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Design Of A Low Noise Radial Fan With Computational Aeroacoustics

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Aim of this study is to employ computational aeroacoustics methods in order to design a fan system. Design objectives of this study are to decrease the flow-induced noise, to provide the necessary flow rate and pressure increase. During the design, modern computational methods will be employed in addition to traditional turbomachinery design methods. The design procedure begins with a baseline fan system design, which is based on traditional semi-empirical correlations. Flow through this fan system is analyzed via computational fluid dynamics. Pressure fluctuations on rotating and stationary solid surfaces are determined to calculate sound sources of the system. The baseline design is improved by eliminating the areas where powerful sound sources occur. Flow analysis and sound prediction is repeated to improve fan system further. This step is repeated until the desired sound power level is achieved. This design procedure employs numerical analysis instead of experiments. Therefore it will be more effective and less time consuming than the experimental trial and error design procedures. The number of prototypes and necessary measurements are decreased dramatically.