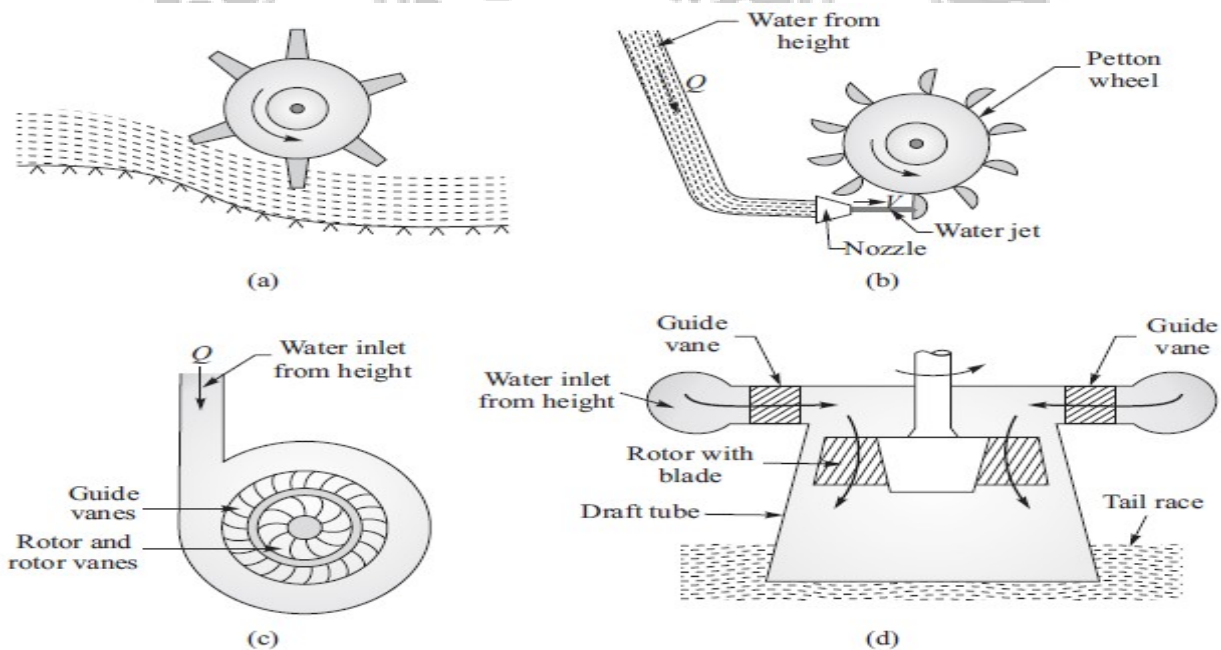


4.12 Turbine theory:

- The turbines can work on the principles of impulse and reaction. In impulse turbine, the complete potential energy or head of water is firstly converted into kinetic energy using a nozzle outside the turbine.
- The fast jet of water emerging from the nozzle is used to strike the vanes of the turbine to impart motion.
- In reaction turbine, nozzle is not used and vanes (guide or stationary vanes and movable vanes on the rotor) are shaped in the form of nozzles to convert potential energy of water into kinetic energy when water flows from the inlet to the outlet of the turbine.
- The turbines can be (i) water wheel (ii) impulse turbine (iii) Francis turbine and (iv) Kaplan turbine



Types of hydraulic turbines. (a) Water wheel, (b) Impulse turbine, (c) Reaction turbine (Francis) and (d) Reaction turbine (Kaplan)

Figure: 4.12

[Source: "Renewable Energy Sources and Emerging Technologies" by D.P.Kothari, K.C Singal, Rakesh Ranjan, Page: 328]

4.12.1 Suitability of Turbines:

The turbines are classified according to their specific speeds. The selection of turbine on the basis of specific speed is made in the following ways:

Low specific speed – Impulse turbines have a low value of specific speeds and these turbines are suitable to work under high head and large discharge conditions. The specific speeds of these turbines vary from 8 to 50.

Medium specific speeds – Reaction turbines such as Francis turbines have specific speeds varying from 51 to 225. These turbines are suitable to work under moderate head and discharge conditions.

High specific speeds – Reaction turbines such as Kaplan turbines have high specific speeds varying from 250 to 850. These turbines are suitable to work under low head and large discharge conditions.

