

LAMPIRAN A

Data pengujian Generator Gas HHO tipe basa (*Wett cell*)

Tabel A.1. Lembar Data Pengujian Generator Gas HHO Tipe *Wet Cell* dengan duty cycle 50 %.

N o.	Waktu Uji (menit)	Frekuensi (Hz)	Duty Cycle	Voltage (V)	Ampere (A)	Temp. (oC)	Waktu produksi 250cc gas HHO
1	30	500	50 %	6.78	16	32	32
2	30	1000	50 %	6.77	16	32	32
3	30	2000	50 %	6.75	15	31	35
4	30	3000	50 %	6.69	14	30	37
5	30	4000	50 %	6.49	14	30	39
6	30	5000	50 %	6.42	13	29	41
7	30	6000	50 %	6.37	13	28	41
8	30	7000	50 %	6.33	12	28	45
9	30	8000	50 %	6.30	12	27	45
10	30	9000	50 %	6.18	12	27	46
11	30	10000	50 %	6.17	12	27	46
12	30	11000	50 %	6.09	12	27	47
13	30	12000	50 %	6.02	12	27	47
14	30	13000	50 %	6.00	12	27	47
15	30	14000	50 %	6.00	11	26	48
16	30	15000	50 %	5.95	11	26	48
17	30	16000	50 %	5.92	11	25	48
18	30	17000	50 %	5.89	11	25	48
19	30	18000	50 %	5.85	11	25	48
20	30	19000	50 %	5.80	11	25	49
21	30	20000	50 %	5.79	11	25	49

Tabel A.2. Lembar Data Pengujian Generator Gas HHO Tipe *Wet Cell* dengan
duty cycle 70 %

N o.	Waktu Uji (menit)	Frekuensi (Hz)	Duty Cycle	Voltage (V)	Ampere (A)	Temp. (oC)	Waktu produksi 250cc gas HHO
1	30	500	70 %	8.32	24	45	18
2	30	1000	70 %	8.30	24	45	18
3	30	2000	70 %	8.20	23	45	19
4	30	3000	70 %	8.20	23	45	19
5	30	4000	70 %	8.07	22	43	20
6	30	5000	70 %	8.00	22	43	20
7	30	6000	70 %	7.91	22	43	20
8	30	7000	70 %	7.84	22	43	20
9	30	8000	70 %	7.76	21	43	21
10	30	9000	70 %	7.68	21	42	21
11	30	10000	70 %	7.61	21	42	21
12	30	11000	70 %	7.58	20	41	22
13	30	12000	70 %	7.55	20	41	22
14	30	13000	70 %	7.50	20	41	22
15	30	14000	70 %	7.48	20	40	22
16	30	15000	70 %	7.42	20	40	22
17	30	16000	70 %	7.38	20	40	22
18	30	17000	70 %	7.32	20	40	23
19	30	18000	70 %	7.30	19	39	23
20	30	19000	70 %	7.28	19	39	23
21	30	20000	70 %	7.26	19	39	23

Tabel A.3. Lembar Data Pengujian Generator Gas HHO Tipe 6Wet Cell dengan
duty cycle 90 %.

No.	Waktu Uji (menit)	Frekuensi (Hz)	Duty Cycle (%)	Voltage (V)	Ampere (A)	Temp. (oC)	Waktu produksi 250cc gas HHO
1	30	500	90 %	10.01	29	54	15
2	30	1000	90 %	9.95	29	54	15
3	30	2000	90 %	9.75	29	54	15
4	30	3000	90 %	9.71	28	52	16
5	30	4000	90 %	9.64	28	52	16
6	30	5000	90 %	9.55	27	50	16
7	30	6000	90 %	9.51	27	50	16
8	30	7000	90 %	9.47	26	50	17
9	30	8000	90 %	9.40	26	50	17
10	30	9000	90 %	9.37	25	50	18
11	30	10000	90 %	9.30	25	49	18
12	30	11000	90 %	9.27	25	49	18
13	30	12000	90 %	9.20	25	48	18
14	30	13000	90 %	9.17	24	48	19
15	30	14000	90 %	9.14	24	47	19
16	30	15000	90 %	9.10	24	47	19
17	30	16000	90 %	9.08	23	47	20
18	30	17000	90 %	9.02	23	46	20
19	30	18000	90 %	8.99	23	46	20
20	30	19000	90 %	8.88	23	45	20
21	30	20000	90 %	8.80	22	45	20

LAMPIRAN B

Data perhitungan Generator Gas HHO tipe basa (*Wett cell*)

Tabel B.1 Data Perhitungan Generator Gas HHO Tipe *Wet Cell* dengan *duty cycle* 50 %

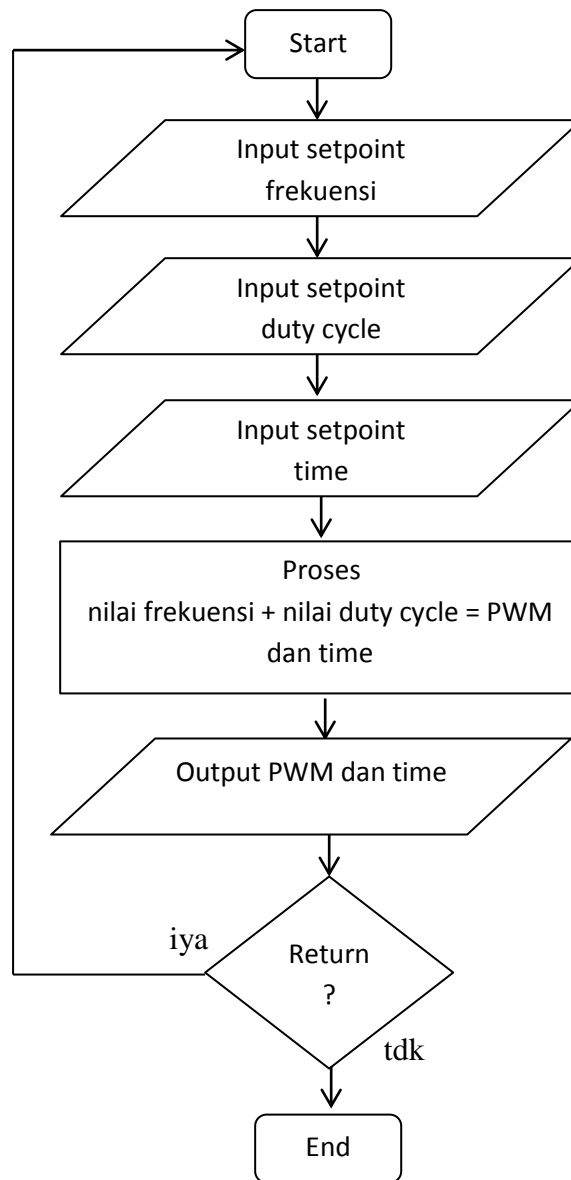
No.	n (mol/s)	Daya Generator (Watt)	Debit (L/menit)	m (gr/menit)	SGP (mg/J)	η Generator (%)
1	0.0003194	108.48	0,46875	0.23023	0.03517	84.16
2	0.0003194	108.32	0,46875	0.23023	0.03542	84.28
3	0.0002920	101.32	0,42857	0.21049	0.03462	82.37
4	0.0002763	93.66	0,40541	0.19912	0.03543	84.32
5	0.0002621	90.86	0,38461	0.18890	0.03465	82.45
6	0.0002493	83.46	0,36585	0.17969	0.03588	84.83
7	0.0002493	82.81	0,36585	0.17969	0.03616	85.85
8	0.0002272	75.96	0,33333	0.16372	0.03592	85.45
9	0.0002272	75.60	0,33333	0.16372	0.03609	85.90
10	0.0002222	74.16	0,32608	0.16013	0.03598	85.56
11	0.0002222	73.44	0,32608	0.16013	0.03634	85.62
12	0.0002175	73.08	0,31915	0.15675	0.03574	85.07
13	0.0002175	72.24	0,31915	0.15675	0.03616	85.86
14	0.0002175	72.00	0,31915	0.15675	0.03628	86.34
15	0.0002130	66.00	0,3125	0.15348	0.03875	90.94
16	0.0002130	65.45	0,3125	0.15348	0.03908	91.71
17	0.0002130	65.12	0,3125	0.15348	0.03928	92.34
18	0.0002130	64.79	0,3125	0.15348	0.03948	92.77
19	0.0002130	64.35	0,3125	0.15348	0.03975	94.60
20	0.0002086	63.80	0,3061	0.15036	0.03927	93.47
21	0.0002086	63,69	0,3061	0.15036	0.03946	93.63

Tabel B.2 Data Penhitungam Generator Gas HHO Tipe *Wet Cell* dengan *duty cycle 70 %*

No.	n (mol/s)	Daya Generator (Watt)	Debit (L/menit)	m (gr/menit)	SGP (mg/J)	η Generator (%)
1	0.0005679	199.68	0.83333	0.40930	0.03416	81.30
2	0.0005679	199.20	0.83333	0.40930	0.03425	81.49
3	0.0005380	188.60	0.78947	0.38776	0.03427	81.54
4	0.0005380	186.53	0.78947	0.38776	0.03465	82.68
5	0.0005111	177.54	0.75	0.36837	0.03458	82.29
6	0.0005111	176.00	0.75	0.36837	0.03488	83.01
7	0.0005111	174.04	0.75	0.36837	0.03528	83.85
8	0.0005111	172.26	0.75	0.36837	0.03564	84.82
9	0.0004868	162.96	0.71428	0.35083	0.03588	85.38
10	0.0004868	161.07	0.71428	0.35083	0.03630	86.38
11	0.0004868	159.60	0.71428	0.35083	0.03664	87.18
12	0.0004646	151.60	0.68181	0.33488	0.03682	87.61
13	0.0004646	151.00	0.68181	0.33488	0.03696	87.96
14	0.0004646	150.00	0.68181	0.33488	0.03721	88.55
15	0.0004646	149.60	0.68181	0.33488	0.03731	88.78
16	0.0004646	148.40	0.68181	0.33488	0.03761	89.50
17	0.0004646	147.60	0.68181	0.33488	0.03781	89.99
18	0.0004444	146.40	0.65217	0.32032	0.03647	86.79
19	0.0004444	138.70	0.65217	0.32032	0.03849	91.60
20	0.0004444	138.32	0.65217	0.32032	0.03840	91.85
21	0.0004444	138.13	0.65217	0.32032	0.03865	91.98

Tabel B.3 Data Penhitungam Generator Gas HHO Tipe *Wet Cell* dengan *duty cycle* 90 %

No.	n (mol/s)	Daya Generator (Watt)	Debit (L/menit)	m (gr/menit)	SGP (mg/J)	η Generator (%)
1	0.0006815	290.29	1	0.49117	0.02819	67.11
2	0.0006815	288.55	1	0.49117	0.02837	67.50
3	0.0006815	282.75	1	0.49117	0.02895	68.89
4	0.0006389	271.88	0.9375	0.46047	0.02823	67.18
5	0.0006389	269.92	0.9375	0.46047	0.02843	67.66
6	0.0006389	257.85	0.9375	0.46047	0.02976	70.08
7	0.0006389	256.77	0.9375	0.46047	0.02988	71.28
8	0.0006013	246.22	0.88235	0.43338	0.03293	69.81
9	0.0006013	244.40	0.88235	0.43338	0.02955	70.33
10	0.0005679	234.25	0.83333	0.40930	0.02912	69.30
11	0.0005679	232.50	0.83333	0.40930	0.02934	69.82
12	0.0005679	231.75	0.83333	0.40930	0.02943	70.01
13	0.0005679	230.00	0.83333	0.40930	0.02965	70.35
14	0.0005380	220.08	0.78947	0.38776	0.02937	69.91
15	0.0005380	219.36	0.78947	0.38776	0.02946	70.12
16	0.0005380	218.40	0.78947	0.38776	0.02959	70.43
17	0.0005111	208.84	0.75	0.36838	0.02940	69.96
18	0.0005111	207.46	0.75	0.36838	0.02960	70.42
19	0.0005111	206.77	0.75	0.36838	0.02969	70.66
20	0.0005111	205.24	0.75	0.36838	0.02992	71.19
21	0.0005111	202.40	0.75	0.36838	0.03033	72.18

LAMPIRAN C*Flowchart Program dan Program PWM arduino NANO**C.1. Flowchart Program*

C.2. Program PWM arduino NANO

```

include <LCD.h>
#include <LiquidCrystal_I2C.h>
#include <PWM.h>
LiquidCrystal_I2C lcd(0x3F,2,1,0,4,5,6,7);
int led =9 ;// the pin that the LED is attached to
int duty =0 ;    // duty cycle
int32_t frequency =300000; //frequency (in Hz)
int btup = 4;
int btdown = 7;
int btok = 8;
int btset = 5;
int frek = 0;
int waktu = 1;
int btupx, btdownx, btsetx, btokx;
int nilaifrek, DutyCycle, nilaiwaktu;
int detik;
const int pinFAN=3;
void setup()
{
    lcd.begin (16,2); // for 16 x 2 LCD module
    lcd.setBacklightPin(3,POSITIVE);
    lcd.setBacklight(HIGH);
    InitTimersSafe();
    bool success = SetPinFrequencySafe(led, frequency);
    if(success) { }
        pinMode(btup,INPUT_PULLUP);
        pinMode(btdown,INPUT_PULLUP);
        pinMode(btok,INPUT_PULLUP);
        pinMode(btset,INPUT_PULLUP);

```



```

        pinMode(pinFAN,OUTPUT);
        pwmWrite(led, DutyCycle);
    }
void loop()
    {
        btupx = digitalRead(btup);
        btdownx = digitalRead(btdown);
        btokx = digitalRead(btok);
        btsetx = digitalRead(btset);
        lcd.setCursor(0,0);
        lcd.print(" FREQUENTION ");
        lcd.setCursor(0,1);
        lcd.print("  SETT  ");
        pwmWrite(led, 0);
        if(btokx == LOW){
            delay(200);
            lcd.clear();
            setfrek();
            delay(1000);
            lcd.clear();
            setDuty();
            delay(1000);
            lcd.clear();
            settime();
            delay(1000);
            lcd.clear();
            mulai();
        }
    }
void setfrek(){
        btupx = digitalRead(btup);

```

```

    btdownx = digitalRead(btdown);
    btokx = digitalRead(btok);
    btsetx = digitalRead(btset);
    lcd.setCursor(0,0);
    lcd.print(" FREQUENTION ");
    lcd.setCursor(5,1);
    lcd.print(frek);
    lcd.print(" Hz ");
    if(frek < 0){
        frek = 0;
    }
    if(frek > 20000){
        frek = 50;
    }
    if(btupx == LOW){
        delay(200);
        frek++;
    }
    if(btdownx == LOW){
        delay(200);
        frek--;
    }
    if(btokx == LOW){
        delay(200);
        nilaifrek = frek;
        return;
    }

    setfrek();
}

void setDuty(){ //fix caculation of duty cycle exxxxspriment
    btupx = digitalRead(btup);

```



```

    btdownx = digitalRead(btdown);
    btokx = digitalRead(btok);
    btsetx = digitalRead(btset);
    lcd.setCursor(0,0);
    lcd.print("  TIME  ");
    lcd.setCursor(5,1);
    lcd.print(waktu);
    lcd.print(" Menit  ");
    if(waktu < 1){
        waktu = 1;
    }
    if(waktu > 60){
        waktu = 60;
    }
    if(btupx == LOW){
        delay(200);
        waktu++;
    }
    if(btdownx == LOW){
        delay(200);
        waktu--;
    }
    if(btokx == LOW){
        delay(200);
        nilaiwaktu = waktu;
        return;
    }

    settime();
}

void mulai(){
    digitalWrite(pinFAN,HIGH);

```

```

btupx = digitalRead(btup);
btdownx = digitalRead(btdown);
btokx = digitalRead(btok);
btsetx = digitalRead(btset);
lcd.setCursor(0,0);
lcd.print("F= ");
lcd.print(nilaifrek);
lcd.setCursor(6,0);
lcd.print("Hz");
lcd.setCursor(9,0);
lcd.print("D= ");
lcd.print(duty);
lcd.setCursor(15,0);
lcd.print("%");
lcd.setCursor(5,1);
lcd.print(nilaiwaktu);
lcd.print(" : ");
lcd.print(detik);
lcd.print(" ");
detik--;
if((nilaiwaktu < 1)&&(detik < 1)){
    nilaiwaktu = 0;
    detik = 0;
    digitalWrite(pinFAN,LOW);
    lcd.clear();
    return;
}

if(detik < 1){
    nilaiwaktu--;
    detik = 59;
}

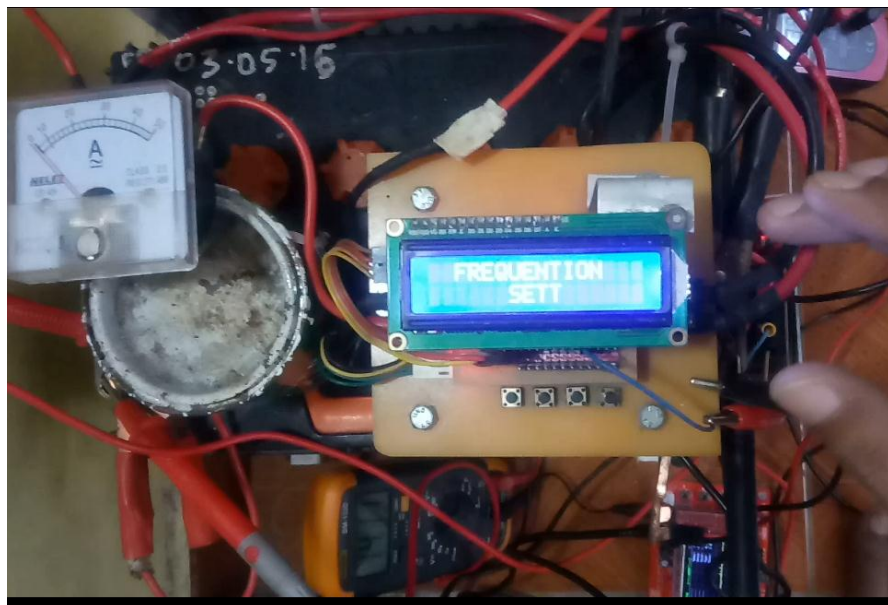
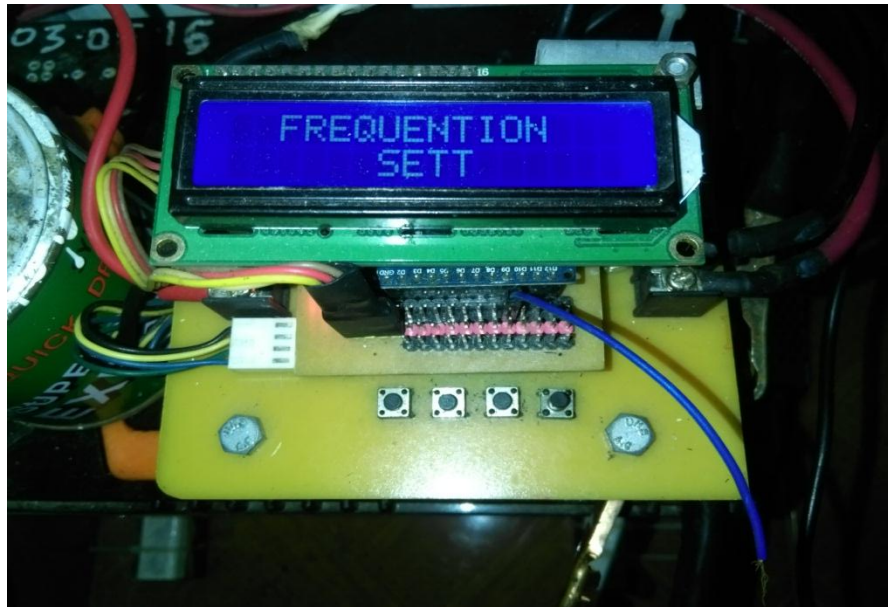
```

```
if((btsetx == LOW)){
    delay(1000);
    digitalWrite(pinFAN,LOW);
    nilaiwaktu = 0;
    detik = 0;
    lcd.clear();
    return;
}

InitTimersSafe();
bool success = SetPinFrequencySafe(led, nilaifrek);
pwmWrite(led,DutyCycle);
delay(1000);
mulai();
}
}
```

LAMPIRAN D

Dokumentasi Generator HHO tipe Basa (*wet cell*)



Gambar. Generator pembangkit gelombang PWM.







Gambar. Bejana Ukur



Gambar. Waktu Pengambilan Data