

ICE TO ELECTRICAL VEHICLE RETROFITTING¹Mr. A. M. Vibhute, ²Mr. N. L. PhadkeLME, G.P. Miraj / DTE Mumbai, India¹, LPE, G.P. Miraj / DTE Mumbai, India²
amvibhute@rediffmail.com¹, phadken005@gmail.com²**ABSTRACT**

Millions of ICE (Internal Combustion Engine) vehicles on-road, India has the largest two-wheeler and three-wheeler market in the world. In the past few years, electric vehicles have gained popularity, especially in the 2-wheeler and 3-wheeler segments in the Indian market. EV (Electrical Vehicle) retrofitting means replacing the petrol engine with an electric power transmission. Prices of new Electrical vehicles are high so retrofitting is feasible as it saves money. So it is better to convert existing petrol two wheelers into electrical vehicles. Converting a existing bike into an e-bike is easy and quick. The converted electric vehicle will emit zero carbon, is eco-friendly. In India total of @ 2.25 lac electric scooters were sold in 2021 with @ 1.4 lac registration of the high-speed electric scooter and which was a @ 130% rise in electric scooters sales compared to 2020. The retail sales value of EVs is expected to cross \$1 billion by 2025, with a compound annual growth rate(CAGR) of 63.9% during the 2020-2025 period.

Keywords: ICE (Internal Combustion Engine), EV (Electrical Vehicle retrofitting, e-bike, Battery, Renewable energy source.

INTRODUCTION

Millions of ICE (Internal Combustion Engine) vehicles on-road, India has the largest two-wheeler and three-wheeler market in the world. In the past few years, electric vehicles have gained popularity, especially in the 2-wheeler and 3-wheeler segments in the Indian market. In order to make e-mobility accessible to everyone, needs to create a retrofitting policy to allow conversion of existing ICE 2 and 3-wheelers into electric vehicles, subject to necessary terms and conditions.

GROWTH OF ELECTRICAL VEHICLES

There are three main reasons for the growth of electric vehicles.

1. Technically, the ICE efficiency is around 40 % and electric motor efficiency is around 88 to 91%. In electric vehicles, the engine is replaced by motors and conventional motors will be replaced by magnet motors.
2. Use of renewable energy, such as solar charging is possible. Small-scale companies are also contributing to the growth of the EV segment in India.
3. In the pandemic period, the positive part is people are more conscious about the environment. In the last few months, the electric vehicle sales have increased.

EV RETROFITTING

EV retrofitting means replacing the petrol engine with an electric power transmission. An electric motor gets fixed in the rear wheel and engine parts get removed. The existing EVs are suitable for user mindset and urban road conditions in India. Spare parts and services are available in the urban market. Converting existing vehicles is the suitable alternative for the current scenario. Almost all companies are importing material from Asian countries and assembling it in India.

Second thing is vehicles that are imported from overseas, people face a lot of issues with spare parts supply and services. Those vehicles are not made according to the Indian road conditions and user mindset as well as they doesn't have an aftermarket value. EV retrofitting is an affordable as we are saving the re-manufacturing processes.

A retrofit electric scooter is a petrol scooter converted to electric that is its internal combustion engine and petrol tanks are replaced by an electric propulsion kit and battery respectively. A retrofit saves a lot of money because you need not have to buy a new scooter that costs higher instead convert your existing petrol scooter to electric with the least spending.

Converting your existing petrol scooter is better than buying a new electric scooter because you also reuse your old scooter instead of throwing it into the trash, thus your smoking emitting machine is a whole new eco-friendly machine that delivers the same output at a low cost.

Although a new electric scooter has more features and comfort compared to a retrofit electric scooter it costs too high. The more luxury demands the more cost, is the rule of nature. For common people converting their existing petrol scooter is the better idea.

SAFETY, APPROVAL OF THE ELECTRICAL VEHICLE RETROFITTING

In India it is essential to follow Government norms for safety of retrofitted electrical vehicles . EV retrofitting needs ARAI and RTO approval and it is more safe and reliable. ARAI prescribed process of tests to be carried out . The old vehicles with internal combustion engines which are being attached with the electric kit have to follow AIS123 Part1, Part2, and Part3. The test is defined in CMVR. Details regarding type approval applications are available on the ARAI website.

FEASIBILITY OF CONVERTING YOUR EXISTING PETROL SCOOTER A NEW ELECTRIC SCOOTER

If you are converting a two wheeler into EV, then charges would vary from @ Rs 20,000 to Rs 45,000 according to the power and model. For a three wheeler, it will be around @ Rs 55,000. EV retrofitting of a 1000cc four-wheeler will take around @ Rs 2.5 lac.

Electric scooters are environmentally friendly because they neither create air pollution nor noise pollution. They are ideal vehicles for short-distance travel without any hassle. Although petrol scooters have dominated the market, electric scooters are replacing petrol scooters slowly due to their suitable features and pollution-free operations. The foreign countries have already adopted electric scooters to a great extent but in India, it has just started due to the recent changes in the Government's policy towards the Electric Vehicles(EV) industry. Prices of new Electrical vehicles are high so retrofitting is feasible as it saves money. So it is better to convert existing petrol two wheelers into electrical vehicles, which is feasible.

BENEFITS OF THE RETROFIT SCOOTER OVER THE NEW ELECTRIC SCOOTER

- For common people, it becomes difficult to purchase new petrol or electric scooter by selling the old scooter. The on-road price of a new scooter costs around 1.2 lac which is too high and the soaring price of petrol makes running costs uneconomical creating a big problem for common people.
- The electric retrofitting kit is the best solution to this problem. It is affordable and costs around Rs. 30000/- making electric vehicle technology more accessible for the average family. This is about one-third the price of the new electric scooter.
- In comparison to a petrol scooter, a retrofit electric scooter can save around Rs. 15000/- annually assuming the scooter runs 1000 Km per month.
- Converting your existing petrol scooter to an electric scooter has multiple advantages and benefits from saving money to cutting emissions. With your retrofit electric scooter say no to greenhouse gases and say

Hello to Mother Nature. Existing bike can be converted into an e-bike which will be more efficient, effective, and eco-friendly.

- Converting a existing bike into an e-bike is easy and quick. The converted electric vehicle will emit zero carbon, is eco-friendly.

SOME FACTS ABOUT ELECTRIC SCOOTERS IN INDIA

Below are some facts extracted from the “Indian Electric Scooter and Motorcycle Market Overview” Report Published in August 2020 by Prescient & Strategic Intelligence

- Two-wheeler vehicles hold the largest vehicle share in India with a 70% share of 200 million vehicles on road and 80% of new vehicle sales every year.
- Low-speed electric scooters are expected to dominate the EV market by 2025.
- 48 V Li-ion batteries are the most commonly used power source in the Indian electric scooters and motorcycle market. Its sales volume was 85% in 2019.
- Electric scooter sales through online channels are surging.
- Electric scooters equipped with Li-ion battery to be the fastest-growing.
- Electric scooters and motorcycle use is growing among businesses.
- Delhi, Karnataka, Maharashtra, and Tamil Nadu are among the fastest-growing markets for electric scooters. Among them, Karnataka is the fastest-growing market for electric scooters.
- Electric scooters and motorcycles can be made more affordable by reducing the price of Li-ion batteries since the battery constitutes 40-50% of the total EV cost.

Some other facts are total of @ 2.25 lac electric scooters were sold in 2021 with @ 1.4 lac registration of the high-speed electric scooter and which was a @ 130% rise in electric scooters sales compared to 2020. The retail sales value of EVs is expected to cross \$1 billion by 2025, with a compound annual growth rate(CAGR) of 63.9% during the 2020-2025 period.

CONCLUSIONS

EVs are still being sold at high prices, despite the fact that they are receiving subsidies. The high cost of taxes on retrofitting kits deters the scope of the retrofitting ecosystem. Policy changes are required to propel the green boost while keeping the new electric vehicle and retrofitting industries.

The soaring petrol price in recent years has also compelled common Indians to shift towards the consumption of clean energy. Last year the petrol price was recorded at Rs. 116 per liter in a few cities of India and common people found it uneconomical. Short-distance travellers like delivery executives, courier executives, milkmen, and other commuters find electric scooters economical compared to petrol scooters. The running cost of a retrofit electric scooter is as low as Rs. 0.17 per Km whereas for a petrol scooter it's Rs. 3.5 per Km which is about 20 times higher.

As the number of electric vehicles is increasing, the power requirement is increasing as well. In India, 20% of electricity is produced from coal. Initiative for standardization and provide subsidies to the battery providers and solar power charging is essential. There should be swappable charging stations. In India, a large number of two-wheelers and three-wheelers are used for commercial purposes as they have taken initiative for last-mile delivery. If parallel charging stations and swappable charging stations would be there then EVs will be successful in India. Increase in electrical vehicle without any provision for increased electricity consumption may lead to scarcity of electrical power. There may be scarcity of electrical energy for home use, agricultural use or increase in electrical bills. So provision for increased consumption is essential.

FUTURE RECOMMENDATIONS

- Research and development in field of battery storage, storage technology, price and its size is essential.
- Swappable battery stations irrespective of brand with specification standardisation.
- Reducing time of charging and long run in single charging.
- Easy access of spares and services with standardisation.
- Increased electrical consumption need to develop electrical power stations using renewable energy sources. It is also necessary to develop vehicle mounted solar charging kits.
- Research and development, Market analysis, mass production, standardisation of EV kit is necessary for cost reduction.

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