

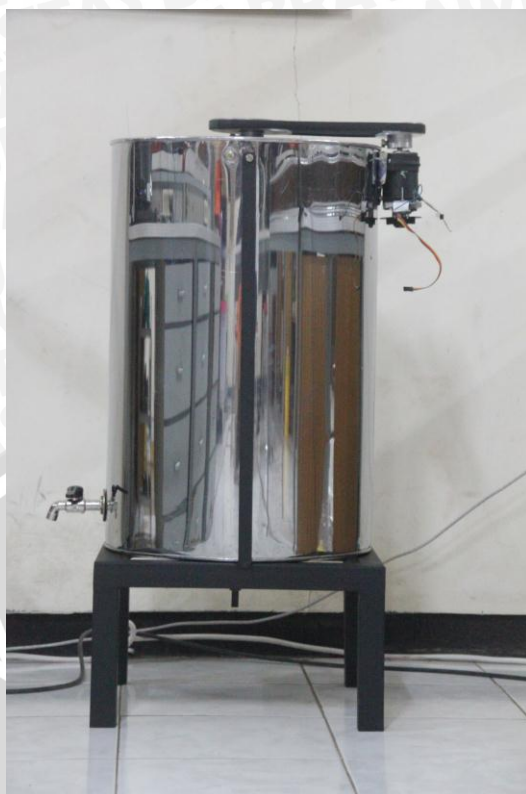
LAMPIRAN



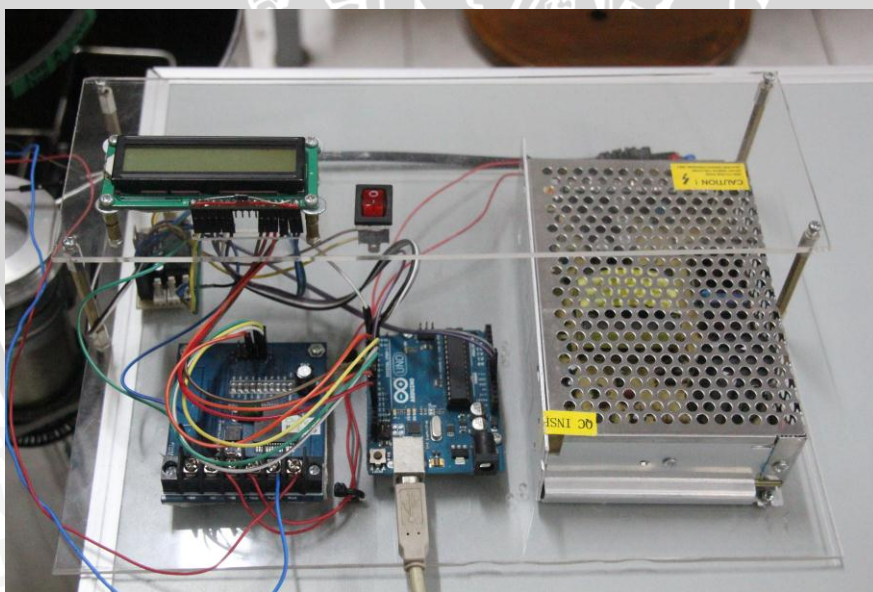
LAMPIRAN I

FOTO ALAT





Gambar ekstraktor madu tampak depan



Gambar modul rangkaian tampak atas

LAMPIRAN II

LISTING PROGRAM

```
#include <LiquidCrystal.h>
long int pulsa;
float kecepatan;
int done;
double PID, kp, ki, kd;
double setpoint, error,PV;
double dT = 0;
double dErr = 0;
const int pwm = 6;

volatile unsigned long lastTime=0;
volatile double errSum=0, lastErr=0;
int pwms;
LiquidCrystal lcd(12, 11, 5, 4, 3, 10);

ISR(TIMER1_COMPA_vect) // timer compare interrupt service routine
{
    kecepatan = (pulsa*0.018 * 60);
    pulsa = 0;
    done = 1;
}

void pulse()
{
    pulsa++;
}
```

```
void compute()
{
  unsigned long now = millis();
  dT = (double)(now - lastTime); //Our Sampling time
  /*Compute all the working error variables*/
  setpoint = 400;

  error = setpoint - kecepatan;
  errSum += (error * dT);
  dErr = (error - lastErr) / dT;
  /*Compute PID Output*/
  PID = (kp * error + ki * errSum + kd * dErr)*0.43;

  pwms+=PID;

  if (pwms>=255){
    pwms = 255;
  }
  else if (pwms<=0){
    pwms = 0;
  }

  analogWrite (pwm,pwms);
  /*Remember some variables for next time*/
  lastErr = error;
  lastTime = now;
}
```

```
void setup()
{
  // put your setup code here, to run once:
```

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```
pinMode(2, INPUT);  
pinMode(pwm,OUTPUT);  
pinMode(7, OUTPUT);  
pinMode(8, OUTPUT);  
pinMode(9, OUTPUT);  
pinMode(10, OUTPUT);
```

```
noInterrupts(); // disable interrupts  
TCCR1A = 0;  
TCCR1B = 0;  
TCNT1 = 0;
```

```
OCR1A = 62498; // compare match register 16MHz/256/50Hz/1000ms  
TCCR1B |= (1 << WGM12); // CTC mode  
TCCR1B |= (1 << CS12); // 256 prescaler  
TIMSK1 |= (1 << OCIE1A); // enable timer compare interrupt  
interrupts();
```

```
attachInterrupt (0,pulse,FALLING);  
Serial.begin (9600);  
kp =0.1;  
ki=0.0000001;  
kd =15;  
  
done = 0;  
pulsa = 0;  
}
```

```
void loop()  
{  
  lcd.begin(16, 2);  
  lcd.setCursor(0,1);  
  lcd.print("Rpm:");
```

```
lcd.setCursor(4,1);  
lcd.print(kecepatan);  
  
lcd.setCursor(0,0);  
lcd.print("Pwm:");  
lcd.print(pwms);  
delay (1000);  
  
// put your main code here, to run repeatedly:  
digitalWrite(7,HIGH);  
digitalWrite(9,HIGH);  
digitalWrite(10,HIGH);  
digitalWrite(8,LOW);  
  
//analogWrite (pwm,150);  
if (done)  
{  
  done = 0;  
  compute();  
  //analogWrite (pwm,255);  
  //Serial.println(pwms);  
  //Serial.println(PID);  
  Serial.println (kecepatan);  
  //Serial.println();  
  //Serial.println("\t");  
  //Serial.println (PID);  
}
```



LAMPIRAN III

DATA SHEET



