

Chapter 5: Steam Turbine

5.1. Turbine

May be defined as, "the turbine is a prime mover in which a rotary motion is obtained by centrifugal force brought into action by changing the direction of a jet or a fluid escaping from a nozzle at high velocity."

In a steam turbine, steam is passed through nozzle or fixed blades where the heat drop takes place, increasing the velocity of steam. This high velocity steam impinges on the curved vanes, which causes the direction of the steam to be changed. Due to this change of momentum motive force is exerted on the moving blades and power is obtained, Figures (5.1) and (5.2).

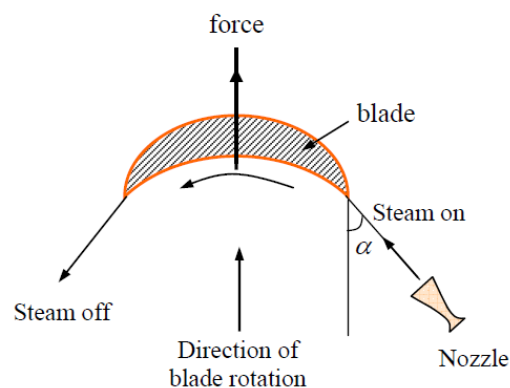
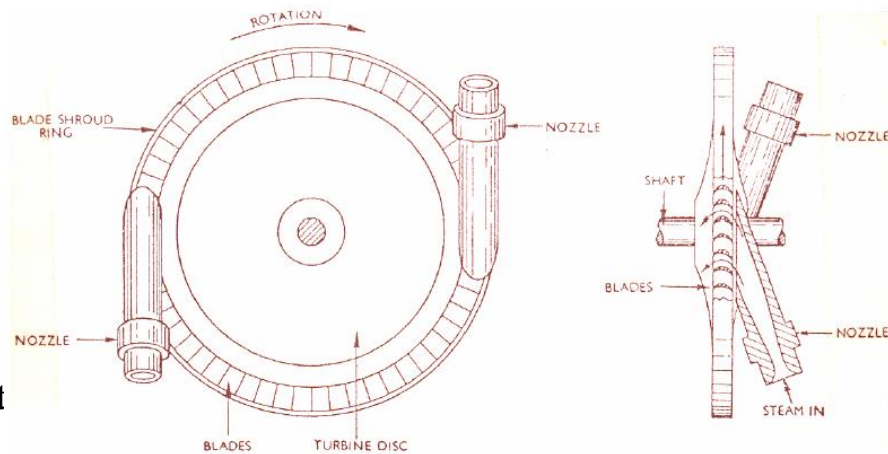


Figure (5.1) Steam flows across turbine blade.

Working principle for Turbine: the working fluid enters at a high pressure and gains an increase kinetic energy as it's expands to a lower pressure in the nozzles. The stream of the fluid then undergoes a change of momentum as it flows through passages between blades attached to the turbine disc (rotor wheel),



5.2. St

There are several ways in which the steam turbines may be classified.
 Figure (5.2): front and side views of simple turbine

Due to action as:

1. Impulse Steam Turbines
2. Reaction Steam Turbines
3. Combination of impulse and reaction

Other classifications are; with respect to the number of step reductions i.e. due to number of stages, as:

1. Single stage turbine.
1. Multi stage turbine.

With respect to the pressure of steam, as:

1. High pressure turbine.
2. Medium pressure turbine.
3. Low pressure turbine.

5.3. Impulse Turbine

An impulse turbine, as the name indicates is a turbine, which runs by the impulse of steam jet. In an impulse design of steam turbine, there is an attempt to attain no expansion of steam within the moving blades and as such its pressure remains constant while passing over the blades (Figure 5.3).

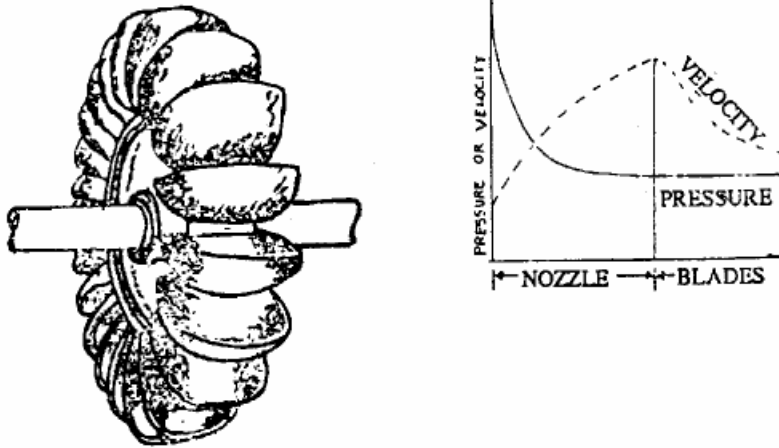


Figure (5.3): (a) Simple impulse Turbine
(b) Velocity and pressure profile.

There are two main type of impulse turbine as shown in figure (5.4). These two types can be combined to get pressure-velocity compounding impulse turbine.

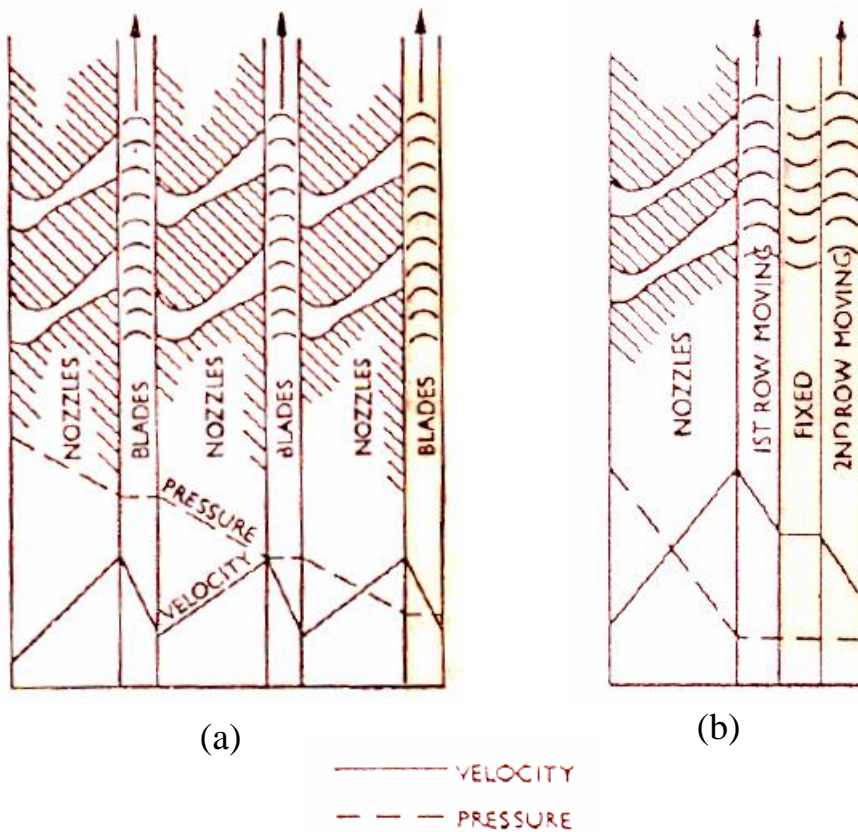


Figure: (5.4) (a) Pressure compound impulse turbine.
(b) Velocity compound impulse turbine.