ENE 327 – Pumps and Compressors

WEEK 1: INTRODUCTION

INTRODUCTION

- **Turbomachinery**

- Liquids / Incompressible fluid
- Air / Compressible fluid

Hydraulic energy in form of kinetic, pressure, potential, strain or thermal energy.

Mechanical energy is the type of energy associated with the moving or rotating parts of machines which transmit power.

- **Classifications [1]**

1. Based on the direction of energy transfer

- Power absorbing fluid machinery (pumps, compressors)
- Power producing fluid machinery (turbines)

2. According to principles of mechanical operation

- Turbomachinery: The fluid flows freely between the inlet and outlet of the machine without any intermittent sealing of the fluid.
- Positive displacement fluid machinery: The fluid first is drown or forced into a finite space bounded by a mechanical part and is sealed in by some mechanical means.

3. According to the direction of flow

- Radial (Centrifugal)
- Mixed
- Axial

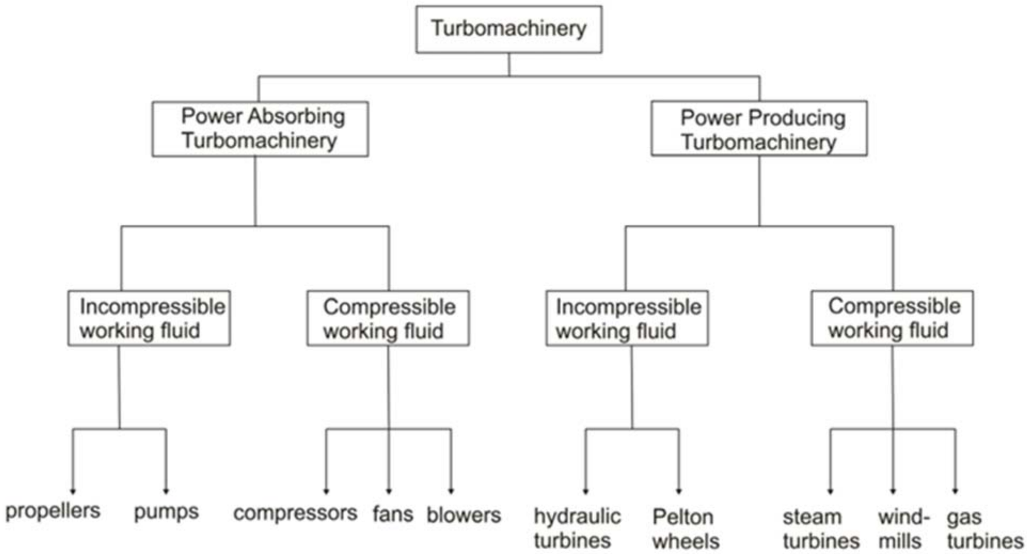

Figure1: Classification of turbomachinery [1]

The power producing turbomachines are usually classified as the impulse and the reaction turbines

The static pressure remains constant in the impulse turbines which of axial turbomachines. There is expansion across reaction turbines with a corresponding decrease in the static pressure.

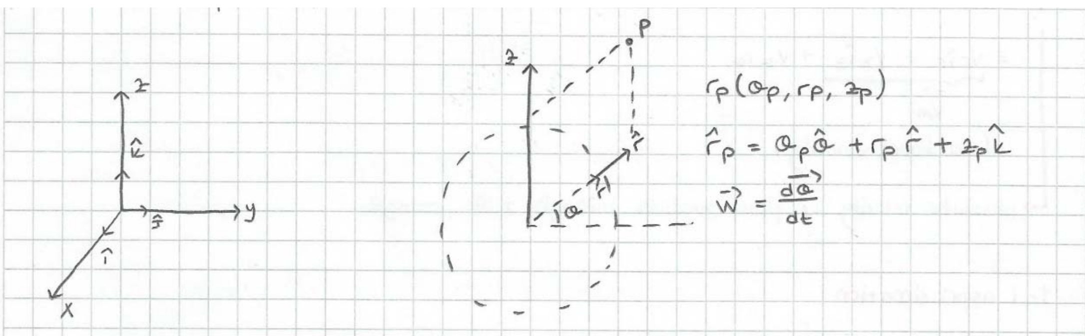

Figure 2. Cartesian and Cylindrical co-ordinates

Absolute velocity, $\vec{v}$

$$\vec{v} = v_r.i_r + v_Q.i_Q + v_z.i_z$$

r: radial   Q : tangential   z : axial

Meridional plane, Q = constant plane

Surface of revolution, r = constant plane

At Q = constant plane, $\vec{v}_m$ which is the tangential velocity defined with respect to absolute frame ($\vec{v}_{frame} = 0$) is defined as

$$\vec{v}_m = v_r.i_r + v_z.i_z$$

$$v_m = \sqrt{v_r^2 + v_z^2}$$

$$\vec{v} = \vec{v}_m + \vec{v}_Q$$

$$\vec{v} = v_r.i_r + v_Q.i_Q + v_z.i_z$$

$\vec{v}$ is velocity of fluid particle through t.m. passage.

REFERENCES

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