

**TUGAS AKHIR**

**PENGUJIAN KINERJA MODEL TURBIN ANGIN  
SAVONIUS DENGAN PERMUKAAN SUDU CEKUNG  
KASAR PADA BERBAGAI *OVERLAP RATIO***

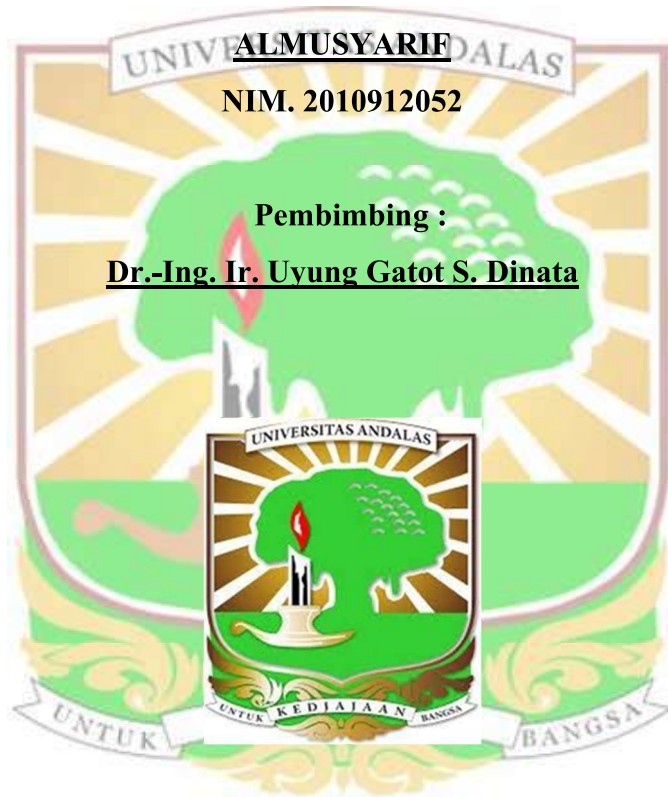
Oleh :

**ALMUSYARIF**

**NIM. 2010912052**

**Pembimbing :**

**Dr.-Ing. Ir. Uyung Gatot S. Dinata**



**DEPARTEMEN TEKNIK MESIN  
FAKULTAS TEKNIK  
UNIVERSITAS ANDALAS  
PADANG**

**2025**

## **ABSTRACT**

*The demand for renewable energy has driven the development of Savonius-type vertical axis wind turbines (VAWTs), which are known for their simple design and low cost but are limited by their efficiency. This study aims to enhance the performance of the Savonius turbine by analyzing the combined effect of two design modifications: the application of a rough surface on the concave side of the blades and variations in the overlap ratio.*

*An experimental method was employed, with tests conducted in a wind tunnel. Five two-bladed Savonius turbine prototypes with rough concave blade surfaces were fabricated using 3D printing technology, featuring overlap ratio variations of 0, 0.1, 0.2, 0.3, and 0.4. The performance of each model was evaluated based on the Coefficient of Power ( $C_p$ ) and Tip Speed Ratio (TSR) at a constant wind speed of 5,6 m/s.*

*The test results indicated that the turbine model with an overlap ratio of 0.2 demonstrated the most superior performance, achieving a maximum  $C_p$  value of 0.282 at a TSR of 1.120. This model also recorded the highest torque value of 0.049 Nm. Based on these findings, it is concluded that an overlap ratio configuration of 0.2 on a Savonius turbine with a rough concave blade surface is the most optimal combination for improving efficiency among the variations tested.*

**Keywords:** *Savonius Turbine, Vertical Axis Wind Turbine, Overlap Ratio, Rough Surface, Coefficient of Power ( $C_p$ )*

## ABSTRAK

Permintaan akan energi terbarukan mendorong pengembangan turbin angin sumbu vertikal (TASV) tipe Savonius, yang dikenal memiliki desain sederhana dan biaya rendah namun efisiensinya terbatas. Penelitian ini bertujuan untuk meningkatkan performa turbin Savonius dengan menganalisis pengaruh gabungan dari dua modifikasi desain: penggunaan permukaan kasar pada sisi sudu cekung dan variasi *overlap ratio*.

Metode yang digunakan adalah eksperimental dengan melakukan pengujian di dalam terowongan angin (*wind tunnel*). Lima prototipe turbin Savonius dua sudu dengan permukaan sudu cekung kasar diproduksi menggunakan teknologi cetak 3D dengan variasi *overlap ratio* sebesar 0; 0,1; 0,2; 0,3; dan 0,4. Kinerja setiap model dievaluasi berdasarkan parameter *Coefficient of Power* ( $C_p$ ) dan *Tip Speed Ratio* (TSR) pada kecepatan angin konstan 5,6 m/s.

Hasil pengujian menunjukkan bahwa model turbin dengan *overlap ratio* 0,2 menunjukkan performa paling unggul, mencapai nilai  $C_p$  maksimum sebesar 0,282 pada TSR 1,120. Model ini juga mencatatkan nilai torsi tertinggi, yaitu 0,044 Nm. Berdasarkan temuan ini, dapat disimpulkan bahwa konfigurasi *overlap ratio* 0,2 pada turbin Savonius dengan permukaan sudu cekung kasar merupakan kombinasi paling optimal untuk meningkatkan efisiensi di antara variasi yang diuji.

**Kata Kunci:** Turbin Savonius, Turbin Angin Sumbu Vertikal, *Overlap Ratio*, Permukaan Kasar, *Coefficient of Power* ( $C_p$ )