e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:11/November-2024 Impact Factor- 8.187 www.irjmets.com

ASSET MANAGEMENT SYSTEMS FOR STATIC AND PORTABLE ELECTROMECHANICAL MACHINES

Poonam Ternikar[*1], Aayush Nalawade[*2], Kirtan Patel[*3], Sairaj Patil[*4], Varad Gandhi[*5]

[*1]Lecturer, Department Of Information Technology, Pimpri Chinchwad Polytechnic, Pune, Maharashtra, India.

[*2,3,4,5]Student, Department Of Information Technology, Pimpri Chinchwad Polytechnic, Pune, Maharashtra, India.

DOI : https://www.doi.org/10.56726/IRJMETS63213

ABSTRACT

In today's industrial landscape, the performance and longevity of electromechanical machines are critical to operational success. These machines, whether static (such as large industrial motors, transformers, and HVAC systems) or portable (such as power tools, generators, and medical equipment), are essential in sectors like manufacturing, healthcare, and utilities. However, improper management of these assets can lead to costly downtime, inefficient maintenance practices, and premature equipment failure. This necessitates the development of a robust Asset Management System (AMS) specifically designed to cater to both static and portable electromechanical machines.

Keywords: Software Asset Management, Error Tracking, Maintenance Automation, Operational Efficiency.

I. INTRODUCTION

Asset Management Systems (AMS) are crucial for the effective management and maintenance of electromechanical machines in industries such as manufacturing, healthcare, and utilities. These machines, whether static or portable, significantly impact productivity and operational costs. Static machines, like large motors and transformers, play a critical role in continuous processes, while portable machines, such as power tools and medical devices, offer flexibility but face challenges in tracking their usage and condition. Without a structured AMS, organizations risk unnecessary downtime, equipment failures, and higher operational expenses, highlighting the need for a tailored system that meets the specific requirements of both types of machines. The challenges in managing static and portable machines often stem from inconsistent maintenance practices. Traditional reactive maintenance approaches lead to significant financial losses due to unexpected breakdowns and extended downtimes. In contrast, adopting predictive and condition-based maintenance strategies can help organizations address potential issues before they escalate, thereby minimizing disruptions. Predictive maintenance analyzes machine data to forecast failures, ensuring timely interventions, while condition-based maintenance relies on real-time performance monitoring. This proactive approach not only reduces costs but also enhances the reliability of static machines and the performance of portable machines operating in varied environments.

II. METHODOLOGY

The project will be carried out in the following phases:

Phase 1: Research and Requirement Analysis

The focus is on examining existing asset management systems to identify critical requirements for handling both static and portable machines. This phase includes defining both functional and non-functional requirements specific to these types of assets.

Phase 2: System Design

The goal is to create a user-friendly interface for data entry, performance tracking, and maintenance scheduling. Additionally, the back-end is designed to store machine data and maintenance logs, with algorithms developed for predictive maintenance based on machine usage history.

Phase 3: Development

The software platform is built to facilitate asset monitoring through real-time data input, maintenance alerts, and condition-based notifications. A feature is also added to manage the lifecycle of portable machines, tracking aspects like deployment, maintenance, and location history.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:11/November-2024 Impact Factor- 8.187 www.irjmets.com

Phase 4: Testing and Validation

It involves testing the system with simulated data to verify the accuracy of maintenance predictions and scheduling. The system's functionality is validated across different industrial scenarios to ensure adaptability and reliability.

Phase 5: Deployment and Support

The system is implemented in a real-world industrial setting. Training sessions are provided to users to help them operate the system effectively, along with ongoing support for any troubleshooting needs.

III. MODELING AND ANALYSIS

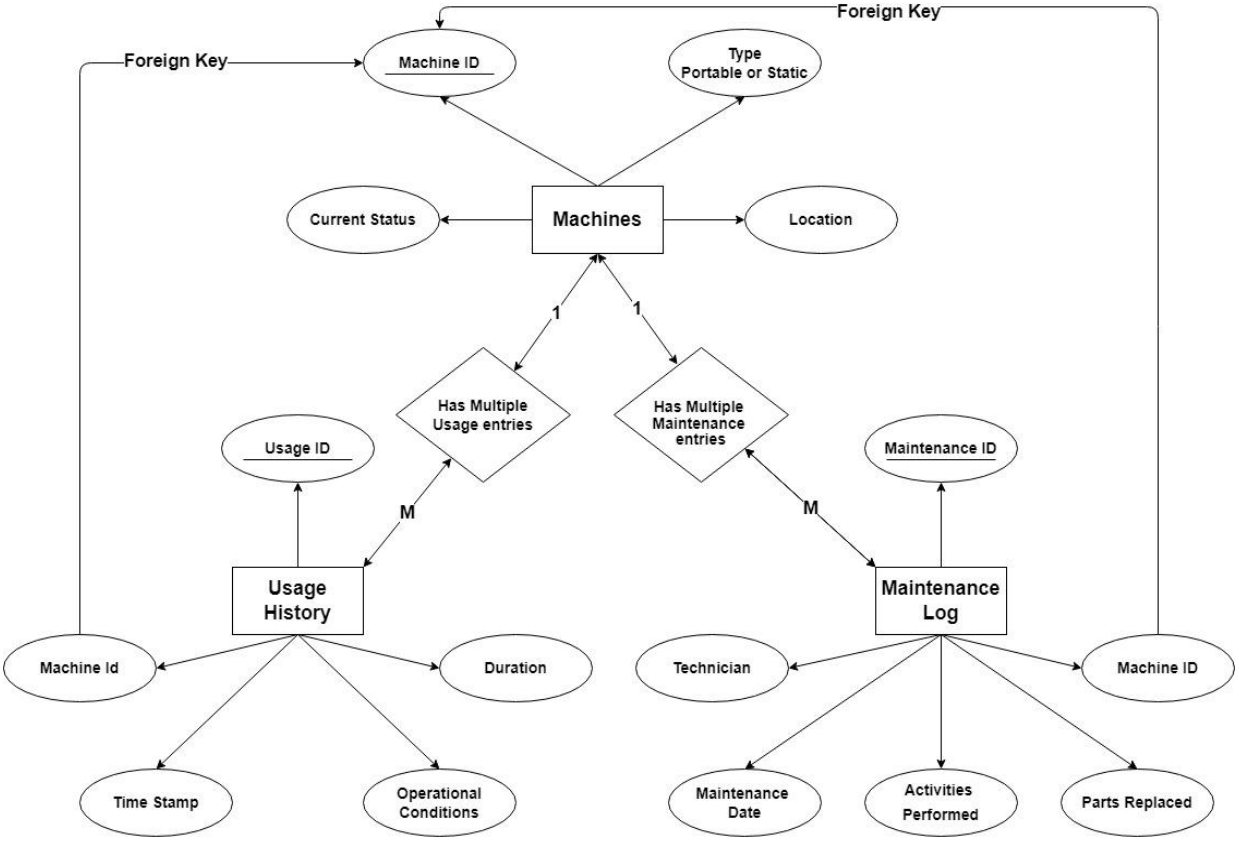

Figure 1: ER Model

Prototype Workflow for Asset Management System for Static and Portable Electric Machines

1. **User Registration and Role Assignment**:
   - Users sign up and are assigned roles such as Inventory Manager, Maintenance Technician, or Admin, each with specific access permissions tailored to their tasks. This role-based access ensures users interact only with relevant system functionalities, enhancing security and streamlining operations.
2. **Monitoring via Real-Time Dashboard**:
   - A centralized dashboard provides a real-time overview of machine statuses, inventory levels, and upcoming maintenance requirements. Users can track critical metrics like machine usage rates and operational status, allowing for quick decision-making and improved resource management.
3. **Demand Forecasting Alerts**:
   - Based on historical usage data, the system generates alerts for inventory demand forecasting. These alerts help anticipate stock shortages or overstock risks, allowing users to maintain optimal inventory levels and avoid potential disruptions due to supply chain issues.
4. **Resource Allocation for Portable Machines**:
   - Users can allocate portable machines to specific projects or locations, tracking their current and historical location, usage, and condition. This functionality ensures effective deployment of portable assets and provides insight into utilization trends across different sites.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:11/November-2024 Impact Factor- 8.187 www.irjmets.com

5. **Reporting on Inventory Performance, Invoices, and Maintenance Records**:
   - The system offers comprehensive reporting features, allowing users to generate detailed reports on inventory performance, maintenance history, and financial records, including invoices. These reports provide valuable insights into asset performance and operational costs, supporting informed decision-making and planning.

IV. RESULTS AND DISCUSSION

The results of implementing this AMS include:

1. **Efficient Inventory Tracking**:
   - The system successfully tracked inventory data using manual data entry, allowing users to record machine IDs, usage histories, and maintenance logs without relying on IoT sensors.
   - An SQL database was implemented to manage large volumes of data related to machine inventory, resulting in organized and easily retrievable data.
2. **Data Analysis and Predictive Maintenance**:
   - Using historical data on machine usage and maintenance logs, the system provided predictive maintenance insights, helping users schedule maintenance at optimal times.
   - Predictive analytics reduced the risk of unexpected machine breakdowns by flagging equipment that needed attention based on past usage patterns.
3. **User Roles and Access Management**:
   - Different user roles were created (such as Inventory Manager and Maintenance Technician), each with specific permissions, which enhanced data security and streamlined operations.
   - The role-based access allowed for efficient allocation of responsibilities, ensuring each user could interact with relevant parts of the system, such as updating maintenance logs or tracking machine locations.
4. **Comprehensive Reporting and Dashboard**:
   - The AMS provided a real-time dashboard that displayed critical metrics such as machine status, inventory levels, and upcoming maintenance schedules, enabling informed decision-making.
   - Automated report generation enabled users to access detailed records of machine performance, maintenance activities, and inventory trends.
5. **System Performance**:
   - The system demonstrated effective data processing capabilities, with fast response times for CRUD operations (Create, Read, Update, Delete) within the SQL database.
   - The predictive maintenance algorithm delivered reliable scheduling suggestions, reducing maintenance costs and increasing machine uptime.

V. CONCLUSION

In conclusion, the Asset Management System (AMS) for Static and Portable Electric Machines demonstrates a comprehensive architecture that effectively integrates manual data entry with a robust SQL database framework. The predictive maintenance leverage historical data to optimize operational efficiency, minimizing unplanned downtimes and associated costs. The real-time monitoring dashboard and role-based access control enhance user interaction and data security. Future enhancements, including advanced analytics and automation, are recommended to further refine system performance and scalability, positioning the AMS as a pivotal tool for asset management across diverse industrial applications.

VI. REFERENCES

[1] Shikha, K., & Shukla, M. (2023). Asset Management of Large Electric Machines through Monitoring of Electric Insulation. Journal of Electrical Engineering & Technology, 18(2), 785-792.

[2] Liu, Y., & Zeng, Y. (2022). A Methodology for Asset Management in Electric Power Systems. IEEE Transactions on Power Systems, 37(4), 3525-3536.

[3] Othman, F. N., & Mamat, R. (2021). Development of a Mobile Application for Asset Management in Industrial Environments. International Journal of Information Technology, 13(3), 827-834.

[4] Khodabakhshian, A., & Rahimi, A. (2021). Reliability-Centered Maintenance for Static and Portable Machinery. Maintenance and Reliability, 23(1), 112-119.