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Energy Audit And Motor Failure Forecasting

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Abstract : *Industrial facilities often face energy inefficiencies due to outdated equipment and poor maintenance practices. These inefficiencies can result in significant operational costs and compliance issues. This paper explores the integration of energy audits with motor failure forecasting to address such challenges. By analyzing energy consumption patterns and employing machine learning algorithms for predictive maintenance, organizations can achieve substantial cost reductions and operational reliability. The methodology involves the development of a microprocessor-based real-time data acquisition system and a mobile application for forecasting. The app, designed using Android Studio with Java or Kotlin, consolidates historical and real-time data, providing actionable insights to maintenance teams. This integration significantly enhances efficiency, reduces downtime, and supports sustainability by minimizing the carbon footprint. Case studies demonstrating successful implementations highlight the benefits of combining these technologies. Ultimately, the study emphasizes the role of proactive energy management in driving industrial excellence.*

Keywords - *Energy audits, motor failure forecasting, predictive maintenance, machine learning, sustainability, industrial efficiency, carbon footprint.*

I. INTRODUCTION

Energy audits and motor failure forecasting are crucial for enhancing industrial efficiency and reliability. Traditional maintenance methods often fail to utilize real-time data, leading to inefficiencies and unplanned outages. This paper aims to integrate energy audits with predictive maintenance techniques to optimize operational performance.

Energy audits provide detailed insights into energy consumption patterns and equipment efficiency, identifying areas for improvement. Motor failure forecasting, using machine learning algorithms, predicts potential breakdowns, enabling preemptive actions. The integration of these processes offers a holistic approach to industrial energy management. This research focuses on developing a mobile application for real-time monitoring and forecasting, leveraging historical and real-time data for actionable insights.

II. LITERATURE SURVEY

The literature highlights advancements in energy auditing and predictive maintenance. Mishuchkov et al. (2020) emphasized digital technologies in energy audits, while Tinazzi et al. (2020) introduced parameter-free predictive control methods for motors. Pargaien et al. (2020) demonstrated renewable energy's role in cost mitigation during energy audits. These studies underscore the need for integrating audit data with real-time monitoring for effective motor failure forecasting.

III. METHODOLOGY

3.1 Methodology:
The proposed system integrates real-time data acquisition, database generation, and mobile application development. Key components include:

a) **Real-time data acquisition:** A microprocessor collects data on voltage, current, temperature, and frequency, indicating motor health.
b) **Database generation:** Historical data from energy audits enhances predictive accuracy.
c) **Mobile application:** Developed using Android Studio, the app provides forecasts and reports to maintenance teams.
d) **User interface:** Enables visualization of motor performance and maintenance scheduling.

3.2 Mathematical Calculations:

$$\textbf{Synchronous Speed (RPM)} = \frac{\mathbf{12OF}}{\mathbf{P}} \quad \text{Eqn.1}$$

$$\textbf{Slip (\%)} = \frac{\textbf{Synchronous Speed} - \textbf{Full Load Rated Speed}}{\textbf{Synchronous Speed}} \quad \text{Eqn. 2}$$

$$\textbf{Power Factor} = \textbf{Cos}\emptyset = \frac{\textbf{kW}}{\textbf{kVA}} \quad \text{Eqn. 3}$$

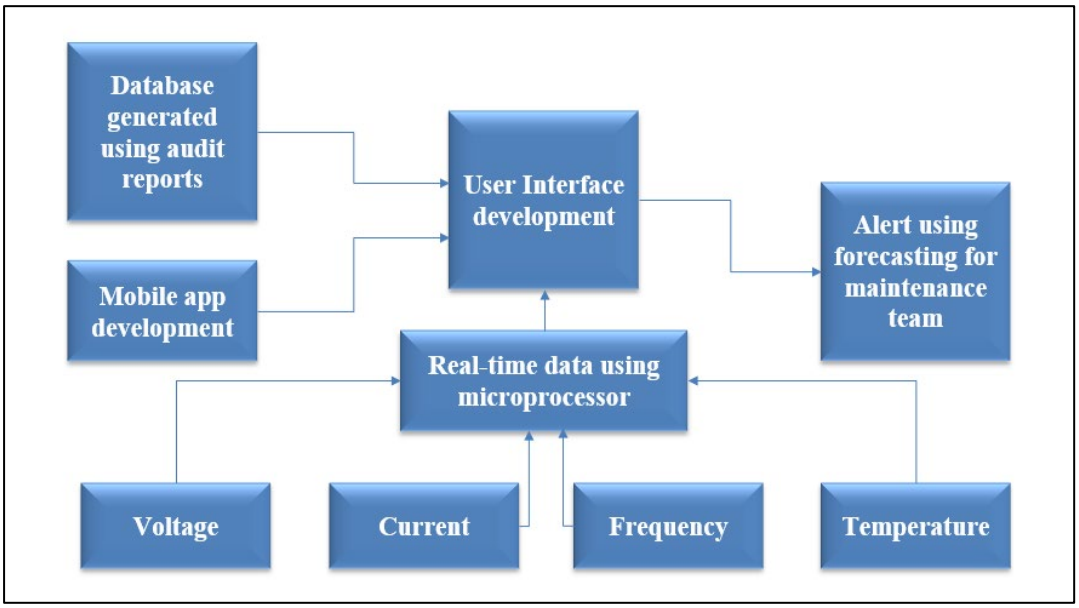

Fig. 4.1 Block Diagram of System

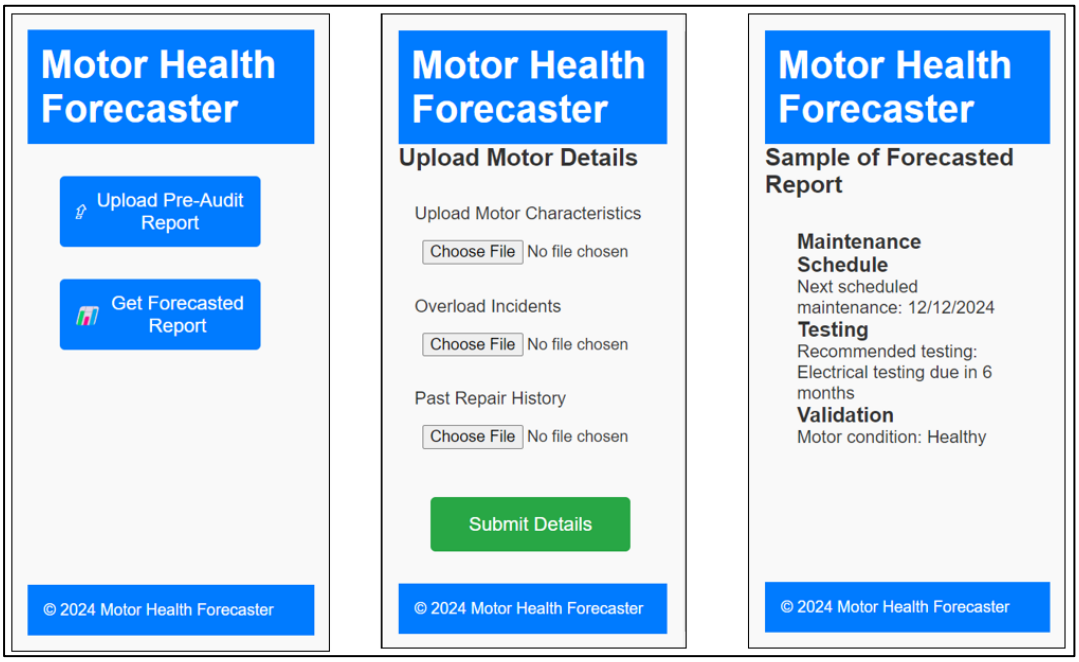

Fig. 4.2 Reference Model of System

Table. 4.1 Cost Estimation

Sr. No.	Course	Price in Rs.
1.	Android App Development with Kotlin	499/-
2.	Energy Audit	449/-
3.	Data Entry Skills	449/-
Total		**1397/-**

IV. CONCLUSION

Integrating energy audits with motor failure forecasting provides a comprehensive approach to industrial energy management. By leveraging real-time data and predictive analytics, organizations can enhance efficiency, reduce costs, and achieve sustainability goals. The proposed system demonstrates the potential for significant operational improvements, paving the way for smarter industrial practices.

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