

Axial and Radial Turbines

This is the first completely new book for more than a decade specifically devoted to axial and radial turbine design and technology. It starts with the fundamental principles of turbine design, but also includes the latest developments and understanding, including the essential role that computer-based analysis plays today. The coverage includes the aerodynamic and structural analysis of turbine blades, together with the important topics of life prediction, design for durability, blade cooling, and exhaust diffuser design.

AERODYNAMIC DESIGN AND PERFORMANCE OF AXIAL TURBINES

Hany Moustapha

Turbine Fundamentals and Parameters

- Components and Applications
- Fundamental Principles of Turbine Expansion
- Blading Terminology
- Non-Dimensional Parameters
- Degree of Reaction
- Airfoil Loading and Diffusion Factors
- Stage Loading
- Incidence and Deviation
- Off-Design Characteristics
- Design Governing Equations

Aerodynamic Losses

- Loss Classification
- Profile Loss
- Trailing Edge Loss
- Secondary Loss
- Clearance Loss
- Control of Secondary Viscous Losses
- Effects of Mach Number, Reynolds Number, and Blade Cooling
- Incidence Loss
- Loss Model Verification

Preliminary and Through Flow Design

- Gas Turbine Overall Design Procedure
- Preliminary Meanline Design
- Mechanical and Structural Design Considerations
- Turbine Ducts
- The Design Procedure

Airfoil Design

- Design of Airfoil Sections
- Blade Stacking – Three-Dimensional Design
- Airfoil Cooling

Advanced Turbine Design

- Design Challenges and Technology Trends
- High Pressure Ratio and Loading
- Advanced Nozzle Design Concepts
- Advanced Rotor Design Concepts
- Effect of Blade Number
- Stator-Rotor Interaction
- The Role of CFD in Turbine Design
- Optimization of Turbine Secondary and Cooling Air
- Impact on Efficiency and Design Time

TURBINE DURABILITY AND COOLING

Mark F. Zelesky

Turbine Durability and Cooling

- Turbine Blade Requirements
- The Need for Cooling
- Turbine Blade Cooling Design
- Analysis of the Internal Heat Transfer
- Film Cooling
- Test and Measurement Techniques
- The Manufacture of Cooled Blades
- Failure Mechanisms
- Turbine Blade Materials
- Creep Life
- Thermal Barrier Coating
- Worked Problem in Turbine Durability and Cooling

RADIAL TURBINE DESIGN

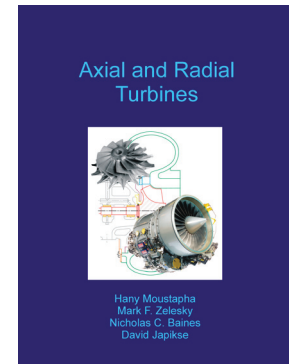
Nicholas C. Baines

Introduction to Radial Turbines

- Fundamentals
- Turbine Stage Performance

The Aerodynamics of Radial Turbines

- Basic Analysis of a Stage
- Rotor Flow Processes
- Rotor Loss Modeling



Axial and Radial Turbines

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- The Volute
- The Nozzle
- Variable Geometry Stators

Radial Turbine Design

- Introduction
- Scaling
- Design Based on Stage or Component Correlations
- Stage Modeling and Optimization
- Blade Layout and Design

EXHAUST ENERGY RECOVERY

David Japikse

Exhaust Energy Recovery

- Introduction
- Turbine Exhaust Diffusers
- Exhaust Collector Design (Hoods)

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About the Authors

About the Publisher