ANALISIS KINERJA TURBIN KINETIK DENGAN VARIASI KEMIRINGAN SUDUT SALURAN PADA PEMBANGKIT LISTRIK TENAGA *MICROHYDRO* (PLTMH)

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ABSTRAK

Penelitian ini bertujuan untuk mengetahui daya listrik yang dihasilkan, kecepatan putaran turbin dan efisiensi dari variasi kemiringan sudut saluran pada turbin kinetik. Penelitian ini dilakukan di Laboratorium Teknik dan Konservasi Lingkungan Pertanian, Fakultas Teknologi Pangan dan Agroindustri, Universitas Mataram. Metode yang digunakan yaitu metode eksperimental dengan percobaan skala laboratorium dengan variasi kemiringan sudut saluran dan variasi diameter *pulley* penggerak dan *pulley* dinamo. Variasi kemiringan sudut saluran yang digunakan, yaitu sudut 15°, sudut 30° dan sudut 45°. Sedangkan variasi diameter *pulley* penggerak yang digunakan yaitu 35 cm dan 25 cm, diameter *pulley* dinamo yang digunakan, yaitu 7 cm dan 5 cm. Setiap perlakuan dilakukan 3 kali ulangan. Parameter yang dikaji pada penelitian ini, yaitu debit aliran, sistem transmisi, kecepatan putaran, daya air, daya listrik yang dihasilkan, efisiensi turbin dan efisiensi transmisi. Turbin yang telah diuji memiliki jumlah sudu 8 buah, panjang sudu 13 cm, tinggi sudu 10 cm dan diameter cakram 9 cm. Berdasarkan hasil penelitian menunjukkan bahwa adanya pengaruh kemiringan sudut saluran terhadap debit aliran, sistem transmisi, daya air, kecepatan putaran, daya listrik dan efisiensi transmisi. Sedangkan pada efisiensi turbin tidak ada pengaruh terhadap kemiringan sudut saluran. Daya air terbesar diperoleh pada kemiringan sudut saluran 45° dengan menggunakan sudu mangkuk yaitu sebesar 0,0383 kW, sedangkan daya air terendah diperoleh pada kemiringan sudut saluran 15°, yaitu sebesar 0,0057 kW pada perlakuan diameter *pulley* 35 cm dan 7 cm. kecepatan putaran turbin terbesar diperoleh pada kemiringan sudut saluran 45°, yaitu sebesar 91,73 rpm dan kecepatan putaran turbin terendah diperoleh pada kemiringan sudut saluran 15°, yaitu sebesar 84,37 rpm. Daya listrik terbesar diperoleh pada kemiringan sudut saluran 45°, yaitu sebesar 0,0081 watt dan nilai terendah diperoleh pada kemiringan sudut saluran 15°, yaitu sebesar 0,0022 watt pada diameter *pulley* 35 cm dan 5 cm. efisiensi turbin terbesar diperoleh pada kemiringan sudut saluran 15°, yaitu sebesar 44,75% dan nilai terendah diperoleh pada kemiringan sudut saluran 45°, yaitu sebesar 14,27%.

Kata kunci: kemiringan sudut, saluran, turbin kinetik, daya air, daya listrik.

PERFORMANCE ANALYSIS OF KINETIC TURBINE WITH VARIATION OF CHANNEL ANGLE IN MICROHYDRO POWER PLANT (MHP)

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ABSTRACT

This study aims to determine the electrical power produced, turbine rotation speed and efficiency of variations in the slope of the channel angle on kinetic turbines. This research was conducted at the Laboratory of Engineering and Environmental Conservation of Agriculture, Faculty of Food Agroindustrial Technology, University of Mataram. The method used was experimental method with laboratory scale experiments by variations in the slope of the channel angle and variations in the diameter of the driving pulley and dynamo pulley. The slope variation of the channel angle used were 15° angle, 30° angle, and 45° angle. While the variations in the diameter of the driving pulley used were 35 cm and 25 cm, the diameter of the pulley dynamo used was 7 cm and 5 cm. Each treatment was performed three times. The parameters studied in this study were flow discharge, transmission system, rotation speed, water power, electrical power produced, turbine efficiency, and transmission efficiency. The turbines that have been tested have 8 blades, 13 cm blade length, 10 cm blade height, and 9 cm disc diameter. Based on the results, the study indicates that there is an influence of the slope of the channel angle on flow discharge, transmission system, water power, rotation speed, electric power and transmission efficiency. While the turbine efficiency has no effect on the slope of the channel angle. The biggest water power was obtained at 45° channel angle slope by using a bowl blade which equal to 0.0383 kW, while the lowest water power was obtained at 15° channel angle slope which equal to 0.0057 kW on the treatment of 35 cm and 7 cm pulley diameter. The largest turbine rotation speed was obtained at the slope of the 45° channel angle which equal to 91.73 rpm and the lowest turbine rotation speed was obtained at the slope of the 15° channel angle which equal to 84.37 rpm. The greatest electrical power was obtained at the slope of the 45° channel angle which equal to 0.0081 watts and the lowest value was obtained at the slope of the 15° channel angle which equal to 0.0022 watts on the 35 cm and 5 cm pulley diameter. The biggest turbine efficiency was obtained at the slope of the 15° channel angle which equal to 44.75% and the lowest value obtained at the slope of the 45° channel angle which equal to 14.27%.

Keywords: slope angle, channel, kinetic turbine, water power, electric power.