

DAFTAR PUSTAKA

- [1] Tim Sekretaris Jenderal Dewan Energi Nasional, “Indonesia Energy Out Look 2019,” *J. Chem. Inf. Model.*, vol. 53, no. 9, pp. 1689–1699, 2019.
- [2] N. A. Adistia, R. A. Nurdiansyah, J. Fariko, V. Vincent, and J. W. Simatupang, “Potensi Energi Panas Bumi, Angin, Dan Biomassa Menjadi Energi Listrik Di Indonesia,” *TESLA J. Tek. Elektro*, vol. 22, no. 2, p. 105, 2020, doi: 10.24912/tesla.v22i2.9107.
- [3] B. Irfan Muhamad Zain, “Optimalisasi Turbin Angin Sumbu Vertikal Darrieus Sebagai Pembangkit Aerator,” Sep. 2020.
- [4] H. Lukas, J. Ginting, and M. F. Soetanto, “Analisis Karakteristik Aerodinamis Turbin Angin Poros Horizontal Tiga Bilah,” pp. 3–8.
- [5] M. A. D. Wicaksono, “Pengaruh Pitch Angle Terhadap Unjuk Kerja Turbin Angin Horizontal Tipe Propeler Dari Bahan Pipa PVC 6 Inch,” p. 6, 2021.
- [6] J. Lubanturuan, “Rancang Bangun Data Logger Arus, Tegangan, Daya dan Waktu Untuk Panel Surya 30 Wp Berbasis Mikrokontroler ATMEGA328,” *Sumtra Utara*, Jul. 2021.
- [7] A. W. Hasanah, “Perancangan Data Logger Turbin Angin Berbasis Mikrokontroler Atmega,” *Ilm. Elektron.*, vol. 6, Oct. 2017.
- [8] I. Arif, “Analisis Dan Pengujian Kinerja Turbin Angin Savonius 4 Sudu,” *J. Tek. Mesin III*, vol. 3, no. 2, p. 46, 2019, doi: 10.31543/jtm.v3i2.307.
- [9] R. Prabowo, A. Muid, and R. Adriat, “Rancang Bangun Alat Pengukur Kecepatan Angin Berbasis Mikrokontroler ATMEGA 328P,” *Tek. Elektro*, vol. VI, no. 2, pp. 94–100, 2018, [Online]. Available: <https://jurnal.untan.ac.id/index.php/jpflu/article/view/25260>.

- [10] E. A. Rahmayanti, “Digital Repository Repository Universitas Universitas Jember Jember Digital Digital Repository Repository Universitas Universitas Jember Jember,” *Digit. Repos. Univ. Jember*, 2021.
- [11] M. Z. Hasan, “Sistem Off-Grid Pembangkit Listrik Tenaga Angin Berbasis IoT (Internet of Things),” *Digit. Repos. Univ. Jember*, no. September 2019, pp. 2019–2022, 2019.
- [12] M. Saputra, R. Kurniawan, and D. Al Munawir, “Rancang Bangun Turbin Angin Skala Kecil Untuk Kawasan Kampus Univ. Teuku Umar,” vol. 5, no. 1, 2019.
- [13] A. Bachtiar and W. Hayyatul, “Analisis Potensi Pembangkit Listrik Tenaga Angin PT. Lentera Angin Nusantara (LAN) Ciheras,” *J. Tek. Elektro ITP*, vol. 7, no. 1, pp. 34–45, 2018, doi: 10.21063/jte.2018.3133706.
- [14] M. Atmega, I. J. Simanjuntak, and H. S. Pangaribuan, “Sistem Monitoring Data Pembangkit Listrik Tenaga Angin Berbasis,” vol. 3, no. 2, 2020.
- [15] M. E. Putra, Z. Amin, I. Islahuddin, and ..., “Rancang Bangun Sistem Kontrol dan Monitoring Data Turbin Angin Berbasis Website Menggunakan Raspberry Pi 3B+,” *Met. J. Sist. ...*, vol. 02, pp. 70–81, 2020, [Online]. Available: <http://metal.ft.unand.ac.id/index.php/metal/article/view/129>.
- [16] A. W. Ramadani, Y. Yulianto, and S. Siswoko, “Kombinasi Sistem Kontrol Dummy Load dan Charger Aki pada Pembangkit Listrik Tenaga Microhidro Berbasis Arduino Mega 2560,” *J. Elektron. dan Otomasi Ind.*, vol. 8, no. 2, p. 87, 2021, doi: 10.33795/elk.v8i2.279.
- [17] U. S. Tian, “Prototipe Sistem Monitoring Parameter Pembangkit Listrik Tenaga Surya Berbasis Internet of Things,” 2017.
- [18] O. A. Ridfi, R. Handayani, and Taftazani, “Monitoring Penggunaan Listrik Pada Rumah Tangga Menggunakan Arduino Berbasis Web Server Dan Android,” *eProceedings Appl. Sci.*, vol. 7, no. 4, pp. 774–784, 2021.

- [19] S. Bahroni, "Monitoring Solar Cell Tracking System Jarak Jauh," Cilacap, Sep. 2020.
- [20] G. Maulana, "Monitoring Tegangan, Arus, Dan Arah Angin Menggunakan Esp32 Pada Data Logger Berbasis Iot Platform Thingspeak," 2021, [Online]. Available: <https://library.universitaspertamina.ac.id/xmlui/handle/123456789/4941>.
- [21] I. Studi, "928X Print) D-244," *Sains dan Seni ITS*, vol. 9, no. 2, 2020, [Online]. Available: 10.12962/j23373520.v9i2.55028.
- [22] C. V. Oramas, D. D. Keluarga, and C. V. Oramas, "Perancangan Telehomecare System berbasis Web Interface," p. 2018, 2018.

LAMPIRAN B

Berikut kode pemrograman

```
#include <Wire.h>
#define windPin 2 // Receive the data from sensor
//Program Kecepatan Angin
// Constants definitions
const float pi = 3.14159265; // pi number
int period = 1000; // Measurement period (milliseconds)
int delaytime = 1000; // Time between samples (milliseconds)
int radio =90; // Distance from center windmill to outer cup (mm)
int jml_celah = 18; //jumlah celah sensor

// Variable definitions
unsigned int Sample = 0; // Sample number
unsigned int counter= 0; // B/W counter for sensor
unsigned int RPM = 0; // Revolutions per minute
float speedwind = 0; // Wind speed (m/s)

//Program Tegangan
int analogPin= A0; //pin arduino yang terhubung
float Vmodul = 0.0;
float R1 = 30000.0; // Resistor 30k
float R2 = 7500.0; // Resistor 7500 ohm
int value = 0;
float HasilTegangan = 0.0;
```

A-3

B-1

```

//Program Arus
double vRef = 5000;
int iter = 2000;
double vMid = (vRef/2 );
double mVpA = 0.066;
double pADC = 0;
unsigned long awalPrint = 0;
unsigned long jeda = 3000;
const int currentPin = A3;
double HasilArus;
//program Daya
float HasilDaya = 0.0;
#include <LCD_I2C.h>
LCD_I2C lcd(0x27, 20, 4); // Default address of most PCF8574
modules, change according
// waktu awal
unsigned long wakn=0; // waktu awal kirim nodemcu
unsigned long wats=0; // waktu awal tampil serial

void setup() {
  lcd.begin();           // this stop the library(LCD_I2C) from calling
  Wire.begin()
  lcd.backlight();
  Serial.begin(9600);
  //Kecepatan Angin

```

```

pinMode(2, INPUT);
digitalWrite(2, HIGH);
pinMode(analogPin, INPUT);}

void loop() {
unsigned long wsts=millis(); // waktu sekarang tampil serial
if(wsts-wats > 2000) // serial tampil setiap 1 second{

//Program Tegangan
value = analogRead (analogPin);
Vmodul= (value*5.0)/1024.0;
HasilTegangan = Vmodul/ (R2/(R1+R2));
//lcd.print ("Tegangan=");
//lcd.print (Vmodul,2);
//lcd.print(" Volt");
Serial.print("Tegangan=");
Serial.println (HasilTegangan,1);
lcd.setCursor(0, 0);
lcd.print ("Tegangan=");
lcd.print(HasilTegangan,1);
lcd.print (" V");
//Program Arus
double adc = 0;
double analog0 = analogRead(currentPin);
for (int i=0; i<iter; i++){
adc += analogRead(currentPin); }

```

```

double avg_adc = adc/iter;
double vAvg = (avg_adc/1023.0)*vRef;
double vDelta = vMid - vAvg;
HasilArus = vDelta/mVpA;
HasilArus = abs(HasilArus/1000);
if (HasilArus<=0){
HasilArus== 0; }
if (millis()-awalPrint>jeda){
awalPrint = millis();
pADC = adc; }
Serial.print(" Arus= ");
Serial.print (HasilArus,2);
Serial.println (" A");
lcd.setCursor(0, 1);
lcd.print (" Arus  = ");
lcd.print (HasilArus,2);
lcd.print ( " A");

//Program Daya
HasilDaya = HasilTegangan*HasilArus;
//program daya
Serial.print("Daya= ");
Serial.print (HasilDaya,3);
Serial.println (" Watt");
lcd.setCursor(0, 2);
lcd.print ("Daya  = ");

```



```

lcd.print (HasilDaya,3);
lcd.print ( " W");
Sample++;
//Serial.print(Sample);
//Serial.print(": Start measurement...");
windvelocity();
//Serial.println(" finished.");
//Serial.print("Counter: ");
//Serial.print(counter);
//Serial.print("; RPM: ");
RPMcalc();
//Serial.print(RPM);
WindSpeed();
Serial.print("Wind speed:");
Serial.print(speedwind);
Serial.print(" [m/s]");
Serial.println();
lcd.setCursor(0,3);
lcd.print("Angin = ");
lcd.setCursor(10, 3);
lcd.print(speedwind);
lcd.print (" [m/s]");
wats=millis();
data_kirim();}}
// Measure wind speed
void windvelocity(){

```

```

speedwind = 0;
counter = 0;
attachInterrupt(0, addcount, CHANGE);
unsigned long millis();
long startTime = millis();
while(millis() < startTime + period) {

detachInterrupt(1);}
void RPMcalc(){
RPM=((counter/jml_celah)*60)/(period/1000); // Calculate revolutions
per minute (RPM)}
void WindSpeed(){
speedwind = ((2 * pi * radio * RPM)/60) / 1000; // Calculate wind speed
on m/s }
void addcount(){
counter++;}
void data_kirim() {
//menampung data yang akan di kirimkan ke nodemcu
Serial.println();
String dkirim = "#" + String(HasilTegangan) + "#" +
String(HasilArus,2) + "#" + String(HasilDaya,3) + "#" + String
(speedwind) + "#" + "$" ;
Serial.println(dkirim);
Serial.println();
}

```

Program NodeMCU ESP8266

```
#include <ESP8266HTTPClient.h>
#include <ESP8266WiFi.h>
#include <WiFiClient.h>

float angin ;
float tegangan ;
float arus ;
float daya ;

//parsing data arduino mega
bool parsing = false;
String sData,ardata[5]; // sData= data serial, data= jumlah data yang di
parsing
//variable wifi
const char* id = "BOLTSuper4G-1234";
const char* pw = "taufik456";
//inisialisasi variable host adress server
//const char* server = "tugasakhirdanu.000webhostapp.com"; (semisal
mau dikirim ke server gratis)
const char* server = "monitoringturbinangin.sazking.my.id";
//waktu awal
unsigned long wakw=0;//waktu awal kirim web
void setup() {
Serial.begin (9600);//pada saat kirim data ke nodemcu maka nilai Rx
nodeMCU dicabut
//inisialisasi host
WiFi.hostname("NodeMCU");
```

```

//konek wifi
WiFi.begin(id, pw);
//cek koneksi
while(WiFi.status() != WL_CONNECTED){
  //coba konek terus
  Serial.print(".");
  delay (500);}
//apabila terkoneksi
Serial.println("Berhasil Konek Dengan Wifi");}
void loop() {
  // baca data dari NodeMCU
  // Sediakan variabel untuk menampung data
  //Selama data serial ada/tersedia
  while (Serial.available()) {
    //Ambil data serial kemudian masukan ke variable data
    char inChar = Serial.read();
    sData += inChar;
    if(inChar == '$'){
      parsing = true;}
    if(parsing){
      int q = 0;
      for(int i = 0; i < sData.length();i++){
        if(sData[i] == '#'){ q++;
          ardata[q]=""; }
        else {ardata[q]+= sData[i];}}

```

```

Serial.println(ardata[1]);
Serial.println(ardata[2]);
Serial.println(ardata[3]);
Serial.println(ardata[4]);
Serial.println();
parsing = false;
sData = "";}

angin = ardata[4].toFloat() ;
tegangan = ardata[1].toFloat() ;
arus = ardata[2].toFloat() ;
daya = ardata[3].toFloat() ; }
//kirim data ke database
WiFiClient client;
const int httpPort = 80;
//mecari data koneksi
if(!client.connect(server, httpPort)){
  Serial.println("gagal konek ke web");
  return ;}
unsigned long wskw = millis();
if((wskw-wakw)>5000){
  //apa bila terkoneksi ke web maka kirim data
  HTTPClient http;
  //siapkan link kirim data
  //kirim ke webserver

```

```

String Link = "http://" + String(server) + "/bacasensor.php?angin=" +
String(angin,1) + "&tegangan=" + String(tegangan,1) + "&arus=" +
String(arus,1) + "&daya=" + String(daya,1) ;
    //kirim ke website gratis
    //String Link = "http://" + String(server) +
"db_multisensor/bacasensor.php?angin=" + String(angin,1) +
"&tegangan=" + String(tegangan,1) + "&arus=" + String(arus,1) +
"&daya=" + String(daya,1) ;
    //eksekusi link
    http.begin(client,Link);
    http.GET();
    //tangkap responent kirim data
    String respon = http.getString();
    Serial.println(respon);
    wakw=millis();
}

```

BIODATA PENULIS



Nama : Danu Maskhuri
Tempat/Tanggal Lahir : Kebumen, 10 Desember 2000
Alamat : Ds. Argopeni RT 006/001
Kec. Kebumen, Kab. Kebumen-54351
Email : danumaskhuri33@gmail.com
Telepon/HP : 08128137648
Hobi : Membaca
Motto : Proses yang sungguh sungguh, akan melahirkan cerita yang jujur

Riwayat Pendidikan

- SD Negeri 01 Argopeni Tahun 2006-2013
- SMP Negeri 7 Kebumen Tahun 2013-2016
- SMK Negeri 2 Kebumen Tahun 2016-2019
Jurusan Teknik Instalasi Tenaga Listrik
- Politeknik Negeri Cilacap Tahun 2019-2022
Prodi D3 Teknik Listrik

Penulis telah mengikuti seminar proposal pada tanggal 17 Juni 2022 sebagai salah satu persyaratan untuk memperoleh gelar Ahli Madya (A.Md)