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MICROCONTROLLER CONTROLLED MAGNETIC STIRRER FOR LOW TEMPARATURE REACTIONS

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ABSTRACT

The laboratories mostly work with chemicals use magnetic stirrers frequently for mixing, stirring chemicals and do some biological experiments. The frequency of usage is more than traditional mechanical stirrer, because of its quieter and more efficient characteristic. When there is no exposed mechanical transmission components, it won't been damaged easily Modern magnetic stirrers basically consist on motor with rotating magnet, heating element and control circuit. In chemistry the speed of the chemical reaction affect many factors such as concentrate of chemicals, Temperature, Pressure. In these factors Temperature is the most important factor. As an example temperature increase in 10 ^{0}C the reaction speed of the chemicals increase two-fold. The reaction speed of reaction increase with increasing temperature as same as decreasing temperature reaction speed is decrease. But Temperature decreasing magnetic stirrers is not available. This paper proposes the low cost and microcontroller controlled magnetic stirrer with temperature decrease function. New system consist microcontroller, cooling element and user interface for enter values for functions.

Keywords: Magnetic stirrer, Cooling element, Low cost, Microcontroller control.

1. INTRODUCTION

In generally laboratories use different types of magnetic stirrers most of them can temperature increase only. But some reactions want to be test under low temperature conditions. For decrease temperature generally use ice pellets. But it is not possible at every time. Because it can't control the temperature and the ice pellet making take too long time. The proposed system use thermo electric coolers for cooling purpose[1].

Thermo electric coolers works on 12v supply and it can easily control for different temperature levels. Also it use as a heating element. This system use for it both heating and cooling purposes. Cooling and heating levels controlled by PWM signals of ATMEGA 16 microcontroller and IRF 540 mosfets. Because of the thermo electric coolers require a high current. For motor control system use BT136 Triacs. Because where use induction motors. User can enter values for temperature, time and RPM also select plate of two plates via 4*4 keypad[2,3].

2. METHODOLOGY

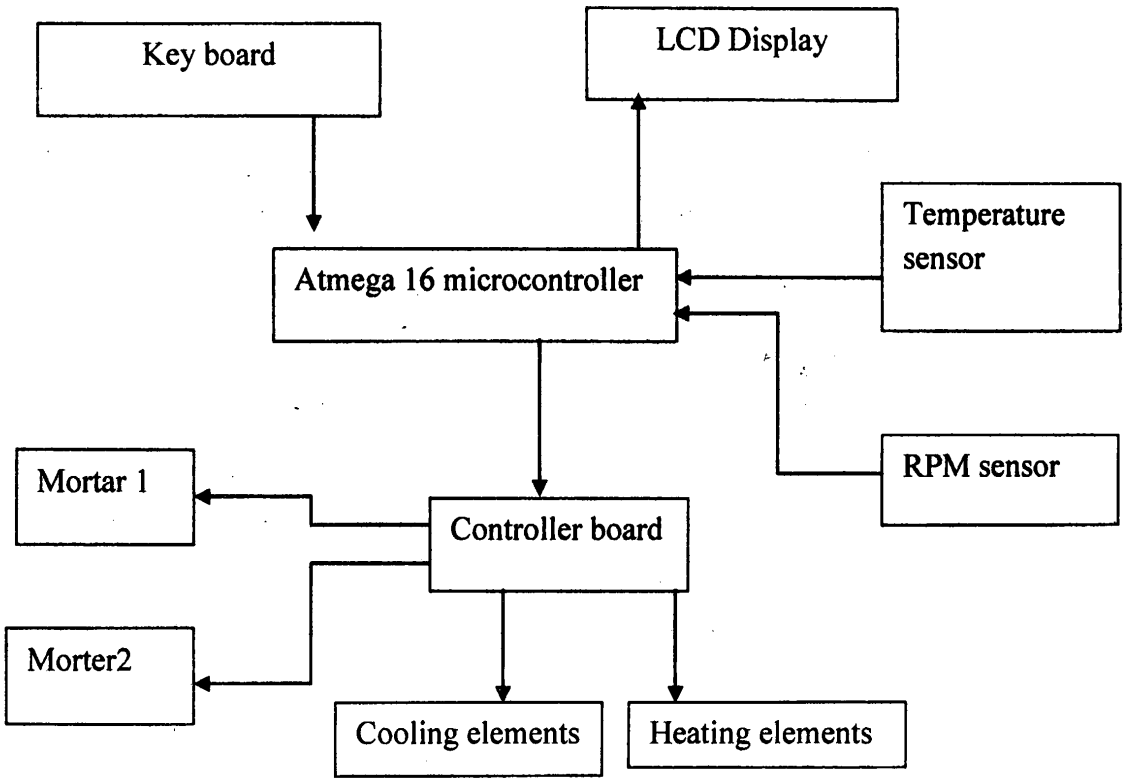


Figure 1: Block diagram of the system

Figure 1 shows block diagram of the system. In the start user must enter the values for temperature, time and RPM. Also select one plate of two using 4*4 keypad. When program starts, start counter for counting time. Temperature and RPM sensors sense their values if values not equal to entered values, microcontroller set PWM signal to keep temperature and RPM in entered values. If entered values are increase maximum values the error message display on LCD.

3. RESULT AND DISCUSSION

When time reach to ending alarm will indicate it. Figure 2 shows flowchart of the system[4,5].

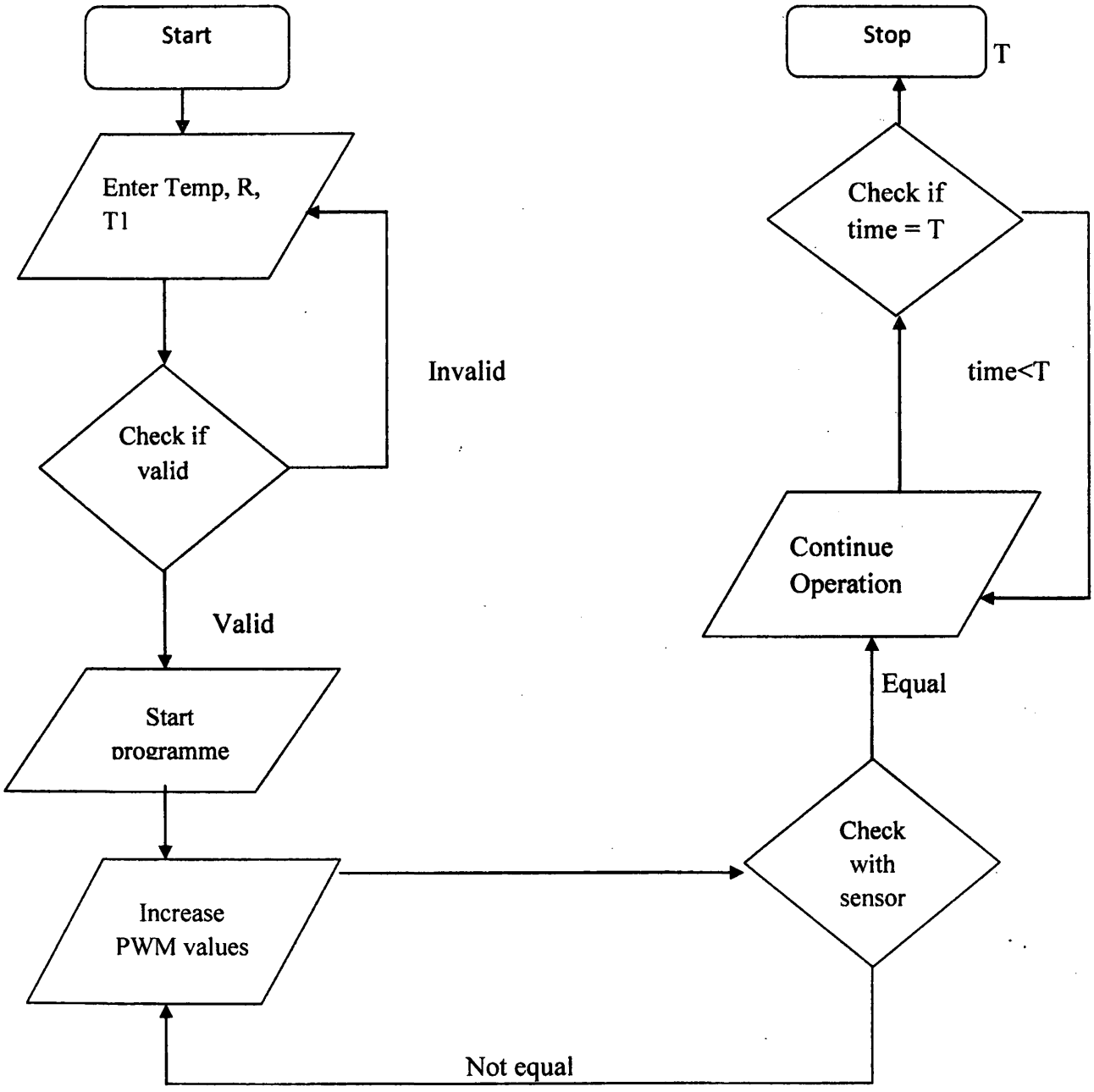


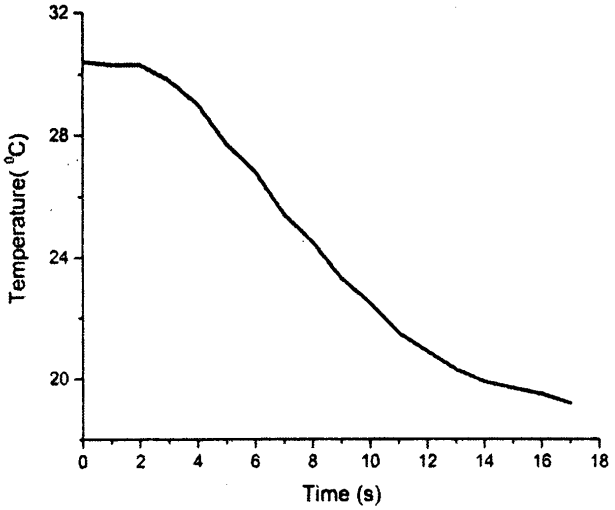
Figure 2.1: Flow chart of system

The hot and cool plate temperature were measured 30s time intervals for its maximum value. Results were tabulated Table 3.1 and Table 3.2.

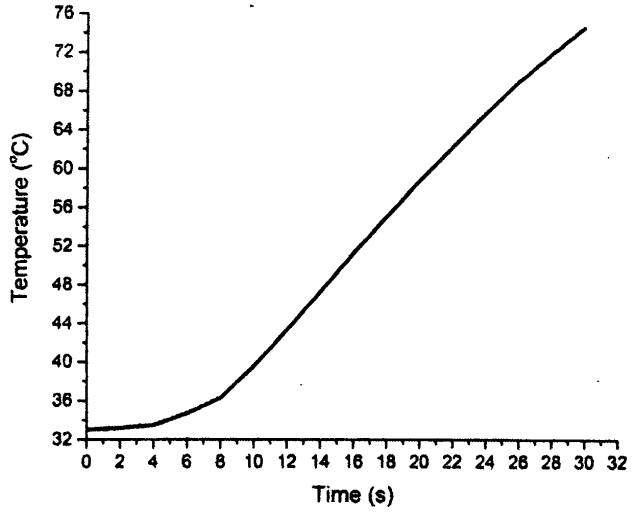
Table 3.1: Cool & Hot plate Temperature

Time (s)	Cooling Temperature (^{0}C)	Heating Temperature (^{0}C)
0	31.3	33.0
2	31.1	33.2
4	29.9	33.5
6	26.9	34.7
8	24.5	36.3
10	22.4	39.5
12	20.8	43.3
14	19.7	47.2
16	18.9	51.2
18	18.3	55.0
20	18.0	58.7
22	17.8	62.2
24	17.6	65.7
26	17.6	68.9
28	17.5	71.8
30	17.5	74.5

According to the Table No 1 graph 3.1 and graph 3.2 plotted.



Graph no 3.1 Temperature vs. time for cooling plate.



Graph no 3.2: Temperature vs. time for heating plate.

This project is called magmatic stirrer for both heating and cooling purposes. The device is design low cost and user friendly interfaces for controlling. According Graph no 3.1 and Graph no3.2 can determine the minimum and maximum values of the temperature to reach the device. The used Thermo electric coolers are easy to control than other heating elements such as heating coils. To reach the minimum and maximum Temperature take a minimum time. When take values the room temperature is 28 ^{0}C. When the device using areas ambient temperature is varies in large numbers, the minimum and maximum values differ than observed values.

4. CONCLUSION

For researching new innovations solutions scientists have done researches worldwide. The proposed device for heating and cooling stirring purposes can use easily chemical or biological testing. It is low cost and easy to control therefore the device more helpful who use this device. In design of the proposed

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