Battery Lifetime Prediction for Electric Vehicle Fleets

Real-time battery state monitoring

THE CHALLENGE

The lifetime of lithium-ion batteries is a major talking point in the automotive industry today, as it directly impacts the electrical range of an electric vehicle (EV) throughout its life cycle. As the battery aging limits the performance of the EV in terms of energy storage and power output capabilities, it should be considered to optimize the battery design, management and the EV's operation strategy.

While battery cell aging is driven by complex interactions of physical and chemical reactions, the lifetime of any electric vehicle is massively influenced by the driving behavior of the end user (driving, charging, parking) and environmental conditions. Nowadays, battery aging analysis is mainly performed on a battery cell level in the early vehicle development stage, but the lifetime requirement from the vehicle's in-use phase is rarely included.

THE AVL SOLUTION

AVL is developing a toolchain of battery testing, battery aging simulation and vehicle fleet tracking to predict the battery lifetime for individual vehicles according to their specific driving usage.

AVL provides remarkably secure data transfer from the vehicle on the road to a customized analytics platform, where the real-time battery data are processed for visualization, statistics, digital twin and predictive maintenance applications.

Based on the direct relationship between the monitored battery operation mode and the associated damage due to aging effects, the presented solution provides valuable insight for battery development, in-use and second-life applications.

THE ADDED VALUE

- Real-time battery observation for all vehicles in the fleet
- Real-time battery damage monitoring
- Fleet monitoring and predictive maintenance
- Optimization of vehicle and battery operation strategy to maximize electric range and lifetime
- Prediction of the battery's end of life
- Planning of battery replacement costs and determination of battery's 2nd life value
- Identification of routes and operating conditions that primarily drive aging

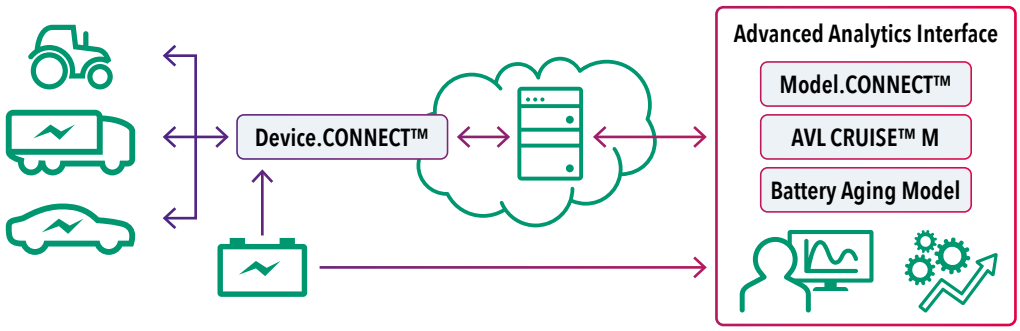
BENEFITS

- Improve battery and vehicle operation strategy by understanding the main drivers of battery aging
- Minimize cell aging tests by design of experiment
- Plan battery replacement costs

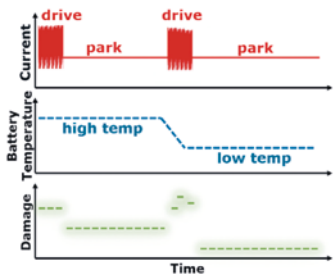
- Know WHEN and WHY the battery reaches its end of life
- Improve vehicle warranty process
- Optimize operation strategy on battery and vehicle level to increase the electric range

- Optimized vehicle routes maximize electric range and lifetime
- Balance battery life across the vehicle fleet

TOOLCHAIN FOR LIFETIME OPTIMIZATION AND VERIFICATION



IDENTIFY BATTERY DAMAGING SCENARIOS



ADVANCED ANALYTICS INTERFACE

FIND OUT MORE

AVL List GmbH
Hans-List-Platz 1, 8020 Graz
Austria

Phone +43 316 787-0
Fax +43 316 787-400
E-mail iodp@avl.com

www.avl.com

January 2021, Classification Public