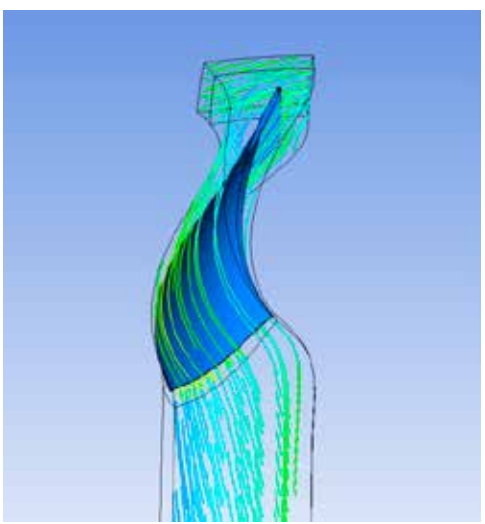
Background

About 30% of all High Head Francis turbines installed worldwide are located in Norway. The average age of a Norwegian hydropower plant is 45 years, and many show sign of fatigue and needs to be refurbished. A serious concern is that some newly refurbished high head power plants have experienced failures after having new and modern Francis runners installed. The main problem is that the turbine runner develops cracks in the blades due to cyclic loads.



Objective

The objective of this project is to establish a correct modeling approach with respect to High Head Francis turbines. A stepwise fluid-structure coupling will be used to handle the interaction in the runner. Reduction of the simulation time by means of model order reduction will be investigated.

The primary output of the project will be a recommended practice and toolkit for FSI simulations on High Head Francis turbines.

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FSI simulation of steady and transient operation of a high head Francis turbine

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INDUSTRIAL PHD