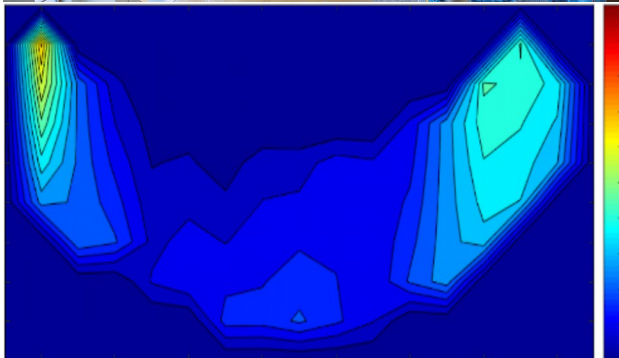
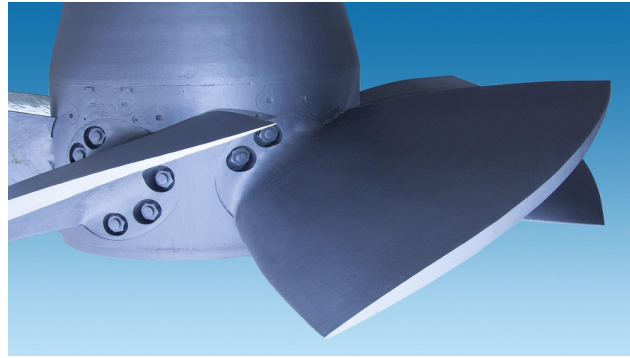


NAW[®]-inspection of hydro power turbine blades



During power generation stress forces on the water power turbines blades are high. Not only the force from the water pushing the turbine blades but also the abrasion from water, cavitation and any debris finding its way through the intake gratings wears the blades down risking unscheduled interruption in power generation.

Inspecting for buried cracks, defects or fatigue is difficult in this underground environment. Using the non destructive (NDT) “NAW[®]-inspection” method is one possibility. By sending nonlinear acoustic waves (NAW[®]) sound energy into the turbine or turbine blades defects are detected.

A crack starts as rifts and tears in the materials grain structure, when these rifts grow together a crack is developed. Cracks and rifts in a structure carries sound differently creating sound anomalies we can detect. Sound is physically energy pulses causing vibration waves. To “hear” a deep buried crack the steel material is provoked with bursts of sound energy. When the grain structure is stressed with our sound energy defects as cracks, gaps or rifts in the grain structure is detected.

Image above shows our transducer sending the sound energy into a turbine blade. Blue lines are the inspection points in the most stressed area where the blade attaches to turbine housing. The result from NAW[®] inspection is a mathematical calculated value we define “Damagevalue”, a mathematical value of the severity of a damage.

The color graph above to left visualizes intensity of material damage in each inspection point with a heat map from blue to red. Low Damagevalues are shown with blue color, high Damagevalue in red color. As expected the heatmap shows highest Damagevalues are located in outer edges of blades.

By transmitting our sound signature through the steel blade and listen for nonlinearities caused by damages we at Acoustic Agree AB localizes and quantifies damages in turbine, turbine blades, turbine shaft and generator. If the NAW[®] inspection is repeated regularly the progression of damages can be determined for the load case establishing a base for estimating remaining life time in material until break (MTBF or MTTF) scheduling maintenance on a mathematical base depending to current load case.