

MAE Seminar Series

On the use of Three-Dimensional Airfoil Diffusers in Centrifugal Compressors Design

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Abstract

Process turbomachinery serves a competitive market with competing requirements namely reliability, efficiency, and operating range. The petrochemical, oil and gas, and air separation are some examples of the industries in this market. Traditionally, improved reliability needed for instance in the petrochemical industry leads to designs with compromised efficiency while improved efficiency needed in the air separation industry leads to designs with compromised operating range. Over the years several attempts have been made by OEM's to mitigate these conflicting requirements. This presentation describes one such effort where both high efficiency and wide operating range are achieved. This is a patented technology that has been commercially pioneered by Praxair for radial turbomachinery designs.

In this presentation a brief description of the different types of turbomachinery used in the process industry is presented. A brief description of Praxair turbomachinery product line is presented. The problem definition of operating range versus efficiency specific to a centrifugal compressor is described. The fluid dynamic concepts used in the new diffuser design that leads to a combined efficient and wide operating range compressor stage are discussed. A test case of the different conventional two-dimensional and the new three-dimensional airfoil diffuser designs is presented. Computational and experimental results of the different designs are compared. The analysis is presented both in terms of the overall compressor performance as well as the detailed flow-field features. Finally Concluding remarks are presented.

Speaker Biography

Ahmed Abdelwahab holds a PhD in Mechanical and Aerospace Engineering from Syracuse University. He has 15 technical publications and 5 patents. He has worked with Praxair for 8 years and has filled several positions from test engineer to aerodynamic designer to lead aerodynamicist to his present position as Manager of turbomachinery aerodynamics.

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3:30 pm – 4:30 pm**

Please contact Dr. Dave Forliti (dforliti@buffalo.edu) for additional information