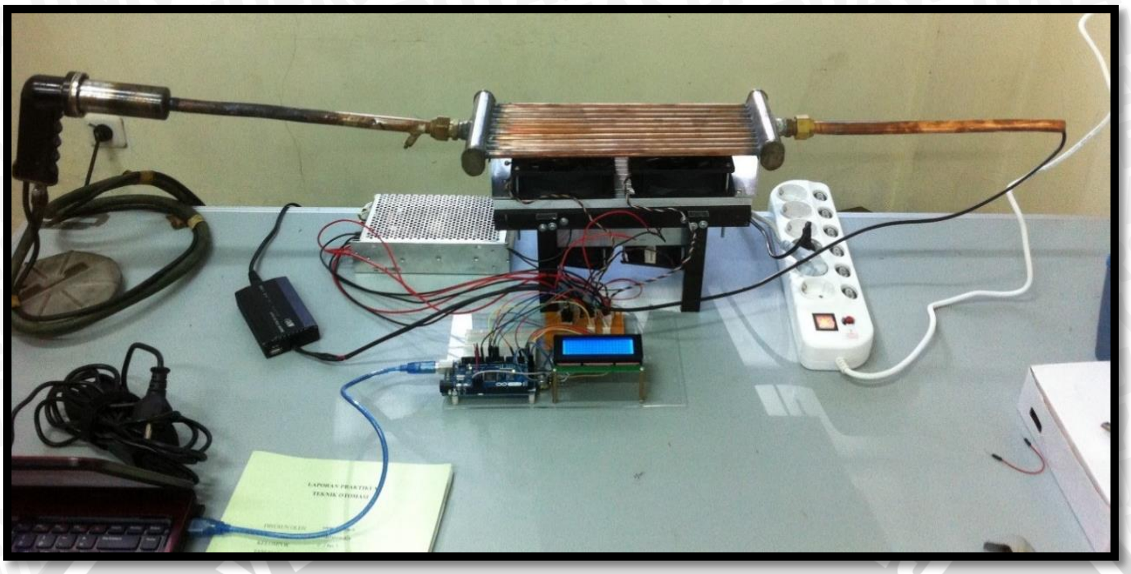
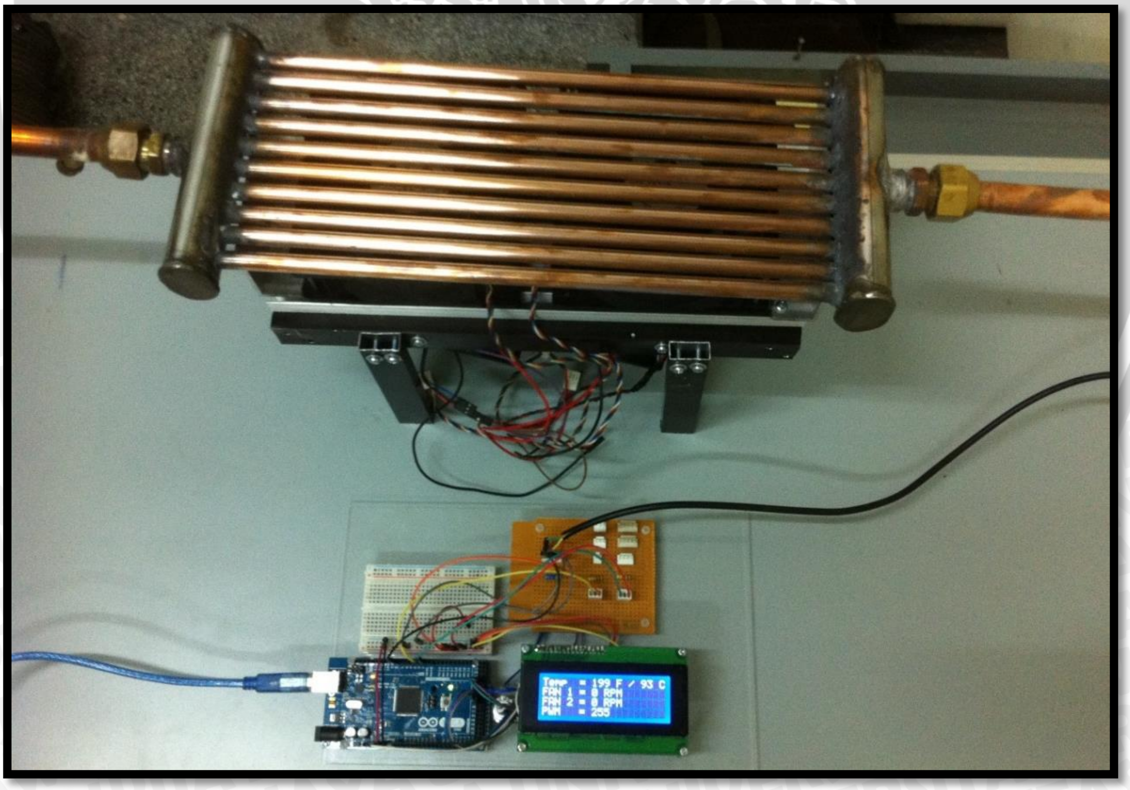
LAMPIRAN I

FOTO ALAT

FOTO ALAT



Gambar 1. Model Miniatur Sistem *Gas Compressor Aftercooler* Tampak Depan



Gambar 2. Model Sistem Miniatur *Gas Compressor Aftercooler* Tampak Atas

LAMPIRAN II

LISTING PROGRAM

Program Utama

```
#include <OneWire.h>
#include <LiquidCrystal.h>
#define pwm 4
#define BacaPutaran1 2
#define BacaPutaran2 3
LiquidCrystal lcd(28, 31, 30, 38, 36, 34, 32);
int backLight = 13;
long int pulsa1,pulsa2;
int kecepatan1,kecepatan2;
int v;
int kerja=0;
int error, error1, nil_pid;
OneWire  ds(8);
byte i;
byte present = 0;
byte data[12];
byte addr[8];
int HighByte, LowByte, SignBit, Whole, Fract, TReading, Tc_100, FWhole;
int SetPoint=135;
void loop(void)
{
 getTemp();
 cetak_lcd();
 if(FWhole>=192){kerja=1;}
 if(kerja==1)
 {
  pid(16, 20, 3, 10);
 }
 delay(200);
}
void pid(int Kp, int Ki, int Kd, int Ts)
{
 error=SetPoint-FWhole;
 nil_pid=Kp*error+ (Ki/10)*(error+error1)+ Kd*(error-error1);
 error1=error;
 if(error<0)
 { v=255; analogWrite(pwm,v); }
 else
 {
  v=255-nil_pid;
  if(v<0) v=0;
  analogWrite(pwm,v);
 }
 delay(Ts);
}
void setup(void)
{
 pinMode(backLight, OUTPUT);
```

```
  digitalWrite(backLight, HIGH);
  lcd.begin(2,16);
  lcd.clear();
  lcd.setCursor(0,0);
   if ( !ds.search(addr))
   {
    lcd.clear(); lcd.print("No more addrs");
    delay(1000);
    ds.reset_search();
    return;
   }
   if ( OneWire::crc8( addr, 7) != addr[7])
   {
     lcd.clear(); lcd.print("CRC not valid!");
     delay(1000);
     return;
   }
  pinMode(7, OUTPUT);
  pinMode(8, OUTPUT);
  pinMode(pwm,OUTPUT);
   noInterrupts();
   TCCR1A = 0;
   TCCR1B = 0;
   TCNT1  = 0;
   OCR1A   = 62498;
   TCCR1B |= (1 << WGM12);
   TCCR1B |= (1 << CS12);
   TIMSK1 |= (1 << OCIE1A);
   attachInterrupt(0, hitung_pulsa, FALLING);
   interrupts();
   Serial.begin(9600);
   Serial.print("TEMP(F)");
   Serial.print("\t\t");
   Serial.print("FAN1(RPM)");
   Serial.print("\t\t");
   Serial.print("FAN2(RPM)");
   Serial.print("\t\t");
   Serial.print("PWM");
   Serial.println();
}
void hitung_pulsa()
{
   pulsa1++;
   pulsa2++;
}
ISR(TIMER1_COMPA_vect)          // timer compare interrupt service routine
{
  kecepatan1 = (pulsa1/2) * 60;
  pulsa1 = 0;
  kecepatan2 = (pulsa2/2) * 60;
```

```
  pulsa2 = 0;
  cetak_serial();
 }
void getTemp()
{
  int foo, bar;
  ds.reset();
  ds.select(addr);
  ds.write(0x44,1);
  present = ds.reset();
  ds.select(addr);
  ds.write(0xBE);
  for ( i = 0; i < 9; i++) {
    data[i] = ds.read();
  }
  LowByte = data[0];
  HighByte = data[1];
  TReading = (HighByte << 8) + LowByte;
  SignBit = TReading & 0x8000;  // test most sig bit
  if (SignBit) {
    TReading = -TReading;
  }
  Tc_100 = (6 * TReading) + TReading / 4;    // multiply by (100 * 0.0625) or 6.25
  Whole = Tc_100 / 100;          // separate off the whole and fractional portions
  Fract = Tc_100 % 100;
  if (Fract > 49) {
    if (SignBit) {
      --Whole;
    } else {
      ++Whole;
    }
  }
  if (SignBit) {
    bar = -1;
  } else {
    bar = 1;
  }
  foo = ((Whole * bar) * 18);
  FWhole = (((Whole * bar) * 18) / 10) + 32;
  if ((foo % 10) > 4) {
      ++FWhole;
  }
}
void cetak_serial()
{
    Serial.print(FWhole);
    Serial.print("\t\t");
    Serial.print(kecepatan1);
    Serial.print("\t\t");
    Serial.print(kecepatan2);
```

```
    Serial.print("\t\t");
    Serial.print(v);
    Serial.println();
}
void cetak_lcd()
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("Temp  = ");
  if (SignBit)
  {
     lcd.print("-");
  }
  lcd.print(FWhole);
  lcd.print(" F / ");
  if (SignBit)
  {
     lcd.print("-");
  }
  lcd.print(Whole);
  lcd.print(" C");
  lcd.setCursor(0,1);
  lcd.print("FAN 1 = ");
  lcd.print(kecepatan1);
  lcd.print(" RPM");
  lcd.setCursor(0,2);
  lcd.print("FAN 2 = ");
  lcd.print(kecepatan2);
  lcd.print(" RPM");
  lcd.setCursor(0,3);
  lcd.print("PWM   = ");
  lcd.print(v);
  }
```

Program Pengujian Sinyal PRBS

```
#define led 13
#define pwm 4
#define BacaPutaran 2
int ledState = LOW;
long int pulsa;
int kecepatan;
int i;
void setup()
{
  pinMode(7, OUTPUT);
  pinMode(8, OUTPUT);
  pinMode(pwm,OUTPUT);
```

```
  pinMode(led,OUTPUT);
  noInterrupts();
  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
  attachInterrupt(0, hitung_pulsa, FALLING);
  interrupts();
  Serial.begin(9600);
  Serial.print("PWM");
  Serial.print("\t\t");
  Serial.print("KECEPATAN");
  Serial.print("\t\t");
  Serial.println();
}
ISR(TIMER1_COMPA_vect)         // timer compare interrupt service routine
{
  kecepatan = (pulsa/2) * 60;
  pulsa = 0;
  }
void loop()
{
  digitalWrite(7,HIGH);
  digitalWrite(8,LOW);
  if(i<256)
  {
   analogWrite(pwm,i);
   delay(250);
   Serial.print(i);
   Serial.print("\t\t");
   Serial.print(kecepatan);
   Serial.print("\t");
   Serial.println();
   i++;
   if (i==256)
  {
   analogWrite (pwm,0);
   Serial.println("PENGAMBILAN DATA SELESAI");
   i = i++;
  }
}
}
void hitung_pulsa()
{
   pulsa++;
}
```

LAMPIRAN III

HASIL PENGUJIAN PRBS

NO	PRBS	INPUT	OUTPUT
1	0	2760	0
2	0	2760	2219
3	1	3961	2636
4	0	2760	3366
5	0	2760	2829
6	0	2760	2710
7	0	2760	2725
8	1	3961	2740
9	0	2760	3455
10	1	3961	2904
11	0	2760	3500
12	0	2760	2934
13	1	3961	2800
14	1	3961	3515
15	1	3961	3649
16	1	3961	3634
17	1	3961	3634
18	0	2760	3649
19	1	3961	2993
20	0	2760	3559
21	1	3961	3008
22	0	2760	3574
23	1	3961	3023
24	0	2760	3604
25	1	3961	3038
26	1	3961	3634
27	1	3961	3768
28	0	2760	3753
29	0	2760	3068
30	0	2760	2934
31	0	2760	2934
32	0	2760	2934
33	1	3961	2949
34	1	3961	3604
35	0	2760	3797
36	0	2760	3098
37	0	2760	2964
38	1	3961	2964
39	0	2760	3649
40	1	3961	3098
41	0	2760	3663
42	1	3961	3127
43	1	3961	3678
44	0	2760	3797
45	0	2760	3142
46	1	3961	3023
47	1	3961	3708
48	0	2760	3827
49	0	2760	3172
50	1	3961	3038
51	0	2760	3708
52	1	3961	3172
53	1	3961	3753
54	1	3961	3857
55	1	3961	3857
56	1	3961	3872
57	1	3961	3872
58	0	2760	3857
59	1	3961	3187
60	1	3961	3738
61	1	3961	3842
62	1	3961	3827
63	0	2760	3842
64	0	2760	3202
65	1	3961	3083
66	1	3961	3753
67	0	2760	3827
68	1	3961	3217
69	1	3961	3738
70	1	3961	3842
71	0	2760	3857
72	1	3961	3232
73	1	3961	3768
74	1	3961	3872
75	0	2760	3902
76	0	2760	3232
77	1	3961	3083
78	0	2760	3753
79	1	3961	3202
80	0	2760	3738
81	1	3961	3202
82	0	2760	3783
83	0	2760	3217
84	1	3961	3068
85	0	2760	3768
86	1	3961	3217
87	0	2760	3783
88	0	2760	3217
89	0	2760	3083
90	1	3961	3083
91	0	2760	3768
92	0	2760	3217
93	1	3961	3098
94	0	2760	3797
95	1	3961	3232

96	1	3961	3783
97	0	2760	3917
98	1	3961	3246
99	0	2760	3812
100	0	2760	3246
101	0	2760	3112
102	1	3961	3098
103	1	3961	3783
104	0	2760	3872
105	0	2760	3232
106	1	3961	3098
107	1	3961	3797
108	1	3961	3917
109	0	2760	3902
110	0	2760	3246
111	1	3961	3112
112	1	3961	3797
113	1	3961	3917
114	1	3961	3931
115	0	2760	3931
116	0	2760	3261
117	0	2760	3112
118	1	3961	3112
119	1	3961	3797
120	0	2760	3902
121	1	3961	3261
122	1	3961	3768
123	0	2760	3872
124	0	2760	3261
125	0	2760	3127
126	0	2760	3112
127	1	3961	3112
128	0	2760	3768
129	0	2760	3246
130	0	2760	3127
131	1	3961	3127
132	0	2760	3783
133	1	3961	3246
134	1	3961	3797
135	1	3961	3887
136	0	2760	3902
137	1	3961	3261
138	0	2760	3783
139	1	3961	3261
140	1	3961	3783
141	1	3961	3902
142	1	3961	3917
143	0	2760	3917
144	1	3961	3276
145	1	3961	3812
146	0	2760	3917
147	1	3961	3276
148	1	3961	3812
149	1	3961	3917
150	1	3961	3946
151	1	3961	3931
152	0	2760	3946
153	0	2760	3291
154	0	2760	3157
155	0	2760	3172
156	1	3961	3157
157	1	3961	3797
158	0	2760	3917
159	1	3961	3276
160	0	2760	3812
161	0	2760	3276
162	1	3961	3142
163	1	3961	3827
164	0	2760	3946
165	1	3961	3291
166	0	2760	3842
167	1	3961	3276
168	1	3961	3827
169	0	2760	3946
170	1	3961	3276
171	1	3961	3827
172	0	2760	3961
173	1	3961	3276
174	0	2760	3827
175	1	3961	3276
176	0	2760	3827
177	0	2760	3276
178	0	2760	3157
179	0	2760	3142
180	0	2760	3142
181	1	3961	3142
182	0	2760	3827
183	0	2760	3261
184	1	3961	3142
185	1	3961	3827
186	1	3961	3931
187	0	2760	3946
188	1	3961	3306
189	1	3961	3842
190	0	2760	3946
191	0	2760	3291
192	1	3961	3172
193	0	2760	3842

194	0	2760	3291
195	1	3961	3187
196	0	2760	3842
197	0	2760	3306
198	1	3961	3157
199	1	3961	3842
200	0	2760	3961
201	0	2760	3291
202	0	2760	3157
203	0	2760	3157
204	0	2760	3172
205	0	2760	3172
206	1	3961	3172
207	1	3961	3827
208	1	3961	3961
209	0	2760	3946
210	1	3961	3306
211	0	2760	3857
212	0	2760	3306
213	1	3961	3187
214	0	2760	3842
215	0	2760	3306
216	0	2760	3187
217	1	3961	3172
218	1	3961	3827
219	1	3961	3902
220	0	2760	3931
221	0	2760	3306
222	0	2760	3187
223	1	3961	3187
224	0	2760	3812
225	0	2760	3306

226	0	2760	3172
227	0	2760	3157
228	0	2760	3157
229	0	2760	3157
230	0	2760	3157
231	1	3961	3172
232	0	2760	3812
233	1	3961	3291
234	1	3961	3842
235	0	2760	3946
236	0	2760	3306
237	0	2760	3157
238	1	3961	3172
239	1	3961	3827
240	1	3961	3976
241	1	3961	3976
242	0	2760	3961
243	1	3961	3306
244	0	2760	3842
245	0	2760	3321
246	0	2760	3187
247	0	2760	3172
248	1	3961	3172
249	1	3961	3842
250	1	3961	3946
251	1	3961	3946
252	1	3961	3931
253	1	3961	3931
254	1	3961	3946
255	1	3961	3976

LAMPIRAN IV

DATASHEET