



Technological Innovation for Range Anxiety

Case Description

One of the impediments faced by the Electric Vehicle (EV) industry is the uncertainty of vehicle drive range. At this moment, the availability of charging infrastructure is still growing in India and is limited to major cities. Range anxiety has become one of the major apprehension in users towards the adoption of EVs. Therefore, a way must be found to assist the user to efficiently manage the limited range capacities and prevent this. There are two solutions to overcome this challenge -

- Improving the drive range of EVs
- Establishing extensive network of charging infrastructure

To improve the range of EVs, global players like Tesla, Morris Garage, Volkswagen, Hyundai, and others have made a significant investment in the Research and Development. This has resulted in a significant improvement in the range of EVs over the period. Since many manufacturers offering a better range were international companies, it presents Indian car manufacturers with a challenge to match their competition.

In collaboration with Electra EV, Tata Motors successfully innovated 'Tata Tigor', one of the most sold EV model of Tata Motors. The Electra EV managed to extend the range of the Tata Tigor electric powertrain from 140 km to 213 km without disturbing the physical boundaries of the EV. The battery pack was upgraded while maintaining the size of the vehicle and the energy losses were tackled with innovative energy optimisation through both software and sub systems-based modification and changes in the powertrain. Innovations like these would help the Indian fleet operators and first time EV owners to have better productivity with the increased range and lower total cost of ownership.

A unique, wide-spread service, maintenance and training support for fleet operators is also provided. The collaboration with Indian Institute of Technology, Delhi for improvement of the Battery Management System using Artificial Intelligence (AI) and machine learning (ML) helped in better estimation of 'State of Health, and 'State of Charge' of the EV battery to optimise the battery life.

Details of Business Model

- Plant Capacity: 5000 powertrains annually
- Capital Expenditure: USD 5 million
- Operational Expenditure: USD 1 million

Impacts

- EV or EV fleet owners to benefit from lower operating costs compared to other EV powertrains due to 15% better range in the same category/ segment of EVs

Innovation

The EV powertrain (comprising of battery pack, vehicle control unit, motor control unit, motor and gearbox) was innovated to overcome the range anxiety. The increase in the energy by 5kWh meant taking 20% more volume for the additional cells which implies huge cost increase for all concerned. Electra EV innovated to ensure that they could increase the desired range whilst ensuring the least increase of kWh in battery pack and keeping the physical boundaries of the vehicle.

Electra EV innovation included –

- The ElectraEV electric powertrain range was increased by 52%. To enable this, the battery pack's energy storage capacity was increased from 16.5 kWh to 21.5 kWh while keeping the 72 V architecture of the original battery intact
- ElectraEV technology is fully FAME II compliant which means all the powertrain components were indigenously developed and manufactured
- As compared to all other EV products in India, the Tigor EV developed by electra EV with extended range has lower total cost of ownership

About Pioneer

Powertrain for the Tata Tigor EV with extended range (213 km) electric powertrain won the award for 'Engineered in India – Product of the Year' at the NASSCOM Engineering & Excellence Awards, 2021.

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Geography

Pune, Maharashtra

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