Optimasi sudut sudu turbin air openflume dengan metode numerik = Hydraulic openflume turbine blade angle optimization with numerical method

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Abstrak

[Indonesia merupakan salah satu negara berkembang di Asia Tenggara dan belum seluruh daerahnya menikmati energi listrik. Sebagian besar daerah yang belum menikmati energi listrik tersebut berada pada daerah terpencil disebabkan oleh tidak adanya jaringan listrik dari pusat. Jaringan listrik dari pusat tidak tersedia karena pada daerah terpencil kebutuhan energi listrik sedikit sehingga harga listrik per kWh jadi lebih mahal. Indonesia memiliki karakteristik geografis pegunungan dan berbukit. Oleh karena itu, pembangkit listrik tenaga mikrohidro menjadi pilihan energi listrik pada daerah terpencil. Sebelumnya telah dilakukan perancangan turbin mikrohidro dengan head total setinggi 2 m, yaitu turbin air openflume dengan rasio hub-to-tip sebesar 0,4 dengan free vortex theory. Tulisan ini menampilkan verifikasi data hasil perancangan sebelumnya dengan metode numerik melalui simulasi CFD (Computational Fluid Dynamics). Modifikasi dilakukan pada rancangan turbin yang sebelumnya dengan merubah besar sudut sudu pada bagian masuk dan keluar. Simulasi CFD pada turbin openflume ini dilakukan menggunakan software ANSYS Fluent 15.0 dengan model turbulensi k- dan mendefinisikan model simulasi dengan turbo-topology. Tulisan ini membandingkan karakteristik performa dari turbin awal dan turbin modifikasi dengan melihat debit aliran, torsi, dan daya poros pada tiap RPM yang dihasilkan. Efisiensi turbin tertinggi dari turbin adalah 62.47% pada kecepatan putar 600 RPM dengan sudut sudu bagian masuk 72.3o dan bagian keluar 76.5o.

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is located in remote areas which is caused by the inexistence of electrical transmision from central. Electrical transmision from central is not avalailable
because the needs of electricity in remote areas are minimum, so that the price of electricity are more expensive per kWh. Indonesia has major geographical
characteristics with its mountains and highlands. Therefore, a power plant powered by microhydro plant has been chosen as electricity source in such place. Beforehand, micro-hydro turbine design has been carried out with total head 2 m, that is openflume propeller turbine with 0,4 hub-to-tip ratio with the free vortex theory. This writing represents the verification of designing results with numeric method accomplished by CFD (Computational Fluid Dynamics) simulation. Modification is applied on the previous turbine design with changing the blade angle on inlet and outlet. The simulation of CFD on this openflume turbine propeller was performed using ANSYS Fluent 15.0 software with k- turbulence model and defining the simulation model with turbo-topology. This writing
compares the performance characteristics of the original turbine and the modified turbine with flow capacity, torsion and shaft power at each RPM produced. The highest turbine efficiency is 62.47% at 600 RPM with inlet blade angle 72.3o and outlet blade angle 76.5o;Indonesia is one of developing country in South East Asia yet ironically parts of its region cannot derive the luxury of electricity. Most area without

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