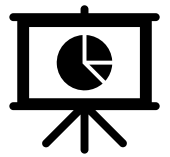
SBOVA

Smart Battery Optimization Vehicles with AI

DECEMBER 2023

Context



- To ensure the success of CO2 emission reduction plans, companies are electrifying their vehicle fleets. They are **equipping themselves with battery-powered vehicles and electric charging systems**. This represents a major shift in the management and optimization of corporate vehicle fleets. It's worth noting that a **wide range of vehicles** is involved, from cars to trucks, forklifts, AGVs (Automated Guided Vehicles), and even drones.

- **New challenges arise for companies in this context**, both **operational** (e.g., maximization of the vehicles' availability, reduce energy cost, maximize the lifespan of batteries…) and in the **investment phase** (battery technology most suitable to their activities, size of the charging infrastructure…).

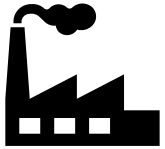
- **Batteries are complex system and require a particular expertise** in particular in the understanding of its **State of Health (SoH)** and **remaining capacity.**

- Companies and software solutions address part of these various issues, but **few consider them comprehensively.**

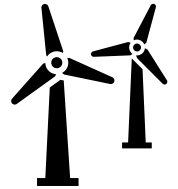
Solution: A dynamic Smart Battery Optimization Vehicles with AI

Input:

Vehicle and battery fleet data

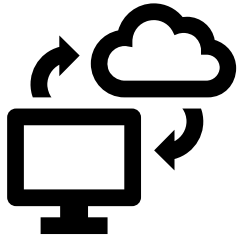


Company activities data



Environment's data (price, energy source, etc.)

AI Algorithms, and Integrated intelligent interface



SBOVA Technology

Output:

Short-term fleet optimisation:

- Charging optimization
- Fleet supervision
- Battery management

Long-term fleet optimisation:

- Selection of suitable vehicles
- Selection of suitable batteries

Key Characteristics summary

Description

- SBOVA offers a solution designed to **optimize a company's fleet of vehicles** using new or reconditioned batteries by maximizing their availability for specific activities (e.g. passenger transport, parcel delivery, warehouse etc.), and increasing the battery's lifetime.
- It's a comprehensive approach, from helping companies make medium- and long-term investment decisions (vehicle and battery type) to optimising the energy and cost efficiency of their existing vehicle fleets in the short term.
- SBOVA **masters predictive models of battery ageing**. It is therefore **possible to simulate the operation of a second-life battery*.**
- It can be adapted to a wide range of applications (road vehicle, forklift...).

Applications (Non exhaustive)

- Electric car, Airport vehicles, Logistics vehicles (forklifts, AGV), Trucks, Buses.
  - Any electric vehicle fleet.

Enerdata

*A second life is a battery that has already been used for a different activity and that has been repurposed

Main Benefits

Vs. Classical Fleet Management System

- Optimizes the availability of vehicles
- Simulates the decreasing State of Health of operating batteries (including second-life ones)
- Helps investment sizing decision and takes into account the type of battery used.
- Allows smart charging of vehicles (charge when the energy price is the lowest)
- Reduces TCO (Total Cost of Ownership), by optimizing the battery's lifetime
- Adapts to inhomogeneous types of vehicles and end-uses
- Adapts optimally to the company's activities

Development status & next steps

Development Status

- **Existing project:** Theoretical principle of the algorithm and knowledge of the appropriate source codes
- **Origin:** developed by INSA Lyon and INSA Strasbourg, France
- **Technology transfer:** Possibilities as a product or as a license

Relevant bibliography

- Babin, N. Rizoug, **T. Mesbahi**, D. Boscher, Z. Hamdoun and C. Larouci, "Total Cost of Ownership Improvement of Commercial Electric Vehicles using Battery Sizing and Intelligent Charge Method," in IEEE Transactions on Industry Applications, 2018.
- **T. Mesbahi**, N. Rizoug, P. Bartholomeüs, R. Sadoun, F. Khenfri and P. Le Moigne, "Dynamic Model of LiIon Batteries Incorporating Electrothermal and Ageing Aspects for Electric Vehicle Applications," in IEEE Transactions on Industrial Electronics.
- Jorge, I., **Mesbahi, T.,** Samet, A., & Boné, R. (2023). Time Series Feature extraction for Lithium-Ion batteries State-Of-Health prediction. Journal of Energy Storage.

Next steps

- **Spring 2024:** Creation of a digital model for testing with manufacturers

For more information,

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