

Internal Flow Characteristics of a Francis Hydro Turbine by Guide Vane Angle

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There is a common sense that the efficiency of a turbine increases along with increasement of guide vane angle and reaches its maximum value in the design point, after that, it decreases again. But for a certain Francis turbine, the exact internal flow characteristics by guide vane angle remains unknown. In this study, vortex core region and streamlines in the draft tube are investigated to examine the location where the strong rotating swirl flow exists. Besides, three cross sectional planes are set near the inlet of draft tube to examine the velocity vectors and pressure contours in the draft tube. The results show that internal flow at the partial flow rate, which means relatively low guide vane opening angle, reveals strong swirl flow region in the draft tube. The swirl flow may introduce strong possibility of generating low pressure region and cavitation occurrence.

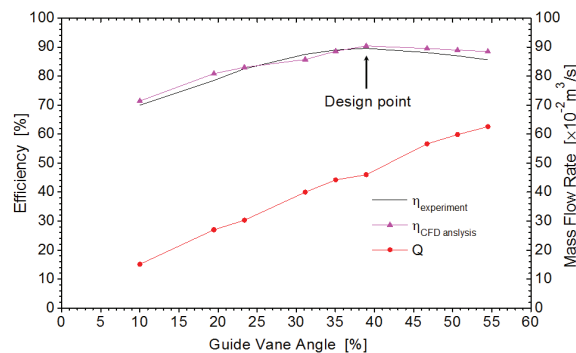


Fig. 1 Performance curves

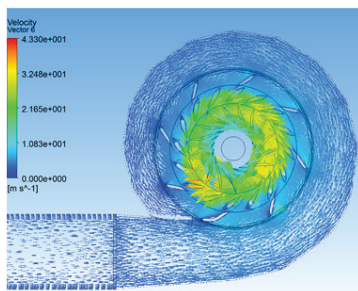


Fig. 2 Velocity vectors (design point)

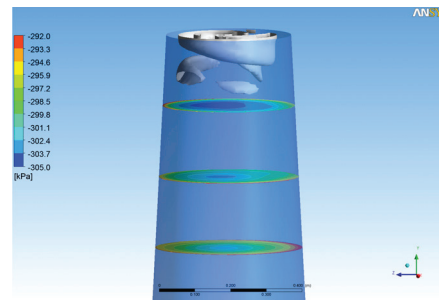


Fig. 3 Vortex core region (partial flow rate)

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References

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