World Academy of Science, Engineering and Technology
International Journal of Industrial and Manufacturing Engineering
Vol:18, No:04, 2024

Artificial Intelligence-Based Thermal Management of Battery System for Electric Vehicles

Authors : Raghunandan Gurumurthy, Aricson Pereira, Sandeep Patil

Abstract : The escalating adoption of electric vehicles (EVs) across the globe has underscored the critical importance of advancing battery system technologies. This has catalyzed a shift towards the design and development of battery systems that not only exhibit higher energy efficiency but also boast enhanced thermal performance and sophisticated multi-material enclosures. A significant leap in this domain has been the incorporation of simulation-based design optimization for battery packs and Battery Management Systems (BMS), a move further enriched by integrating artificial intelligence/machine learning (AI/ML) approaches. These strategies are pivotal in refining the design, manufacturing, and operational processes for electric vehicles and energy storage systems. By leveraging AI/ML, stakeholders can now predict battery performance metrics—such as State of Health, State of Charge, and State of Power—with unprecedented accuracy. Furthermore, as Li-ion batteries (LIBs) become more prevalent in urban settings, the imperative for bolstering thermal and fire resilience has intensified. This has propelled Battery Thermal Management Systems (BTMs) to the forefront of energy storage research, highlighting the role of machine learning and AI not just as tools for enhanced safety management through accurate temperature forecasts and diagnostics but also as indispensable allies in the early detection and warning of potential battery fires.

Keywords : electric vehicles, battery thermal management, industrial engineering, machine learning, artificial intelligence, manufacturing
Conference Title : ICIPE 2024 : International Conference on Industrial and Production Engineering
Conference Location : New York, United States
Conference Dates : April 22-23, 2024