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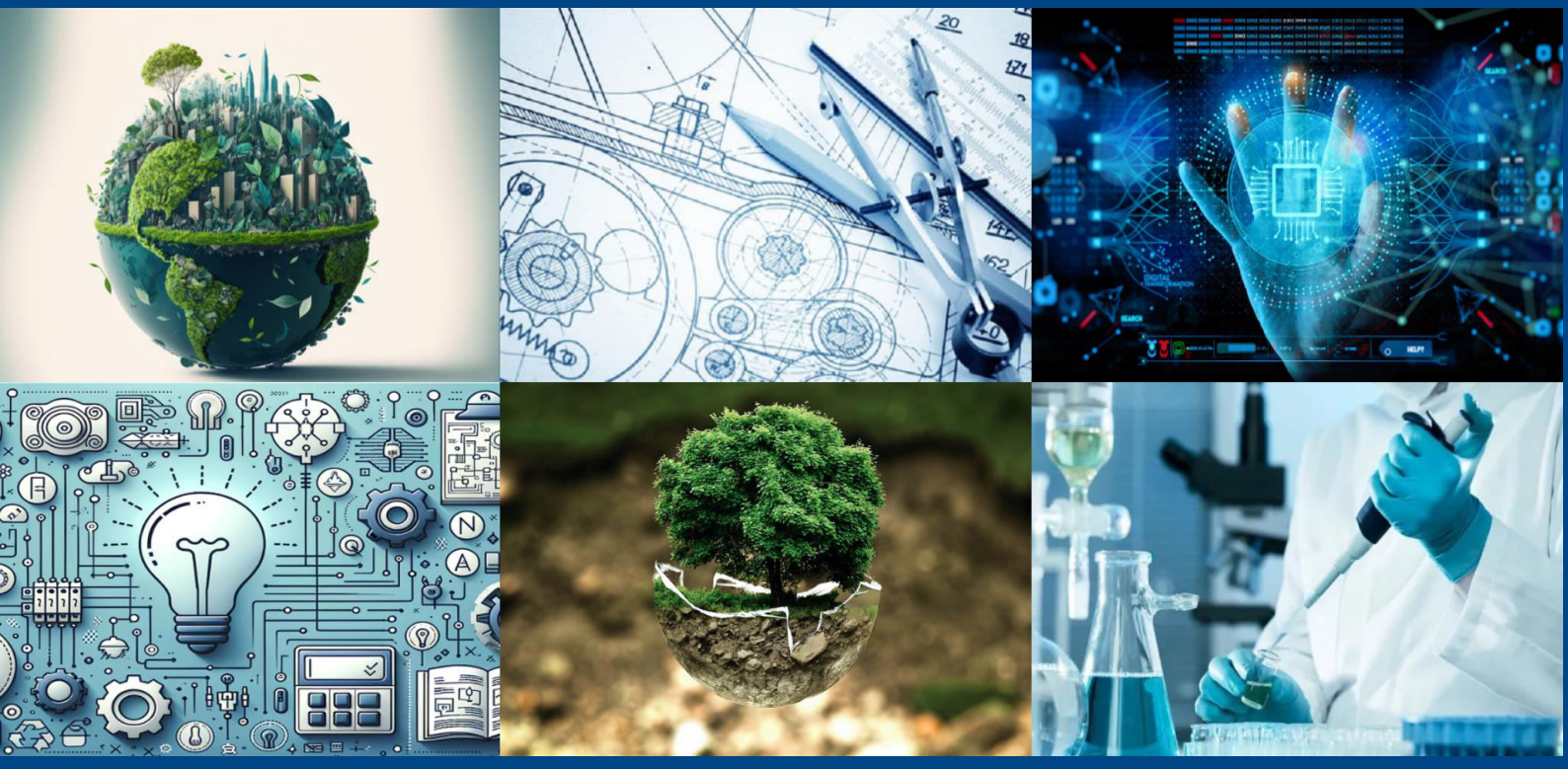

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# Online CNG Booking using PHP

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**ABSTRACT:** Compressed Natural Gas (CNG) is increasingly being adopted as a cleaner alternative to conventional fuels, especially in urban areas. However, the lack of digital infrastructure for booking CNG refueling slots often results in long waiting times, inefficient operations, and user dissatisfaction. This paper proposes an Online CNG Booking System designed to automate and streamline the booking process. The system is developed using PHP, MySQL, and HTML/CSS, providing a real-time dashboard for users, pump owners, and administrators. Users can book slots, make secure payments, and receive real-time notifications, while CNG pump owners can efficiently manage booking schedules, monitor fuel availability, and generate reports.The system's primary goal is to reduce fuel queue congestion, enhance customer convenience, and improve operational productivity at CNG stations. The integration of digital slot management, user authentication, and booking analytics enables transparent and scalable operations. The solution addresses gaps in existing manual or semi-digital systems and can be extended to integrate mobile applications and IoT-based sensors in future iterations.

**KEYWORDS**: CNG Booking, Fuel Management, Web Application, Real-Time Slot Booking, PHP, MySQL, Urban Mobility, Digital Fuel Infrastructure

## I. INTRODUCTION

Compressed Natural Gas (CNG) is a sustainable and cost-effective alternative to traditional fuels like petrol and diesel. Its adoption in urban transportation has been motivated by concerns over rising fuel costs, air pollution, and the global drive toward greener alternatives. Despite the increasing number of CNG-powered vehicles, the infrastructure to support efficient CNG distribution, especially in terms of booking and management, remains inadequate. In most urban locations, users are required to queue for long hours at CNG stations, leading to time wastage, fuel idling, and inefficient station utilization [1][2].

The absence of an online or automated system for booking CNG refueling slots not only hampers customer convenience but also creates operational inefficiencies for pump station owners. Manual entries, unpredictable traffic at stations, and resource misallocation often result in economic and logistical drawbacks. Prior works, such as by Sharma et al. (2018) and Ghosh & Mehta (2021), emphasized the growing need for digital transformation in fuel station management systems [3][4]. Despite the advancement in other sectors of e-governance and smart cities, fuel distribution still lacks digitization, making it ripe for innovation.

This paper proposes a web-based Online CNG Booking System aimed at solving these inefficiencies. The platform allows users to book CNG slots from their devices, make payments, and get real-time booking confirmation. Simultaneously, it provides station owners with dashboards for managing slot availability, generating reports, and analyzing usage. The research outlines the system's development, architecture, modules, algorithmic flow, and application scenarios, demonstrating its effectiveness in streamlining urban fuel management.

## II. LITERATURE SURVEY

The transition towards digital solutions in fuel management has garnered significant attention in recent years. Gupta et al. (2020) introduced a smart LPG monitoring and automatic booking system utilizing IoT technologies. Their approach involved using load cells interfaced with microcontrollers to measure gas levels, providing real-time updates to users via mobile notifications . Similarly, Chandan et al. (2018) developed an automatic gas booking system employing IoT, where weight sensors detected gas levels and triggered automatic bookings through GSM modules . Sireesha et al. (2020) further

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enhanced this concept by integrating sensor networks for LPG monitoring, enabling automatic cylinder bookings and leak detections, thereby improving safety and efficiency

In the realm of CNG infrastructure, Panchal and Srivastava (2019) conducted a qualitative analysis of CNG dispensing systems using a fuzzy FMEA–GRA integrated approach. Their study emphasized the importance of risk assessment in ensuring the reliability and safety of CNG stations . Complementing this, a study on mitigating risks in CNG stations employed fuzzy-integrated techniques to prioritize failure modes, aiding in effective maintenance planning .

The design aspects of CNG dispensers were explored by Bharshankar and Chakravarthy, who aimed to enhance user convenience by redesigning dispenser interfaces, addressing issues like long queues and user ergonomics . From a broader perspective, Besselink et al. (2015) discussed the cyber-physical control of road freight transport, highlighting how coordinated vehicle platooning and real-time data exchange can lead to significant fuel savings and reduced emissions . Alvarez et al. (2020) provided a comprehensive survey on reducing road vehicle fuel consumption through connectivity and automation. They identified that technologies like eco-driving, predictive gear shifting, and vehicle-to-vehicle communication can substantially lower fuel usage . In the context of renewable energy integration, a study on the coordinated operation and optimal sizing strategy of P2G–CNG truck systems demonstrated how curtailed wind power could be effectively utilized for natural gas production and distribution, enhancing the sustainability of fuel supply chains .

The challenges faced by CNG vehicle users, such as insufficient refueling stations, were analyzed in a system dynamics-based assessment, which quantified the inconvenience costs and emphasized the need for infrastructure expansion to promote CNG adoption . In addressing user accessibility, a review on charging station locators for EV and CNG vehicles highlighted the gaps in existing applications and proposed solutions to improve station discovery and booking processes .

In the domain of fleet management, Saghaei (2016) designed and implemented a system using GPS/GLONASS trackers and web-based software to monitor vehicle positions, fuel consumption, and other parameters, facilitating efficient decision-making . Additionally, a study on feasible fuel price monitoring technology in India proposed an IoT-based framework that adjusts fuel prices based on vehicle type and usage, aiming to balance government revenue with consumer affordability .

Collectively, these studies underscore the critical role of integrating IoT, automation, and user-centric designs in revolutionizing fuel management systems. However, there remains a gap in comprehensive solutions that combine real-time booking, user notifications, risk assessments, and infrastructure optimization specifically tailored for CNG refueling. Addressing this gap is essential for enhancing user convenience, operational efficiency, and the broader adoption of cleaner fuel alternatives.

## III. MOTIVATION OF THE PROJECT

The motivation for this project arises from the practical difficulties faced by CNG vehicle owners and pump station operators. Long queues, inefficient scheduling, and lack of data analytics for daily operations continue to hinder effective fuel delivery. These challenges not only inconvenience customers but also result in fuel wastage and time loss. Moreover, the COVID-19 pandemic further emphasized the importance of contactless services, adding urgency to implement digital infrastructure in traditional sectors like fuel management.

Our project is aimed at improving the fuel ecosystem by introducing a smart, web-based CNG booking platform that is easy to use, scalable, and effective. It aligns with smart city initiatives and promotes sustainable practices.

## IV. PROPOSED SYSTEM OF THE PROJECT

The proposed system consists of three major stakeholders: **Users**, **CNG Pump Owners**, and **Administrators**.

- Users can register, log in, book a CNG slot based on availability, make online payments, and receive notifications.
- CNG pump owners can manage bookings, view real-time slot occupancy, and track user traffic.
- Administrators can oversee the system, resolve issues, generate analytics, and improve policy decisions.

The platform is built using **PHP** for backend logic, **MySQL** as the database, and **HTML/CSS with JavaScript** for the frontend. It features a dynamic dashboard, integrated payment APIs, and a notification system. The architecture ensures modularity, scalability, and security.

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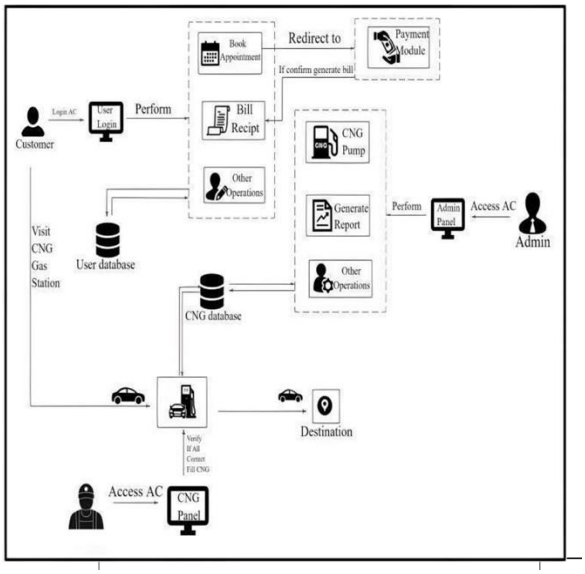
## V. SYSTEM ARCHITECTURE

The architecture follows a **3-tier web system**:

- **Presentation Layer** (User Interface)
- **Business Logic Layer** (PHP Modules)
- **Data Access Layer** (MySQL DB)

**Diagram Description**:

- Users interact via a responsive frontend.
- Requests are processed by PHP backend, which checks database for slot availability.
- Confirmations and updates are sent via email/SMS.
- All actions are logged and stored securely.




## VI. ALGORITHM USED

**Slot Booking Algorithm (Simplified Logic):**

1. Input: User ID, selected station, desired time slot
2. Check: Slot availability from DB
3. If available:
   - Reserve slot
   - Send confirmation
   - Update DB
4. Else:
   - Prompt user to choose another slot

Optional modules include **Greedy Scheduling** for peak-time slot optimization.

## VII. MODULES USED

1. **User Module** – Registration, Login, Booking, Payment, History
2. **Pump Owner Module** – Slot Control, User Management, Reports
3. **Admin Module** – View Logs, Update DB, Error Management
4. **Booking Module** – Time Slot Picker, Live Slot Status
5. **Notification Module** – Email/SMS Alerts
6. **Payment Module** – UPI/Credit/Debit Gateway
7. **Analytics Module** – Charts, Reports, Daily Logs

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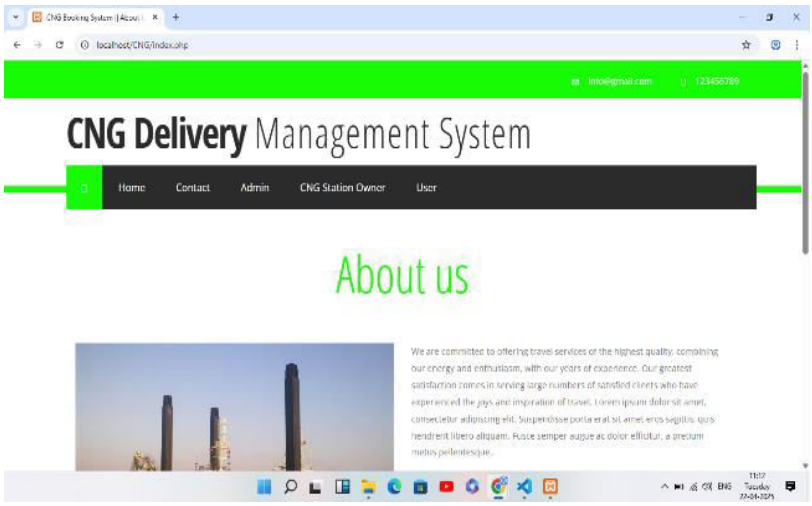
## VIII. APPLICATIONS

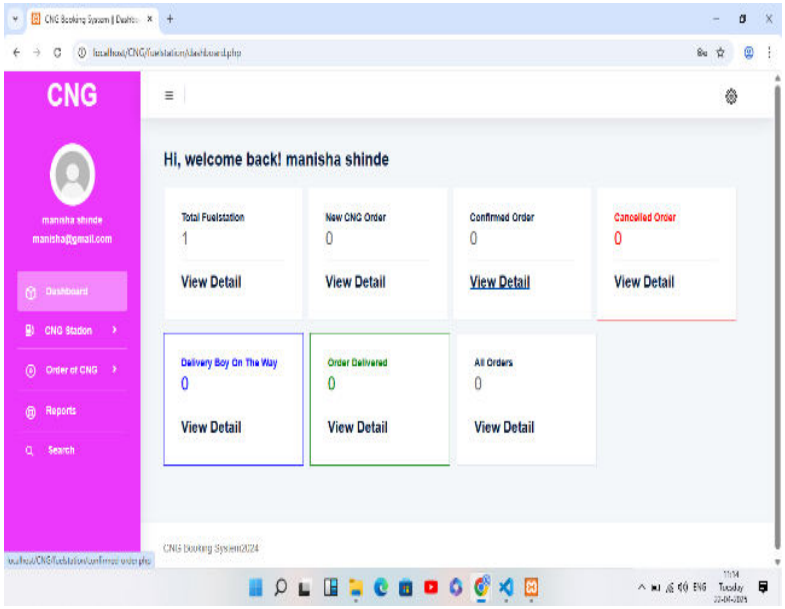
- **Urban CNG Fuel Stations**
- **Fleet Management Companies**
- **Government Transport Departments**
- **Public-Private Transport Systems**
- **Integration with Smart City Infrastructure**

## IX. CONCLUSION

This project successfully demonstrates a web-based solution to tackle the inefficiencies in current CNG fuel distribution systems. By digitizing slot booking, payment, and tracking processes, the system enhances customer satisfaction and optimizes station operations. The modular design allows for easy scaling and integration into larger systems like smart cities or public transport platforms. The solution significantly reduces queue times and improves operational planning for CNG pump owners.

## X. RESULTS



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## XI. FUTURE SCOPE OF THE PROJECT

- **Mobile App Integration** using Flutter/React Native
- **IoT Sensor Integration** to monitor real-time fuel levels
- **AI-based Slot Prediction** to suggest optimal booking times
- **GPS Integration** for navigation to stations
- **Cloud Hosting** for wider scalability
- **Integration with Government Platforms** for subsidies and compliance

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