Electric- Vehicle Challenges

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Abstract: Nowadays, the emissions from conventional vehicles significantly contribute to increasingly serious environmental issues. In addition, the energy crisis and the low energy efficiency of conventional vehicles also offer a good opportunity to develop electric vehicles. Hybrid electric vehicles have better fuel economy compared to conventional vehicles, but they are just an interim step in vehicle development and pure electric vehicles are the ultimate goal. Currently, the technologies of hybrid electric vehicles can be found in numerous literature surveys, however there is a lack of published papers to present a comprehensive technical review for pure electric vehicles. In this study, the characteristics and challenges faced by electric vehicles are firstly described. Then the environmental impacts of the typical pure electric vehicles are discussed. Moreover, charging technologies are investigated. The main challenges faced by pure electric vehicles and corresponding solutions are discussed, whilst the latest developments of pure electric vehicles are presented. The awareness of environmental issues and the energy crisis as well as the incentives from the governments of many countries continuously enhance the rapid development of pure electric vehicles.

Keywords: charging stations, Lithium Fuel, Torque

1. INTRODUCTION

Electrically operated vehicles that are non-polluting as well as pocket friendly acquiring more share in the market. High efficiency, no lubrication and cooling and simplified construction than conventional I.C engine makes them first choice of the customers now a days but there are lots of challenges to replace all conventional vehicles with E-vehicles.

1. Two-wheelers: 79% of the total number of vehicles.

2. Three-wheelers (passenger and goods), including tempos: 4% of the total number of vehicles.

3. Buses and large goods vehicles like trucks: 3% of the total number of vehicles.

4. Economy four-wheelers (cars costing less than ₹1 million): 12% of the total number of vehicles.

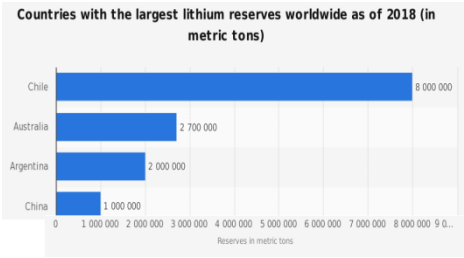
5. Premium four-wheelers (cars costing higher than ₹1 million): 2% of the total number of vehicles.

2. CONTENT

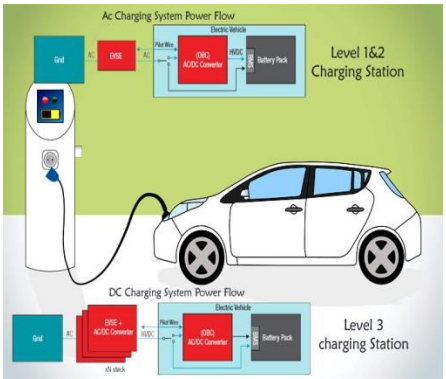
I. **Lithium source** Lithium is a chemical element with symbol Li and atomic number 3. It is a soft, silvery-white alkali metal. Lithium is good for batteries for three main reasons.



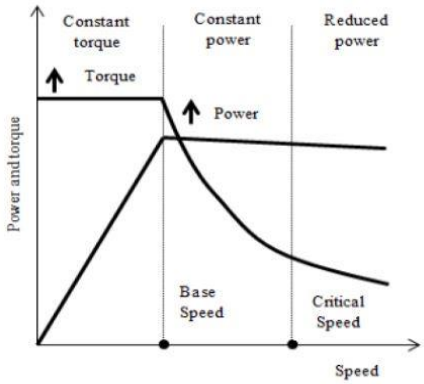
First, it is highly reactive because it readily loses its outermost electron, making it easy to get current flowing through a battery. Second, lithium is much lighter than other metals used in batteries, such as lead, which is important for small objects such as phones but also for cars that require many batteries. Third, lithium-ion batteries are rechargeable, because lithium ions and electrons move easily back into negative electrodes. Batteries of E– vehicles contain Lithium as it can store electricity. Unfortunately, lithium sources are unavailable in India.



II. **Infrastructure/charging stations** – after draining of the batteries the e-vehicle become dormant. The charging stations must be in line with conventional refueling stations.



III. **Torque requirement** – Power-speed and torque-speed profiles of electric motor and internal combustion engine (ICE) differs significantly, as per the road and load conditions torque requirement varies which is a big task for DC motor of E - vehicle.



Disadvantages of electric vehicles are mainly manifested in achieving higher driving speed than those which are common to city traffic conditions. Advantages of electric vehicles could be significantly improved by reducing the weight of the vehicle battery which would greatly alleviate their disadvantages or completely eliminate them.

IV. **Charging time** – even efficient vehicles like Audi E-Tron requires 30-40 minutes for 80% charging.

V. **Disposal of batteries** – old and used batteries are difficult to dispose off.

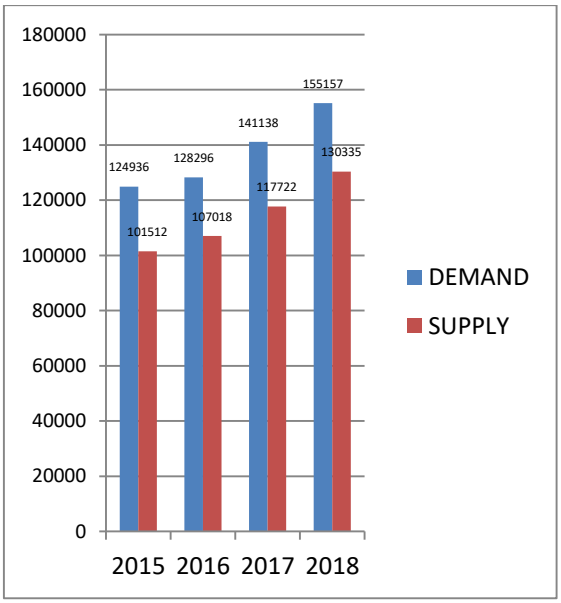


From miners to battery makers and car manufacturers- governments must manage the growth of these industries with care; improving power mixes to safeguard the environmental benefits of switching to battery operated electric vehicles.

VI. **Government regulations** – currently 12%GST is slashed to 5% on e-vehicles in India. More subsidies must be planned by the government like other countries.

Country	Tax Reduction
Austria	Exempt of car tax
Belgium	Reduced annual circulation tax, no registration tax
China	Subsidies of $9.900 for PEV
Czech	No road tax (business vehicles only)
Denmark	Exempt from registration tax
Finland	Reduced registration tax
France	n/a (only sales bonus)
Germany	Exempt from annual circulation tax
Greece	Exempt from registration tax
Ireland	Exempt from registration tax
Italy	n/a (only sales bonus)
Japan	Subsidies pp to $8.500 for PEV; Additionally tax exemption of automobile acquisition & automobile weight tax

VII. **Electricity** – Maharashtra is largest electricity generating state in India which still suffers scarcity of power primarily in rural region.



VIII. **Battery cooling**

When a battery is charged or discharged at 1C, typical heat generation may be only 1% to 3% of the energy used. But at 2C, the heat generation can be 4% to 9% of the energy used and at 3C it can rise to 9% to 27%. First, this would be considerable energy loss for the vehicle. But more important is that the cell-temperature will shoot-up rapidly and the cells would require significant cooling. Problem gets compounded in Indian conditions where the ambient temperature is of the higher range.

CONCLUSION

As non-polluting and lesser running cost, E vehicles are the best alternative for conventional vehicles. Still there is huge need of promoting them as customers and dealers are more reluctant to it.

The environmental issues such as air pollution and global warming have brought serious impacts on living and production for human beings. The energy crisis is also becoming an important and pressing problem. Based on these reasons, E- vehicle with high efficiencies will be the ultimate goal of developing vehicles, This paper has presented an overview of challenges faced by E – vehicles to be on road. Among the energy sources, Li-ion batteries and hydrogen energy are becoming more popular and promising. The charging technologies for E- vehicle are the analyzed and trend indicate that renewable resources are very promising to generate electricity for charging .Finally, the main challenges faced by E- vehicle for practical applications are discussed and general problem-solving methods are provided, Under the pressure from objective environmental factors and the subjective incentives from governments, E- vehicle will be developing rapidly in the next decades.

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