Percobaan menggunakan fluida udara dengan waktu 1 s setiap pembacaan, percobaan dilakukan dengan mengunakan tabunng dengan volume 1.9 Lt dan sensor Hall sensor dengan variasi tekanan pada spoit

Delay time : 1 s
Volume total : 1.9 Lt
Fluida : udara

No.	Rpm	Debit(lt/m)	Volume(Lt)
1	105	68	1.13
2	90	58	2.1
	97.5	63	

Kalibrasi Sensor Udara

No.	Rpm	Debit(lt/m)	Volume(Lt)
1	105	68	1.13
2	45	29	1.62
	75	48.5	

No.	Rpm	Debit(lt/m)	Volume(Lt)
1	15	9	0.15
2	120	78	1.45
	67.5	43.5	

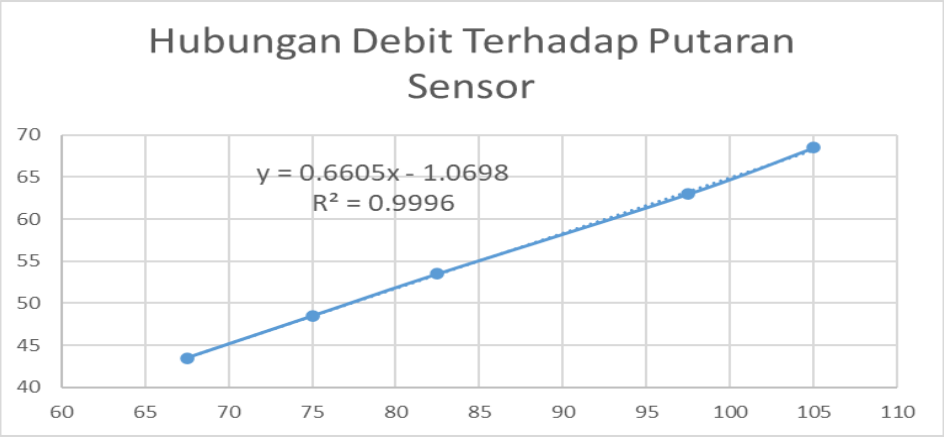
No.	Rpm	Debit(lt/m)	Volume(Lt)
1	45	29	0.48
2	120	78	1.78
	82.5	53.5	

No.	Rpm	Debit(lt/m)	Volume(Lt)
1	150	98	1.63
2	60	39	2.28
	105	68.5	

KALIBRASI SENSOR UDARA

Delay time : 1 s
Volume total : 1.9 Lt
Fluida : udara

No.	Rpm	Debit(lt/m)	Konstanta
1	67.5	43.5	0.644444
2	75	48.5	0.646667
3	82.5	53.5	0.648485
4	97.5	63	0.646154
5	105	68.5	0.652381



Percobaan menggunakan fluida udara dengan waktu 1 s setiap pembacaan, percobaan dilakukan dengan mengunakan spoit dan flow meter sensor dengan variasi tekanan pada spoit

Delay time : 1 s
Volume total : 100 ml
Fluida : air

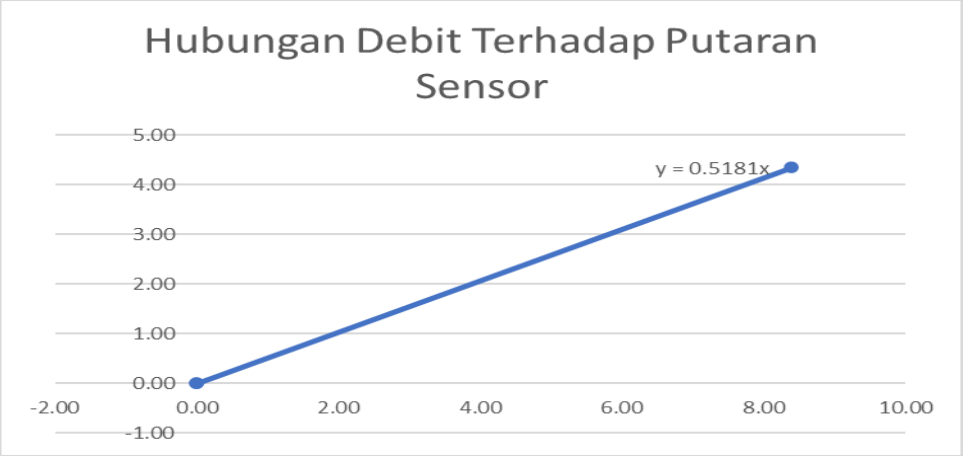
Kalibrasi Sensor Solar

No.	debit	rps	volume	No.	Rps	Debit(ml/s)	Volume(ml)
1	1	2	1	1	1	0	0
2	6	10	6	2	9	5	5
3	6	10	13	3	10	6	11
4	6	10	19	4	10	6	17
5	6	10	25	5	10	5	22
6	6	10	31	6	10	5	27
7	5	10	36	7	10	5	32
8	5	10	41	8	10	5	37
9	5	10	46	9	10	5	42
10	5	10	51	10	9	5	47
11	5	8	56	11	9	5	52
12	5	8	61	12	9	5	57
13	4	8	65	13	9	4	61
14	5	8	70	14	8	4	65
15	4	8	74	15	8	4	69
16	4	8	78	16	8	4	73
17	4	8	82	17	8	4	77
18	4	8	86	18	8	4	81
19	4	8	90	19	8	4	85
20	4	8	94	20	8	4	89
21	4	8	98	21	8	4	93
22	4	6	102	22	7	4	97
23	1	2	103	23	6	3	100

KALIBRASI SENSOR SOLAR

Delay time : 1s
Volume total : 100 ml
Fluida : solar

No.	Rps	Debit(ml/s)	Konstanta
1	8.17391304	4.48	0.547872
2	8.39	4.35	0.518135



Tampilan Program arduino

Lampiran 2 :Code Arduino

```
#include <EEPROM.h>
#include "MgsModbus.h"
#include <Ethernet.h>
#include "_0defenitions.h"
#include "PinChangeInt.h"
MgsModbus Mb;
void countRpm(){
  radEng++;
}
void countHho(){
  radHho++;
}
void countUdara(){
  radUdara++;
}
void countSolar1(){
  radSolar1++;
}
void countSolar2(){
  radSolar2++;
}
void speedControl() {
 // Turn on motors
 digitalWrite(in1, LOW);
 digitalWrite(in2, HIGH);
 analogWrite(enA,pwmGen);
}

void setup() {
  Ethernet.begin(mac,ip,gateway,subnet);
  Serial.begin(115200);
  MgsModbus::MgsModbus();
 // enablePinChangeInterrupt(pinSolar);
  pinMode(enA, OUTPUT);
  pinMode(in1, OUTPUT);
  pinMode(in2, OUTPUT);
  pinMode(pinRpm, INPUT);            // pin putaran mesin
```

```
  pinMode(pinHho, INPUT);             // pin debit Hho
  pinMode(pinUdara, INPUT);           // pin debit udara
  pinMode(pinSolar1, INPUT);          // pin debit solar
  pinMode(pinSolar2, INPUT);          // pin debit solar
  attachInterrupt(digitalPinToInterrupt(3),countRpm, RISING);
  attachInterrupt(digitalPinToInterrupt(2),countHho, RISING);
  attachPinChangeInterrupt(pinUdara,countUdara, RISING);
  attachPinChangeInterrupt(pinSolar1,countSolar1, RISING);
  attachPinChangeInterrupt(pinSolar2,countSolar2, RISING);


}

void loop() {
int trig = millis()-periodeRead;
if(trig>=1000) {
   //disablePinChangeInterrupt(digitalPinToPinChangeInterrupt(pinRpm));
   //disablePinChangeInterrupt(digitalPinToPinChangeInterrupt(pinHho));
   Mb.MbData[0] = radEng*(60000/trig);        // Rpm mesin
   Mb.MbData[1] = radHho*(60000/trig);
   Mb.MbData[2] = radUdara*(60000/trig);
   Mb.MbData[3] = radSolar1*(60000/trig);
   Mb.MbData[4] = radSolar2*(60000/trig);
   speedControl();
   pwmGen = Mb.MbData[5];
   Serial.print(Mb.MbData[1]);
   Serial.print('\t');
   Serial.print(Mb.MbData[0]);
   Serial.print('\t');
   Serial.print(Mb.MbData[2]);
   Serial.print('\t');
   Serial.print(Mb.MbData[3]);
   Serial.print('\t');
   Serial.print(Mb.MbData[4]);
   Serial.print('\t');
   Serial.println(pwmGen);
   Serial.print('\t');
   periodeRead = millis();
   radEng = 0;
```

```
   radHho = 0;
   radUdara = 0;
   radSolar1 = 0;
   radSolar2 = 0;
  Mb.MbsRun();
}}
// end of loop
```

Tab 2: MgsModbus.cpp

```
#include "MgsModbus.h"
EthernetServer MbServer(MB_PORT);
EthernetClient MbmClient;
#define DEBUG
MgsModbus::MgsModbus()  {
}

//******************** Recieve data for ModBusSlave ****************
void MgsModbus::MbsRun() {
//******************** Read from socket ****************
EthernetClient client = MbServer.available();
//******************** Read from serial ****************

  if(client.available()) {
    int i = 0;
    while(client.available()) { MbsByteArray[i] = client.read();   i++; }
      MbsFC = SetFC(MbsByteArray[7]);            //Byte 7 of request is FC
  }

  int Start, WordDataLength, ByteDataLength, CoilDataLength, MessageLength;
  //******************** Read Coils (1 & 2) **********************
  if(MbsFC == MB_FC_READ_COILS || MbsFC ==
MB_FC_READ_DISCRETE_INPUT) {
    Start = word(MbsByteArray[8],MbsByteArray[9]);
    CoilDataLength = word(MbsByteArray[10],MbsByteArray[11]);
    ByteDataLength = CoilDataLength / 8;
```

```
    if(ByteDataLength * 8 < CoilDataLength) ByteDataLength++;
      CoilDataLength = ByteDataLength * 8;
      MbsByteArray[5] = ByteDataLength + 3; //angka bytes setelah ini.
      MbsByteArray[8] = ByteDataLength;       //angka bytes setelah ini (atau angka bytes
data).
      for(int i = 0; i < ByteDataLength ; i++) {
        MbsByteArray[9 + i] = 0; // To get all remaining not written bits zero
        for(int j = 0; j < 8; j++) {
          bitWrite(MbsByteArray[9 + i], j, GetBit(Start + i * 8 + j));
          }
        }
    MessageLength = ByteDataLength + 9;
    client.write(MbsByteArray, MessageLength);
    MbsFC = MB_FC_NONE;
  }
  //****************** Read Registers (3 & 4) ******************
  if(MbsFC == MB_FC_READ_REGISTERS || MbsFC ==
MB_FC_READ_INPUT_REGISTER) {
    Start = word(MbsByteArray[8],MbsByteArray[9]);
    WordDataLength = word(MbsByteArray[10],MbsByteArray[11]);
    ByteDataLength = WordDataLength * 2;
    MbsByteArray[5] = ByteDataLength + 3; //Number of bytes after this one.
    MbsByteArray[8] = ByteDataLength;      //Number of bytes after this one (or number
of bytes of data).
    for(int i = 0; i < WordDataLength; i++)
      {
        MbsByteArray[ 9 + i * 2] = highByte(MbData[Start + i]);
        MbsByteArray[10 + i * 2] = lowByte(MbData[Start + i]);
      }
    MessageLength = ByteDataLength + 9;
    client.write(MbsByteArray, MessageLength);
    MbsFC = MB_FC_NONE;
```

```
}
//****************** Write Coil (5) **********************
if(MbsFC == MB_FC_WRITE_COIL) {
  Start = word(MbsByteArray[8],MbsByteArray[9]);
  if (word(MbsByteArray[10],MbsByteArray[11]) == 0xFF00){SetBit(Start,true);}
  if (word(MbsByteArray[10],MbsByteArray[11]) == 0x0000){SetBit(Start,false);}
  MbsByteArray[5] = 2; //Number of bytes after this one.
  MessageLength = 8;
  client.write(MbsByteArray, MessageLength);
  MbsFC = MB_FC_NONE;
}

//****************** Write Register (6) ******************
if(MbsFC == MB_FC_WRITE_REGISTER) {
  Start = word(MbsByteArray[8],MbsByteArray[9]);
  MbData[Start] = word(MbsByteArray[10],MbsByteArray[11]);
  MbsByteArray[5] = 6; //Number of bytes after this one.
  MessageLength = 12;
  client.write(MbsByteArray, MessageLength);
  MbsFC = MB_FC_NONE;
}

//****************** Write Multiple Coils (15) **********************
if(MbsFC == MB_FC_WRITE_MULTIPLE_COILS) {
  Start = word(MbsByteArray[8],MbsByteArray[9]);
  CoilDataLength = word(MbsByteArray[10],MbsByteArray[11]);
  MbsByteArray[5] = 6;
  for(int i = 0; i < CoilDataLength; i++) {
     SetBit(Start + i,bitRead(MbsByteArray[13 + (i/8)],i-((i/8)*8)));
   }
  MessageLength = 12;
  client.write(MbsByteArray, MessageLength);
```

```
    MbsFC = MB_FC_NONE;
  }
  //****************** Write Multiple Registers (16) ******************
  if(MbsFC == MB_FC_WRITE_MULTIPLE_REGISTERS) {
    Start = word(MbsByteArray[8],MbsByteArray[9]);
    WordDataLength = word(MbsByteArray[10],MbsByteArray[11]);
    ByteDataLength = WordDataLength * 2;
    MbsByteArray[5] = 6;
    for(int i = 0; i < WordDataLength; i++) {
        MbData[Start + i] =  word(MbsByteArray[ 13 + i * 2],MbsByteArray[14 + i * 2]);
      }
    MessageLength = 12;
    client.write(MbsByteArray, MessageLength);
    MbsFC = MB_FC_NONE;
  }
}


//****************** ?? ******************
MB_FC MgsModbus::SetFC(int fc) {
  MB_FC FC;
  FC = MB_FC_NONE;
  if(fc == 1) FC = MB_FC_READ_COILS;
  if(fc == 2) FC = MB_FC_READ_DISCRETE_INPUT;
  if(fc == 3) FC = MB_FC_READ_REGISTERS;
  if(fc == 4) FC = MB_FC_READ_INPUT_REGISTER;
  if(fc == 5) FC = MB_FC_WRITE_COIL;
  if(fc == 6) FC = MB_FC_WRITE_REGISTER;
  if(fc == 15) FC = MB_FC_WRITE_MULTIPLE_COILS;
  if(fc == 16) FC = MB_FC_WRITE_MULTIPLE_REGISTERS;
  return FC;
}
```

```
word MgsModbus::GetDataLen() {
  return MbDataLen;
}
boolean MgsModbus::GetBit(word Number) {
  int ArrayPos = Number / 16;
  int BitPos = Number - ArrayPos * 16;
  boolean Tmp = bitRead(MbData[ArrayPos],BitPos);
  return Tmp;
}

boolean MgsModbus::SetBit(word Number,boolean Data) {
  int ArrayPos = Number / 16;
  int BitPos = Number - ArrayPos * 16;
  boolean Overrun = ArrayPos > MbDataLen * 16; // check for data overrun
  if (!Overrun){
    bitWrite(MbData[ArrayPos],BitPos,Data);
  }
  return Overrun;
}
```

Tab 3: Mgsmodbus.h

```
#include "Arduino.h"
#include <SPI.h>
#include <Ethernet.h>
#ifndef MgsModbus_h
#define MgsModbus_h
#define MbDataLen 21        // length of the MdData array
#define MB_PORT 502
enum MB_FC {
  MB_FC_NONE                  = 0,
  MB_FC_READ_COILS            = 1,
```

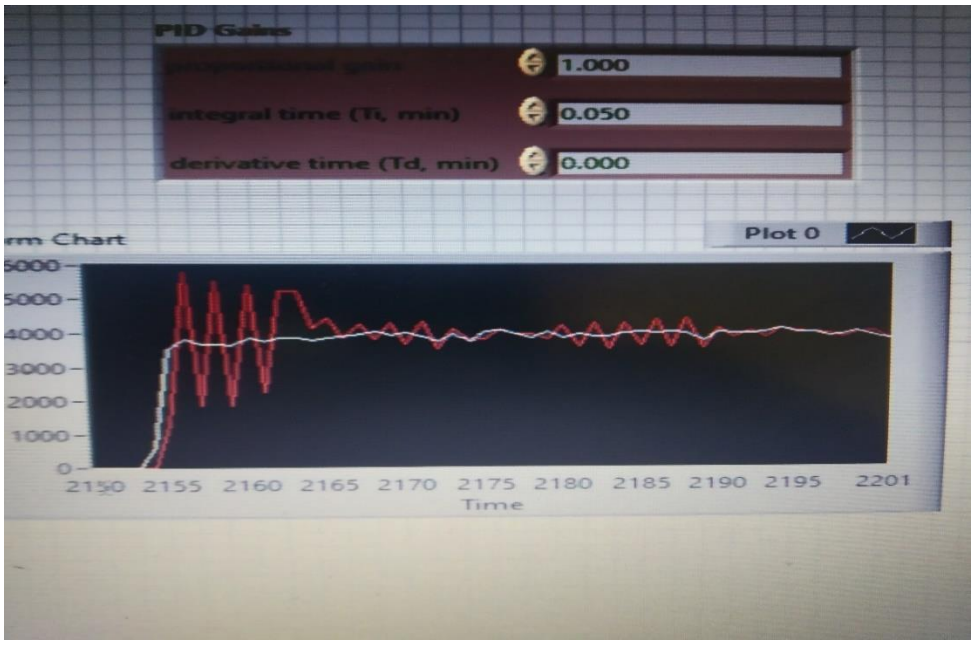
```
  MB_FC_READ_DISCRETE_INPUT      = 2,
  MB_FC_READ_REGISTERS           = 3,
  MB_FC_READ_INPUT_REGISTER      = 4,
  MB_FC_WRITE_COIL               = 5,
  MB_FC_WRITE_REGISTER           = 6,
  MB_FC_WRITE_MULTIPLE_COILS     = 15,
  MB_FC_WRITE_MULTIPLE_REGISTERS = 16  };
class MgsModbus {
public:
  //  general
  MgsModbus();
  word MbData[MbDataLen]; // memory block that holds all the modbus user data
  boolean GetBit(word Number);
  boolean SetBit(word Number,boolean Data); // returns true when the number is in the
MbData range
  // modbus master
  void Req(MB_FC FC, word Ref, word Count, word Pos);
  IPAddress remSlaveIP;
  // modbus slave
  void MbsRun();
  word GetDataLen();
private:
  //  general
  MB_FC SetFC(int fc);
  // modbus slave
  uint8_t MbsByteArray[260]; // send and recieve buffer
  MB_FC MbsFC;
};

#endif
```

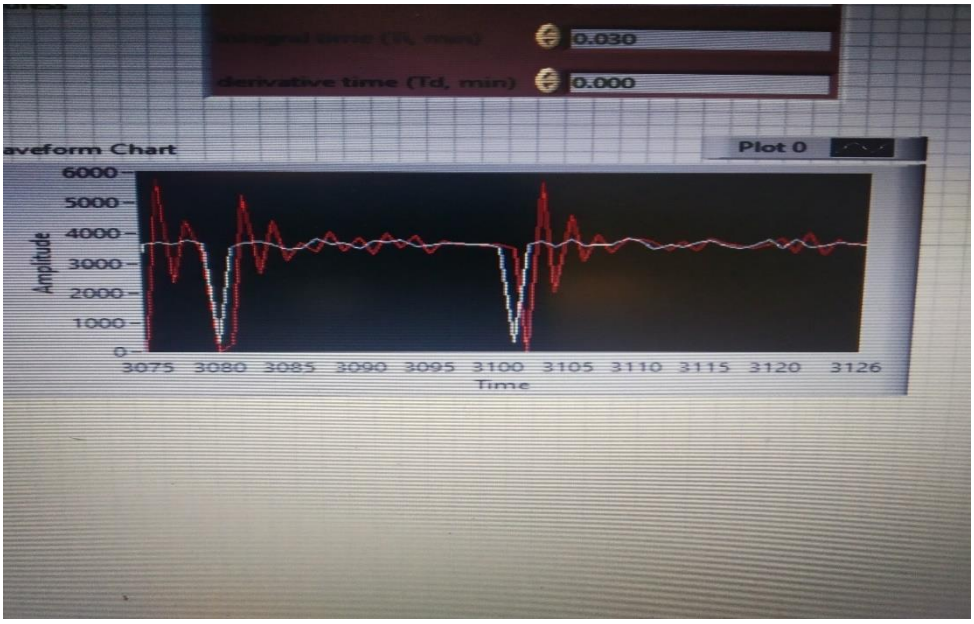
Tab 4 : _0defenitions.h

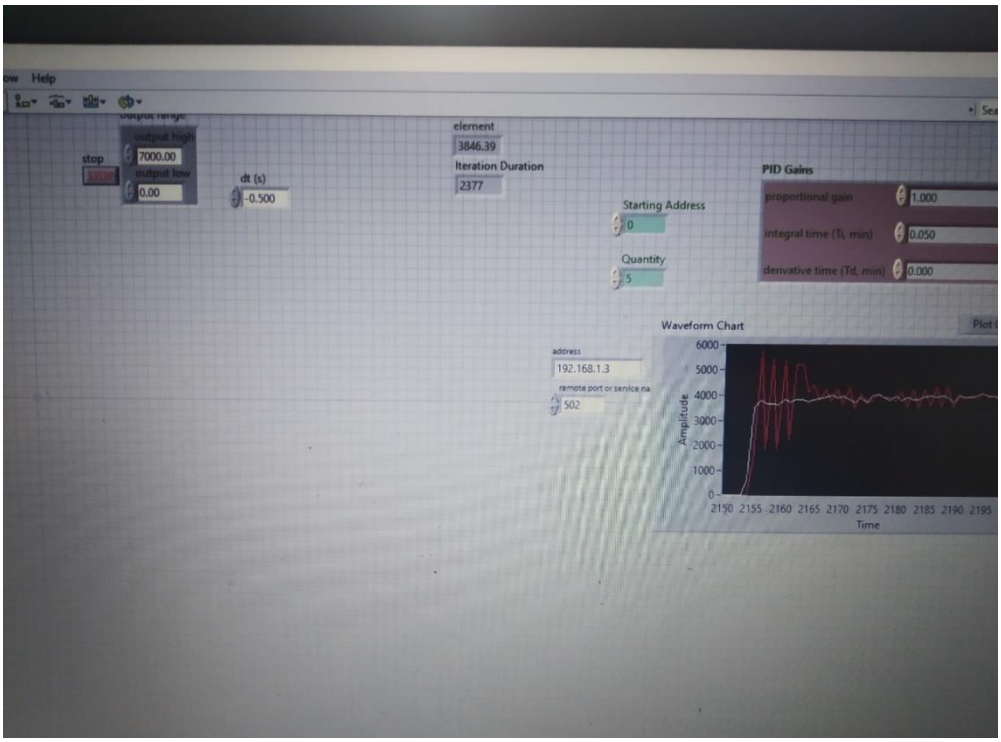
```
uint8_t   nSample = 10;
int enA = 6;
int in1 = 5;
int in2 = 4;
int pwmGen;
uint16_t  pinSolar1  = 7;
uint16_t  pinSolar2  = 8;
uint16_t  pinUdara  = 9 ;
float konstanta1 = 0.275;
float konstanta2 = 0.655;
float konstanta3 = 0.521;

// ================ digital sensor =============
long prevperioderpm, prevperiodehho, periodeRead, periode;
int  radEng = 0, radHho=0, radSolar1=0, radSolar2=0, radUdara=0;
const byte  pinRpm = 3, pinHho = 2;
uint16_t tes1;
uint16_t tes2;


// ================ ModBus ====================
// Ethernet  settings  (depending  on  MAC  and Local  network)
byte  mac[]  =  {0x00, 0xAA, 0xBB, 0xCC, 0xDE, 0x02  };

IPAddress  ip(192,168,1,3);
IPAddress  gateway(192,168,1,3);
IPAddress  subnet(255,  255,  255,  0);
```

Lampiran 3 : Mengetes Respon PID Pada LabView

Tes respon pid pada softwere LabView dengan menggunakan 2 kipas yang masing-masing diletakkan sensor proximity untuk mengukur rpm pada kipas,dimana satu kipas putarannya dijadikan sebagai setpoin dan kipas yang lain sebagai output dari penggunaan PID






Help
output high
7000.00
output low
0.00
stop
STOP
dt (s)
-0.500
element
3846.39
Iteration Duration
2377
Starting Address
0
Quantity
5
PID Gains
proportional gain
1.000
integral time (Ti, min)
0.050
derivative time (Td, min)
0.000
Waveform Chart
address
192.168.1.3
remote port or service na
502
6000
5000
4000
3000
2000
1000
0
Amplitude
2150 2155 2160 2165 2170 2175 2180 2185 2190 2195
Time

Lampiran 4 : Data Hasil Pengujian

Rpm Mesi	Rpm HHO	Rpm Udara	Rpm Bbm	Rpm Bbm Out	Debit HHo	Debit Udar	Debit Bbm	Total Hho	Total Udar	Total Bbm
840	1365.643	1860	1620	1260	6.26	10.1525	0.7815	6.26	10.1525	0.7815
1080	1361.297	2340	1200	1200	6.24	12.7725	0	12.50	22.925	0.7815
1140	1847.092	2310	1380	1320	8.47	12.60875	0.13025	20.96	35.53375	0.91175
1200	1666.625	2310	1260	1200	7.64	12.60875	0.13025	28.60	48.1425	1.042
1020	1846.322	2280	1320	1200	8.46	12.445	0.2605	37.07	60.5875	1.3025
1003	1716.541	2250	1239	1239	7.87	12.28125	0	44.93	72.86875	1.3025
1020	1758.3	1830	1380	1320	8.06	12.445	0.13025	52.99	85.31375	1.43275
960	1554.852	1890	1500	1260	7.13	10.31625	0.521	60.12	95.63	1.95375
1200	1798.192	2310	1500	1260	8.24	12.60875	0.521	68.36	108.2388	2.47475
1200	1724.068	2310	1260	1260	7.90	12.60875	0	76.26	120.8475	2.47475
1140	1772.383	2310	1440	1200	8.12	12.60875	0.521	84.39	133.4563	2.99575
1140	1853.636	2310	1320	1200	8.50	12.60875	0.2605	92.88	146.065	3.25625
1140	1676.09	2310	1500	1320	7.68	12.60875	0.39075	100.56	158.6738	3.647
1200	1737.064	2310	1560	1260	7.96	12.60875	0.65125	108.52	171.2825	4.29825
1020	2030.126	2280	1740	1260	9.30	12.445	1.042	117.83	183.7275	5.34025
960	1596.651	1890	1440	1320	7.32	10.31625	0.2605	125.15	194.0438	5.60075
960	1463.798	1890	1500	1260	6.71	10.31625	0.521	131.86	204.36	6.12175
1003	1437.3	2250	1475	1239	6.59	12.28125	0.512317	138.44	216.6413	6.634067
1140	1597.03	2310	1500	1260	7.32	12.60875	0.521	145.76	229.25	7.155067
1200	1981.253	2310	1500	1320	9.08	12.60875	0.39075	154.84	241.8588	7.545817
1080	1892.487	2340	1620	1320	8.67	12.7725	0.65125	163.52	254.6313	8.197067
1200	1837.659	1830	1500	1260	8.42	12.60875	0.521	171.94	267.24	8.718067
1020	1958.358	2280	1500	1320	8.98	12.445	0.39075	180.92	279.685	9.108817
1020	1750.426	2280	1500	1260	8.02	12.445	0.521	188.94	292.13	9.629817
1020	1564.617	2280	1560	1260	7.17	12.445	0.65125	196.11	304.575	10.28107
1020	1728.936	2280	2220	1260	7.92	12.445	0.7815	204.04	317.02	11.06257
1380	1811.413	1770	1500	1260	8.30	9.66125	0.521	212.34	326.6813	11.58357
1080	1991.819	2340	1440	1320	9.13	12.7725	0.2605	221.47	339.4538	11.84407
1020	1598.076	2280	1860	1320	7.32	12.445	0.7815	228.79	351.8988	12.62557
1020	1677.457	2280	1560	1260	7.69	12.445	0.65125	236.48	364.3438	13.27682
1020	1476.286	2280	1500	1260	6.77	12.445	0.521	243.25	376.7888	13.79782
1260	1651.881	2370	1500	1260	7.57	12.93625	0.521	250.82	389.725	14.31882
1140	2079.165	2310	1440	1320	9.53	12.60875	0.2605	260.35	402.3338	14.57932
1180	1621.51	2242	1560	1260	7.43	12.23758	0.65125	267.78	414.5713	15.23057
1080	1683.116	2340	1500	1260	7.71	12.7725	0.521	275.49	427.3438	15.75157
1140	1678.302	2310	1500	1260	7.69	12.60875	0.521	283.18	439.9526	16.27257
960	1609.702	1890	1560	1260	7.38	10.31625	0.65125	290.56	450.2688	16.92382
1020	1460.006	2280	1560	1260	6.69	12.445	0.65125	297.25	462.7138	17.57507
960	1753.412	1890	1500	1320	8.04	10.31625	0.39075	305.29	473.0301	17.96582
1080	1640.667	2340	1860	1260	7.52	12.7725	0.91175	312.81	485.8026	18.87757
1320	1842.939	2400	1500	1320	8.45	13.1	0.39075	321.26	498.9026	19.26832
1260	2027.914	2370	1440	1320	9.29	12.93625	0.2605	330.55	511.8388	19.52882
1080	1934.051	2340	1500	1320	8.86	12.7725	0.39075	339.42	524.6113	19.91957
1140	1806.203	2310	1500	1320	8.28	12.60875	0.39075	347.69	537.2201	20.31032
960	1961.097	1890	1500	1320	8.99	10.31625	0.39075	356.68	547.5363	20.70107
1020	1473.21	2280	1920	1380	6.75	12.445	0.7815	363.44	559.9813	21.48257
1080	1836.689	2340	1500	1260	8.42	12.7725	0.521	371.85	572.7538	22.00357
1239	1896.455	2370	1888	1357	8.69	12.93625	0.7815	380.55	585.6901	22.78507
1140	1677.599	2310	1920	1380	7.69	12.60875	0.7815	388.23	598.2988	23.56657
1140	1788.834	2310	1500	1260	8.20	12.60875	0.521	396.43	610.9076	24.08757
1080	1891.045	2340	1500	1260	8.67	12.7725	0.521	405.10	623.6801	24.60857
1080	1821.25	2340	1440	1320	8.35	12.7725	0.2605	413.45	636.4526	24.86907
1020	2013.946	2280	1440	1320	9.23	12.445	0.2605	422.68	648.8976	25.12957
1140	1615.08	2310	1920	1380	7.40	12.60875	0.7815	430.08	661.5063	25.91107
960	1725.099	1890	1920	1380	7.91	10.31625	0.7815	437.99	671.8226	26.69257
1200	1535.211	2310	1560	1260	7.04	12.60875	0.65125	445.02	684.4313	27.34382
1200	1752.689	2310	1560	1260	8.03	12.60875	0.65125	453.06	697.0401	27.99507
1140	1682.637	2310	1920	1380	7.71	12.60875	0.7815	460.77	709.6488	28.77657
1260	1750.057	2370	1500	1260	8.02	12.93625	0.521	468.79	722.5851	29.29757
1140	1813.012	2310	1500	1260	8.31	12.60875	0.521	477.10	735.1938	29.81857
1260	1681.995	2370	1920	1380	7.71	12.93625	0.65125	484.81	748.1301	30.46982

1080	1765.772	2340	1920	1380	8.09	12.7725	0.65125	492.90	760.9026	31.12107
1140	1895.315	2310	1500	1260	8.69	12.60875	0.521	501.59	773.5113	31.64207
1020	1661.507	2310	2220	1860	7.62	12.60875	0.7815	509.20	786.1201	32.42357
1020	1582.087	2250	2220	1860	7.25	12.28125	0.7815	516.46	798.4013	33.20507
1020	1530.849	2310	1920	1380	7.02	12.60875	0.65125	523.47	811.0101	33.85632
1020	1475.075	2280	2220	1860	6.76	12.445	0.7815	530.23	823.4551	34.63782
1080	1682.119	2280	2220	1860	7.71	12.445	0.7815	537.94	835.9001	35.41932
1020	1551.125	2280	2220	1860	7.11	12.445	0.7815	545.05	848.3451	36.20082
1200	1789.839	2310	1500	1260	8.20	12.60875	0.521	553.26	860.9538	36.72182
1260	1938.515	2370	1500	1320	8.88	12.93625	0.39075	562.14	873.8901	37.11257
1080	1898.939	2340	1500	1320	8.70	12.7725	0.39075	570.84	886.6626	37.50332
1260	1652.864	2280	1500	1260	7.58	12.93625	0.521	578.42	899.5988	38.02432
1180	1795.047	2242	1500	1260	8.23	12.23758	0.521	586.65	911.8364	38.54532
1140	1629.588	2310	2220	1860	7.47	12.60875	0.7815	594.12	924.4452	39.32682
1080	1982.242	2310	1440	1320	9.09	12.60875	0.2605	603.20	937.0539	39.58732
1080	1759.825	2370	1500	1320	8.07	12.93625	0.39075	611.27	949.9902	39.97807
1140	1909.824	2340	1500	1320	8.75	12.7725	0.39075	620.02	962.7627	40.36882
1020	1880.167	2310	1500	1320	8.62	12.60875	0.39075	628.64	975.3714	40.75957
1080	1621.563	2340	2220	1860	7.43	12.7725	0.7815	636.07	988.1439	41.54107
1020	1856.773	2280	1500	1260	8.51	12.445	0.521	644.58	1000.589	42.06207
1020	1530.849	2310	2220	1800	7.02	12.60875	0.91175	651.60	1013.198	42.97382
1020	1475.075	2280	2220	1860	6.76	12.445	0.7815	658.36	1025.643	43.75532
1080	1682.119	2280	2280	1860	7.71	12.445	0.91175	666.07	1038.088	44.66707
1020	1551.125	2280	2220	1860	7.11	12.445	0.7815	673.18	1050.533	45.44857
1080	1992.356	2370	1500	1320	9.13	12.93625	0.39075	682.31	1063.469	45.83932
1080	1701.646	2340	2340	2040	7.80	12.7725	0.65125	690.11	1076.241	46.49057
1080	1802.788	2310	1500	1260	8.26	12.60875	0.521	698.37	1088.85	47.01157
1080	1539.474	2340	2400	2100	7.06	12.7725	0.65125	705.43	1101.623	47.66282
1180	1795.047	2242	2242	1829	8.23	12.23758	0.521	713.65	1113.86	48.18382
1140	1629.588	2310	1500	1260	7.47	12.60875	0.7815	721.12	1126.469	48.96532
1080	1693.733	2310	1500	1260	7.76	12.60875	0.7815	728.88	1139.078	49.74682
1020	1756.123	2340	2242	1829	8.05	12.7725	0.521	736.93	1151.85	50.26782
1080	1791.893	2340	2242	1829	8.21	12.7725	0.521	745.15	1164.623	50.78882
1080	1666.76	2280	2280	1920	7.64	12.445	0.7815	752.79	1177.068	51.57032
1080	1627.653	2310	2280	1920	7.46	12.60875	0.7815	760.25	1189.677	52.35182
1140	1587.617	2370	2280	1920	7.28	12.93625	0.7815	767.52	1202.613	53.13332
1140	1960.457	2340	1500	1320	8.99	12.7725	0.39075	776.51	1215.385	53.52407
1020	1530.849	2310	2220	1800	7.02	12.60875	0.91175	783.52	1227.994	54.43582
1020	1475.075	2280	2220	1860	6.76	12.445	0.7815	790.29	1240.439	55.21732
1080	1682.119	2280	2280	1860	7.71	12.445	0.91175	797.99	1252.884	56.12907
1020	1551.125	2280	2220	1860	7.11	12.445	0.7815	805.10	1265.329	56.91057
1080	1992.356	2370	1500	1320	9.13	12.93625	0.39075	814.24	1278.265	57.30132
1080	1701.646	2340	1500	1260	7.80	12.7725	0.521	822.03	1291.038	57.82232
1080	1802.788	2310	1500	1260	8.26	12.60875	0.521	830.30	1303.647	58.34332
1080	1539.474	2340	2400	2100	7.06	12.7725	0.65125	837.35	1316.419	58.99457
1180	1795.047	2242	1500	1260	8.23	12.23758	0.521	845.58	1328.657	59.51557
1140	1629.588	2310	2220	1860	7.47	12.60875	0.7815	853.05	1341.265	60.29707
1080	1982.242	2310	1500	1320	9.09	12.60875	0.39075	862.14	1353.874	60.68782
1080	1811.622	2310	1500	1260	8.30	12.60875	0.521	870.44	1366.483	61.20882
1080	1534.854	2310	2280	1980	7.03	12.60875	0.65125	877.47	1379.092	61.86007
1080	1784.973	2310	2280	1980	8.18	12.60875	0.65125	885.65	1391.7	62.51132
1080	1532.418	2280	2280	1920	7.02	12.445	0.7815	892.68	1404.145	63.29282
1080	1927.546	2340	2280	1980	8.83	12.7725	0.65125	901.51	1416.918	63.94407
1080	1639.751	2280	2340	1980	7.52	12.445	0.7815	909.03	1429.363	64.72557
1020	1617.126	2310	2340	1980	7.41	12.60875	0.7815	916.44	1441.972	65.50707
1080	1818.51	2340	2280	1980	8.33	12.7725	0.65125	924.77	1454.744	66.15832
1080	1819.444	2340	2280	1980	8.34	12.7725	0.65125	933.11	1467.517	66.80957
1080	1867.798	2340	2340	1980	8.56	12.7725	0.7815	941.67	1480.289	67.59107
1080	1620.115	2370	2340	1980	7.43	12.93625	0.7815	949.10	1493.225	68.37257
1080	1894.388	2370	1500	1320	8.68	12.93625	0.39075	957.78	1506.162	68.76332

1560	1560.563	3750	3060	2700	7.15	20.46875	0.521	964.94	1526.63	69.28432
1620	2073.172	3690	3060	2700	9.50	20.14125	0.521	974.44	1546.772	69.80532
1560	2370.406	3750	3060	2700	10.86	20.46875	0.521	985.30	1567.24	70.32632
1560	2053.351	3690	3120	2760	9.41	20.14125	0.521	994.71	1587.382	70.84732
1620	2394.934	3810	3060	2760	10.98	20.79625	0.65125	1005.69	1608.178	71.49857
1560	2239.347	3810	3060	2760	10.26	20.79625	0.65125	1015.95	1628.974	72.14982
1560	2149.57	3870	3060	2760	9.85	21.12375	0.65125	1025.81	1650.098	72.80107
1620	1993.648	3840	3060	2760	9.14	20.96	0.39075	1034.94	1671.058	73.19182
1620	2362.166	3810	3180	2820	10.83	20.79625	0.39075	1045.77	1691.854	73.58257
1560	2162.359	3780	3180	2760	9.91	20.6325	0.65125	1055.68	1712.487	74.23382
1560	2068.067	3810	3060	2760	9.48	20.79625	0.65125	1065.16	1733.283	74.88507
1560	2123.997	3840	3120	2760	9.73	20.96	0.7815	1074.89	1754.243	75.66657
1620	2400.101	3810	3120	2760	11.00	20.79625	0.7815	1085.89	1775.039	76.44807
1620	2305.567	3870	3120	2760	10.57	21.12375	0.521	1096.46	1796.163	76.96907
1620	2469.029	3840	3120	2760	11.32	20.96	0.39075	1107.78	1817.123	77.35982
1620	2346.474	3840	3180	2820	10.75	20.96	0.39075	1118.53	1838.083	77.75057
1620	2076.34	3840	3120	2820	9.52	20.96	0.521	1128.05	1859.043	78.27157
1620	2412.01	3750	3120	2760	11.06	20.46875	0.65125	1139.10	1879.512	78.92282
1620	2347.914	3870	3180	2760	10.76	21.12375	0.65125	1149.87	1900.635	79.57407
1620	2255.223	3930	3120	2760	10.34	21.45125	0.7815	1160.20	1922.087	80.35557
1620	2156.578	3900	3120	2820	9.88	21.2875	0.65125	1170.09	1943.374	81.00682
1620	2346.264	3900	3120	2820	10.75	21.2875	0.65125	1180.84	1964.662	81.65807
1620	2331.302	3720	3120	2760	10.69	20.305	0.7815	1191.53	1984.967	82.43957
1620	2076.189	3840	3120	2820	9.52	20.96	0.65125	1201.04	2005.927	83.09082
1620	2134.86	3870	3120	2820	9.78	21.12375	0.65125	1210.83	2027.05	83.74207
1680	2195.912	3990	3120	2820	10.06	21.77875	0.521	1220.89	2048.829	84.26307
1620	2154.477	4080	3180	2880	9.87	22.27	0.65125	1230.77	2071.099	84.91432
1620	2327.767	3930	3120	2820	10.67	21.45125	0.521	1241.43	2092.55	85.43532
1620	2198.794	3990	3180	2820	10.08	21.77875	0.7815	1251.51	2114.329	86.21682
1680	2099.584	4080	3180	2880	9.62	22.27	0.65125	1261.14	2136.599	86.86807
1620	2292.581	3990	3180	2880	10.51	21.77875	0.65125	1271.64	2158.378	87.51932
1680	2174.534	3990	3180	2820	9.97	21.77875	0.7815	1281.61	2180.157	88.30082
1680	2380.949	3930	3180	2880	10.91	21.45125	0.65125	1292.52	2201.608	88.95207
1680	2328.217	4020	3180	2880	10.67	21.9425	0.65125	1303.19	2223.55	89.60332
1680	2277.86	3960	3180	2880	10.44	21.615	0.65125	1313.63	2245.165	90.25457
1680	2232.685	3990	3180	2940	10.23	21.77875	0.521	1323.87	2266.944	90.77557
1680	2328.476	4110	3240	2880	10.67	22.43375	0.39075	1334.54	2289.378	91.16632
1560	2254.765	3900	3180	2940	10.33	21.2875	0.39075	1344.87	2310.665	91.55707
1560	2146.088	4080	3180	2940	9.84	22.27	0.521	1354.71	2332.935	92.07807
1500	2543.847	4200	3180	2940	9.69	22.925	0.521	1364.40	2355.86	92.59907
1560	2228.052	4200	3240	2940	10.01	22.925	0.521	1374.41	2378.785	93.12007
1560	2494.519	4290	3240	2940	9.76	23.41625	0.65125	1384.17	2402.202	93.77132
1560	2354.26	4290	3240	2940	10.53	23.41625	0.65125	1394.70	2425.618	94.42257
1560	2316.302	4350	3240	3000	10.51	23.74375	0.39075	1405.21	2449.362	94.81332
1560	2638.762	3870	3180	2880	10.34	21.12375	0.39075	1415.55	2470.485	95.20407
1560	2356.185	3690	3060	2760	10.80	20.14125	0.65125	1426.35	2490.627	95.85532
1560	2085.595	3570	3060	2760	9.56	19.48625	0.65125	1435.91	2510.113	96.50657
1560	2297.917	3660	3060	2760	10.53	19.9775	0.65125	1446.44	2530.09	97.15782
1500	2113.618	3630	3120	2700	9.69	19.81375	0.91175	1456.13	2549.904	98.06957
1560	2184.834	3630	3060	2760	10.01	19.81375	0.39075	1466.14	2569.718	98.46032
1560	2130.31	3630	3060	2700	9.76	19.81375	0.521	1475.90	2589.532	98.98132
1560	2296.783	3600	3060	2760	10.53	19.65	0.65125	1486.43	2609.182	99.63257
1560	2292.921	3660	3120	2760	10.51	19.9775	0.7815	1496.94	2629.159	100.4141
1560	2255.445	3630	3120	2700	10.34	19.81375	0.521	1507.28	2648.973	100.9351
1560	2256.331	3660	3120	2760	10.34	19.9775	0.7815	1517.62	2668.95	101.7166
1560	2016.421	3660	3120	2760	9.24	19.9775	0.7815	1526.86	2688.928	102.4981
1560	2296.831	3600	3060	2760	10.53	19.65	0.65125	1537.39	2708.578	103.1493
1560	2392.777	3630	3060	2760	10.97	19.81375	0.65125	1548.35	2728.392	103.8006
1620	2181.01	3630	3120	2820	10.00	19.81375	0.65125	1558.35	2748.205	104.4518
1560	2422.799	3660	3060	2820	11.10	19.9775	0.521	1569.46	2768.183	104.9728

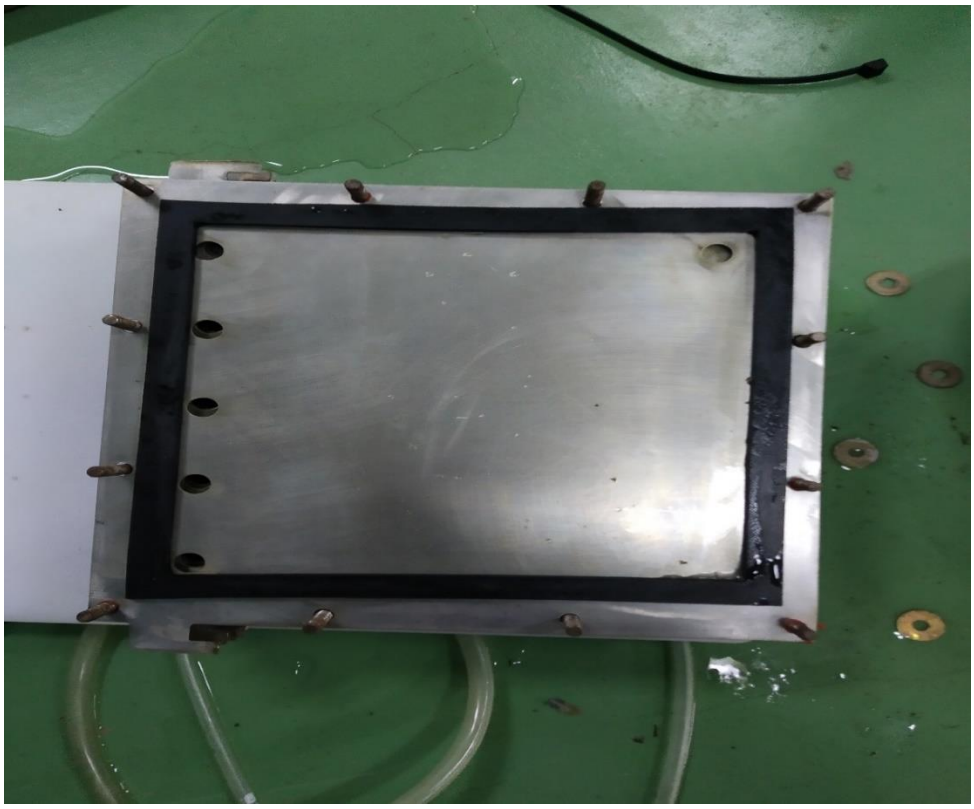
1500	2275.103	3480	3060	2760	10.43	18.995	0.65125	1579.88	2787.178	105.6241
1500	2329.535	3450	3120	2760	10.68	18.83125	0.521	1590.56	2806.009	106.1451
1560	2017.527	3540	3009	2655	9.25	19.3225	0.521	1599.81	2825.332	106.6661
1560	2067.248	3540	3009	2714	9.47	19.3225	0.640396	1609.28	2844.654	107.3065
1560	2172.595	3599	2950	2714	9.96	19.64454	0.512317	1619.24	2864.299	107.8188
1500	1999.845	3060	2940	2580	9.17	16.7025	0.521	1628.41	2881.001	108.3398
1620	1999.845	3060	3060	2580	9.17	16.7025	0.521	1637.5713	2897.704	108.8608
1560	2422.799	3660	3060	2820	11.10	19.9775	0.65125	1648.6758	2917.681	109.512
1620	2255.445	3930	3120	2760	10.34	21.45125	0.65125	1659.0132	2939.132	110.1633
1560	2255.445	3630	3120	2700	10.34	19.81375	0.521	1669.3507	2958.946	110.6843
1560	2017.527	3540	3009	2655	9.25	19.3225	0.65125	1678.5977	2978.269	111.3355
1560	2400.101	3810	3120	2760	11.00	20.79625	0.65125	1689.5981	2999.065	111.9868
1560	2123.997	3840	3120	2760	9.73	20.96	0.65125	1699.3331	3020.025	112.638
1620	2256.331	3660	3120	2760	10.34	19.9775	0.65125	1709.6746	3040.002	113.2893
1560	2275.103	3480	3060	2760	10.43	18.995	0.7815	1720.1022	3058.997	114.0708
1560	2017.527	3540	3009	2655	9.25	19.3225	0.65125	1729.3492	3078.32	114.722
1560	2130.31	3630	3060	2700	9.76	19.81375	0.65125	1739.1131	3098.134	115.3733
1620	2400.101	3810	3120	2760	11.00	20.79625	0.521	1750.1136	3118.93	115.8943
1620	2275.103	3480	3060	2760	10.43	18.995	0.39075	1760.5411	3137.925	116.285
1620	2181.01	3630	3120	2820	10.00	19.81375	0.39075	1770.5374	3157.739	116.6758
1620	2469.029	3840	3120	2760	11.32	20.96	0.521	1781.8538	3178.699	117.1968
1620	2356.185	3690	3060	2760	10.80	20.14125	0.521	1792.653	3198.84	117.7178
1620	2085.595	3570	3060	2760	9.56	19.48625	0.521	1802.212	3218.326	118.2388
1620	2400.101	3810	3120	2760	11.00	20.79625	0.65125	1813.2124	3239.122	118.89
1620	2356.185	3690	3060	2760	10.80	20.14125	0.65125	1824.0116	3259.264	119.5413
1620	2275.103	3480	3060	2760	10.43	18.995	0.7815	1834.4392	3278.259	120.3228
1620	2356.185	3690	3060	2760	10.80	20.14125	0.65125	1845.2384	3298.4	120.974
1620	2113.618	3630	3120	2700	9.69	19.81375	0.65125	1854.9258	3318.214	121.6253
1620	2275.103	3480	3060	2760	10.43	18.995	0.7815	1865.3533	3337.209	122.4068
1620	2113.618	3630	3120	2700	9.69	19.81375	0.65125	1875.0407	3357.022	123.058
1620	2296.831	3600	3060	2760	10.53	19.65	0.65125	1885.5679	3376.672	123.7093
1620	2356.185	3690	3060	2760	10.80	20.14125	0.521	1896.3671	3396.814	124.2303
1680	2328.217	4020	3180	2880	10.67	21.9425	0.65125	1907.0381	3418.756	124.8815
1680	2328.217	4020	3180	2880	10.67	21.9425	0.521	1917.7091	3440.699	125.4025
1620	2016.421	3660	3120	2760	9.24	19.9775	0.7815	1926.951	3460.676	126.184
1680	2067.248	3540	3009	2714	9.47	19.3225	0.65125	1936.4259	3479.999	126.8353
1680	2232.685	3990	3180	2940	10.23	21.77875	0.65125	1946.659	3501.777	127.4865
1680	2232.685	3990	3180	2940	10.23	21.77875	0.7815	1956.8921	3523.556	128.268
1680	2356.185	3690	3060	2760	10.80	20.14125	0.65125	1967.6913	3543.697	128.9193
1680	2275.103	3480	3060	2760	10.43	18.995	0.65125	1978.1189	3562.692	129.5705
1680	2275.103	3480	3060	2760	10.43	18.995	0.65125	1988.5464	3581.687	130.2218
1680	2130.31	3630	3060	2700	9.76	19.81375	0.521	1998.3104	3601.501	130.7428
1680	2400.101	3810	3120	2760	11.00	20.79625	0.39075	2009.3108	3622.297	131.1335
1620	2356.185	3690	3060	2760	10.80	20.14125	0.39075	2020.11	3642.439	131.5243
1560	2296.831	3600	3060	2760	10.53	19.65	0.521	2030.6371	3662.089	132.0453
1560	2113.618	3630	3120	2700	9.69	19.81375	0.521	2040.3246	3681.902	132.5663
1500	2256.331	3660	3120	2760	10.34	19.9775	0.65125	2050.6661	3701.88	133.2175
1560	2017.527	3540	3009	2655	9.25	19.3225	0.7815	2059.9131	3721.202	133.999
1560	2017.527	3540	3009	2655	9.25	19.3225	0.65125	2069.1601	3740.525	134.6503
1560	2296.831	3600	3060	2760	10.53	19.65	0.7815	2079.6872	3760.175	135.4318
1560	2296.831	3600	3060	2760	10.53	19.65	0.521	2090.2144	3779.825	135.9528
1560	2275.103	3480	3060	2760	10.43	18.995	0.65125	2100.6419	3798.82	136.604
1560	2275.103	3480	3060	2760	10.43	18.995	0.65125	2111.0695	3817.815	137.2553
1560	2017.527	3540	3009	2655	9.25	19.3225	0.65125	2120.3165	3837.137	137.9065
1560	2296.831	3600	3060	2760	10.53	19.65	0.91175	2130.8436	3856.787	138.8183
1560	2400.101	3810	3120	2760	11.00	20.79625	0.65125	2141.8441	3877.584	139.4695
1560	2181.01	3630	3120	2820	10.00	19.81375	0.7815	2151.8404	3897.397	140.251
1560	2017.527	3540	3009	2655	9.25	19.3225	0.65125	2161.0874	3916.72	140.9023
1560	2067.248	3540	3009	2714	9.47	19.3225	0.7815	2170.5622	3936.042	141.6838
1560	2067.248	3540	3009	2714	9.47	19.3225	0.521	2180.0371	3955.365	142.2048

1620	2256.331	3660	3120	2760	10.34	19.9775	0.7815	2190.3786	3975.342	142.9863
2040	2192.594	4350	3480	3240	10.05	23.74	0.521	2200.428	3999.086	143.507
2040	2774.257	4230	3480	3240	12.72	23.09	0.521	2213.1434	4022.175	144.028
2040	2874.92	4230	3480	3240	13.18	23.09	0.521	2226.3201	4045.264	144.549
2100	2665.927	4290	3540	3240	12.22	23.42	0.65125	2238.5389	4068.68	145.201
2006	2702.681	4573	3422	3245	12.39	24.96	0.384237	2250.9262	4093.638	145.585
2065	2624.314	4160	3481	3245	12.03	22.70	0.512317	2262.9543	4116.342	146.097
2006	2868.76	3924	3422	3245	13.15	21.42	0.384237	2276.1028	4137.758	146.481
2040	2917.092	4530	3540	3300	13.37	24.73	0.521	2289.4728	4162.484	147.002
2040	2707.457	4050	3480	3300	12.41	22.11	0.39075	2301.882	4184.59	147.393
2040	2632.158	4110	3540	3300	12.06	22.43	0.521	2313.9461	4207.024	147.914
2160	2783.13	4350	3540	3300	12.76	23.74	0.521	2326.7021	4230.768	148.435
2065	2820.951	4425	3481	3245	12.93	24.15	0.512317	2339.6314	4254.921	148.947
2065	2684.979	4042	3481	3245	12.31	22.06	0.512317	2351.9376	4276.981	149.460
2100	2777.198	4470	3540	3300	12.73	24.40	0.521	2364.6664	4301.38	149.981
2124	2811.886	4366	3481	3245	12.89	23.83	0.512317	2377.5542	4325.211	150.493
2183	2956.158	4278	3481	3304	13.55	23.35	0.384237	2391.1033	4348.559	150.877
2124	2766.977	4278	3481	3245	12.68	23.35	0.512317	2403.7852	4371.907	151.390
2242	2894.028	4484	3481	3186	13.26	24.48	0.640396	2417.0495	4396.382	152.030
2183	3054.545	4219	3481	3245	14.00	23.03	0.512317	2431.0495	4419.408	152.542
2124	3054.545	4396	3481	3245	14.00	23.99	0.512317	2445.0495	4443.4	153.055
2220	3054.545	4590	3540	3300	14.00	25.05	0.521	2459.0495	4468.454	153.576
2220	2820.969	4320	3600	3240	12.93	23.58	0.7815	2471.979	4492.034	154.357
2183	2938.868	4573	3481	3245	13.47	24.96	0.512317	2485.4488	4516.992	154.869
2124	2742.572	4248	3481	3304	12.57	23.19	0.384237	2498.0189	4540.179	155.254
2006	2692.465	4278	3481	3245	12.34	23.35	0.512317	2510.3594	4563.527	155.766
2242	2798.162	3924	3481	3245	12.82	21.42	0.512317	2523.1843	4584.943	156.278
2300	3054.545	4101	3481	3186	14.00	22.38	0.640396	2537.1843	4607.325	156.919
2006	2918.547	4366	3481	3186	13.38	23.83	0.640396	2550.561	4631.156	157.559
2065	2816.902	4337	3481	3186	12.91	23.67	0.640396	2563.4718	4654.826	158.199
2124	2624.12	4130	3540	3186	12.03	22.54	0.768475	2575.499	4677.369	158.968
2160	2928.541	4350	3600	3240	13.42	23.74	0.7815	2588.9215	4701.112	159.749
2124	2860.785	4366	3540	3245	13.11	23.83	0.640396	2602.0334	4724.943	160.390
2183	3054.545	4897	3599	3245	14.00	26.73	0.768475	2616.0334	4751.673	161.158
2280	2812.885	4470	3540	3300	12.89	24.40	0.521	2628.9258	4776.072	161.679
2124	3054.545	4366	3481	3245	14.00	23.83	0.512317	2642.9258	4799.903	162.192
2183	3054.545	4484	3481	3245	14.00	24.48	0.512317	2656.9258	4824.378	162.704
2183	2857.038	4130	3540	3245	13.09	22.54	0.640396	2670.0205	4846.921	163.344
2160	3036.235	4470	3600	3300	13.92	24.40	0.65125	2683.9366	4871.32	163.996
2220	2901.136	4410	3600	3360	13.30	24.07	0.521	2697.2335	4895.391	164.517
2300	3038.043	4455	3540	3245	13.92	24.31	0.640396	2711.1579	4919.705	165.157
2300	2999.19	4543	3481	3245	13.75	24.80	0.512317	2724.9041	4944.502	165.669
2160	3054.545	4140	3600	3360	14.00	22.60	0.521	2738.9041	4967.1	166.190
2124	2724.671	4396	3540	3245	12.49	23.99	0.640396	2751.3922	4991.092	166.831
2183	2796.466	4573	3540	3245	12.82	24.96	0.640396	2764.2093	5016.05	167.471
2242	3054.545	4632	3540	3245	14.00	25.28	0.640396	2778.2093	5041.33	168.112
2065	3054.545	4484	3540	3245	14.00	24.48	0.640396	2792.2093	5065.805	168.752
2242	2616.545	4130	3540	3304	11.99	22.54	0.512317	2804.2018	5088.348	169.264
2242	2963.211	4484	3540	3304	13.58	24.48	0.512317	2817.7832	5112.824	169.777
2124	3054.545	4455	3599	3304	14.00	24.31	0.640396	2831.7832	5137.138	170.417
2065	2790.617	4484	3540	3304	12.79	24.48	0.512317	2844.5736	5161.613	170.929
2220	2755.29	4440	3600	3360	12.63	24.24	0.521	2857.202	5185.848	171.450
2242	3054.545	5074	3540	3304	14.00	27.70	0.512317	2871.202	5213.543	171.963
2300	2939.533	4130	3599	3304	13.47	22.54	0.640396	2884.6748	5236.086	172.603
2124	3054.545	4573	3599	3304	14.00	24.96	0.640396	2898.6748	5261.045	173.243
2300	2969.468	4396	3540	3245	13.61	23.99	0.640396	2912.2849	5285.037	173.884
2124	3054.545	4278	3540	3245	14.00	23.35	0.640396	2926.2849	5308.385	174.524
2124	3036.873	4219	3540	3304	13.92	23.03	0.512317	2940.2039	5331.411	175.036
2220	2855.675	4350	3600	3360	13.09	23.74	0.521	2953.2924	5355.154	175.557
2280	2871.24	4860	3600	3360	13.16	26.53	0.521	2966.4523	5381.682	176.078

2220	2954.962	4380	3660	3360	13.54	23.91	0.65125	2979.9958	5405.589	176.730
2300	2927.414	4470	3660	3300	13.42	24.40	0.7815	2993.4131	5429.988	177.511
2300	3054.545	4366	3540	3304	14.00	23.83	0.512317	3007.4131	5453.819	178.024
2183	3054.545	4160	3599	3245	14.00	22.70	0.768475	3021.4131	5476.523	178.792
2124	2836.655	4366	3599	3304	13.00	23.83	0.640396	3034.4145	5500.354	179.432
2300	2936.664	4130	3599	3304	13.46	22.54	0.640396	3047.8742	5522.897	180.073
2160	3054.545	4500	3660	3300	14.00	24.56	0.7815	3061.8742	5547.46	180.854
2280	3054.545	4410	3600	3360	14.00	24.07	0.521	3075.8742	5571.531	181.375
2124	2975.972	4396	3599	3245	13.64	23.99	0.768475	3089.5141	5595.523	182.144
2124	2685.659	4455	3540	3304	12.31	24.31	0.512317	3101.8233	5619.837	182.656
2065	3054.545	4307	3540	3304	14.00	23.51	0.512317	3115.8233	5643.346	183.168
2124	3001.528	4219	3599	3245	13.76	23.03	0.768475	3129.5803	5666.372	183.937
2183	3018.114	4602	3540	3245	13.83	25.12	0.640396	3143.4134	5691.492	184.577
2183	2876.425	4101	3599	3304	13.18	22.38	0.640396	3156.597	5713.873	185.218
2100	2863.749	4560	3660	3300	13.13	24.89	0.7815	3169.7225	5738.763	185.999
2160	2880.149	4530	3600	3300	13.20	24.73	0.65125	3182.9232	5763.49	186.650
2100	2794.16	4260	3600	3300	12.81	23.25	0.65125	3195.7298	5786.742	187.302
2242	2956.567	4661	3599	3304	13.55	25.44	0.640396	3209.2807	5812.183	187.942
2183	2927.283	4543	3599	3245	13.42	24.80	0.768475	3222.6974	5836.981	188.711
2124	3054.545	4838	3599	3245	14.00	26.41	0.768475	3236.6974	5863.388	189.479
2124	2985.88	4691	3599	3245	13.69	25.60	0.768475	3250.3827	5888.99	190.248
2065	2963.56	4838	3599	3304	13.58	26.41	0.640396	3263.9657	5915.398	190.888
2160	2983.048	4560	3600	3300	13.67	24.89	0.65125	3277.638	5940.288	191.539
2124	3054.545	4396	3599	3245	14.00	23.99	0.768475	3291.638	5964.28	192.308
2100	2699	4560	3660	3360	12.37	24.89	0.65125	3304.0084	5989.17	192.959
2160	2665.317	4710	3660	3300	12.22	25.71	0.7815	3316.2244	6014.879	193.740
2160	2861.098	4500	3660	3360	13.11	24.56	0.65125	3329.3378	6039.441	194.392
2124	2743.536	4278	3599	3304	12.57	23.35	0.640396	3341.9123	6062.789	195.032
2065	3039.017	4602	3599	3304	13.93	25.12	0.640396	3355.8412	6087.908	195.672
2124	2887.654	4396	3599	3304	13.24	23.99	0.640396	3369.0762	6111.901	196.313
2124	2670.72	4602	3658	3304	12.24	25.12	0.768475	3381.317	6137.02	197.081
2160	2963.163	4710	3660	3360	13.58	25.71	0.65125	3394.8982	6162.729	197.733
2124	2843.398	4573	3599	3304	13.03	24.96	0.640396	3407.9304	6187.687	198.373
2160	2884.628	4650	3720	3300	13.22	25.38	0.91175	3421.1516	6213.068	199.285
2160	2949.598	4200	3660	3420	13.52	22.93	0.521	3434.6706	6235.993	199.806
2124	2784.446	4396	3599	3363	12.76	23.99	0.512317	3447.4327	6259.985	200.318
2160	2899.835	4290	3660	3360	13.29	23.42	0.65125	3460.7236	6283.401	200.969
2160	2962.251	4710	3660	3300	13.58	25.71	0.7815	3474.3006	6309.11	201.751
2160	2821.725	4740	4012	3304	12.93	25.87	1.53695	3487.2335	6334.983	203.288
2160	2748.079	4800	5160	3300	12.60	26.20	0.91175	3499.8288	6361.183	204.199
2124	2752.763	4779	4012	3304	12.62	26.09	1.53695	3512.4457	6387.268	205.736
2300	3047.346	4590	4080	3360	13.97	25.05	1.563	3526.4127	6412.322	207.299
2160	2913.18	4800	3780	3360	13.35	26.20	0.91175	3539.7647	6438.522	208.211
2160	2986.306	4650	3660	3360	13.69	25.38	0.65125	3553.452	6463.903	208.862
2300	3054.545	4337	3599	3304	14.00	23.67	0.640396	3567.452	6487.573	209.503
2220	2942.297	4290	3660	3360	13.49	23.42	0.65125	3580.9375	6510.989	210.154
2220	3054.545	4680	3600	3360	14.00	25.55	0.521	3594.9375	6536.534	210.675
2220	3054.545	4650	3660	3360	14.00	25.38	0.65125	3608.9375	6561.916	211.326
2220	2788.51	4500	3660	3360	12.78	24.56	0.65125	3621.7182	6586.478	211.978
2160	2845.068	4710	3660	3360	13.04	25.71	0.65125	3634.7581	6612.187	212.629
2220	3021.894	4620	3660	3360	13.85	25.22	0.65125	3648.6084	6637.404	213.280
2280	2868.477	4470	3720	3360	13.15	24.40	0.7815	3661.7556	6661.803	214.062
2300	2884.66	4470	3600	3360	13.22	24.40	0.521	3674.977	6686.202	214.583
2242	3043.378	4750	3599	3304	13.95	25.92	0.640396	3688.9258	6712.126	215.223
2220	3054.545	4650	3660	3360	14.00	25.38	0.65125	3702.9258	6737.507	215.874
2220	3054.545	4680	3660	3360	14.00	25.55	0.65125	3716.9258	6763.052	216.525
2183	3054.545	4543	3599	3363	14.00	24.80	0.512317	3730.9258	6787.85	217.038
2280	3054.545	4680	3660	3420	14.00	25.55	0.521	3744.9258	6813.395	217.559
2280	2963.458	4620	3660	3420	13.58	25.22	0.521	3758.5083	6838.612	218.080
2220	3013.401	4500	3660	3360	13.81	24.56	0.65125	3772.3197	6863.175	218.731

Lampiran 5 : Perakitan Generator HHO

Perakitan generator HHO dilakukan setelah maintenance generator HHO

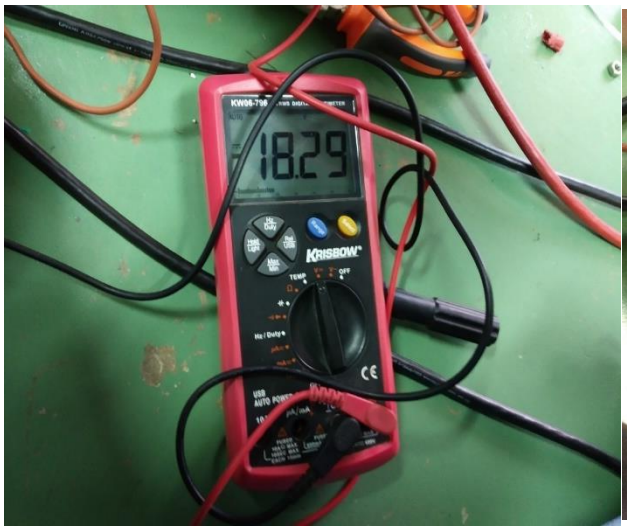


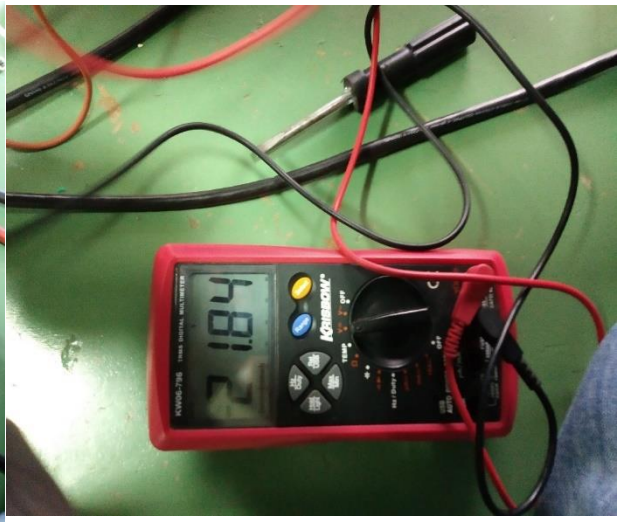
Lampiran 6 : Pengukuran Jumlah KOH Yang Digunakan

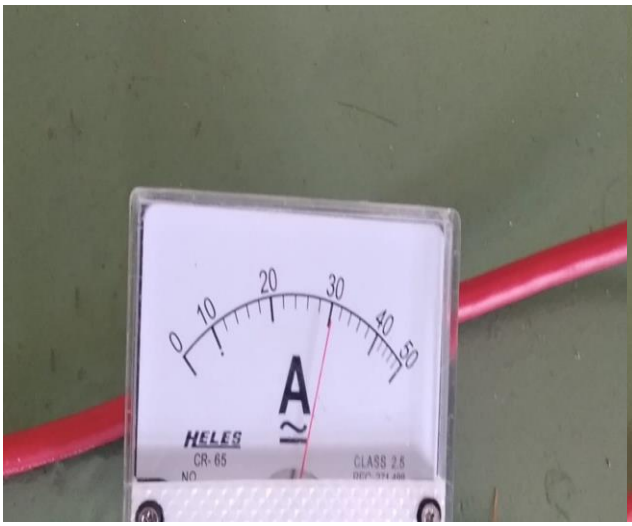
Jumlah KOH yang digunakan yaitu 3% dibandingkan dengan 1500 ml air sehingga didapat 45 g seperti pada timbangan berikut

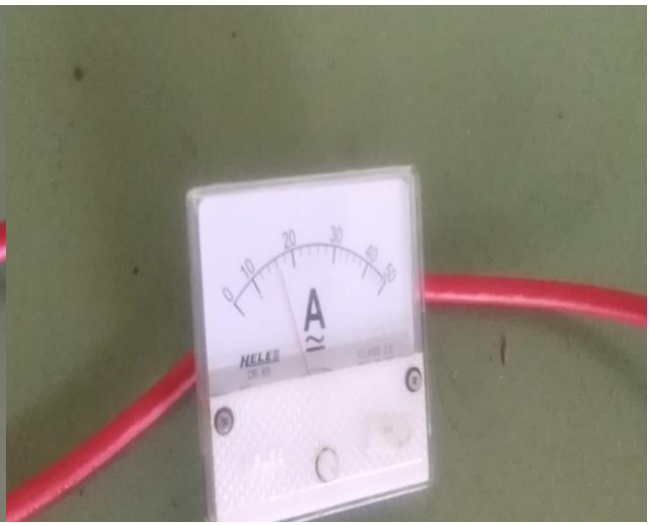
Lampiran 7 : Tegangan dan Ampere

Tegangan dan ampere di ukur dari yang terendah (16A) yang diberikan ke generator HHO sampai yang paling tinggi (30A).









Lampiran 8 : Kondisi plat setelah penggunaan dalam rentang waktu 6 bulan

Kondisi plat setelah digunakan dalam waktu 6 bulan,cairan elektrolit yang digunakan pada generator merupakan campuran dari air dan KOH dengan persentase penambahan 3% KOH, Dimana kondisi plat terlihat berubah warna dan terdapat pengikisan pada plat