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A numerical study on prediction of the aerodynamic performance and design of a centrifugal compressor

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A centrifugal compressor is generally composed of a impeller by whose rotational motion the energy is obtained, a diffuser by which static pressure is recovered, and finally a volute serving as a receiver to transfer for other devices. It is important requirement to properly evaluate the aerodynamic performance and characteristics during preliminary design of a centrifugal compressor because it is not obvious to figure out the internal flow property of a centrifugal compressor including complicated three dimensional turbulent flow. The prediction and design of the aerodynamic performance of a compressor have been studied in various ways. Recently, it has not only been empirically researched but calculated by the computer simulation. In this study the industrial centrifugal compressor was calculated in three dimensional compressible viscous flow through CFX 11.0 and in method of k- ϵ RANS turbulent model. A lot of quantitative performance values were obtained and through these databases several variables were investigated to certainly predict and correctly design the centrifugal compressor. And the methods proposed are useful to analyze the aerodynamic performance and characteristics of internal respective parts of the compressor. Especially, momentum transfer and loss characteristics of the impeller and pressure recovery and loss properties of the diffuser were focused when the compressor is operated with several flow coefficients such as at surge, peak efficiency, flow separation on diffuser vane, and choke.

Biography

Won-SeokHeo has completed his Master's degree from Seoul National University in 2015. He is a Researcher of Seoul National University, Institute of Advanced Machines and Design (IAMD), Turbomachinery Research Center. He has researched the aerodynamic performance of turbomachinery, especially a centrifugal compressor.

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