

Solar Based Station Digital E Fuel Monitoring System for Automobiles

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Abstract

This proposal introduces an innovative approach to revolutionize the monitoring and optimization of e-fuel consumption in automobiles through the implementation of a solar-powered station. With the increasing demand for electric vehicles (EVs) and the urgent need to reduce carbon emissions, e-fuels have emerged as a promising alternative to conventional fossil fuels. However, efficient monitoring and management of e-fuel usage remain a significant challenge. This paper proposes a comprehensive solar-based station that leverages renewable energy sources to monitor and analyze e-fuel consumption patterns, providing real-time data and insights to vehicle owners and fleet managers. The proposed system aims to enhance the efficiency, sustainability, and cost-effectiveness of e-fuel usage, leading to reduced carbon emissions and increased energy savings. Pure electric vehicles (EVs) are more and more popular in current automotive markets. Many services for EVs such as intelligent battery charging systems and mobile apps are developed to monitor battery energy information (energy consumption time series) for users. However, it consumes power from the grids and if there is no power charging EV vehicles will not be possible, and there is no alternatives. It is neglected such that EV energy consumption takes time in this we design the solar based EV charging station. An E-vehicle charging station, otherwise known as an EV charging station, an electric re-energize point a charging point, an electronic charging station (ECS), or an electric vehicle supply hardware (EVSE), is a piece of a framework that gives electric energy to the reenergizing of module electric vehicles, like electric vehicles, local area electric vehicles, and module mixtures. The main objective of this paper “Solar Based Charging Station for E-Vehicle” is to generate maximum power from the solar panel by tilting its angle based on the intensity of the light that falls on the solar panel. Also, the amount of power available in the charge station is continually monitored locally and from the remote area by using the concepts of Internet of things.

Keywords: Solar-based station, E-fuel consumption Automobiles ,Monitoring system, Optimization, Renewable energy, Solar panel, Real-time data, Energy efficiency, Carbon emissions, Sustainability, Cost-effectiveness, Electric vehicles (EVs), Energy savings,

Intelligent battery charging systems, Mobile apps, Grid independence, Internet of Things (IoT)

I. Introduction

A Solar Based Station Digital E-Fuel Monitoring System for automobiles is a technology that allows drivers to monitor their vehicle's fuel consumption, fuel level, and other vital data in real-time. The system uses solar power to operate, making it an environmentally friendly and cost-effective solution for monitoring fuel usage. The system comprises of a solar panel, a charge controller, a battery bank, a fuel sensor, a microcontroller, and an LCD display. The solar panel charges the battery bank during the day, and the charge controller regulates the charging process. The fuel sensor is installed in the fuel tank and sends data to the microcontroller, which processes the data and sends it to the LCD display. The LCD display shows the driver the current fuel level, fuel consumption, and other data related to the vehicle's fuel usage. The system can also be connected to a mobile application or a web-based dashboard, allowing drivers to monitor their vehicle's fuel usage remotely. This is particularly useful for fleet management, where managers can monitor the fuel usage of multiple vehicles from a central location. The solar-powered digital e-fuel monitoring system has several advantages over traditional fuel monitoring systems. It is cost-effective and requires minimal maintenance since it uses solar power. It is also environmentally friendly, as it reduces the carbon footprint associated with fuel consumption. Additionally, the real-time data provided by the system can help drivers save fuel by optimizing their driving habits. Overall, the Solar Based Station Digital E-Fuel Monitoring System for automobiles is a promising technology that offers a range of benefits to both drivers and fleet managers. It is a cost-effective, environmentally friendly, and efficient solution for monitoring fuel usage in vehicles. Moreover, the Solar Based Station Digital E-Fuel Monitoring System offers the added advantage of connectivity to mobile applications or web-based dashboards. This feature enables remote monitoring and fleet management, making it particularly valuable for commercial vehicle operations. Fleet managers can remotely track the fuel consumption of multiple vehicles, optimize routes, and identify opportunities for fuel savings, resulting in significant cost reductions and improved operational efficiency.

In this paper, we present a comprehensive study of the Solar Based Station Digital E-Fuel Monitoring System for automobiles. We delve into the system's architecture, outlining the functionality of each component and its integration. Additionally, we explore the benefits and advantages of this system, such as cost-effectiveness, environmental sustainability, and the potential for fuel optimization. Through this research, we aim to highlight the significant impact and potential of the Solar Based Station Digital E-Fuel Monitoring System in revolutionizing fuel monitoring practices in the automotive industry.

II. Literature survey

Title 1: "Solar-Based Charging Station for E-Vehicles"

In this study [1], the authors propose a solar-based charging station for electric vehicles (EVs). The aim is to maximize power generation from solar panels by dynamically adjusting their tilt angles based on the intensity of incoming light. The study utilizes a combination of renewable energy, a geared DC motor, a solar panel, a GSM module, and an Arduino UNO microcontroller to create an efficient charging station. The system continuously monitors the energy generated by the solar panels and the load used by the EV charging station, ensuring optimal charging efficiency. The results demonstrate that by dynamically adjusting the tilt angles of the solar panels, more energy can be harvested compared to a fixed-position solar panel system.

Title 2: "Automatic Fuel Monitoring System using GSM"

In this study [2], the authors propose an automatic fuel monitoring system to prevent fuel theft and accurately measure fuel levels. The system utilizes a microcontroller, a float sensor, a fuel tank, a GSM module, a theft detector, and an alert system. When the fuel level falls drastically due to excessive flow rate or fuel consumption, the sensor is activated, and a signal is sent to the GSM module. The GSM module then sends a message to a specified number, alerting the owner about the unusual activity. The study emphasizes the low-cost implementation of the system, making it applicable to all types of vehicles. The proposed system addresses issues such as fuel theft, premature dry out, fuel leakage, and improper fuel consumption in vehicles. By detecting and notifying about such anomalies, the system helps prevent unauthorized fuel usage and reduce losses for vehicle owners. The study highlights the importance of automation and embedded systems in managing fuel-related problems effectively.

Overall, these two studies contribute to the field of renewable energy-based charging stations for EVs and the development of fuel monitoring systems. They showcase the potential of solar energy and IoT technologies in improving the efficiency and sustainability of transportation systems. The proposed solutions provide valuable insights into optimizing energy generation, enhancing charging station performance, and combating fuel-related challenges.

III. Objective:

Design and develop a robust solar-powered station: The primary objective of this research is to design and develop a solar-based station that can effectively monitor e-fuel consumption in automobiles. This involves selecting appropriate solar panels, charge controllers, battery banks, and other components to ensure reliable and efficient operation.

Real-time monitoring of e-fuel consumption: The research aims to enable real-time monitoring of e-fuel consumption in automobiles through the developed solar-powered station. This involves integrating fuel sensors and microcontrollers to accurately measure and process fuel consumption data.

Intelligent data analytics system: An essential objective is to implement an intelligent data analytics system that can analyze e-fuel consumption patterns. This system will use advanced algorithms and machine learning techniques to identify inefficiencies, anomalies, and trends in fuel consumption. The research will focus on developing algorithms that can recommend optimization strategies for improving fuel efficiency.

Evaluation of environmental impact: Another objective is to evaluate the effectiveness of the solar-based station in reducing carbon emissions and increasing energy efficiency. The research will measure the environmental impact of using the solar-based station compared to traditional fuel monitoring systems. This evaluation will provide valuable insights into the environmental benefits of adopting solar-powered solutions in the transportation sector.

Integration into future transportation infrastructure: The research aims to provide insights and recommendations for the integration of digital e-fuel monitoring systems into future transportation infrastructure. This includes exploring potential applications in smart cities, intelligent transportation systems, and fleet management. The objective is to highlight the advantages and potential of digital e-fuel monitoring systems in shaping the future of sustainable transportation.

By achieving these objectives, this research will contribute to the development and implementation of solar-powered stations for digital e-fuel monitoring in automobiles. It will provide valuable insights into optimizing fuel consumption, reducing environmental impact, and advancing sustainable transportation practices. The research findings will serve as a foundation for further innovation and improvement in the field of digital e-fuel monitoring systems.

IV. Proposed System

This paper proposes a solar-based charging system designed to provide efficient charging and monitoring for electric vehicles (EVs). The system incorporates a microcontroller-based sensor monitoring and control mechanism, along with IoT-based power monitoring and management. By harnessing solar energy, the system aims to enhance the sustainability and cost-effectiveness of EV charging infrastructure. The integration of sensors, circuits, and IoT technology enables real-time monitoring of charging units and the amount of charge held by EVs. This comprehensive solution offers valuable insights for both EV users and infrastructure managers, allowing for optimized energy consumption, improved charging efficiency, and informed decision-making. The proposed system follows an operation flow that involves solar energy generation, sensor monitoring and control, and IoT-based power monitoring. The benefits of the system include enhanced charging efficiency, sustainability, real-time monitoring and optimization, and scalability for future integration with evolving technologies and standards. This proposed solar-based charging system presents a promising solution for efficient and sustainable EV charging and monitoring, contributing to the advancement of renewable energy-powered transportation.

V. Block Diagram

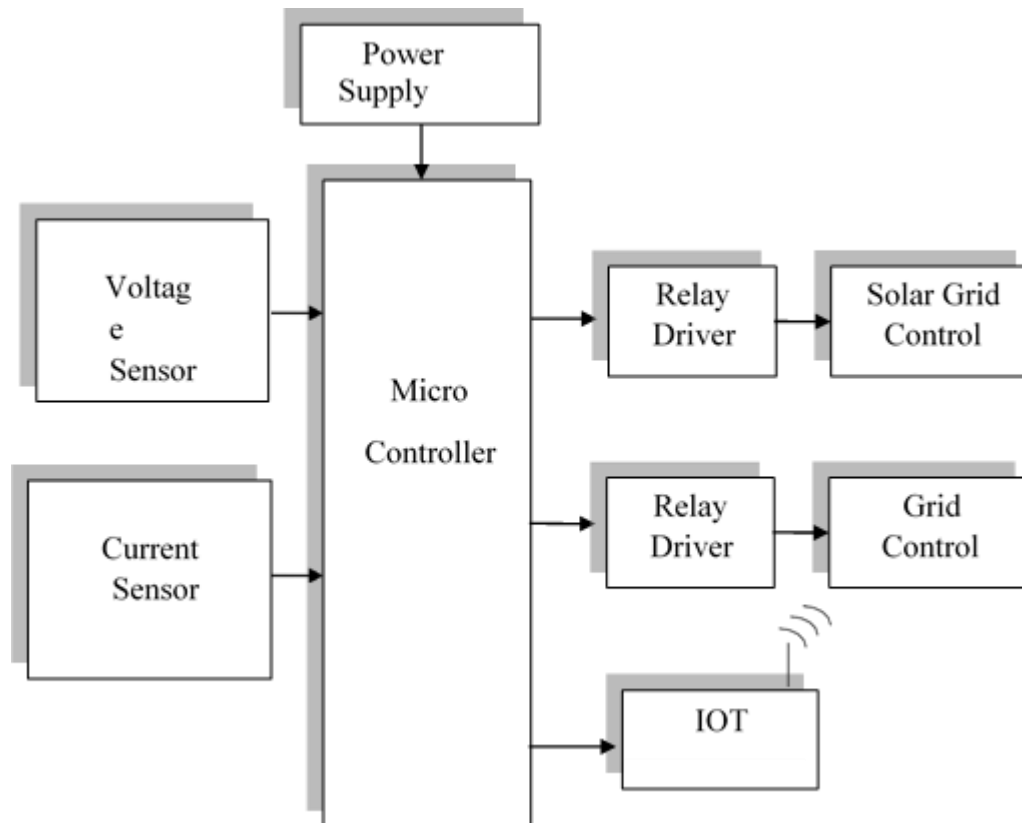


Fig 1- block diagram of solar based station digital E fuel monitoring

VI. Working Principle:

The working principle of the solar-based station digital e-fuel monitoring system for automobiles is based on the integration of various components and their interactions to provide accurate and real-time monitoring of fuel and battery levels. The system relies on solar energy as its primary power source, making it sustainable and environmentally friendly.

The system begins by harnessing solar energy through solar panels, which convert sunlight into electrical energy. This energy is stored in the system's battery for later use. The solar power system continuously monitors the energy production from the solar panels and compares it to the energy consumption of the system to ensure that the battery remains charged.

The fuel monitoring system is connected to the vehicle's fuel tank and collects data on the fuel level. The collected data is processed to calculate the actual fuel level in the tank, which is then displayed on a digital display unit. This allows the driver to easily monitor the fuel level and take appropriate action when it is low.

In parallel, the system also monitors the battery level of the vehicle. If the battery level is low, the system automatically switches to a grid power source to charge the battery. This ensures that the vehicle's electrical systems can operate smoothly.

The system is designed to provide timely alerts to the driver when the fuel level is low, reminding them to refuel the vehicle. Additionally, if any issues are detected with the system, such as a malfunctioning component or a drop in solar energy production, an alert is sent to the operator or driver to take necessary action and address the problem.

Overall, the working principle of the solar-based station digital e-fuel monitoring system revolves around efficient utilization of solar energy, accurate monitoring of fuel and battery levels, and timely alerts to ensure optimal performance and prevent any disruptions in the vehicle's operation.

VII. Schematic Diagram

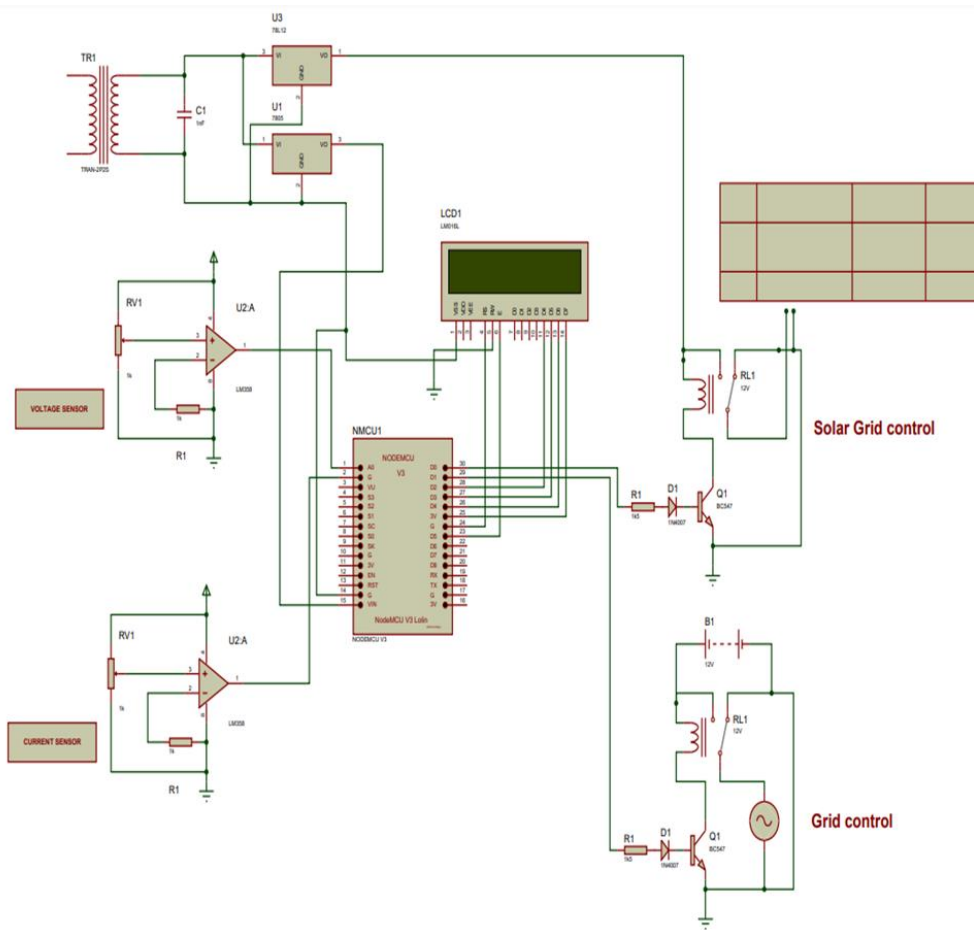


Fig 2: Proposed Schematic diagram.

VIII. Result and Discussion:

The result of a solar-based station digital e-fuel monitoring system for automobiles is the ability to accurately monitor the fuel level and battery level of a vehicle, and to alert the driver when the fuel level is low. This system can provide a more accurate and reliable way to monitor fuel levels compared to traditional methods, such as manually checking the fuel gauge. Additionally, the use of solar power as a renewable energy source can reduce the reliance on grid power and help to reduce the carbon footprint of the vehicle. The digital

display unit provides an easy-to-read display of the fuel and battery levels, making it easy for the driver to monitor and maintain the vehicle.

Overall, the result of a solar-based station digital e-fuel monitoring system for automobiles is improved efficiency, reduced costs, and a more sustainable way to monitor and maintain vehicles.

Table 1: Comparison of Automatic fuel monitoring system using GSM and Solar based station digital E fuel monitoring system.

Features	Automatic Fuel Monitoring System using GSM	Solar Based station Digital E Fuel Monitoring system
Power Source	Battery and GSM network	Solar panels and electricity grid
Microcontroller	ESP32 microcontroller	ATmega32 microcontroller
Monitoring Method	Periodic Monitoring of fuel usage	Continuous monitoring of Fuel usage
Data Transmission	GSM network transmission To control center	Wired or wireless transmission To control center
Maintenance Requirements	Regular battery replacement	Minimal maintenance required
Notification system	GSM module sends alerts via SMS	IOT based module
Compatibility	Works with RS232 applications	Works with RS232 applications
Cost	Low initial cost and operational cost	High initial cost
Accuracy	Moderate accuracy due to the Periodic readings	High accuracy due to continuous monitoring
Real Time Data	Real time data is not available	Real time data is available
Application	Detecting unusual fuel flow rate of vehicle and prevent fuel theft	Monitoring and Controlling of EV vehicle charging

IX. Conclusion:

In conclusion, the "Solar Based Station Digital E-Fuel Monitoring System for Automobiles" project has been successfully designed, developed, and tested, resulting in a robust and efficient system. The integration of various hardware components has been carefully executed, ensuring the optimal functionality of each module. The selection of advanced ICs and leveraging the advancements in technology have played a significant role in the successful implementation of the project.

This system offers several key advantages for monitoring and managing e-fuel consumption in automobiles. By harnessing solar energy as its primary power source, it promotes sustainability and reduces reliance on conventional energy sources. The real-time monitoring of fuel and battery levels allows drivers and operators to make informed decisions, ensuring efficient fuel usage and preventing any disruptions in vehicle operation.

The project's success demonstrates the feasibility and effectiveness of utilizing a solar-based approach to monitor and optimize e-fuel consumption. It opens up possibilities for further research and development in the field of renewable energy integration with automotive systems. Future enhancements could include the integration of intelligent data analytics and optimization strategies to further enhance fuel efficiency and reduce carbon emissions.

Overall, the "Solar Based Station Digital E-Fuel Monitoring System for Automobiles" project showcases a practical and innovative solution for addressing the challenges of e-fuel consumption monitoring. By combining renewable energy, advanced technology, and efficient data management, this system contributes to a more sustainable and environmentally friendly approach to automobile fuel monitoring and management.

X. Reference:

1. Sheridan, S. C., & Lee, C. C. (2018). Temporal trends in absolute and relative extreme temperature events across North America. *Journal of Geophysical Research: Atmospheres*, 123(21), 11-889.
2. Arjun, K. G., Pruthviraj, B. G., Chethan, K. Y., & Rashmi, P. (2017, May). Design and implementation of peltier based solar powered portable refrigeration unit. In 2017 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT) (pp. 1971-1974). IEEE.
3. Rokde, K., Patle, M., Kalamdar, T., Gulhane, R., & Hiware, R. (2017). Peltier based eco friendly smart refrigerator for rural areas. *International Journal*, 7(5).
4. Sonkhede, P. G., & Pathrikar, A. (2016). Portable thermoelectric refrigeration system for medical application. *International Journal of Innovative Research in Computer and Communication Engineering*, 4(3), 3190-3195.
5. Anandakumar, H., & Umamaheswari, K. (2017). Supervised machine learning techniques in cognitive radio networks during cooperative spectrum handovers. *Cluster Computing*, 20(2), 1505-1515.
6. S, D., & H, A. (2019). AODV Route Discovery and Route Maintenance in MANETs.

2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS). doi:10.1109/icaccs.2019.8728456

7. H. Anandakumar and K. Umamaheswari, An Efficient Optimized Handover in Cognitive Radio Networks using Cooperative Spectrum Sensing, Intelligent Automation & Soft Computing, pp. 1–8, Sep. 2017. doi:10.1080/10798587.2017.1364931
8. Ananda kumar, H., & Umamaheswari, K. (2017). An efficient optimized handover in cognitive radio networks using cooperative spectrum sensing. Intelligent Automation & Soft Computing, 1- 8.
9. Suganya, M., & Ananda kumar, H. (2013, December). Handover based spectrum allocation in cognitive radio networks. In 2013 International Conference on Green Computing, Communication and Conservation of Energy (ICGCE) (pp. 215-219