

Analysis of Non-Conventional Diffuser Designs in High-Speed Centrifugal Compressor

Dr. Porika Niveditha, IIT Madras, India

ABSTRACT

Gas turbines and turbochargers require centrifugal compressors with a wide operating range and high efficiency. Centrifugal compressors are fitted with either vaneless diffuser, vaned diffuser, or both enabling them to produce high-pressure recovery in a single stage. The diffuser of a centrifugal compressor is one of the most significant components, as its flow behavior impacts the compressors overall performance. The vaneless diffuser is easier to maintain and manufacture than the vaned diffuser, yet vaned diffusers are employed in centrifugal compressors to obtain a higher-pressure rise. The operating range of the centrifugal compressor is limited by the use of a vaned diffuser. The discussion will therefore mostly center on cutting-edge diffuser designs developed in recent research works to enhance compressor performance and stable operating range. Non-conventional designs includes pinching, rotating, and combining pinch and rotation effects in a vaneless diffuser. The presentation also covers non-conventional vaned diffuser designs, such as partial and lean vanes.

ABOUT THE SPEAKER

My name is Porika Niveditha, and I am now working as a Senior Project Scientist in the Mechanical Engineering department at IIT Madras on a Tribi project named "Aerodynamic design of low wattage ceiling fan". I obtained a Direct PhD (MS+PhD) in Mechanical Engineering from the Indian Institute of Technology, Madras. During my doctoral studies, I worked on analyzing the performance of "High-speed centrifugal compressors with various diffuser configurations". In addition, I was a Senior Project Officer for a DRDO project entitled "Performance improvement of high-pressure compressor stage by optimizing vane diffuser geometries". I hold a bachelor's degree in mechanical engineering from Jawaharlal Nehru Technological University Hyderabad. Aerothermal analysis, computational fluid dynamics in complex flows, compressor aerodynamics, aero engine component design, and turbomachinery are some of my research interests.



June 21, 2024, 4:00 pm, Microsoft Teams (ONLINE)