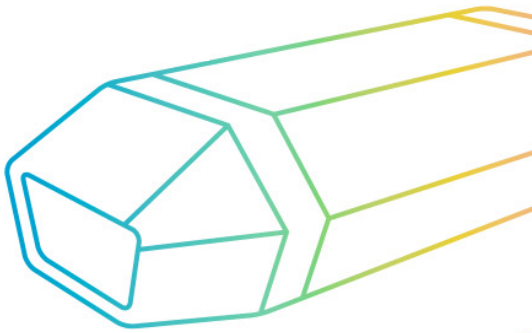
AVILOO
BATTERY DIAGNOSTICS

AVILOO
CASE STUDY

EFFICIENT FLEET MANAGEMENT

Use of AVILOO battery diagnostics in fleet management

The number of partially or fully electric fleets is continuously increasing. The lack of public data and the rapid development of this area of technology presents fleet management with difficult tasks. It is crucial to continuously monitor and analyze vehicles in order to optimize fleet performance based on the data obtained.



TASK:

As electromobility continues to develop and the use of electric vehicles becomes more widespread, there are constantly new challenges to increase efficiency and save time.

Experts and institutions are working on an optimal charging infrastructure to improve the performance of electric vehicles. Fleet management experts are working on determining the range of their vehicles and optimizing charging processes. This requires the testing and monitoring of vehicles within a fleet with detailed cross-analyses and evaluations.

AVILOO has extensive experience in various fleet management projects. For this case study, a collaboration with a technologically advanced company from Austria was selected, using all available AVILOO services, including a customized approach to data analysis and processing.

The client was diligent in managing its resources and sought to gain important insights from extensive analysis that could be useful for future endeavors. A number of tasks were therefore defined:

- Thorough examination of individual vehicle batteries in various segments to reduce costs and conduct predictive maintenance
- Analysis of current routes for optimization
- Continuous monitoring of vehicles to record battery data and ensure employee safety
- Expert advice on the best purchase options for fleet renewal

DURATION OF THE PROJECT:
The project has a duration of 2 years, and it began in October 2021.

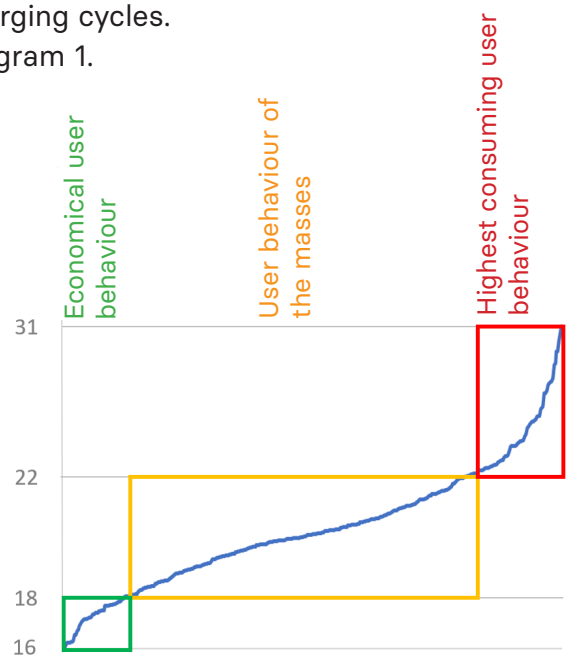
WORK PROCESSES:

AVILOO supports preventive fleet maintenance at these points:

1. Minimize charging cicles and energy consumtion

User behavior has a significant impact on energy consumption, influencing the number of charging cycles by up to a factor of two! Diagram 1 illustrates the energy consumption over the lifespan of 408 Tesla Model 3 LR vehicles, revealing a stark contrast between economical and high-consuming user behaviors. On average, economically-minded users consume 16–18 kWh/100km, while those with high-consuming habits consume nearly double that amount.
It is crucial to train EV fleet users to adopt practices that optimize energy efficiency and minimize charging cycles:
- During summer, park the vehicle under shade, preferably underground, to reduce the energy needed for battery and cabin preconditioning, thus lowering charging cycles.
- In winter, park the car in garages to minimize energy usage for pre-conditioning and reduce charging cycles.

Diagram 1.



WORK PROCESSES:

-Utilize an AC-cable for cabin and battery pre-conditioning to decrease charging cycles.
- Drive economically and foresightedly to minimize energy consumption during acceleration, reducing the need for additional charging cycles caused by recuperation. This also significantly lowers tire wear.
- Use Tesla Model 3 “dog mode” sparingly, as its frequent usage contributes to an increase in the number of charging cycles.

2. Determine and adhere to maintenance intervals: The FLASH test is of crucial importance as part of the (semi-annual to annual) vehicle inspection. This test determines the battery status quickly and efficiently. If the AVILOO score shows poor results, the PREMIUM test is required to determine the SoH value in detail. If a „Red Flag“ alarm without a numerical value appears in the report, the battery must be thoroughly examined at cell level to determine the type of anomaly. As experience from many practical examples has shown, AVILOO actively supports the repair workshops with a detailed report that helps the technicians to isolate and rectify the fault more quickly.

Diagram 2.
Analysis of SoH values over time

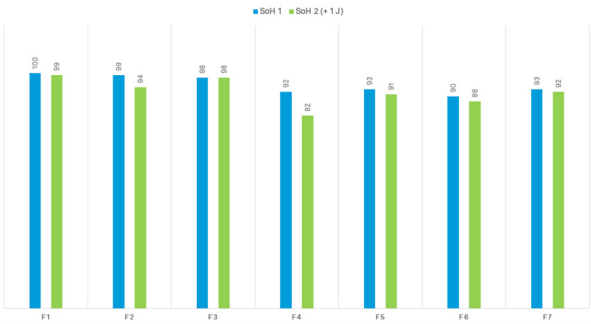
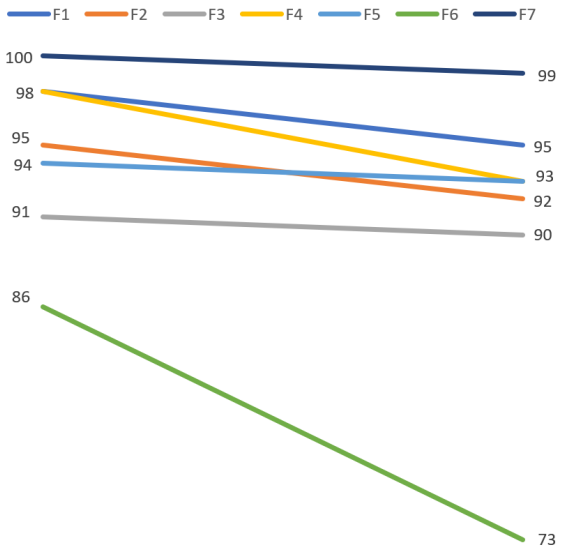


Diagram 3.
Analysis of the FLASH Test score over time



3. Decisions based on the analysis of data
Analyzing data plays an essential role in decision-making. By continuously monitoring the vehicles, real-time data is stored in the AVILOO Battery Data Cloud, which enables subsequent analysis in various forms.

4. Monitor important KPIs and optimize processes accordingly
Monitoring can be adapted to the customer’s specific needs and objectives, e.g. monitoring important KPIs and optimizing processes accordingly.

5. Minimize risks and reduce costs
Inventory monitoring can minimize risks and reduce costs. - Monitoring the battery status is useful to ensure that vehicles are replaced in good time, thus avoiding idle times.

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CARA Approved Battery Health Check

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OBJECTIVES:

A detailed explanation of the work processes, broken down by objectives:

1. Analysis of individual vehicles in different segments:
The vehicles are tested twice a year in two different ways, with the results being recorded and monitored.
- Once a year, the PREMIUM test is carried out, a comprehensive test that measures the SoH values during discharge and expresses them as a percentage.
- A FLASH test is carried out on every vehicle every six months. It is a fast and efficient method, in which four different categories are analyzed and evaluated by comparing them with the extensive AVILOO database.

2. Analysis of spinning routes:
The input data for this analysis is recorded by the vehicle monitoring system. In addition to the standard battery data, GPS data is also analyzed to determine the effective discharge of the battery in relation to the number of kilometers covered. The analysis also includes the terrain conditions and other relevant factors, such as the consumption of heating or air conditioning.

3. Monitoring 24/7:
Continuous vehicle monitoring is carried out for several reasons - in addition to collecting valuable battery data for various analyses, it also serves to monitor vehicle efficiency to increase employee safety in order to successfully complete the planned route

4. Advice on the best purchase options:
Fleet management also includes cost management, including the replacement of existing vehicles and the purchase of new vehicles. As part of the cooperation with customers, advice is offered on the best time to replace existing vehicles. It also evaluates, which of the vehicles available on the market best suits the customer's needs.

Graph 1.
Detailed testing results table

	Vehicle 1		Vehicle 2		Vehicle 3		Vehicle 4		Vehicle 5		Vehicle 6		Vehicle 7		Vehicle 8		Vehicle 9		Vehicle 10	
Date	09.2022	08.2023	11.2022	06.2023	11.2022	06.2023	10.2022	08.2023	05.2023	08.2023	01.2023	08.2023	10.2022	11.2022	11.2022	06.2023	11.2022	06.2023	11.2022	06.2023
AVILOO Score	86	97	100	100	93	100	86	73	94	93	98	93	84	95	91	90	95	92	98	95
High Voltage Battery Usage and History	39/50	48/50	50/50	50/50	50/50	50/50	38/50	51/70	46/50	45/50	48/50	65/70	47/50	47/50	43/50	43/50	47/50	45/50	48/50	47/50
High Voltage Battery Performance	28/30	29/30	30/30	30/30	26/30	30/30	28/30	22/30	28/30	28/30	30/30	28/30	27/30	28/30	29/30	27/30	28/30	28/30	30/30	28/30
High Voltage Battery Control Unit	10/10	10/10	10/10	10/10	9/10	10/10	10/10	OK	10/10	10/10	10/10	OK	0/10	10/10	9/10	10/10	10/10	10/10	10/10	10/10
Vehicle Communication Interface	4/5	5/5	5/5	5/5	5/5	5/5	5/5	OK	5/5	5/5	5/5	OK	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5

connect to detect.

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