International Journal of Computer Science and Engineering (IJCSE)
ISSN (P): 2278–9960; ISSN (E): 2278–9979
Vol. 12, Issue 2, Jul–Dec 2023; 323–372

International Academy of Science, Engineering and Technology
Connecting Researchers; Nurturing Innovations

PREDICTIVE MAINTENANCE STRATEGIES FOR PROLONGING LIFESPAN OF ELECTROMECHANICAL COMPONENTS

Akshay Gaikwad[1], Srikanthudu Avancha[2], Vijay Bhasker Reddy Bhimanapati[3], Om Goel[4], Niharika Singh[5] & Raghav Agarwal[6]

[1]Rochester Institute of Technology, Rochester, New York, US,

[2]Department of CSE Bharathidasan University Tiruchirappalli Tamilnadu, India

[3]Department of Computer Science Southern University and A&M College L.A., U.S.A.

[4]ABES Engineering College Ghaziabad, India

[5]ABES Engineering College Ghaziabad, India

[6]Assistant System Engineer, TCS Bangaluru, India

ABSTRACT

Predictive maintenance (PdM) has emerged as a key strategy for enhancing the longevity and reliability of electromechanical components in various industries. This approach leverages real-time data and advanced analytics, including machine learning algorithms, to predict potential failures before they occur. By continuously monitoring critical parameters such as temperature, vibration, and electrical currents, predictive maintenance allows for early detection of performance degradation, reducing unplanned downtime and optimizing the maintenance schedule. This paper explores the fundamental principles of PdM, its application to electromechanical systems, and the benefits of transitioning from traditional time-based maintenance to condition-based models. The integration of sensors and IoT (Internet of Things) devices with predictive algorithms not only extends the operational lifespan of components but also minimizes maintenance costs and improves overall equipment efficiency. Challenges such as data integration, model accuracy, and implementation in complex systems are discussed, alongside future opportunities for enhancing predictive maintenance strategies with advancements in artificial intelligence and cloud computing. Through case studies and analysis, this paper demonstrates the impact of PdM on the sustainability and reliability of electromechanical components in industries such as manufacturing, healthcare, and transportation.

KEYWORDS: *Predictive maintenance, electromechanical components, machine learning, real-time data, condition-based maintenance, IoT, sensors, operational lifespan, cost reduction, equipment efficiency, artificial intelligence, cloud computing*

Article History

Received: *12 Nov 2023* | ***Revised:*** *18 Nov 2023* | ***Accepted:*** *28 Nov 2023*