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Design of Photovoltaic Systems

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NPTEL Online Certification Course

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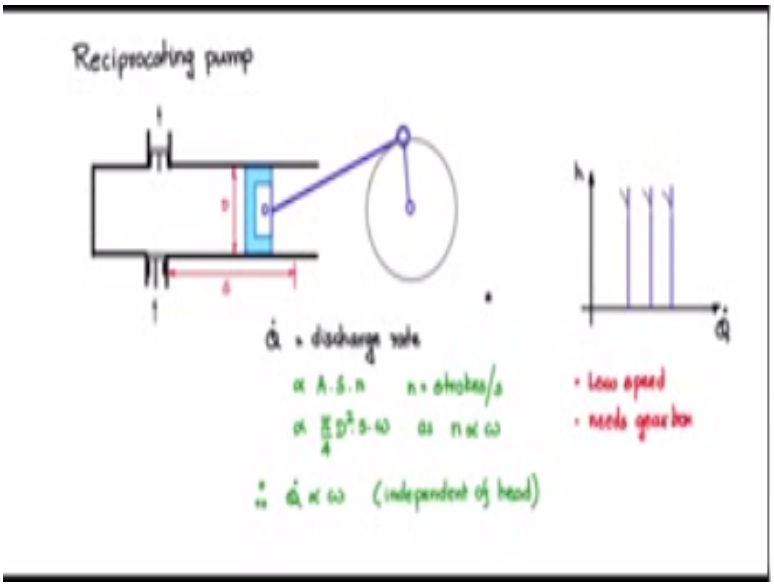

Let us now discuss briefly about the reciprocating pump, the reciprocating pump as a case like this is an enclosed case cylindrical this is the inlet and this is the outlet this is on the section side and this is on the delivery side it has a piston on one side and this piston moves two and four creating the pressure difference and this chamber, this piston is attached to a crank shaft which is attach to a cam of the wheel and that wheel is rotating by means of a DC moder or AC moder.

So as this wheel rotates this crank shaft reaches a distance here, and that is when this would have gone maximum and then when the crank position comes to this position this would be maximum out, so that would be the maximum in and out would be the stroke length. So this is the diameter write that one d, now there are two valves one is the inlet valve and the outlet valve there are two stoppers.

So which means there are unidirectional valves, so let me put a valve there and the valve here. So the valve can lift and allow water to come in likewise here the valve can lift and allow water to go out but the pressure of the water on the pipe will see that the water does not come back in to the chamber, likewise here there is not reverse flow, so this is the inlet and this is the outlet. Now this would be the stroke line if we take that this piston moves from here to here.

So this volume keeps changing, now q. is the discharge rate or the flow rate and that is proportional to this area of the cylinder in to the stroke length that is the volume that it is going to displace in to the number of strokes per second will the discharge rate, number of strokes per second is basically depend on the speed of this wheel rotation, so a is $\pi/ 4 d^2 x s x \omega$ so it is proportional to ω, d is constant fixed quantity is stroke line it is a fixed quantity ω is the only varying quantity.

So you will see that q. is proportional to ω and absorbed that it is independent of pressure or independent of head, now that is the beauty of this reciprocating pump. It is truly a constant flow rate pump, so if you draw the flow rate versus the heat it will appear as though it is, it just goes vertically up in the ideal sense. So independent of the pressure it can deliver a particular flow rate so at different powers you will get different flow rates and the flow rate can be maintain independent of whatever is the head.

In the ideal sense but in a practical sense as the head increased towards the head the flow rate reduces slightly, so more or less it is a constant flow rate pump, it operates a low speeds this cranking is that low speed and therefore the motor connected to it generally they are at higher speeds and then you need to have a gearing mechanism and therefore a gear boxes near with makes it expense out and therefore reciprocating pump is not commonly preferred in low power and low expense pumping applications that is where the centrifugal pump scores and as the advantage over the reciprocating pump.