LAMPIRAN

Lampiran 1. Data pengukuran nilai tegangan dan arus pada panel surya dan kicir angin di hari pertama

No	Waktu	Panel Surya		Daya (Watt)	Kincir Angin		Daya (Watt)
		Tegangan (V)	Arus (A)		Tegangan (V)	Arus (A)	
1	09.00	17,67	2,9	51,24	15,08	0,49	7,39
2	10.00	18,09	2,29	41,43	17,39	2,53	44,00
3	11.00	18,78	2,98	55,96	4,33	0,8	3,46
4	12.00	18,43	2,57	47,37	16,41	1,45	23,79
5	13.00	17,24	2,37	40,86	2,21	0,4	0,88
6	14.00	18,56	2,62	48,63	18,67	3,21	59,93
7	15.00	17,48	2,82	49,29	3,18	0,7	2,23
8	16.00	17,6	1,92	33,79	18,41	3,5	64,44

Lampiran 2. Data pengukuran nilai tegangan dan arus pada PLTH di hari pertama

No	Waktu	Hybrid		Daya (Watt)
		Tegangan (V)	Arus (A)	
1	09.00	14,31	3,32	47,51
2	10.00	14,92	4,64	69,23
3	11.00	14,38	2,78	39,98
4	12.00	14,11	4,01	56,58
5	13.00	14,92	2,32	34,61
6	14.00	15,09	5,1	76,96
7	15.00	14,7	2,81	41,31
8	16.00	15,09	5,29	79,83

Lampiran 3. Data pengukuran nilai tegangan dan arus pada panel surya dan kicir angina hari kedua

No	Waktu	Panel Surya		Daya (Watt)	Kincir Angin		Daya (Watt)
		Tegangan (V)	Arus (A)		Tegangan (V)	Arus (A)	
1	09.00	17,18	2,89	49,65	1,23	0	0,00
2	10.00	17,22	1,7	29,27	19,36	4,44	85,96
3	11.00	18,46	2,64	48,73	16,17	1,29	20,86
4	12.00	17,65	2,88	50,83	2,02	0,6	1,21
5	13.00	18,6	2,9	53,94	15,28	0,59	9,02
6	14.00	17,19	2,34	40,22	4,02	2,17	8,72
7	15.00	18,54	2,64	48,95	16,21	1,66	26,91
8	16.00	18,37	1,9	34,90	18,52	3,68	68,15

Lampiran 4. Data pengukuran nilai tegangan dan arus pada PLTH hari kedua

No	Waktu	Hybrid		Daya (Watt)
		Tegangan (V)	Arus (A)	
1	09.00	14,29	2,79	39,87
2	10.00	15,5	5,85	90,68
3	11.00	14,42	3,9	56,24
4	12.00	14,41	2,78	40,06
5	13.00	14,55	3,22	46,85
6	14.00	14,48	2,26	32,72
7	15.00	14,43	4,01	57,86
8	16.00	15,29	5,24	80,12

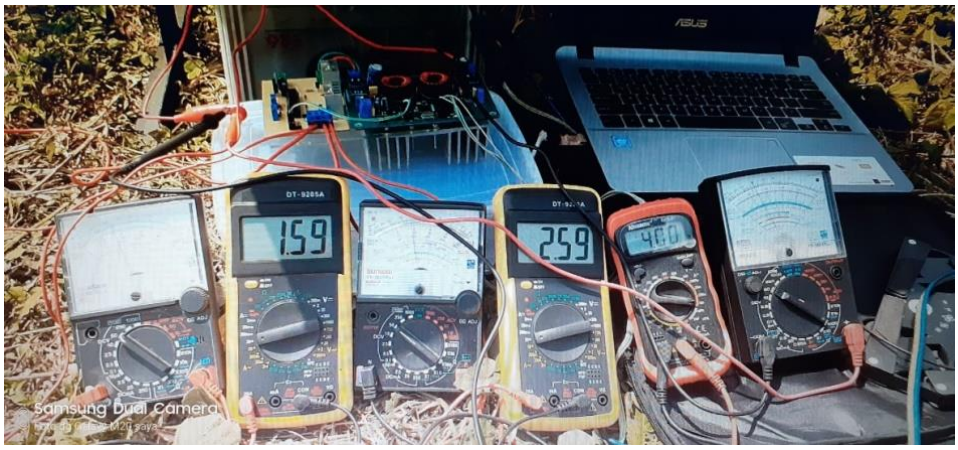
Lampiran 5. Pengukuran nilai tegangan dan arus pada panel surya dan kicir angina hari ketiga

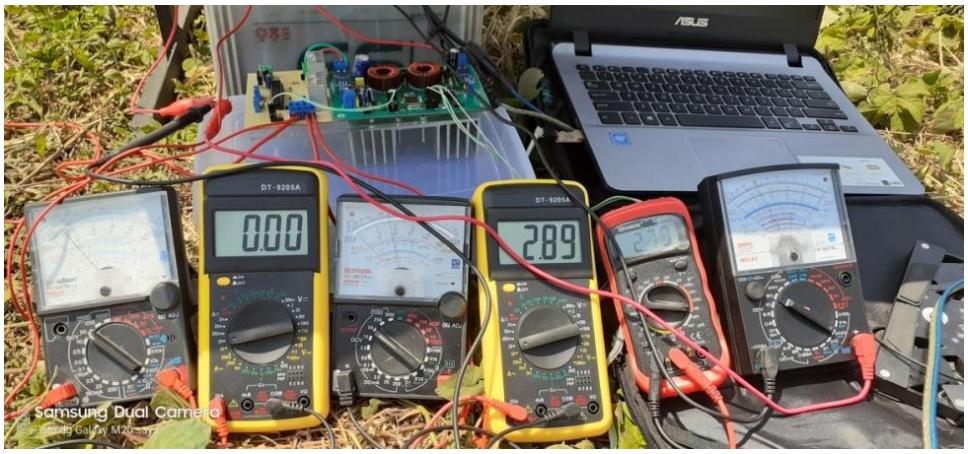
No	Waktu	Panel Surya		Daya (Watt)	Kincir Angin		Daya (Watt)
		Tegangan (V)	Arus (A)		Tegangan (V)	Arus (A)	
1	09.00	17,62	1,79	31,54	18,23	4,27	77,84
2	10.00	17,93	2,81	50,38	4,09	0,8	3,27
3	11.00	17,54	1,7	29,82	18,47	4,44	82,01
4	12.00	18,07	2,03	36,68	18,32	3,33	61,01
5	13.00	17,89	2,81	50,27	3,35	0,7	2,35
6	14.00	18,56	1,75	32,48	18,07	4,25	76,80
7	15.00	18,43	2,51	46,26	16,18	1,84	29,77
8	16.00	18,49	3,72	68,78	1,45	0,4	0,58

Lampiran 6. Data pengikuran nilai tegangan dan arus pada PLTH hari ketiga

No	Waktu	Hybrid		Daya (Watt)
		Tegangan (V)	Arus (A)	
1	09.00	15,46	5,89	91,06
2	10.00	14,49	2,72	39,41
3	11.00	15,6	5,85	91,26
4	12.00	15,19	5,06	76,86
5	13.00	14,19	2,71	38,45
6	14.00	15,12	5,75	86,94
7	15.00	14,69	4,16	61,11
8	16.00	14,98	3,72	55,73

Lampiran 7. Pengukuran nilai tegangan dan arus pada PLTH





Lampiran 8. Program Switching

```
/*****************************************************
This program was created by the
CodeWizardAVR V3.12 Advanced
Automatic Program Generator
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http://www.hpinfotech.com

Project :
Version :
Date    : 8/30/2019
Author  :
Company :
Comments:

Chip type               : ATmega328
Program type            : Application
AVR Core Clock frequency: 8.000000 MHz
Memory model            : Small
External RAM size       : 0
Data Stack size         : 512
*****************************************************/

#include <mega328.h>

#include <delay.h>
#include <stdlib.h>
#include <math.h>

float volt;
float volt1;
unsigned char cstrg0[20];
// Declare your global variables here

// Standard Input/Output functions
#include <stdio.h>

// Voltage Reference: AVCC pin
#define ADC_VREF_TYPE ((0<<REFS1) | (1<<REFS0) | (0<<ADLAR))

// Read the AD conversion result
unsigned int read_adc(unsigned char adc_input)
{
ADMUX=adc_input | ADC_VREF_TYPE;
// Delay needed for the stabilization of the ADC input voltage
```

```
delay_us(10);
// Start the AD conversion
ADCSRA|=(1<<ADSC);
// Wait for the AD conversion to complete
while ((ADCSRA & (1<<ADIF))==0);
ADCSRA|=(1<<ADIF);
return ADCW;
}

void WT(char loop);
void PS(char loop1);
void switching(int PWMA, int PWMB);
void main(void)
{
// Declare your local variables here

// Crystal Oscillator division factor: 1
#pragma optsize-
CLKPR=(1<<CLKPCE);
CLKPR=(0<<CLKPCE) | (0<<CLKPS3) | (0<<CLKPS2) | (0<<CLKPS1) |
(0<<CLKPS0);
#ifdef _OPTIMIZE_SIZE_
#pragma optsize+
#endif

// Input/Output Ports initialization
// Port B initialization
// Function: Bit7=In Bit6=In Bit5=In Bit4=In Bit3=In Bit2=In Bit1=In Bit0=In
DDRB=(0<<DDB7) | (0<<DDB6) | (0<<DDB5) | (0<<DDB4) | (0<<DDB3) |
(0<<DDB2) | (0<<DDB1) | (0<<DDB0);
// State: Bit7=T Bit6=T Bit5=T Bit4=T Bit3=T Bit2=T Bit1=T Bit0=T
PORTB=(0<<PORTB7) | (0<<PORTB6) | (0<<PORTB5) | (0<<PORTB4) |
(0<<PORTB3) | (0<<PORTB2) | (0<<PORTB1) | (0<<PORTB0);

// Port C initialization
// Function: Bit6=In Bit5=In Bit4=In Bit3=In Bit2=In Bit1=In Bit0=In
DDRC=(0<<DDC6) | (0<<DDC5) | (0<<DDC4) | (0<<DDC3) | (0<<DDC2) |
(0<<DDC1) | (0<<DDC0);
// State: Bit6=T Bit5=T Bit4=T Bit3=T Bit2=T Bit1=T Bit0=T
PORTC=(0<<PORTC6) | (0<<PORTC5) | (0<<PORTC4) | (0<<PORTC3) |
(0<<PORTC2) | (0<<PORTC1) | (0<<PORTC0);

// Port D initialization
// Function: Bit7=Out Bit6=Out Bit5=Out Bit4=In Bit3=In Bit2=In Bit1=In
Bit0=In
```

```
DDRD=(1<<DDD7) | (1<<DDD6) | (1<<DDD5) | (0<<DDD4) | (0<<DDD3) |
(0<<DDD2) | (0<<DDD1) | (0<<DDD0);
// State: Bit7=0 Bit6=0 Bit5=0 Bit4=T Bit3=T Bit2=T Bit1=T Bit0=T
PORTD=(0<<PORTD7) | (0<<PORTD6) | (0<<PORTD5) | (0<<PORTD4) |
(0<<PORTD3) | (0<<PORTD2) | (0<<PORTD1) | (0<<PORTD0);

// Timer/Counter 0 initialization
// Clock source: System Clock
// Clock value: 8000.000 kHz
// Mode: Fast PWM top=0xFF
// OC0A output: Non-Inverted PWM
// OC0B output: Inverted PWM
// Timer Period: 0.032 ms
// Output Pulse(s):
// OC0A Period: 0.032 ms Width: 0 us
// OC0B Period: 0.032 ms Width: 0.032 ms
TCCR0A=(1<<COM0A1) | (0<<COM0A0) | (1<<COM0B1) | (1<<COM0B0) |
(1<<WGM01) | (1<<WGM00);
TCCR0B=(0<<WGM02) | (0<<CS02) | (0<<CS01) | (1<<CS00);
TCNT0=0x00;
OCR0A=0x00;
OCR0B=0x00;

// Timer/Counter 1 initialization
// Clock source: System Clock
// Clock value: Timer1 Stopped
// Mode: Normal top=0xFFFF
// OC1A output: Disconnected
// OC1B output: Disconnected
// Noise Canceler: Off
// Input Capture on Falling Edge
// Timer1 Overflow Interrupt: Off
// Input Capture Interrupt: Off
// Compare A Match Interrupt: Off
// Compare B Match Interrupt: Off
TCCR1A=(0<<COM1A1) | (0<<COM1A0) | (0<<COM1B1) | (0<<COM1B0) |
(0<<WGM11) | (0<<WGM10);
TCCR1B=(0<<ICNC1) | (0<<ICES1) | (0<<WGM13) | (0<<WGM12) |
(0<<CS12) | (0<<CS11) | (0<<CS10);
TCNT1H=0x00;
TCNT1L=0x00;
ICR1H=0x00;
ICR1L=0x00;
OCR1AH=0x00;
OCR1AL=0x00;
OCR1BH=0x00;
```

```
OCR1BL=0x00;

// Timer/Counter 2 initialization
// Clock source: System Clock
// Clock value: Timer2 Stopped
// Mode: Normal top=0xFF
// OC2A output: Disconnected
// OC2B output: Disconnected
ASSR=(0<<EXCLK) | (0<<AS2);
TCCR2A=(0<<COM2A1) | (0<<COM2A0) | (0<<COM2B1) | (0<<COM2B0) |
(0<<WGM21) | (0<<WGM20);
TCCR2B=(0<<WGM22) | (0<<CS22) | (0<<CS21) | (0<<CS20);
TCNT2=0x00;
OCR2A=0x00;
OCR2B=0x00;

// Timer/Counter 0 Interrupt(s) initialization
TIMSK0=(0<<OCIE0B) | (0<<OCIE0A) | (0<<TOIE0);

// Timer/Counter 1 Interrupt(s) initialization
TIMSK1=(0<<ICIE1) | (0<<OCIE1B) | (0<<OCIE1A) | (0<<TOIE1);

// Timer/Counter 2 Interrupt(s) initialization
TIMSK2=(0<<OCIE2B) | (0<<OCIE2A) | (0<<TOIE2);

// External Interrupt(s) initialization
// INT0: Off
// INT1: Off
// Interrupt on any change on pins PCINT0-7: Off
// Interrupt on any change on pins PCINT8-14: Off
// Interrupt on any change on pins PCINT16-23: Off
EICRA=(0<<ISC11) | (0<<ISC10) | (0<<ISC01) | (0<<ISC00);
EIMSK=(0<<INT1) | (0<<INT0);
PCICR=(0<<PCIE2) | (0<<PCIE1) | (0<<PCIE0);
// USART initialization
// Communication Parameters: 8 Data, 1 Stop, No Parity
// USART Receiver: On
// USART Transmitter: On
// USART0 Mode: Asynchronous
// USART Baud Rate: 9600
UCSR0A=(0<<RXC0) | (0<<TXC0) | (0<<UDRE0) | (0<<FE0) | (0<<DOR0) |
(0<<UPE0) | (0<<U2X0) | (0<<MPCM0);
UCSR0B=(0<<RXCIE0) | (0<<TXCIE0) | (0<<UDRIE0) | (1<<RXEN0) |
(1<<TXEN0) | (0<<UCSZ02) | (0<<RXB80) | (0<<TXB80);
UCSR0C=(0<<UMSEL01) | (0<<UMSEL00) | (0<<UPM01) | (0<<UPM00) |
(0<<USBS0) | (1<<UCSZ01) | (1<<UCSZ00) | (0<<UCPOL0);
```

```
UBRR0H=0x00;
UBRR0L=0x33;

// Analog Comparator initialization
// Analog Comparator: Off
// The Analog Comparator's positive input is
// connected to the AIN0 pin
// The Analog Comparator's negative input is
// connected to the AIN1 pin
ACSR=(1<<ACD) | (0<<ACBG) | (0<<ACO) | (0<<ACI) | (0<<ACIE) |
(0<<ACIC) | (0<<ACIS1) | (0<<ACIS0);
// Digital input buffer on AIN0: On
// Digital input buffer on AIN1: On
DIDR1=(0<<AIN0D) | (0<<AIN1D);

// ADC initialization
// ADC Clock frequency: 500.000 kHz
// ADC Voltage Reference: AVCC pin
// ADC Auto Trigger Source: ADC Stopped
// Digital input buffers on ADC0: On, ADC1: On, ADC2: On, ADC3: On
// ADC4: On, ADC5: On
DIDR0=(0<<ADC5D) | (0<<ADC4D) | (0<<ADC3D) | (0<<ADC2D) |
(0<<ADC1D) | (0<<ADC0D);
ADMUX=ADC_VREF_TYPE;
ADCSRA=(1<<ADEN) | (0<<ADSC) | (0<<ADATE) | (0<<ADIF) | (0<<ADIE)
| (1<<ADPS2) | (0<<ADPS1) | (0<<ADPS0);
ADCSRB=(0<<ADTS2) | (0<<ADTS1) | (0<<ADTS0);

// SPI initialization
// SPI disabled
SPCR=(0<<SPIE) | (0<<SPE) | (0<<DORD) | (0<<MSTR) | (0<<CPOL) |
(0<<CPHA) | (0<<SPR1) | (0<<SPR0);

// TWI initialization
// TWI disabled
TWCR=(0<<TWEA) | (0<<TWSTA) | (0<<TWSTO) | (0<<TWEN) |
(0<<TWIE);
    PORTD.7=1;
while (1)
     {

    WT(100);
    PS(100);
    if((volt>=5.1)&&(volt1<5.1))switching(127,0);
    if((volt<5.1)&&(volt1>=5.1))switching(0,127);
    if((volt>=5.1)&&(volt1>=5.1))switching(127,127);
```

```
  sprintf(cstrg0,"%2.3f Volt %2.3f Volt ",volt,volt1);
    puts(cstrg0); putchar(13);
     }
}

void WT(char loop)
{
  unsigned long int hasil=0;
  unsigned int tmp;
  float rata=0;
  unsigned char x;
    for (x=0; x<loop; x++)
    {
       tmp = read_adc(0);
       hasil = tmp + hasil;              // adc untuk tegangan
       delay_us(5);      // optional tapi recomended..
    }
  rata = (float)hasil / (float)loop;       //rata-rata adc tegangan
  floor(rata);  // pembulatan ke bawah adc tegangan
  delay_us(5);
  volt  = rata/29.68;
}

void PS(char loop1)
{
  unsigned long int hasil=0;
  unsigned int tmp;
  float rata=0;
  unsigned char x;
    for (x=0; x<loop1; x++)
    {
       tmp = read_adc(1);
       hasil = tmp + hasil;              // adc untuk tegangan
       delay_us(5);      // optional tapi recomended..
    }
  rata = (float)hasil / (float)loop1;       //rata-rata adc tegangan
  floor(rata);  // pembulatan ke bawah adc tegangan
  delay_us(5);
  volt1  = rata/29.68;
}
void switching(int PWMA,int PWMB)
{
OCR0A=PWMA;
OCR0B=PWMB;
}
```

Lampiran 9. Lembar Revisi dan Tugas Ujian Sarjana Penguji Satu

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Tempat : R. Rapat

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Nama : Ahmad Ayib Sandzali
NIM : 30601401527
Judul TA : Analisis Optimasi Daya dari Penggabungan Panel Surya dan Kincir Angin Menggunakan Metode Switching

wajib melakukan perbaikan dan membuat tugas seperti tercantum dibawah ini:

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NO	TUGAS

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NIDN. 0005036501

Semarang, 27 September 2019
Penguji. I

Ir. Ida Widihastuti, MT
NIDN. 0005036501

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Nama : Ahmad Ayib Sandzali
NIM : 30601401527
Judul TA : Analisis Optimasi Daya dari Penggabungan Panel Surya dan Kincir Angin Menggunakan Metode Switching

wajib melakukan perbaikan dan membuat tugas seperti tercantum dibawah ini:

NO	REVISI	BATAS REVISI
-	Perlu ada tambahan beberapa data. Saat tegangan kincir angin dibawah nilai tegangan batere. → misal 9 volt, 10 volt dst.. bagaimana dengan efisiensi Hybridnya ?	

NO	TUGAS

Mengetahui,
Ketua Tim Penguji

Ir. Ida Widihastuti, MT
NIDN. 0005036501

Semarang, 27 September 2019
Penguji, II

Dedi Nugroho, ST, MT
NIDN. 0617126602

Lampiran 11. Lembar Revisi dan Tugas Ujian Sarjana Penguji Ketiga

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Tanggal : 27 September 2019
Tempat : R. Rapat

Memutuskan bahwa mahasiswa :

Nama : Ahmad Ayib Sandzali
NIM : 30601401527
Judul TA : Analisis Optimasi Daya dari Penggabungan Panel Surya dan Kincir Angin Menggunakan Metode Switching

wajib melakukan perbaikan dan membuat tugas seperti tercantum dibawah ini:

NO	REVISI	BATAS REVISI
1	Perbaiki abstrak. → typo	2 minggu Acc
2.	Bab 3 tdk ada pendefinisian rumus.	
3	Kata ganti: orang ke 1, 2, 3 tdk boleh. Saya, penulis, penyusun.	

NO	TUGAS
	Jelaskan prinsip kerja dr switching Gambar skema rangkaian. blok diagram.

Mengetahui,
Ketua Tim Penguji

Ir. Ida Widihastuti, MT
NIDN. 0005036501

Semarang, 27 September 2019
Penguji, III

Bustanul Arifin, ST, MT
NIDN. 0614117701

Lampiran 12. Hasil Turnitin

ANALISIS OPTIMASI DAYA PENGGABUNGAN PANEL SURYA DAN KINCIR ANGIN MENGGUNAKAN METODE SWITCHING

by Ahmad Ayib

Submission date: 24-Sep-2019 11:25AM (UTC+0800)
Submission ID: 1178808063
File name: BAB_I-V.docx (5.89M)
Word count: 8612
Character count: 51033

ANALISIS OPTIMASI DAYA PENGGABUNGAN PANEL SURYA DAN KINCIR ANGIN MENGGUNAKAN METODE SWITCHING

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