go some way to easing pains. The focus here is to demonstrate how it is possible in a single simulation environment, and using a finite volume methodology, to deal with real turbine blade geometries in terms of CAD handling, and then to perform conjugate-heat transfer and stress analyses using one mesh which is generated to be continuous through the fluid (external and internal passages) and blade metal. Possible gains to productivity become obvious.

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