

Introduction to Steam Turbines

- Conversion of steam energy into mechanical work
- Use of steam nozzles

Steam Nozzles

- Definition
- Energy conversion
- Applications

Applications of Nozzles

- Steam turbines
- Jet engines
- Rocket motors
- Flow measurement

Types of Steam Nozzles

- Convergent
- Divergent
- Convergent-Divergent

Velocity of Steam Through Nozzle

- Steady flow energy equation
- Enthalpy drop
- Kinetic energy increase

Mass Flow Rate Through Nozzle

- Isentropic expansion
- Mass flow rate equations

Steam Turbine Basics

- Prime mover
- Converts kinetic energy to shaft work

History of Steam Turbine

- Sir Charles Parsons
- First turbine in 1884

Classification of Steam Turbines

- Impulse and Reaction
- Axial and Radial flow
- Single and Multistage

Impulse Turbine

- Steam expands in nozzle
- Pressure remains constant across blades

Reaction Turbine

- Pressure drop in fixed and moving blades

Compounding of Turbines

- Purpose and need
- Methods of compounding

Velocity Compounding

- Curtis stage
- Multiple blade rows

Pressure Compounding

- Multiple nozzle stages
- Pressure drops in stages

Pressure-Velocity Compounding

- Combination of pressure and velocity compounding

Velocity Diagrams

- Impulse turbine velocity triangles
- Steam flow analysis

Reaction Turbine Velocity Diagram

- Parsons reaction turbine
- Symmetrical velocity diagram

Forces and Work Done

- Tangential force
- Work done
- Power developed

Turbine Efficiencies

- Diagram efficiency
- Stage efficiency
- Nozzle efficiency

Multi-stage Turbines

- Advantages and operation

Governing of Steam Turbines

- Throttle governing
- Nozzle control governing
- By-pass governing

Conclusion

- Steam turbines are essential for power generation and energy conversion