

ME 122 Introduction to Turbomachinery

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Reference:

Ingram, Grant. 2009. *Basic Concepts in Turbomachinery*. Ventus Publishing ApS. ISBN: 978-87-7681-435-9. Pages 144.

Coverage

1. Introduction

- 1.1. What is a Turbomachine?
- 1.2. The Cascade View
- 1.3. The Meridional View

2. Relative and Absolute Motion

- 2.1. 1D Motion
- 2.2. 2D Motion
- 2.3. Velocity Triangles in Turbomachinery
- 2.4. Velocity Components

3. Simple Analysis of Wind Turbines

- 3.1. Aerofoil Operation and Testing
- 3.2. Wind Turbine Design
- 3.3. Turbine Power Control

4. Different Turbomachines and Their Operation

- 4.1. Axial Flow Machines
- 4.2. Radial and Centrifugal Flow Machines
- 4.3. Radial Impellers
- 4.4. Centrifugal Impellers
- 4.5. Hydraulic Turbines
- 4.6. Common Design Choices
- 4.7. The Turbomachine and System

5. Application of The Equations of Fluid Motion

- 5.1. Conservation of Mass
- 5.2. Conservation of Momentum
- 5.3. Conservation of Energy and Rothalpy

6. Efficiency and Reaction

- 6.1. Efficiency
- 6.2. Reaction
- 6.3. Reaction on the $h-s$ Diagram

7. Dimensionless Parameters for Turbomachinery

- 7.1. Coefficients for Axial Machines
- 7.2. Coefficients for Wind Turbines
- 7.3. Coefficients for Hydraulic Machines

8. Axial Flow Machines

- 8.1. Reaction for Repeating Stage
- 8.2. Loading and Efficiency Variation with Reaction
- 8.3. Stage Efficiency
- 8.4. Choice of Reaction for Turbines
- 8.5. Compressor Design
- 8.6. Multistage Steam Turbine

9. Hydraulic Turbines

- 9.1. Pelton Wheel
- 9.2. Analysis Approach
- 9.3. Francis Turbine
- 9.4. Kaplan Turbine

10. Analysis of Pumps

- 10.1. Pump Diffuser Analysis
- 10.2. Pump Losses
- 10.3. Centrifugal Pump Example
- 10.4. Net Positive Suction Head (NPSH)
- 10.5. Application to Real Pumps

Mid Term Exam

Distribution of Problem Specification for Project

Final Exam

Submission of Project

Plant Visit

Course Requirements:

Mid Term Exam	30%
Final Exam	30%
Project	30%
Plant Visit	10%

Grading Scale:

G	Final Grade	G	Final Grade
92 and higher	1.0	68 to below 72	2.5
88 to below 92	1.25	64 to below 68	2.75
84 to below 88	1.5	60 to below 64	3
80 to below 84	1.75	Lower than 60	5
76 to below 80	2.0		
72 to below 76	2.25		

Reminders:

- Attendance in class is not required, but highly recommended.
- Anyone caught cheating will be given a grade of 5, and the case may be brought to the Student Disciplinary Tribunal.
- As courtesy to the class, cell phones must be turned off or in silent mode during class hours and, stowed away and never used during exams.
- There is zero tolerance for not following instructions. Ignorance to the given instructions is not an acceptable excuse.