SafeFlow Intelligent Gas Safety Monitoring And Management System

AMRITA VISHWA VIDYAPEETHAM
DEEMED TO BE UNIVERSITY UNDER SECTION 3 OF UGC ACT, 1956

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SCHOOL OF ENGINEERING, AMRITAPURI

Ambadi A (21012) Sreehari R (21051) Akash Gopinath (21009)

Abstract

SafeFlow is an IoT-based LPG safety system that detects gas leaks with an MQ2 sensor and automatically closes the valve via a servo motor.

It monitors cylinder weight using a load cell and updates real-time data to Firebase.

Alerts and refill notifications are sent through Telegram, and a dashboard enables remote monitoring, improving safety and convenience.

Methods and Materials

Hardware: ESP32, MQ2 sensor, HX711 + load cell, servo, LCD, buzzer, LED, 5V supply.

Software: Arduino IDE; Firebase, Telegram alerts, Wix dashboard.

Working: Reads gas & weight

- Gas > 300 ppm: valve closes, alarm on, Telegram alert.
- Weight < 1.5 kg: low gas alert, refill advised.
- Live Monitoring updates .

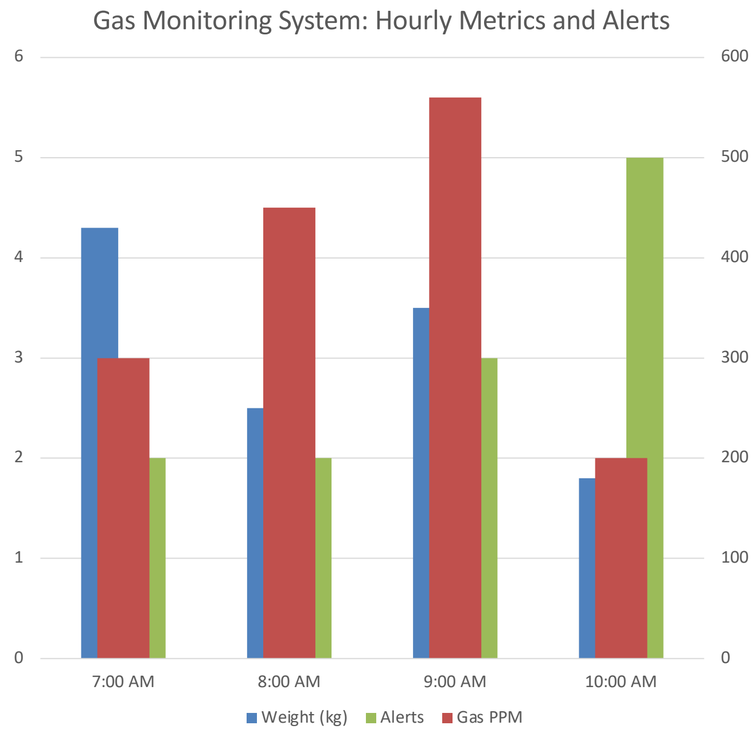

Figure 1. Gas Monitoring System: Hourly Metrics and Alerts .

Introduction

LPG is a common domestic fuel but poses serious risks if leaks occur, especially when regulators are left open. Traditional gas detectors only alert users without preventing accidents.

SafeFlow is an IoT-based system that detects leaks, automatically shuts the valve using a servo motor, and monitors cylinder weight with a load cell and HX711. Powered by ESP32, it connects to Firebase for real-time data.

Users receive alerts via Telegram, and a Wix dashboard shows live gas levels, weight, and valve status. The system also provides automatic refill notifications for added safety and convenience.

Results

- Leak detected above 300 ppm.
- Valve auto-closed.
- Alerts via buzzer, LED, Telegram.
- Cylinder weight monitored.
- Data sent to Firebase.
- Live Wix dashboard.
- Valve stays closed until reset.
- Stable Wi-Fi connection.
- Auto-booking synced.
- System checks settings every 3S
- Accurate weight measurement

Table 1. Gas Monitoring System Comparison

Ref	Leakage Detection	Control Gas Flow	Alarm/Buzzer	SMS/Call	Weight Monitor	Gas Booking
[1]	Yes	Yes	Yes	No	No	No
[2]	Yes	No	Yes	No	No	No
[3]	No	No	No	No	Yes	No
[4]	No	Yes	Yes	No	Yes	No
[5]	Yes	No	Yes	No	No	No
[6]	Yes	Yes	Yes	No	No	No

Discussion

- SafeFlow detects leaks, closes the valve, and sends alerts. It monitors gas levels and weight with real-time cloud updates.
- Challenges like sensor calibration and Wi-Fi were managed with tuning and reconnects.
- The valve stays closed until reset, ensuring safety.
- SafeFlow is a practical, smart gas safety system.

Conclusions

SafeFlow successfully combines gas leak detection, automatic valve control, and real-time monitoring to improve LPG safety. It alerts users via buzzer, LED, Telegram, and a live dashboard. Cylinder weight monitoring ensures timely refills.

This IoT system offers a smart, reliable solution to prevent accidents and simplify gas management.

Future work includes AI analytics and offline alert features.

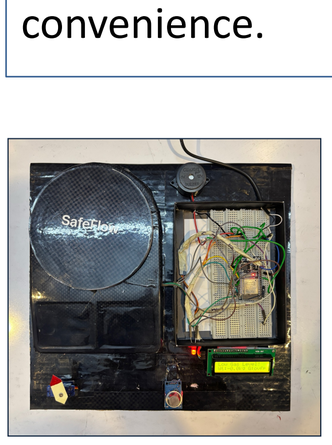

Figure 1. TOP VIEW

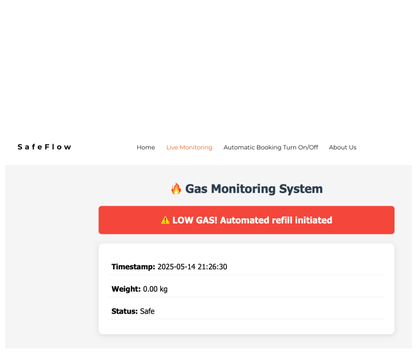

Figure 2. LIVE WEBSITE

Publications

1. IOT-Based Fuel Gas Safety Control System," CN203287793U, China, 2013
2. Intelligent Gas Meter of Internet of Things Based on Wi-Fi Technology," CN202615503U, China, 2012.
3. Gas Leakage Detection and Fail-Safe Control Method for Gas Fueled Internal Combustion Engine," US6467466B1, United States, 2000.

References

1. **[1]** IOT-Based Fuel Gas Safety Control System *A system focusing on fuel gas safety using IoT to detect leakage, control gas flow, and trigger alarms.*
2. **[2]** Intelligent Gas Meter of Internet of Things based on WIFI (Wireless Fidelity) Technology
3. **[3]** Gas Leakage Detection and Fail-Safe Control Method for Gas Fuel Internal Combustion Engine and Apparatus for Implementing the Same
4. **[4]** Product Available - B24IoT *A commercially available product named B24IoT that provides gas flow control, alarms, and weight monitoring.*
5. **[5]** Smart Gas Level Monitoring, Booking & Gas Leakage Detector over IoT *Presented at the 2017 IEEE 7th International Advance Computing Conference (IACC)*
6. **[6]** Arduino Based LPG Gas Monitoring & Automatic Cylinder Booking with Alert System