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Design of an Adaptive Power Regulation Mechanism and a Nozzle for a Hydroelectric Power Plant Turbine Test Rig[1] BURAK MERT, ZEYNEP AYTAC, YIGIT TASCIOGLU, KUTAY CELEBIOGLU, SELIN ARADAG, TOBB University of Economics and Technology, ETU HYDRO RESEARCH CENTER TEAM — This study deals with the design of a power regulation mechanism for a Hydroelectric Power Plant (HEPP) model turbine test system which is designed to test Francis type hydroturbines up to 2 MW power with varying head and flow(discharge) values. Unlike the tailor made regulation mechanisms of full-sized, functional HEPPs; the design for the test system must be easily adapted to various turbines that are to be tested. In order to achieve this adaptability, a dynamic simulation model is constructed in MATLAB/Simulink SimMechanics. This model acquires geometric data and hydraulic loading data of the regulation system from Autodesk Inventor CAD models and Computational Fluid Dynamics (CFD) analysis respectively. The dynamic model is explained and case studies of two different HEPPs are performed for validation. CFD aided design of the turbine guide vanes, which is used as input for the dynamic model, is also presented.

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