Smart Heat Controller for Liquid

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Objectives :

1. To replace manual temperature measurement.
2. To maintain a certain range of temperature .
3. To automate the temperature variation.
4. To show the current temperature level in a display.
5. To keep it at a more or less constant elevated temperature.
6. To automatically turn on the heating system when the temperature is below a cetain level and turn it off temperature level is higher than

Introduction :

Water heating is a heat transfer process that uses an energy source to heat water above its initial temperature.Heat controller for liquid is a system that monitors and controls the temperature of a liquid such that as soon as the temperature is Lower than required, the system brings the liquid temperature up to a certain range. Liquid heat controller can be manual or automatic. The former requires full human intervention to operate, while the latter requires little or not at all.

It has a huge amount of usages in food industry. While manufacturing industry graded quality food in different steps the tempareture of liquid food elements needs to be kept in optimal range, the liquid food heat controller will come handy in those aspects.

The liquid temperature control unit (LTCU) provides a cooling liquid flow which is used to remove the heat produced by equipment and sensors and streamed in from the ambient. A typical principle diagram is shown in figure below. The heat is removed to the ships chilled water by the LTCU (right side in the figure). This is referred to as the primary circuit. The liquid flow to the systems is referred to as the secondary circuit (left side in the figure). When the sensor systems are off, and there is no dissipation, the LTCU's are used to keep the sensor systems on their operational temperature. The LTCU has a heater for the heating of the secondary cooling liquid. Additional functions of the LTCU are the overpressure protection of the liquid circuit by means of expansion compensation devices and safety overpressure relief valves. For reasons of redundancy and flexibility multiple LTCU's can be considered.

Connecting componets :

Software Tools :

1. Programming Languages : Arduino
2. Operating Systems : Windows 11
3. IDE : Arduino IDE

Harward Tools:

Table 1 : Table for Hardware Tools

Serial	Product Name	Rating	Quantity
1	Arduino Mega	Analog Input Pins: 6 Weight: 25 g Flash Memory: 32 KB Clock Speed: 16 MHz Power Consumption :73.19mA	01
2	Potentiometer	230V AC 5 V DC	01
3	LCD Display	Model: 1602A	01
4	1 Channel Relay Board	AC: 10A, 250V DC: 10A, 30V	01
5	Digital Thermal Sensor	Thermocouple--210 °C to 1760 °C Thermistor-40 °C to 250 °C Model : DS18B20	01
6	Register	4.7k-ohm	04
7	Heating Plate	-	02
8	Power Source	Voltage : 9V Current :3.5 mA	05
9	Push Button	Voltage Rating : Up to 24 Vdc Current Rating : Up to 14 mA Acuator Height : Flush,3.3mm,5.4mm and beyond Pitch : 2.54 mm or 5.08 mm	02

Methodology :

1. The temperature sensor is connected to the aurdino mega vcc and ground and data pin to the pin 2.
2. LCD Display 1 and 2 pin is VSS and VDD which is connected to vcc and ground.
3. LCD Display pin 3 is connected to potentiometer 2nd pin which is control to contrast the display.
4. LCD Display pin 4 and 6 is called RS and E which is connected to aurdino 12 and 11 pin
5. LCD Display pin 5 RW is connected to the ground.
6. LCD Display pin 11-14 d4-d7 is connected to the aurdino mega 4 - 7 pin which is called data pin.
7. LCD Display pin 15 and 16 is respectively vcc and ground
8. Push button is connected 16 and 17 pin to aurdino.
9. IN pin of the primary circuit of relay board is connected to aurdino 13 pin and VCC, and GND are connected to arduino accordingly.
10. The secondary circuit of the relay board is connect to the heating plate along with power source.

Flow Chart:

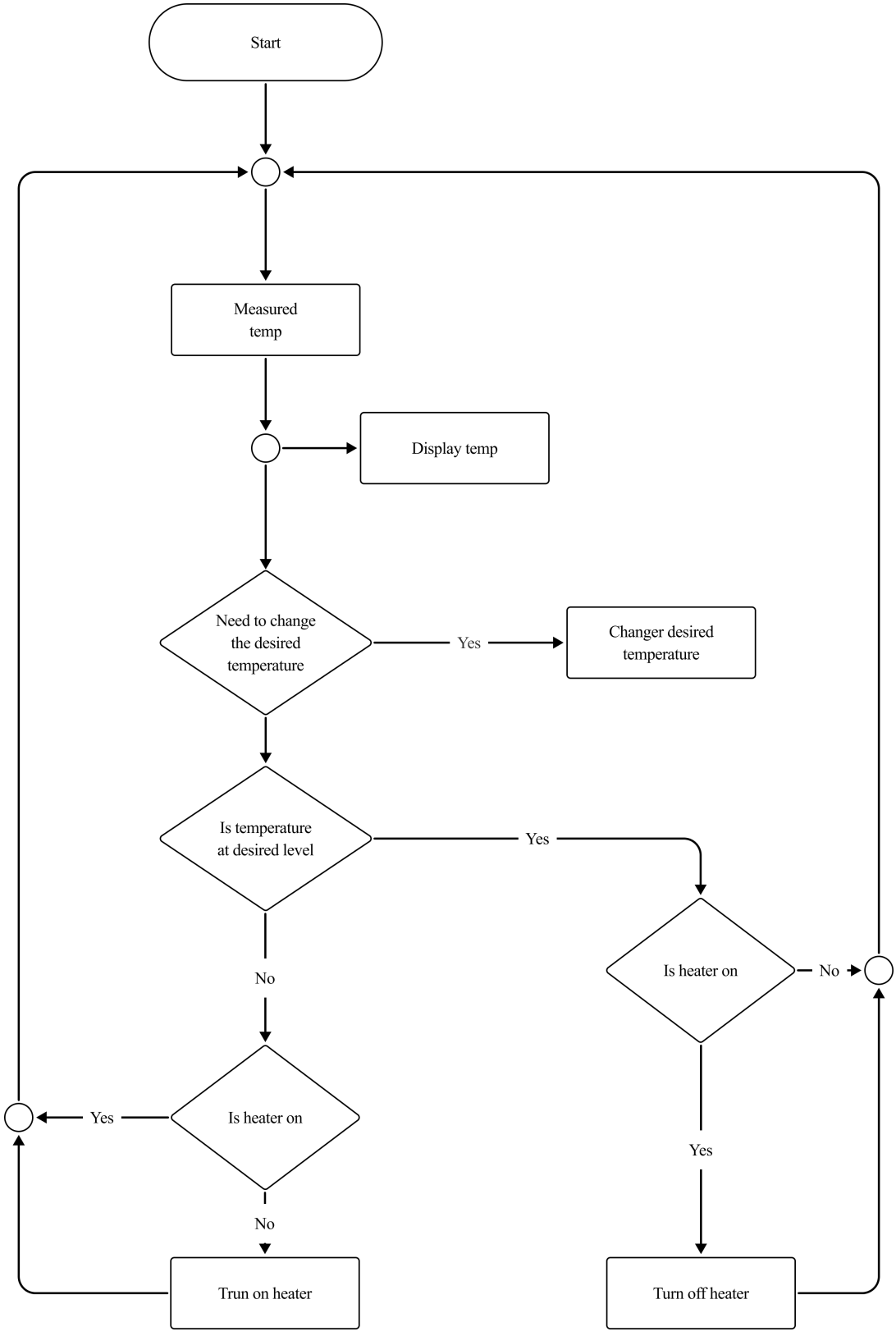

Figure 1: Flow Chart for "Smart Heat Controller for Liquid"

Circuit Diagram :

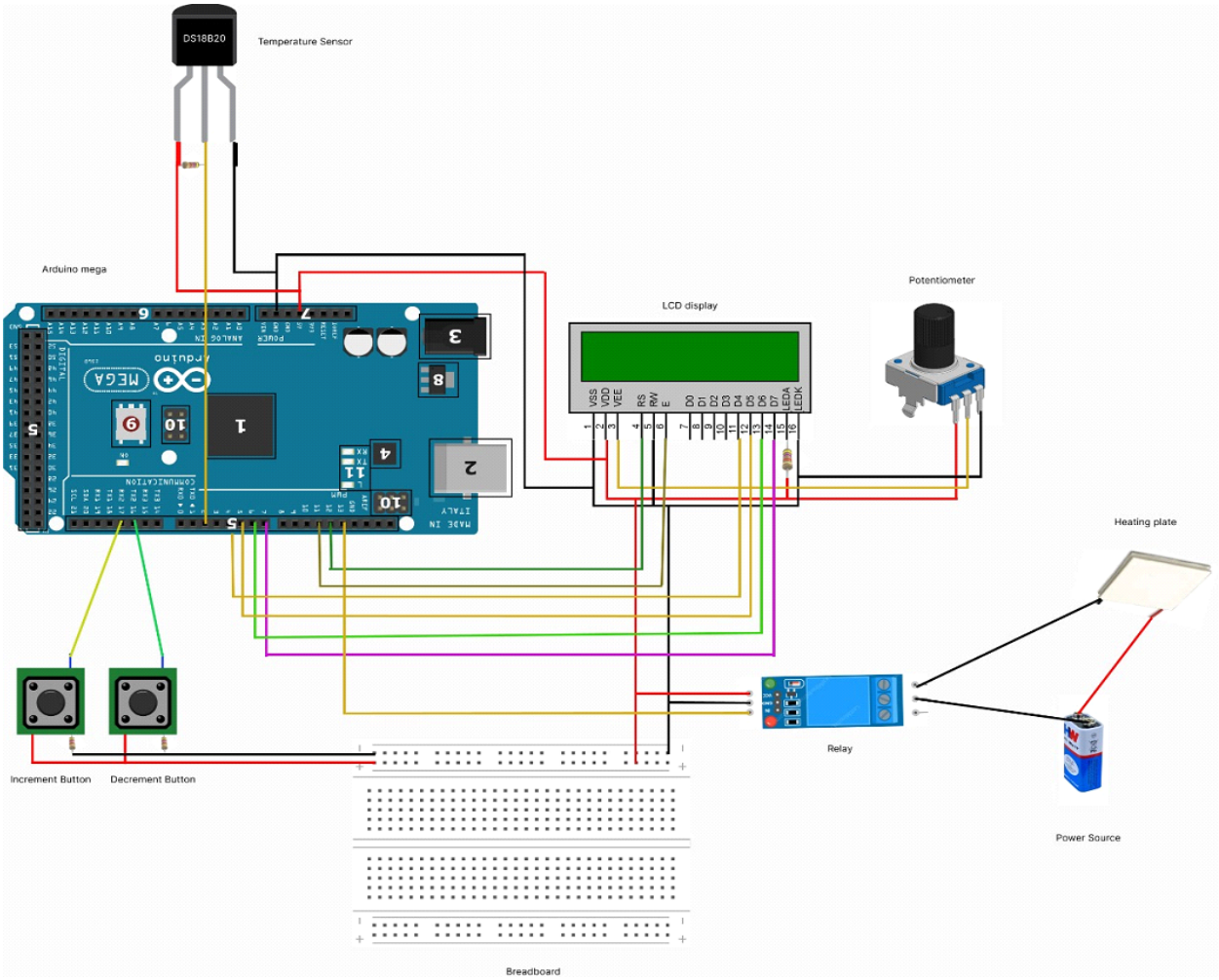

Figure 2: Wiring Diagram for "Smart Heat Controller For Liquid"

Conclusion and Discussion :

This is an automatic device for temperature contolling. This device can reduce man power required to maintain a controlled environment in an industry. This device can also be used as relay.Reduction in flow is the most common reason for overheating.This device can reduce this flow.

References :

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2 .https://forum.arduino.cc/t/arduino-mega-heating-up/28727

3. https://heinenhopman.com/en/product-selector/liquid-temperature-control-unit/