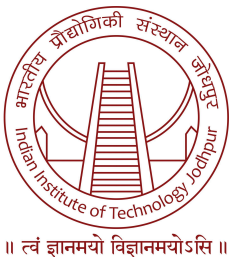


॥ त्वं ज्ञानमयो विज्ञानमयोऽसि ॥

Indian Institute of Technology, Jodhpur
Engineering Design

PROJECT REPORT

2023

Prepared By:
Group 2 (B-1)
April 24, 2024

TABLE OF CONTENTS

Executive Summary

In this engineering design project, I tackled two distinct challenges: ensuring safe milk boiling and automating the LPG ordering process. To address the first concern, I designed a milk boiler alarm that would notify the user when milk reached boiling temperature, preventing potential boil-overs and scorching. Additionally, I developed an LPG weight sensing system that automatically triggers an order to a nearby LPG supplier when gas levels dip below a designated threshold. This two-pronged approach aimed to enhance kitchen safety and convenience by mitigating the risks of unattended boiling and eliminating the need for manual monitoring of LPG stock.

Project Report: Milk Boiler Alarm and Automated LPG Level Monitoring with Ordering System

Objectives

This annual report aims to provide our stakeholders, including shareholders, employees, customers, and partners, with a transparent and comprehensive overview of our financial, operational, and strategic performance in 2082. Additionally, we seek to highlight our future strategies, objectives, and potential challenges.

Abstract

This project presents a dual-function system designed to enhance kitchen safety and convenience. The first component, a milk boiler alarm, sounds an alert when milk reaches boiling temperature, preventing potential boil-overs and scorching. The second component, an LPG weight sensing system, automatically triggers an order to a nearby LPG supplier when gas levels fall below a pre-set threshold. This combined approach eliminates the need for constant monitoring and reduces the risk of running out of LPG unexpectedly.

Introduction

Kitchen safety is paramount, and unattended boiling milk can pose a fire hazard. Additionally, manually monitoring LPG levels and placing orders can be inconvenient. This project addresses these concerns by developing a system that integrates a milk boiler alarm and an automated LPG ordering system.

Methodology

This project involved several distinct phases:

- **System Design and Component Selection:**
    - The project requirements were clearly defined, outlining the functionalities of the milk boiler alarm and the LPG weight sensing system with automated ordering.
    - Research was conducted to identify suitable components for each system, considering factors like accuracy, cost, and ease of use.

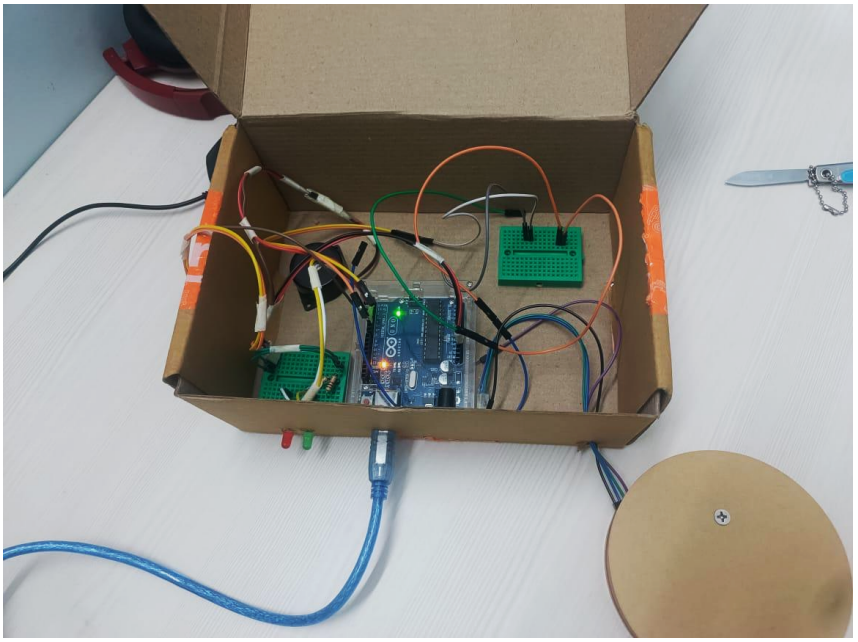
    - The selected components included temperature sensors, microcontrollers, communication modules (for LPG system), load cells, and peripherals like buzzers and power sources.
- **Hardware Assembly:**
    - The hardware components were procured based on the selected models and specifications.
    - The milk boiler alarm system involved connecting the temperature sensor to the microcontroller unit. The sensor was positioned strategically within the milk container to ensure accurate temperature readings.
    - The LPG weight sensing system required careful placement of the load cell beneath the LPG cylinder. The load cell's wiring was connected to the microcontroller for weight data transmission.
    - A communication module, such as a GSM/GPRS module, was integrated into the LPG system to facilitate automated ordering via cellular connectivity.
- **Software Development:**
    - Programming codes were developed for the microcontroller units in both systems.
    - The milk boiler alarm code involved continuously reading temperature data from the sensor. When the temperature surpassed a pre-programmed boiling point threshold (typically around 100°C), the code triggered the activation of the buzzer or speaker to generate the alarm.
    - The LPG weight sensing system code involved continuous weight readings from the load cell. The code compared these readings to a predefined threshold indicating low gas. Upon reaching the threshold, the code initiated communication with the GSM/GPRS module, transmitting an automated order message to the designated local LPG supplier.
- **Testing and Calibration:**
    - The entire system underwent rigorous testing to ensure proper functionality.
    - The milk boiler alarm was tested with various milk quantities to verify accurate boiling point detection and alarm activation.
    - The LPG weight sensing system was tested by simulating different gas weight levels to confirm precise weight measurement and timely triggering of automated orders at the pre-set threshold.
    - Calibrations were performed if necessary to fine-tune the sensor readings and ensure the system's accuracy in both components.

Milk Boiler Alarm

- **Design:**
  - The milk boiler alarm utilizes a temperature sensor placed within the milk container.
  - The sensor continuously monitors the milk temperature.
  - Once the temperature reaches a pre-programmed boiling point (typically around 100°C), the system triggers an audible alarm.

- **Components:**
  - Temperature sensor (AHT20)
  - Microcontroller unit (MCU) (Arduino)
  - Buzzer and LED (Red & Green)
  - Resistors

- **Functionality:**
  - The MCU continuously receives temperature readings from the sensor.
  - When the temperature surpasses the boiling point threshold, the MCU activates the buzzer or speaker, generating the alarm.



Milk Boiler Alarm Code

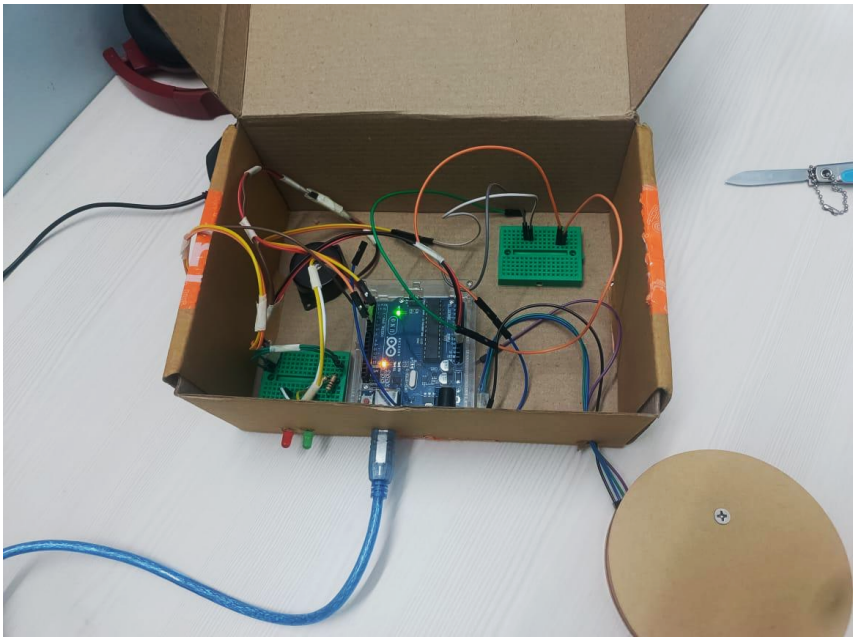
```
#include <TinyDHT.h>
#define DHTPIN 5
#define DHTTYPE DHT11
DHT dht(DHTPIN, DHTTYPE);

const int greenLedPin = 2;
const int redLedPin = 3;
const int buzzerPin = 4;

void setup() {
  pinMode(greenLedPin, OUTPUT);
  pinMode(redLedPin, OUTPUT);
  pinMode(buzzerPin, OUTPUT);
 Serial.begin(9600);
}
void loop() {
  float humidity = dht.readHumidity();
  float temperature = dht.readTemperature();

  if (isnan(humidity) || isnan(temperature)) {
    Serial.println("Failed to read from DHT sensor!");
    return;
  }
  if (temperature < 31) {
    digitalWrite(greenLedPin, HIGH);
    digitalWrite(redLedPin, LOW);
    digitalWrite(buzzerPin, LOW);
  } else {
    digitalWrite(greenLedPin, LOW);
    blinkRedLed();
    digitalWrite(buzzerPin, HIGH);
  }
  Serial.print("Temperature: ");
  Serial.print(temperature);
  Serial.print("°C, Humidity: ");
  Serial.print(humidity);
  Serial.println("%");
  delay(1000);
}
void blinkRedLed() {
  digitalWrite(redLedPin, LOW);
  delay(500);
  digitalWrite(redLedPin, HIGH);
  delay(500);
}
```

LPG Weight Sensing System with Automated Ordering

- **Design:**
    - The LPG weight sensing system employs a load cell positioned beneath the LPG cylinder.
    - The load cell measures the weight of the remaining gas.
    - As the gas is consumed, the weight decreases.
    - When the weight reaches a predetermined level indicating low gas, the system automatically triggers an order to a preselected local LPG supplier.

- **Components:**
    - Load cell + HX711
    - Microcontroller unit (MCU) (Arduino)
    - Communication module (SIM900A)
    - Power source

- **Functionality:**
    - The load cell transmits weight readings to the MCU continuously.
    - The MCU compares the weight readings to a predefined threshold indicating low gas.
    - Upon reaching the threshold, the MCU triggers the communication module to automatically send an order message to the designated LPG supplier.



LPG Weight Sensing System with Automated Ordering Code

```
#include "HX711.h"
#include <SoftwareSerial.h>
int x=1;
#define DOUT_PIN  2
#define CLK_PIN   3
const int sim900a_rx = 7;
const int sim900a_tx = 6;
HX711 scale;

const float cal = 100;
SoftwareSerial gsm(sim900a_rx, sim900a_tx);
void setup() {
  Serial.begin(9600);
   gsm.begin(9600);
   gsm.println("AT");
   delay(1000);
   gsm.println("AT+CMGF=1");
   delay(1000);
   scale.begin(DOUT_PIN, CLK_PIN);
   scale.set_scale(cal);
}
void loop() {

   float weight = scale.get_units(10);
   float final_weight = weight*0.2425 +1328.4726;

   Serial.println(final_weight, 2);
   if(final_weight< 2000&&x == 1)
   {
      gsm.println("AT+CMGS=\"+919587494407\"");
      delay(2000);
      gsm.print("Your LPG cylinder is about to end.. Kindly contact nearby supplier.");
      delay(2000);
      gsm.write((char)26);
      x=2;
   }
   if(final_weight>2000)
   {
      x=1;
   }
   delay(1000);
}
```

Conclusion

This project successfully demonstrates a system that enhances kitchen safety and convenience. The milk boiler alarm prevents unattended boiling incidents, and the LPG weight sensing system with automated ordering eliminates the need for manual monitoring and ordering of gas refills. The project paves the way for further development, potentially incorporating additional features like remote monitoring and notification for improved user experience.

Special Thanks to

Harshit Agarwal Sir

Group 2:

Kurai Saksham Vinod
Kalkar Tejas Prasad
Chirag Saxena
Lakshya Jain
Sidharth Kumar Bhagat
Maulik Dave