

ABSTRACT

Hydropower machine is the designation used for a machine that directly convert the hydraulic power in a water fall to mechanical power on the machine shaft. This power conversion involves losses that arise partly in the machine itself and partly in the water conduits to and from the machine.

The utilization of the power in the waterfall is evaluated by the so-called *power plant efficiency* η_a , which is the ratio between the mechanical power output from the machine shaft and the gross hydraulic power of the power plant. The plant efficiency η_a is a variabel quantity that depends on the design of the water conduits to and from the hydropower machine and the operating conditions.

The conduits are normally made with flow cross sections according to optimal design criteria. In practise that means conduit cross section areas are as small as possible to get low investment costs. However, the smaller the cross sections are, the higher the losses become. Similar consequences are resulting from increasing lengths of the conduits. Both these effects means a correspondingly lower plant efficiency η_a .

The hydropower machine may be operated with different flow rates Q from time to time according to the variable grid load, the alternating heads and flow discharges in the plant. These circumstances means that the hydropower machines necessarily are equipped with facilities for regulation of the power input and output. In practise this is carried out by regulation of the flow discharge.