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# Radial Flow Turbocompressors

Design, Analysis, and Applications

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*PCA Engineers Limited*

**and Chris Robinson**

*PCA Engineers Limited*

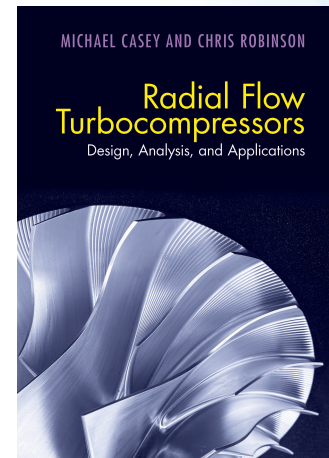
An introduction to the theory and engineering practice that underpins the component design and analysis of radial flow turbocompressors. Drawing upon an extensive theoretical background and years of practical experience, the authors provide descriptions of applications, concepts, component design, analysis tools, performance maps, flow stability, and structural integrity, with illustrative examples. Features wide coverage of all types of radial compressor over many applications unified by the consistent use of dimensional analysis. Discusses the methods needed to analyse the performance, flow, and mechanical integrity that underpin the design of efficient centrifugal compressors with good flow range and stability. Includes explanation of the design of all radial compressor components, including inlet guide vanes, impellers, diffusers, volutes, return channels, de-swirl vanes and side-streams. Suitable as a reference for advanced students of turbomachinery, and a perfect tool for practising mechanical and aerospace engineers already within the field and those just entering it.

1. Introduction; 2. Energy Transfer; 3. Equations of State; 4. Efficiency Definitions for Compressors; 5. Fluid Mechanics; 6. Gas Dynamics; 7. Aerodynamic Loading; 8. Similarity; 9. Specific Speed; 10. Losses and Performance; 11. Impeller Design; 12 Diffuser Design; 13. Casing Component Design; 14. Geometry Definition; 15. Throughflow Code for Radial Compressors; 16. Computational Fluid Dynamics; 17. Compressor Instability and Control; 18. Maps and Matching; 19. Structural Integrity; 20. Development and Testing.

## About the Authors

**Professor Michael Casey** is a director of PCA Engineers Limited. He was previously director of the Institute of Thermal Turbomachinery and Machinery Laboratory, Stuttgart University, specializing in steam turbine and radial compressor research. Prior to this he held posts in Sulzer and Rolls Royce plc. He is a Fellow of both the Institution of Mechanical Engineers and of the American Society of Mechanical Engineers.

**Dr Chris Robinson** is Managing Director at PCA Engineers Limited and a specialist in the aero-mechanical design of centrifugal compressors. Prior to joining PCA he was a principal engineer with Rolls Royce plc., working in research and methods for transonic fan and core engine compressor aerodynamics for civil aircraft engines. He is a Fellow of the Royal Aeronautical Society.



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