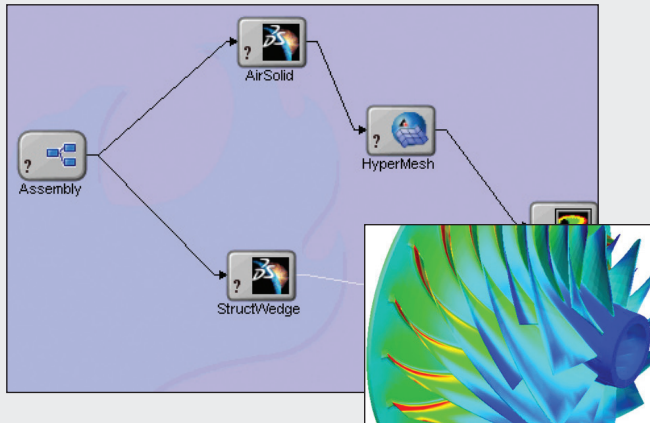


PHX ModelCenter Enables High Fidelity Stress Analysis of a Turbocompressor Impeller

Challenge: Verify Compliance with Aerodynamic Performance Requirements of New Impeller Design



A new impeller design must be extensively verified through a computational fluid dynamics (CFD) analysis to ensure aerodynamic performance requirements are met and to confirm that no detrimental separation zones occur. Next a finite element analysis (FEA) must be conducted to understand the detailed stress distribution, especially under the pressure loads imposed by aerodynamic forces.

Solution: PHX ModelCenter Integration for High Fidelity Design Techniques

PHX ModelCenter was used to apply high fidelity techniques to this analysis of a new impeller design. The process of creating this model first involved creating the models in their native tools, Dassault Systèmes' CATIA, Altair's HyperMesh, and ANSYS' Fluent and Structural solver. The impeller was modeled in CATIA and then the resulting geometry was meshed using HyperMesh. Finally, a CFD and FEA stress analysis using ANSYS were performed. By creating PHX ModelCenter components for these steps, an integrated model was created so that PHX ModelCenter's trade study tools could be leveraged to study the design. Once the process was integrated in PHX ModelCenter, a simple parametric study could be used to change, for example, the backsweep angle of the impeller so that the effect on performance and stress could be understood. A resulting, automatically created plot verifies the correct trend between increased backsweep angle and lower head. PHX ModelCenter's extensive trade study capabilities can further be used to study more subtle variations in the flow field, such as pressure distribution, as a result of changing the blade angle or blade thickness.

Benefit: Expose Downstream Design Problems Early to Reduce Design Cycles and Iterations

Phoenix Integration's products enable the integration of many different design tools. In addition to its legacy use in conceptual design, ModelCenter is capable of handling downstream design scenarios where high fidelity techniques are employed. In many cases, the 1- or 2-D codes that form the backbone of a company's design process need to be married to the higher fidelity tools to make their use practical. Another feature of this process is the notion that the lower-order tools are essentially pre-processors for the higher fidelity tools. As such, providing a simple, interactive experience for the user to perform this pre-processing is important. Ultimately, automation of high fidelity tools in PHX ModelCenter shortens design cycles, reduces design iterations, and exposes downstream design problems earlier.