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입구 유입각도가 프란시스 수차의 출력 성능에 미치는 영향

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An Effect of Induced Angle on the Performance of a Francis Hydraulic Turbine

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Key words : Induced angle(유입각도), Inlet guide vane(유입안내깃), Indicated power(지시출력), Brake power(제동출력), FVM(유한체적법)

Abstract : An effect of inlet flow angle on the output power performance of a Francis hydraulic turbine was studied numerically. The flow pattern in a blade-to-blade path of the impeller was visualized and static pressure distribution on the pressure and suction side of impeller blade was obtained with the change of induced angle and rotational speed of the impeller. The result of flow visualization is used to analyze the stability of flow pattern in the path and the static pressure distributions on blade surfaces are used to have the indicated power of the impeller at the given operating condition. An experimental work was conducted by KIER to have the brake power of the turbine at each operating condition. The loss of mechanical power of the model turbine was obtained from the comparison of two different powers and the turbine efficiency or the energy conversion efficiency of the model turbine could be estimated. From this study, it was found that the rotating power of the turbine linearly increases with respect to the rotating speed. It means that the higher volume flow rate supplied, the bigger torque generated on the turbine shaft. The maximum brake efficiency of the turbine is around 46% at 35 degree of induced angle. The difference between numerical and experimental output of the model turbine is defined as mechanical efficiency. The maximum mechanical efficiency of the turbine is around 93% at 25~30 degree of induced angle.

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