

### ABSTRACT

A water turbine is a turbine with potential energy from air to mechanical energy on the turbine shaft to rotate an electric generator and one type of water turbine, including the Pelton turbine. The purpose of this study was to simulate and measure the torque, power, and efficiency of the Pelton water turbine against variations in nozzle diameter. The nozzle serves to direct the air jet to the bucket to move the runner, thereby affecting turbine efficiency. This research was conducted with a numerical simulation method using CFD (Computational Fluid Dynamic) software to simulate solidworks flow to see the results of the torque and water jet speed of the pelton water turbine. The variables that were varied were the variation of the nozzle diameter 8 mm, 10 mm, 15 mm, and 30 mm. In this test, the optimal results were obtained at a nozzle diameter of 8 mm with a torque value = 15063000 Nm, turbine power = 63062755 W, efficiency = 41,43 %. This shows that the smaller the nozzle diameter, the greater the torque, turbine power and efficiency resulting in turbine performance.

**Keywords: Power turbine, Nozzle diameter, Efficiency, Pelton turbine**

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Turbin air adalah turbin yang mengkonversi energi potensial air menuju energi mekanik pada poros turbin untuk memutar generator listrik dan salah satu jenis turbin air diantaranya turbin pelton. Tujuan penelitian ini adalah mensimulasikan dan mengetahui torsi, daya, dan efisiensi turbin air pelton terhadap variasi diameter *nozzle*. *Nozzle* berfungsi mengarahkan pancaran air menuju ke bucket untuk menggerakkan runner, sehingga mempengaruhi efisiensi turbin. Penelitian ini dilakukan dengan metode simulasi numerik menggunakan *software CFD (Computational Fluid Dynamic)* solidworks flow simulation untuk mengetahui hasil dari torsi dan kecepatan pancar air turbin air pelton. Variabel yang divariasikan adalah variasi diameter *nozzle* 8 mm, 10 mm, 15 mm, dan 30 mm. Pada pengujian ini didapatkan hasil paling optimal diperoleh pada diameter *nozzle* 8 mm dengan nilai torsi = 1506300 Nm, daya turbin = 63062755 W, efisiensi = 41,43 %. Hal ini menunjukkan bahwa semakin kecil diameter *nozzle* maka torsi, daya turbin, dan efisiensi yang dihasilkan pada kinerja turbin akan semakin besar.

**Kata Kunci : Daya Turbin, Diameter Nozzle, Efisiensi, Turbin Pelton**