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A Study of Surge-Tank Stability Condition at a Hydraulic Power Station

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In this thesis, a stability condition at a hydraulic power station is treated. Thoma's theory gives the stability condition under the assumption that the hydraulic power to the turbine is constant and the power station is isolated from other stations, while other theories give the stability condition under the assumption that the power station is not isolated and interconnected with other station. In this theory, the only effect of the water level displacement of one station is considered and that of others are neglected. The author gives such a stability condition that contains the effect of the water level displacement of other stations. The result of calculation shows that the effect of the water level displacement of other stations is fairly large. Particularly in the case that the periods of the oscillation of some power stations are nearly equal, the water level sometimes becomes unstable, even if Thoma's theory is fulfilled. So, the period of the oscillation from that of other stations should be separated when the power stations are interconnected each other. Generally, the governor time lag is neglected in the theoretical analysis for the stability conditions, because it is shorter than the period of the oscillation of the water level displacement, but in this thesis, stability condition is discussed without neglecting this effect.

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