A Minor Project

Report on

SMART LPG GAS MANAGEMENT SYSTEM

Submitted by

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BONAFIDE CERTIFICATE

Certified that this Report titled **"SMART LPG GAS MANAGEMENT SYSTEM"** is the bonafide work of **DEEPIKA S (927622BEE018), DURGADEVI N (927622BEE028), KAVIN V (927622BEE055), KISHORE N (927622BEE059)** who carried out the work during the academic year (2024-2025) under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other project report.

SIGNATURE	**SIGNATURE**
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Engineering, Karur.	Engineering, Karur

Submitted for Minor Project IV (18EEP302L) viva-voce Examination held at M. Kumarasamy College of Engineering, Karur-639113 on ………………..

DECLARATION

We affirm that the Minor Project IV report titled "**SMART LPG GAS MANAGEMENT SYSTEM"** being submitted in partial fulfillment for the award of **Bachelor of Engineering in Electrical and Electronics Engineering** is the original work carried out by us.

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VISION AND MISSION OF THE INSTITUTION

VISION

- ✓ To emerge as a leader among the top institutions in the field of technical education

MISSION

- ✓ Produce smart technocrats with empirical knowledge who can surmount the global Challenges.
- ✓ Create a diverse, fully-engaged, learner - centric campus environment to provide Quality education to the students.
- ✓ Maintain mutually beneficial partnerships with our alumni, industry and Professional associations.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

- ✓ To produce smart and dynamic professionals with profound theoretical and practical knowledge comparable with the best in the field.

MISSION

- ✓ Produce hi-tech professionals in the field of Electrical and Electronics Engineering by inculcating core knowledge.
- ✓ Produce highly competent professionals with thrust on research.
- ✓ Provide personalized training to the students for enriching their skills.

PROGRAMME EDUCATIONAL OBJECTIVES(PEOs)

- ✓ **PEO1:** Graduates will have flourishing career in the core areas of Electrical Engineering and also allied disciplines.
- ✓ **PEO2:** Graduates will pursue higher studies and succeed in academic/research careers
- ✓ **PEO3:** Graduates will be a successful entrepreneur in creating jobs related to Electrical and Electronics Engineering /allied disciplines.
- ✓ **PEO4:** Graduates will practice ethics and have habit of continuous learning for their success in the chosen career.

PROGRAMME OUTCOMES(POs)

After the successful completion of the B.E. Electrical and Electronics Engineering degree program, the students will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of solutions:

Design solutions for Complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal and environmental considerations.

PO4: Conduct Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs)

The following are the Program Specific Outcomes of Engineering Students:

PSO1: Apply the basic concepts of mathematics and science to analyse and design circuits, controls, Electrical machines and drives to solve complex problems.

PSO2: Apply relevant models, resources and emerging tools and techniques to provide solutions to power and energy related issues & challenges.

PSO3: Design, Develop and implement methods and concepts to facilitate solutions for electrical and electronics engineering related realworld problems.

Abstract (Key Words)	Mapping of POs and PSOs
Meal Input, Calculating Gas consumption, Remaining Gas, Send notification	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO11, PO12, PSO1, PSO2, PSO3

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ABSTRACT

This system is designed to monitor LPG gas usage and send timely alerts to users through the Twilio SMS platform. It helps the users to track how much gas is used in each day and shows how many days left for usage of gas. The system has a login page to ensure only registered users can access the features. After logging in, users can choose from a list of fixed meals, each with a set gas usage per person. Users select meals and enter the number of people avail it. The system calculates how much gas is needed for those meals. Users can also add extra meals by entering the meal name, gas required, and number of people. These meals are also counted in the gas usage for the day. The total gas used is then calculated, and the remaining gas in the cylinder is updated. Based on the total cylinder capacity and average daily use, the system estimates how many days the gas will last. The backend is built using Node.js and Express, with Twilio API used for sending SMS.

PROBLEM IDENTIFICATION

LPG gas is used for cooking every day and customer face the problem of gas getting finished suddenly without any warning. This usually happens while cooking, people may not have a backup cylinder ready, and ordering a refill takes time. The main reason is that people don’t know how much gas is left in the cylinder. Most of the time, they try to guess by shaking the cylinder or lifting it to feel the weight. This method is not accurate and doesn’t help to plan properly. Also, most families don’t keep track of how much gas they are using every day. They don’t record what meals are being cooked or how many people are eating. This makes it hard to know when the gas will run out. Another big problem is that people don’t get any kind of alert or message when the gas is running low. This makes it impossible to prepare in advance. Moreover, users do not have access to any software or tool that helps them track gas usage patterns, predict refill needs, or manage gas consumption based on meal preferences and family size. In households with elderly or busy individuals, remembering to check gas levels manually is often overlooked. This system that provides real-time monitoring, daily usage tracking, consumption analysis, and timely alerts for refill reminders.

CHAPTER 1

INTRODUCTION

LPG (Liquefied Petroleum Gas) is commonly used as a fuel for cooking. However, one of the biggest problems faced during cooking is the sudden exhaustion of gas without any prior warning. This leads to interruption of work and delays in preparing meals. Often, there is no backup available, and arranging a new cylinder takes time. The core reason behind this problem is the lack of awareness about how much gas is left in the cylinder. There is also no proper method to track how much gas is used daily. Without this information, it becomes difficult to plan properly and manage gas usage efficiently. This results in sudden gas outages and waste of time, energy, and resources. To solve this issue, a smart system has been developed to monitor gas usage and provide alerts in advance. This system tracks daily gas consumption and estimates how many days the remaining gas can last. When the level goes below a safe limit, it sends a warning message to the user's phone, allowing time to arrange a refill. The system includes a secure login feature to ensure that only authorized users can access the platform. Once logged in, the user is presented with a list of fixed meals, each having a predefined gas requirement per person. The user selects meals according to the need and inputs the number of people being served. The system calculates the total gas needed for those meals using the stored gas usage values. In addition to fixed meals, the system allows the addition of extra meals. This feature offers flexibility for users to enter the meal name, the amount of gas it needs, and the number of people. These meals are then included in the total gas usage for the day. After all the meal information is entered, the system calculates the daily gas consumption and subtracts it from the cylinder's total capacity. Based on the current gas level and average daily usage, the system estimates how many more days the gas will last. If the remaining days are 12 or fewer, the system automatically sends an alert to the user's registered mobile number through the Twilio SMS platform. The message contains the amount of gas used and the number of days remaining. The user interface is designed to be simple and easy to use, allowing anyone to monitor gas usage effectively. This system provides gas usage more predictable, reduces last-minute issues, and helps users plan better for the future.

CHAPTER 2

LITERATURE REVIEW

Paper 1

Title: Cooking Gas Monitoring and Alert System

Inference: Liquid Petroleum Gas (LPG) is widely used in households and the food industry due to its efficiency and cost-effectiveness. However, users often face difficulties in monitoring the remaining gas in cylinders, leading to unnecessary expenses from purchasing backup cylinders. Moreover, gas leakage poses serious fire hazards, raising safety concerns. To address these issues, an IoT-based LPG monitoring and smart alarm system is proposed. The system integrates MQ-6 gas sensor, load cell and HX711 to monitor gas levels and detect leakages. Real-time data is transmitted via Wi-Fi to a mobile application. Users receive timely notifications about low gas levels and potential gas leaks. This solution enhances household safety, ensures user convenience, and minimizes avoidable costs.

Paper 2

Title: IoT-Based Integrated Household Gas Monitoring System

Inference: Efficient management of Liquefied Petroleum Gas (LPG) is essential for ensuring safety, avoiding unexpected gas depletion, and optimizing resource usage. This paper presents the design and implementation of an IoT-based integrated household LPG monitoring and safety system aimed at enhancing residential safety, convenience, and efficiency. The system incorporates MQ6 gas sensors, a servo motor for automatic shutoff, an ESP32 microcontroller, and the Blynk IoT platform to enable real-time monitoring, gas leak detection, and remote control. The mobile application provides users with a user-friendly interface for real-time alerts, gas level monitoring, and remote valve control. To ensure data integrity and user safety, the system includes robust security measures such as encrypted data transmission and authentication. Overall, this project effectively addresses LPG monitoring challenges and offers a scalable, adaptable solution suitable for future enhancements and broader applications.

Paper 3

Title: Smart LPG Monitoring System: Enhanced Safety with Leakage Detection

Inference: Gas leaks can cause severe accidents, resulting in property damage and risks to human life. Inadequate maintenance of gas systems and low public awareness are key factors contributing to such incidents. Since LPG cylinders are essential in daily life, monitoring their levels is crucial for managing consumption and ensuring timely refills. The system uses a load cell to constantly monitor gas content and a GSM module to notify users when a replacement is needed. In case of a leak, gas sensors detect the presence of LPG and trigger alarms, activate exhaust mechanisms, and send real-time alerts via GSM. This ensures timely action and significantly enhances household safety through automated monitoring and smart notifications.

Paper 4

Title: LPG Gas Usage and Leakage Detection Using IoT

Inference: LPG gas cylinders are the most popular home cooking source in Brunei and other parts of the world. However, LPG gas is highly inflammable and can easily cause fire or explosion if there is a leakage and if it is not monitored. When the gas runs out at odd time, it can be difficult to order. This system also sends automatic alert notifications to the user through mobile application. Web interface and mobile application are also created to monitor and place order to the supplier.

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Paper 5

Title: Intelligent kitchen management system based on gas safety and usage

Inference: This paper introduces the intelligent kitchen management system based on gas safety. This system connects the intelligent gas appliance, intelligent meter, intelligent switch, alarm and other equipment in the kitchen through wireless network. The software freely controls the operation of each intelligent equipment, realize the intelligent operation of gas equipment, automatic optimal control of energy consumption, ensure the health and comfort of the kitchen environment, and provide users with intelligent and convenient life services.

CHAPTER 2

PROPOSED METHODOLOGY

2.1 BLOCK DIAGRAM

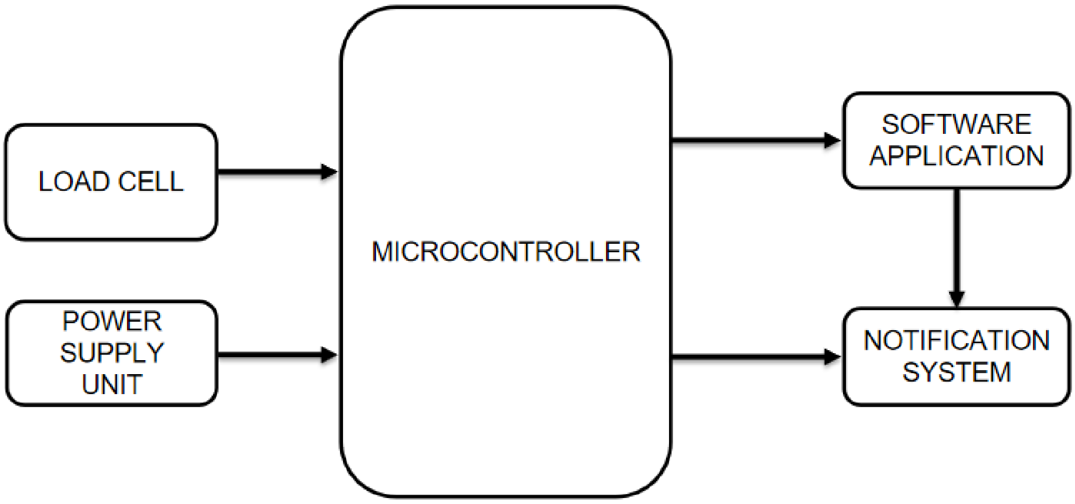


Fig 2.1 Block Diagram for LPG Gas Monitoring System

2.2 DESCRIPTION

Frontend Technologies (HTML, CSS, JavaScript)

The user interface of the Smart Gas Management System is built using HTML, CSS, and JavaScript. HTML provides the basic structure of the interface, allowing users to enter the number of people and select meals. It organizes the content on the page in a clear and simple way. CSS is used to enhance the design and layout. It improves the visual appearance by adjusting colours, fonts, and spacing. CSS also makes the interface responsive, ensuring it works well on different devices like phones, tablets, and computers. JavaScript adds interactivity to the system. It validates user inputs and performs real-time calculations to estimate gas usage based on meal selection and the number of people. JavaScript also updates the user interface dynamically, showing the remaining gas in the cylinder and estimated days left before a refill is needed. Together, these technologies create a user-friendly and efficient system for managing gas usage.

Node.js

Node.js acts as the backend engine for the entire system. It handles form input, calculates total gas usage based on meal configuration and number of persons. It serves the frontend using HTTP and enables server-side logic without using heavyweight frameworks. It integrates with the Twilio API to send real-time SMS notifications. The system is designed in a modular fashion, making it easy to scale or add database functionality later. Node.js can be extended to handle simulated or real sensor data input from Arduino in the future.

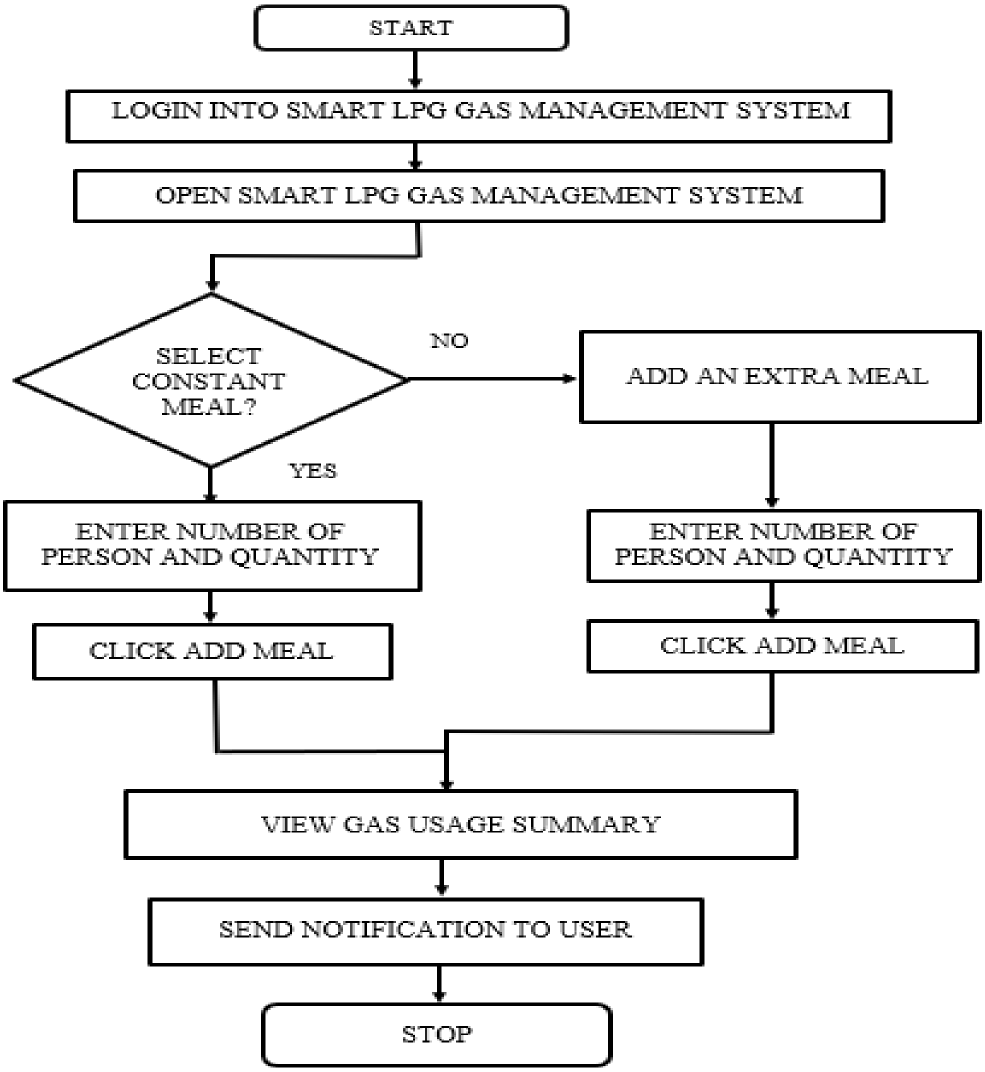
Twilio API

Twilio is used for SMS-based alert notifications. The backend uses Twilio's API to send SMS when the estimated gas level falls below a critical value. It helps demonstrate the real-time notification concept without physical sensors. Twilio setup involves simple authentication tokens and a registered phone number. It allows multiple types of messages including emergency alerts, refill reminders, or monthly usage reports. This service bridges the gap between simulation and real-world application.

PlatformIO IDE (Arduino Framework)

PlatformIO in VS Code manages the embedded software side of the project. It supports writing Arduino-compatible code in C++ for sensors like HX711 and microcontrollers like Arduino Uno/Nano. The system is designed with mock logic that reads weight values (simulated), calculates consumption, and sends data. PlatformIO handles library management (like HX711.h) and builds firmware code with its integrated toolchain. Although not uploaded to hardware, the codebase is hardware-ready for future expansion. The logical separation makes it easy to simulate sensor data or connect to an actual board if needed.

2.3 FLOW CHART



The flowchart illustrates the working process of the Smart LPG Gas Management System. The process begins with the user logging into the system and accessing the main interface. Once inside, the user is asked whether they want to select a predefined constant meal. If yes, they proceed by entering the number of people and the quantity of gas required, then click the "Add Meal" button. If the user does not want a constant meal, they can add an extra meal by manually entering the meal name, the number of people, and the gas quantity, followed by clicking "Add Meal." After all meals are entered, the system calculates the total gas consumed and displays a gas usage summary. Based on this data, if the remaining gas reaches a low level (based on the threshold set), the system automatically sends a notification to the user. This ensures timely alerts and better planning for gas refills.

2.4 SOFTWARE TOOL

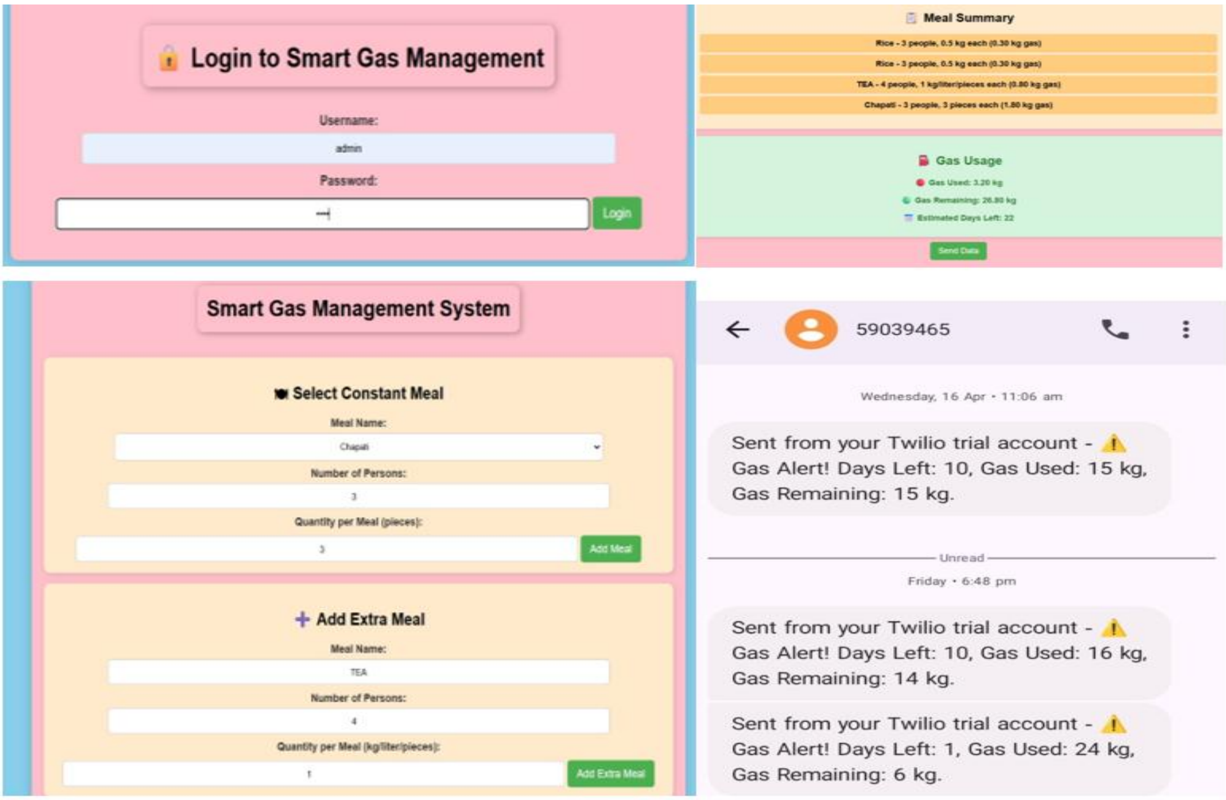


Fig 2.4 Software Execution

WORKING PRINCIPLE

The Smart LPG Gas Management System works in a simple and user-friendly way. First, the user logs into the system using their credentials. After successful login, they can select meals from a predefined list of constant meals. For each selected meal, the user enters the number of persons and the quantity required. If the user wants to prepare any additional meal that is not in the constant list, they can add it manually by entering the meal name, the number of persons, and the quantity. Once the meals are selected and added, the system calculates the total gas consumption based on the quantities used. It then calculates the remaining gas in the cylinder and estimates the number of days left before the gas runs out. If the estimated number of days left becomes 12 or less, the system automatically sends an SMS notification to the user through the Twilio platform. This message informs the user about the amount of gas used and the number of days remaining, helping them take timely action to refill the gas and avoid running out. This is a simple way to manage the gas usage and stay informed.

CHAPTER 3

CONCLUSION

Managing cooking gas usage is important, but many people struggle when their gas runs out unexpectedly. This can cause delays and extra costs. Most people don’t know how much gas is left or how fast it’s being used. With this system, users can log in and select meals like breakfast, lunch, and dinner. They can also add extra meals. Based on this, the system calculates the gas usage for each meal. It keeps track of how much gas is used and how much is still left in the cylinder. The system also tells users how many days of gas are left, so they can plan ahead and avoid running out. Another useful feature is the SMS notification using Twilio. When the gas is running low, the system sends a message to the user’s phone to remind them to order a refill. This system is easy to use, affordable, and doesn’t require expensive hardware or apps. It uses a simple web interface and a small server for SMS notifications. Even people with little technical knowledge can use it. In the future, the system can be expanded with more features like sensor integration, mobile apps, voice assistant support, or even AI to predict gas usage. In short, the Smart Gas Management System is a helpful tool for every home. It helps avoid gas shortages, saves time, and makes cooking easier. By using this system, families can plan better and reduce stress.

CHAPTER 4

FUTURE SCOPE AND ITS IMPLEMENTATION

The Smart Gas Management System holds immense future potential with a range of enhancements designed to improve user convenience and operational efficiency. Key future features include mobile app integration, enabling real-time monitoring and notifications, as well as cloud-based data storage to track historical consumption and predict future gas needs. The system can integrate with gas distributors for automatic refill requests when gas levels fall below a threshold, ensuring uninterrupted supply. AI-based algorithms will optimize gas usage, suggesting meal plans and forecasting consumption based on past data and patterns. Voice assistant integration with platforms like Alexa and Google Assistant will provide hands-free updates, enhancing user experience. The system will also support multi-cylinder management, automatically switching between tanks when one runs out, and emergency alerts for abnormal gas drops or potential leaks, improving safety. IoT integration with smart kitchen appliances will automate gas usage tracking, while an enhanced user interface with graphical insights will help users make informed decisions. Solar-powered options can be explored for eco-friendly operation, especially in remote areas. For users without smartphones, SMS or call alerts will ensure they are kept informed. Predictive analytics will factor in weather or seasonal habits to forecast future gas consumption. Additionally, community-based insights can provide users with best practices for gas management. The implementation will focus on hardware setup with the HX711 sensor and ESP32, cloud integration, AI algorithms, and gradually introduce these advanced features as the core system stabilizes. This scalable and user-friendly system promises to be both smarter and safer in managing LPG gas usage.

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