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CalBatt™
premium charging technology

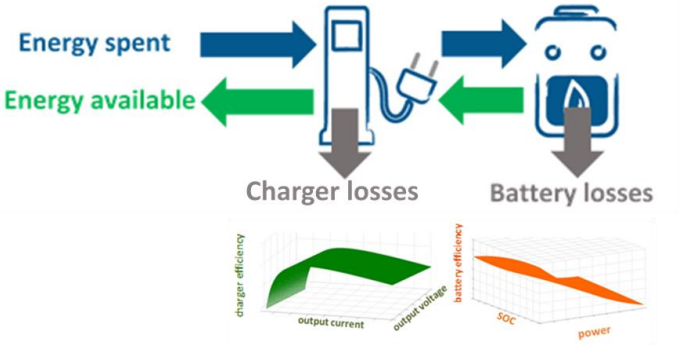
CalBatt Smart Charging Technology

THE PROBLEM OF BATTERY CHARGING EFFICIENCY

Owners of battery-powered electric vehicles are more and more aware of the importance of charging efficiency, asking for a solution to a fundamental question:

"How to set charging profile for maximum efficiency"?

This is a very simple question with a quite complicate answer, because charging efficiency actually depends in a very complex way on the characteristics of the specific battery/charger bundle, which vary during life and even during the charging process with battery state of charge.

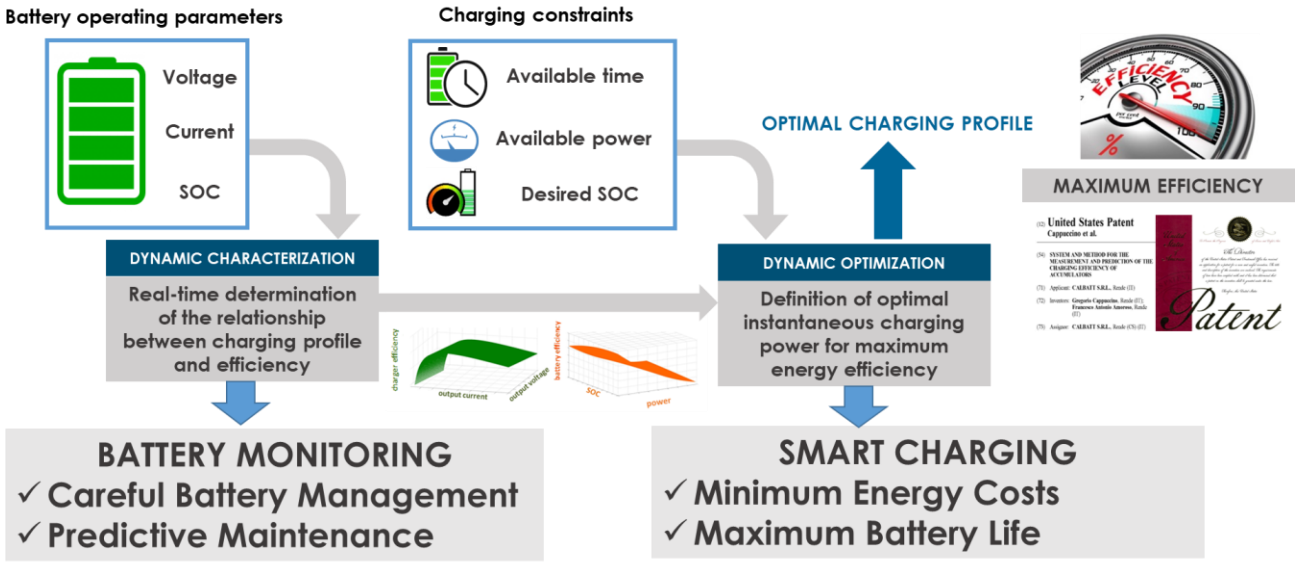


Standard charging technologies perform a static charging power modulation, "spreading" the charge of the vehicle on the available time window according to the maximum power available for charging on the basis of a **predetermined charging curve**, without therefore taking into account, in each instant of the charge, the real efficiency characteristics of the specific battery/charger set.

This leads to useless energy losses during the charge.

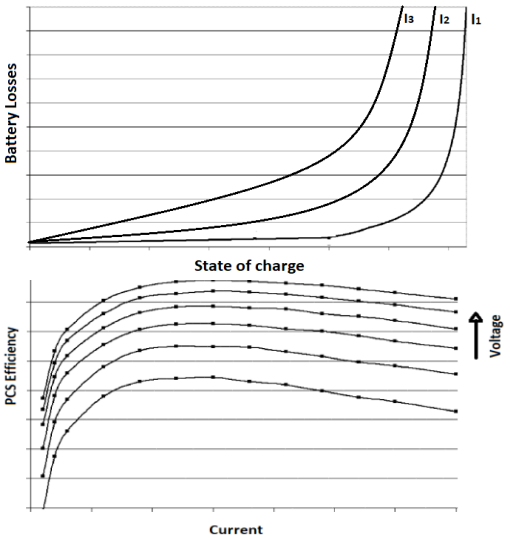
CALBATT PATENTED INNOVATION

CalBatt patented Smart Charging technology is based on proprietary algorithms for the dynamic characterization and optimization of charging efficiency of each specific battery/charger set.



DYNAMIC CHARACTERIZATION

The **dynamic characterization phase** consists in determining in **real time** the relationship between the overall energy efficiency of the specific charging system/battery set of each vehicle starting from the operating parameters (current, voltage, state of charge, etc.), taking into account the energy losses on both the battery and the charging station.



DYNAMIC OPTIMIZATION

After the characterization phase, CalBatt algorithms calculate the **optimum instantaneous charge power set-point** in order to optimize the energy efficiency and then the charging cost, taking into account:

- The relationship between efficiency and battery operating parameters;
- The maximum power available for charging;
- The charging time available for charging according to the battery usage;
- The desired minimum state of charge at the end of charge;
- Variable electricity tariffs.

UNIQUE BENEFITS

As validated on the field by key players of the e-mobility industry, CalBatt Smart Charging technology allows unique benefits in terms of:

- **Minimum re-charging costs (up to 15% cost saving)**
- **Maximum battery care (up to 25% life increase)**