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CFD Aided Design and Optimization of Francis Turbine Runners[1] FATMA AYANCIK, GIZEM DEMIREL, KUTAY CELEBIOGLU, ERDEM ACAR, SELIN ARADAG, TOBB University of Economics and Technology, ETU HYDRO RESEARCH CENTER TEAM — Francis turbines are commonly used for hydroelectric power plants with their wide range of flow rate and head values. They are composed of five main components and they generate energy with the help of the runner connected to the generator. Therefore, runner is the most important part of a Francis turbine. All components of turbines are linked and they are designed to maximize the turbine efficiency. The dimensions of the runner vary depending on the design discharge, head and the speed of the rotor of the generators. In this study, a design methodology is developed to design turbine runners with the help of computational fluid dynamics and is applied to the runner design of three different hydroelectric power plant turbines. Multi objective design optimization is also performed and the response surfaces are investigated to obtain maximum turbine efficiency and cavitation free design.

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