ABSTRACT

The uncertainty of wind patterns in Indonesia impacts wind turbine efficiency, with wind direction control being a key challenge. A prototype is proposed to address this, utilizing PID Tuning Cohen Coon for faster system response. The system uses a Rotary Encoder sensor and nacelle to detect wind direction and measure the yaw angle, sending data to an Arduino to drive a Stepper Motor that adjusts the nacelle accordingly. The Rotary Encoder achieves 99% accuracy, while the Stepper Motor operates at 99.27% precision. Without PID, testing at set points (90°, 180°, 270°, 360°) showed infinite steady-state error, overshoot, slow rise time (~17.4 seconds), and unstable settling time, highlighting the need for PID control. Using PID parameters (Kp = ±19.5, Ki = ±0.2, Kd = ±0.5), steady-state error and overshoot dropped below 0.4%, rise time improved to 1.4-3.7 seconds, and settling time to 2-6.5 seconds. This confirms PID's effectiveness in enhancing yaw control performance for wind turbines.

Keywords: *Wind, Turbine, Prototype, PID, Sensor, Motor.*