CAVITATION PREDICTION OVER A 6-BLADE KAPLAN TURBINE

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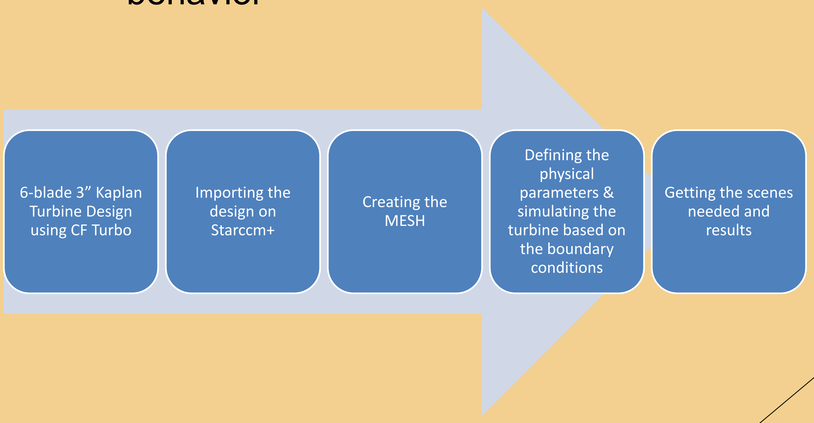
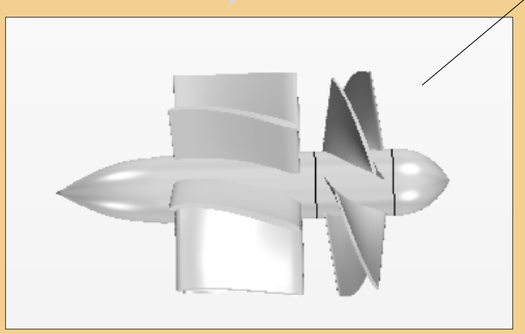
OBJECTIVES

The purpose of this study is to analyze and study a 6-blade Kaplan hydro turbine to predict the cavitation behavior. Predicating the cavitation behavior for the turbine will help us in the future in the hydro turbine design stages, and limit the probability of its occurrence

APPROACH

All the data has been collected through numerical analysis using computational fluid dynamics software to help us track and predict the occurrence of the cavitation phenomena.
6-blade Kaplan turbine was used to study the location of the occurrence of the vapor fluid, giving us an indication of the cavitation location and its behavior





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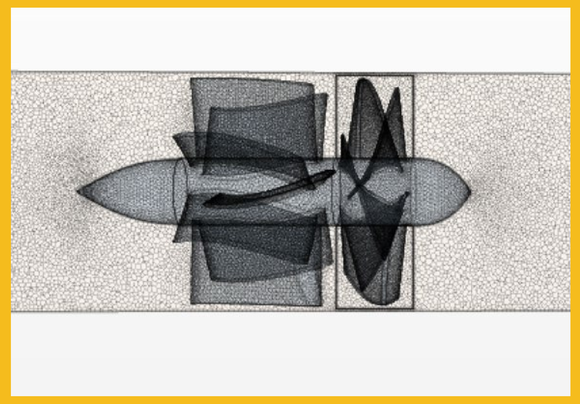
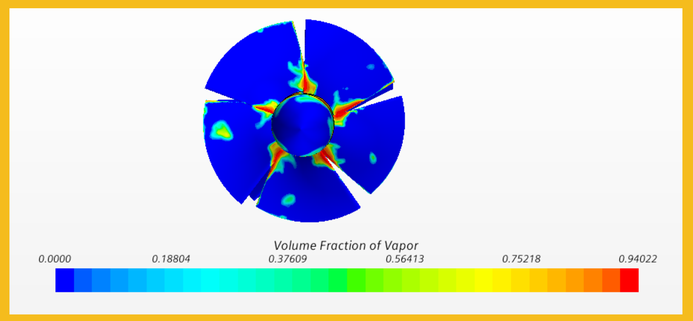
METHODOLOGY

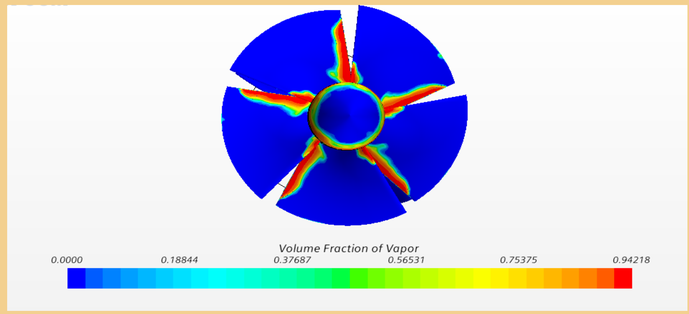
- Kaplan turbine was designed to study the cavitation effect
- Implicit unsteady, Multi-phase (water and Vapor) with turbulent flow was chosen as the physical parameters due to the nature of the experimental setup. to resolve all kinds of scales of eddies, more grids are needed to capture the smallest eddies, so Large eddy simulation (LES) was chosen.
- Different boundary conditions were tested (inlet velocities at 10 m/s with different rotational speed (1000,2000,3000 RPM), and with an outlet pressure to the atmosphere

RESULTS

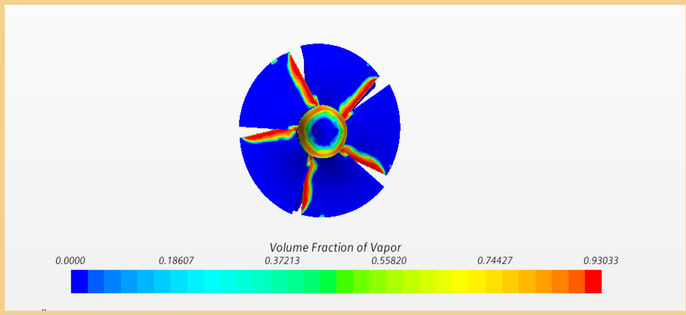




VVF Scene at 10 m/s and 1000 RPM



VVF Scene at 10 m/s and 2000 RPM



VVF Scene at 10 m/s and 3000 RPM

CONCLUSION

- As can be seen from the results, at a certain velocity and when increasing the RPM of the turbine, the tendency of the cavitation increases
- Also, noticing from the VVF scenes the cavitation is occurring around the blades and the rotor. Increasing to the tip of the rotor as the RPM increases
- CFD has been proven as a tool to predict the phenomena of cavitation while comparing it to the experimental results

BIBLIOGRAPHY

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