



Vaned diffuser effect on the performance of centrifugal compressor performance and stall

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August 19, 2022 at 2:00 PM

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ABSTRACT

A centrifugal compressor is a mechanical device that helps to achieve higher pressure ratios at lower mass flow rates. It is used in many applications such as turbochargers, cruise missiles, and turbojet engines where compact high pressure ratio compressors are required. The performance of a centrifugal compressor is greatly influenced by instabilities like stall and surge, which decrease the operating range and the efficiency of a compressor. These instabilities are effected by the geometry of the vaned diffuser used and hence, the present study aims to see the effect of vaned diffuser parameters like the number of vanes (solidity) and the vane setting angle (α) on the performance and stall of a centrifugal compressor. Different vaned diffuser geometries with varying solidity and vane setting angle are studied both computationally and experimentally. The computational steady-state study is performed for all the geometries to understand their effects on performance. A new rotating centrifugal compressor facility is used for the experimental study. This facility uses a connected turbine driven by compressed air to achieve the required rotation rates, with the compressor RPM being controlled by valves in the turbine inlet and the load on the compressor being controlled by valves at the compressor outlet. This facility enables studies of both performance and stall of centrifugal machines as a function of the vaned diffuser geometry.

ABOUT THE SPEAKER

Mayank Jaiswal is an MTech (Research) candidate joined in 2019 in the Department of Mechanical engineering at Indian Institute of Science, Bengaluru. He is working with Prof. Raghuraman N. Govardhan in Flow physics lab. He graduated with bachelor's degree in Mechanical engineering from Radha Raman Institute of Technology and Science, Bhopal in 2018. His research interest is broadly in Fluid Mechanics and Turbomachines.

