

# Hydraulic Pelton turbine developments

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Founded in 1990, VA TECH Hydro Vevey is a Swiss company belonging to the Austrian firm VA TECHVOEST MCE, which is itself part of the VA Technology group. VA TECH Hydro Vevey designs, manufactures and delivers hydraulic turbines, especially high-head turbines and pump-turbines.

High-head turbines are mostly of the Pelton type, in which a Pelton wheel, comprised of buckets, is

driven by a cylindrical water jet. The discharge and diameter of this jet are regulated by an injector-needle system which is fed by a distributing manifold.

CFD is now fully integrated in the daily design and analysis processes for all other turbine types at VA TECH Hydro Vevey. However, applying CFD to the injectors and runner buckets in Pelton turbines is still on a research level as the physical phenomena involved are far from being fully understood and described. Despite this, CFD offers unique opportunities to investigate the detailed behaviour of these machines much more economically than using experimental methods.

For VA TECH Hydro Vevey's research on Pelton turbine developments, CFX-4's capacity for handling free surface and two-phase flows made it the obvious choice. Furthermore, considering the scientific and technical challenges of the modelling work, our strong connections with AEA Technology as users of

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CFX-TASCflow and the support offered by AEA Technology were additional deciding factors.

While considerable experimental validation is needed before CFD can be applied to Pelton turbine design on a daily basis, the results demonstrate CFX-4's potential to improve and optimize this type of rotating machinery.

Above: Water jet velocity field at the outlet of a Pelton injector. The red curves show the air/water interfaces. The pipe is presented in red and the servomotor body and needle group are illustrated in orange, the needle being the sharp edge of the orange body.

Below: Injectors and runner in a scale Pelton model.

