

Background

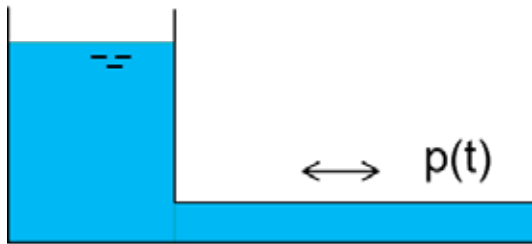
Dynamic loads on hydro turbines during transient operation is highly dependent on the conduit system, i.e penstock, tunnels and surge shafts, in which the turbine is installed. During steady state operation, the pressure fluctuation inflicted by the turbine will propagate into the system and reflect. During start-stop, the retardation forces and elastic waves will give additional stress in the turbine.

Full 3D-CFD simulation of the whole system is naturally out of the question due to the time consume of such simulations. The system

dynamic simulations are more effectively done by 1D. The 1D simulations can be implemented as input to the 3D simulations.

By this method, it should be possible to find the correlation or dependency between the internal dynamic flow in the turbine and the attached system.

The dynamic load simulations should be analyzed with respect to crack propagation and fatigue. Both low and high cycle fatigue should be addressed.



1D - simulations



3D - simuleringer

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Fatigue loads on
turbines attached to a
conduit system

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