

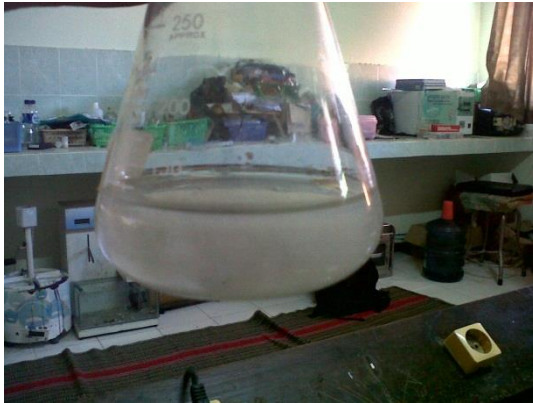
LAMPIRAN

- Hasil Percobaan

Percobaan 100 rpm dengan waktu 50 menit



Gambar penimbangan 1g semen

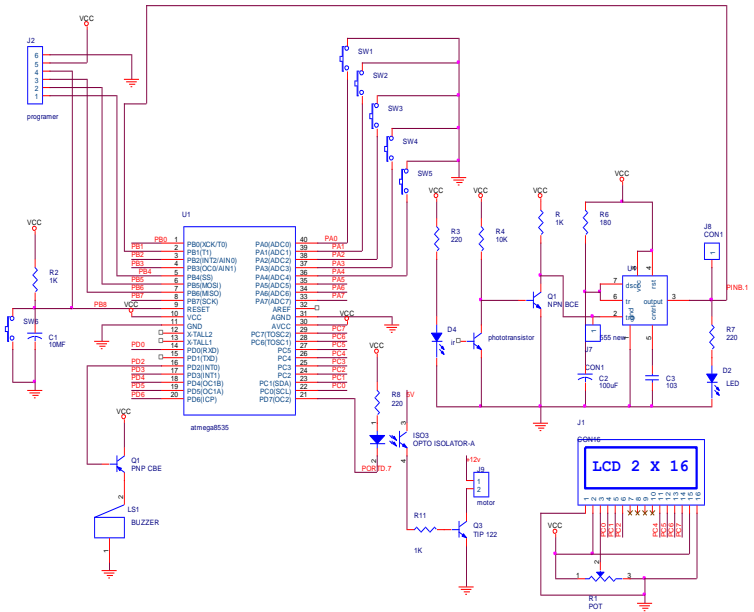


Gambar 1g semen dengan air 100 ml sebelum pencampuran

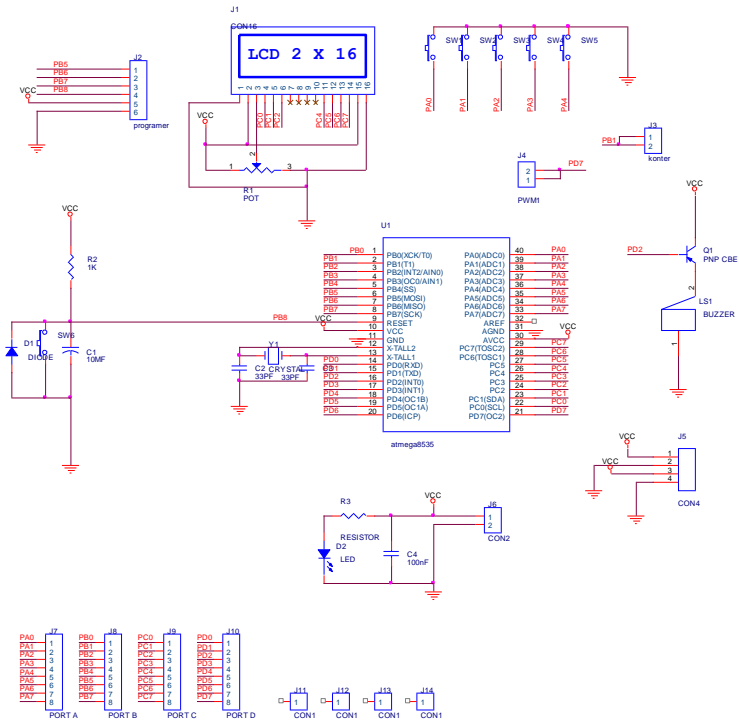


Gambar setelah pencampuran menggunakan orbital shaker

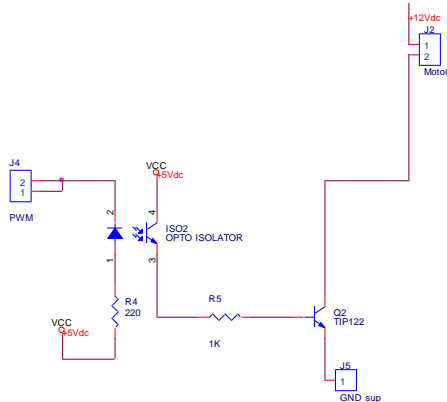
• Rangkaiankeseluruhan



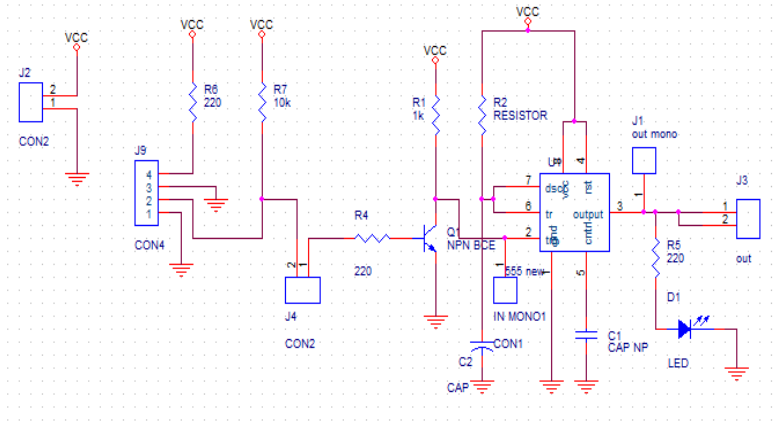
● Rangkaian ATmega 8535



● Rangkaian Driver Motor



• Rangkaian Sensor Putaran Motor



- **Listing Program**

```
#include <mega8535.h>
#include <stdlib.h>
#include <delay.h>
#define buzzer PORTD.2
#include <alcd.h>

unsigned char temp[6],temp2[6];
int a,b,hitung2;
unsigned char pelan=160, cepat=25 ;

unsigned char mikrodetik,detik=0, menit=0, jam=0,
detikk=0;
// Alphanumeric LCD Module functions
#include <alcd.h>

// Timer 0 overflow interrupt service routine
interrupt [TIM0_OVF] void timer0_ovf_isr(void)
//fungsinyabuatapa?
{
    // Place your code here
    TCNT0=0x9F;
    mikrodetik++;
    if (mikrodetik==10)
    {
        detik++;
        detikk++;
        mikrodetik=0;
    }
}

// Declare your global variables here
voidjam_digital()
```

```
{  
if (detik==60)  
{  
lcd_gotoxy(0,1);  
lcd_putsf(" ");  
detik=0;  
menit++;  
}
```

```
if (menit==60)  
{  
menit=0;  
jam++;  
}
```

```
if (jam==24)  
{  
jam=0;  
}
```

```
voidtampil_lcd()  
{  
lcd_gotoxy(0,0);  
lcd_putsf(" TIMER ");  
itoa(jam,temp); //menampilkan JAM di LCD  
lcd_gotoxy(0,1);  
lcd_puts(temp);  
itoa(detik,temp); //menampilkan DETIK di LCD  
lcd_gotoxy(6,1);  
lcd_puts(temp);  
lcd_gotoxy(5,1); //menampilkan :  
lcd_putsf(":");  
itoa(menit,temp); //menampilkan MENIT di LCD
```

```
lcd_gotoxy(3,1);  
lcd_puts(temp);  
lcd_gotoxy(2,1); //menampilkan :  
lcd_putsf(":");  
}
```

```
voidkonter() //menampilkankonteranoptokpler  
{  
lcd_gotoxy(12,0);  
lcd_putsf("RPM");  
hitung2=TCNT1;  
hitung2=hitung2/4*10/10;
```

```
if (detikk==6)  
{ if (b==1)  
{  
if (hitung2<98)  
{  
pelan=pelan-3;  
}  
else if (hitung2>102 )  
{  
pelan=pelan+3;  
}  
}  
else if (b==2)  
{  
if (hitung2<148)  
{  
cepat=cepat-5;  
}  
else if (hitung2>152)  
{  
cepat=cepat+5;
```



```

    }
}
lcd_gotoxy(13,1);
lcd_putsf(" ");
detikk=0;
    TCNT1=0;
    itoa(hitung2,temp2);
    lcd_gotoxy(12,1);
    lcd_puts(temp2);
}
}

```

```

void rpm1()
{
    TCCR2=0x6D;
    OCR2=pekan;
}

```

```

void rpm2()
{
    TCCR2=0x6C;
    OCR2=cepat;
}

```

```

void main(void)
{
// Declare your local variables here

// Input/Output Ports initialization
// Port A initialization
// Func7=In Func6=In Func5=In Func4=In Func3=Out
Func2=In Func1=In Func0=In
// State7=T State6=T State5=T State4=T State3=I
State2=P State1=P State0=P

```

```
PORTA=0x0F;
DDRA=0x08;

// Port B initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In
Func2=In Func1=In Func0=In
// State7=T State6=T State5=T State4=T State3=T
State2=T State1=T State0=T
PORTB=0x00;
DDRB=0x00;

// Port C initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In
Func2=In Func1=In Func0=In
// State7=T State6=T State5=T State4=T State3=T
State2=T State1=T State0=T
PORTC=0x00;
DDRC=0x00;

// Port D initialization
// Func7=Out Func6=In Func5=In Func4=In Func3=In
Func2=Out Func1=In Func0=In
// State7=0 State6=T State5=P State4=T State3=T
State2=1 State1=T State0=T
PORTD=0xA4;
DDRD=0xFF;

// Timer/Counter 0 initialization
// Clock source: System Clock
// Clock value: 0.977 kHz
// Mode: Normal top=0xFF
// OC0 output: Disconnected
TCCR0=0x05;
TCNT0=0x00;
```

```
OCR0=0x00;
```

```
// Timer/Counter 2 initialization  
// Clock source: System Clock  
// Clock value: 7.813 kHz  
// Mode: Fast PWM top=0xFF  
// OC2 output: Non-Inverted PWM  
ASSR=0x00;  
TCCR2=0x00;  
TCNT2=0x00;  
OCR2=0xFF;
```

```
// Timer(s)/Counter(s) Interrupt(s) initialization  
TIMSK=0x00;  
// RS - PORTC Bit 0  
// RD - PORTC Bit 1  
// EN - PORTC Bit 2  
// D4 - PORTC Bit 4  
// D5 - PORTC Bit 5  
// D6 - PORTC Bit 6  
// D7 - PORTC Bit 7  
// Characters/line: 16  
lcd_init(16);  
lcd_clear();  
delay_ms(100);  
#asm("sei")
```

```
lcd_gotoxy(1,0);  
lcd_putsf("Ma'rifaKholis");  
lcd_gotoxy(2,1);  
lcd_putsf("P27838011026");  
delay_ms(3000);  
lcd_clear();  
lcd_gotoxy(1,0);
```

```
lcd_putsf("Orbital Shaker");  
lcd_gotoxy(2,1);  
lcd_putsf("Display RPM");  
delay_ms(3000);  
lcd_clear();  
lcd_gotoxy(0,0);  
lcd_putsf("Lakukan");  
lcd_gotoxy(7,1);  
lcd_putsf("Pemilihan");
```

```
while (1)  
{  
start:  
if (PINA.1==0)  
    {  
    lcd_clear();  
    a=1;  
    gotodetek;  
    }  
  
else if (PINA.3==0)  
    {  
    lcd_clear();  
    a=2;  
    gotodetek;  
    }  
  
else if (PINA.0==0)  
    {  
    gotomulai;  
    }  
goto start;  
}
```

```
detek:
if(a==1)
{
lcd_gotoxy(6,0);
lcd_putsf("Mode 1");
lcd_gotoxy(0,1);
lcd_putsf("100 RPM 50 menit");
goto start;
}
else if(a==2)
{
lcd_gotoxy(6,0);
lcd_putsf("Mode 2");
lcd_gotoxy(0,1);
lcd_putsf("150 RPM 30 menit");
goto start;
}
```

```
mulai:
lcd_clear();
lcd_gotoxy(2,0);
lcd_putsf("Processing...");
delay_ms(2000);
lcd_clear();
if(a==1)
{
b=1;
TIMSK=0x01;
mulai2:
jam_digital();
tampil_lcd();
konter();
```

```

rpm1();
if (menit==50)
    {
        TIMSK=0x00;
gotoakhir;
    }
goto mulai2;
}

else if (a==2)
    {
        b=2;
        TIMSK=0x01;
        mulai3:
jam_digital();
tampil_lcd();
konter();
rpm2();

if (menit==30)
    {
        TIMSK=0x00;
gotoakhir;
    }
goto mulai3;
}

akhir :
lcd_clear();
OCR2=0xFF;
lcd_gotoxy (1,0);
lcd_putsf("Proses Selesai");
delay_ms (10);
buzzer=0;

```

```

delay_ms (3000);
mati:
buzzer=1;
gotomati;

}

```

**Hasil pengukuran waktu menggunakan stopwatch
Waktu 50 menit = 3000 sekon**

- Nilai Rata rata

$$X = \frac{2985 + 2986 + 2985 + 2986 + 2986}{5}$$

$$X = 2985,6$$

- Simpangan
= 3000 – 2985,6

= 14,4

- Error %
= $\frac{3000 - 2985,6}{3000}$

= 0,048%

- StandartDeviasi

$$= \sqrt{\frac{(3000 - 2985)^2 + (3000 - 2986)^2 + (3000 - 2986)^2 + (3000 - 2986)^2 + (3000 - 2986)^2}{4}}$$

$$= \frac{\sqrt{225 + 196 + 225 + 196 + 196}}{4}$$

$$= 16,10$$

- UA
$$= \frac{16,10}{\sqrt{5}}$$
$$= 7,219$$

Waktu 300 menit = 1800 sekon

- Nilai Rata rata

$$X = \frac{1793 + 1793 + 1794 + 1795 + 1794}{5}$$
$$X = 1793,6$$

- Simpangan
 $= 1800 - 1793,8$

$$= 6,2$$

- Error %
$$= \frac{1800 - 1793,8}{1800}$$
$$= 0,34\%$$

- StandartDeviasi

$$= \sqrt{\frac{(1800 - 1793)^2 + (1800 - 1793)^2 + (1800 - 1794)^2 + (1800 - 1795)^2 + (1800 - 1794)^2}{4}}$$

$$= \frac{\sqrt{49 + 49 + 36 + 25 + 36}}{4}$$

$$= 6,98$$

- UA

$$= \frac{6,98}{\sqrt{5}}$$

$$= 3,122$$

**Hasil perhitungan pengukuran rpm
Pengukuran perbandingan rpm LCD dengan setting
100 rpm**

- Nilai Rata rata

$$X = \frac{100 + 99 + 100 + 100 + 100}{5}$$

$$X = 99,8$$

- Simpangan

$$= 100 - 99,8$$

$$= 0,2$$

- Error %

$$= \frac{100 - 99,8}{100}$$

$$= 0,02\%$$

- StandartDeviasi

$$\begin{aligned}
 &= \frac{\sqrt{(100 - 100)^2 + (100 - 99)^2 + (100 - 100)^2 + (100 - 100)^2 + (100 - 100)^2}}{4} \\
 &= \frac{\sqrt{0 + 1 + 0 + 0 + 0}}{4} \\
 &= 0,5
 \end{aligned}$$

- UA

$$\begin{aligned}
 &= \frac{0,5}{\sqrt{5}} \\
 &= 0,223
 \end{aligned}$$

Pengukuran perbandingan rpm Tachometer dengan setting 100 rpm

- Nilai Rata rata

$$\begin{aligned}
 X &= \frac{98,7 + 98,1 + 100,9 + 101 + 101}{5} \\
 X &= 99,94
 \end{aligned}$$

- Simpangan

$$\begin{aligned}
 &= 100 - 99,94 \\
 &= 0,06
 \end{aligned}$$

- Error %

$$= \frac{100 - 99,94}{100}$$

$$= 0,006\%$$

- StandartDeviasi

$$= \sqrt{\frac{(100 - 98,7)^2 + (100 - 98,1)^2 + (100 - 100,9)^2 + (100 - 101)^2 + (100 - 101)^2}{4}}$$

$$= \frac{\sqrt{1,69 + 3,61 + 0,81 + 1 + 1}}{4}$$

$$= 1,423$$

- UA

$$= \frac{1,423}{\sqrt{5}}$$

$$= 0,635$$

Pengukuran perbandingan rpm LCD dengan setting 150 rpm

- Nilai Rata rata

$$X = \frac{151 + 151 + 151 + 150 + 150}{5}$$

$$X = 150,6$$

- Simpangan

$$= 150 - 150,6$$

$$= 0,6$$

- Error %
$$= \frac{150 - 150,6}{150}$$
$$= 0,004\%$$

- StandartDeviasi

$$= \sqrt{\frac{(150 - 151)^2 + (150 - 151)^2 + (150 - 151)^2 + (150 - 150)^2 + (100 - 150)^2}{4}}$$

$$= \frac{\sqrt{1 + 1 + 1 + 0 + 0}}{4}$$

$$= 0,866$$

- UA
$$= \frac{0,866}{\sqrt{5}}$$
$$= 0,387$$

Pengukuran perbandingan rpm Tachometer dengan setting 150 rpm

- Nilai Rata rata

$$x = \frac{150,3 + 151,2 + 149,8 + 149,5 + 151,3}{5}$$
$$X = 150,42$$

- Simpangan

$$= 150 - 150,42$$

$$= 0,42$$

- Error %

$$= \frac{150 - 150,42}{150}$$

$$= 0,028\%$$

- StandartDeviasi

$$= \sqrt{\frac{(150 - 150,3)^2 + (150 - 151,2)^2 + (150 - 149,8)^2 + (150 - 149,5)^2 + (100 - 151,3)^2}{4}}$$

$$= \frac{\sqrt{0,09 + 1,44 + 0,04 + 0,25 + 1,69}}{4}$$

$$= 0,936$$

- UA

$$= \frac{0,936}{\sqrt{5}}$$

$$= 0,418$$