Feasibility Study on Investment in Electric Vehicle Battery Manufacturing

[*]Nirav D. Mehta and Piyush R. Patel

Department of Electrical Engineering, Sankalchand Patel University, Visnagar, Mehsana, Gujarat, India

[*]Corresponding author: niravdmehta225@gmail.com

Abstract

In engineering, particularly for electrical engineers, a new business line is going to open in India. The government of India has taken some steps toward achieving India's long-term goal of reaching net zero carbon emissions by 2070. E-mobility is one of the initiatives taken to achieve this goal. Most parts of electric vehicles are equivalent to those of petrol vehicles, but the battery and motor have some differentiation from ordinary vehicles. In electric vehicles, BLCD motors are used, which can be manufactured through the relevant technology of BLDC fan, but for EV batteries, we need to develop a new process plant with precise technology because recently there have been so many burnt EV cases, which may be due to the heat of the battery or a fault in the battery management system. In this research paper, we discuss the feasibility study on investment in an electric vehicle battery manufacturing plant.

Keywords*: Battery, Machine, Electric vehicle, Tools, Market analysis*

Introduction

The electric vehicle industry is at a rising stage in India. The Indian automobile industry is the fifth largest in the world and is expected to become the third largest by 2030**[1].** As per the India Energy Storage Alliance (IESA), the Indian EV industry is expected to expand at a CAGR of 36%. As the population rises and grows for vehicles, dependence on conventional energy resources is not a sustainable option as India imports close to 80% of its crude oil requirements. At present, more than 5 Lakh two wheelers and some thousand four-wheelers running electric vehicles on the road. It mainly depends on the policy offered by the government, awareness, among consumers related to climate change's impact on their lives. NITI Aayog aims to achieve EV sales penetration of 70% for all commercial cars, 30% for private cars, 40% for buses and 80% for two and three-wheelers by 2030. This is in line with the goal to achieve net Zero carbon emissions by 2070. E-mobility is one of the initiatives taken to achieve this goal.

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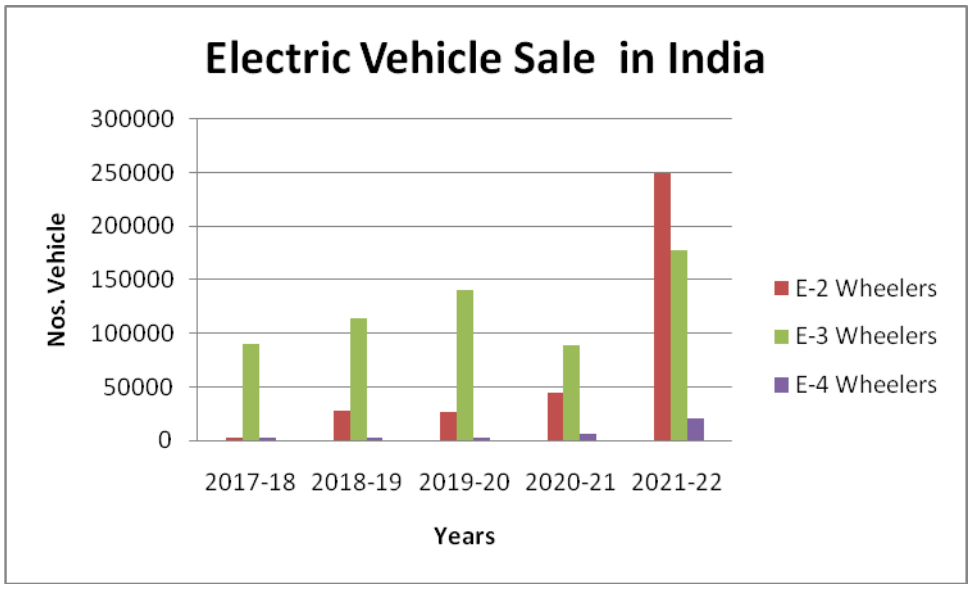

Figure 1: EV sales in India **[1]**

Electric Vehicle Sale in India					
Category	2017-18	2018-19	2019-20	2020-21	2021-22
E-2 Wheelers	1981	27478	26512	44394	249615
E-3 Wheelers	90411	114136	140754	88497	178169
E-4 Wheelers	2433	2460	2740	5952	20172

The most common battery type in modern electric vehicles is,**[1]**

1. Lead–acid
2. Nickel–metal hydride
3. Sodium nickel chloride batteries
4. Lithium-ion

Table 1: Comparative of EV batteries

Particular	**Lead–acid**	**Nickel–metal hydride**	**Sodium nickel chloride batteries**	**Lithium-ion**
First came into existence in the year of ,	1859	1980	1985	1991
Energy density (Wh/L)	80-90	100-140	160	250-400
Energy Efficiency (%)	85	85	75	90

II. Market Scenario

India is at a critical juncture in its infrastructure, energy, and mobility development. The nation has seen a 10 percent annual increase in vehicle registrations over the last decade and

is set to surpass Germany as the world's fourth-largest car market by domestic sales by the end of 2017. If current mobility trends continue, the number of personal vehicles in India could increase three- to four-fold by 2030, at significant direct and indirect costs to India's citizens, economy, and environment. **[2]** Now, India has set ambitious targets of installing 175 gigawatts of renewable energy generation by 2022, and a draft government target aims to generate 57 percent of India's electricity from non-fossil sources by 2027. These targets, coupled with India's electric mobility vision, can create more value and be more readily achieved when pursued together, rather than separately. And as mobility costs impact low- and moderate-income citizens the most, this transformation could provide important economic and social benefits to this population segment.**[3]**

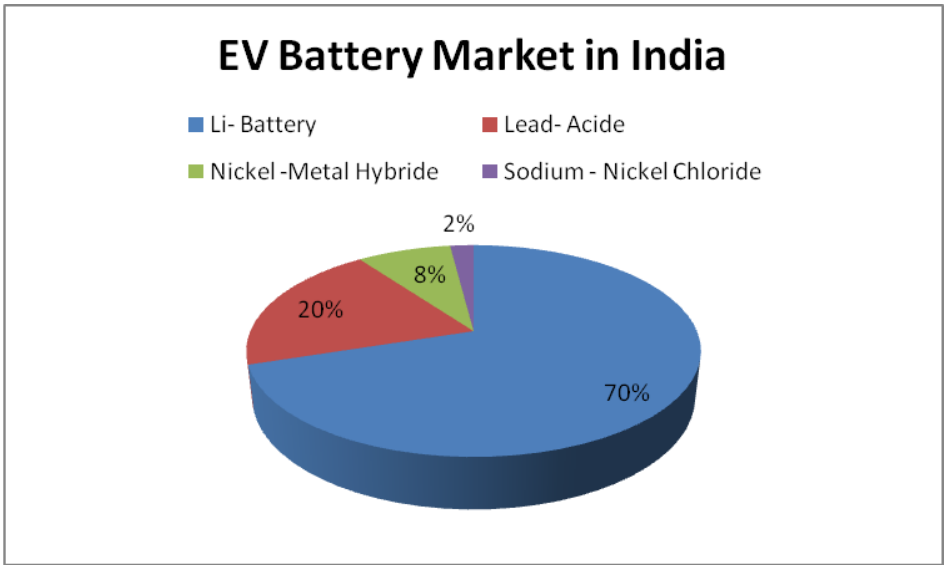

Figure 2: EV Battery market in India **[4]**

The rising adoption of electric vehicles among consumers has helped boost the market for these energy- saving, pollution-reducing vehicle. The numbers of automobile companies involved in the development of new and improved EVs has also increased. For instance Tesla Motors, General Motors Company, Toyota Motor Corporation, Ford Motor Company, Nissan Motor Company and Jaguar Land Rover Limited are also involved in the production of EVs. **[2]**

The India lithium-ion battery market is fragmented. Some of the major players operating in the market include TDS Lithium-Ion Battery Gujarat Private Limited (TDSG), Bharat Electronics Limited (BEL), Okaya Power Group, Telemax India Industries Pvt Ltd, and Toshiba Corporation. **[2]**

III. Lithium – Ion Battery Manufacturing Process

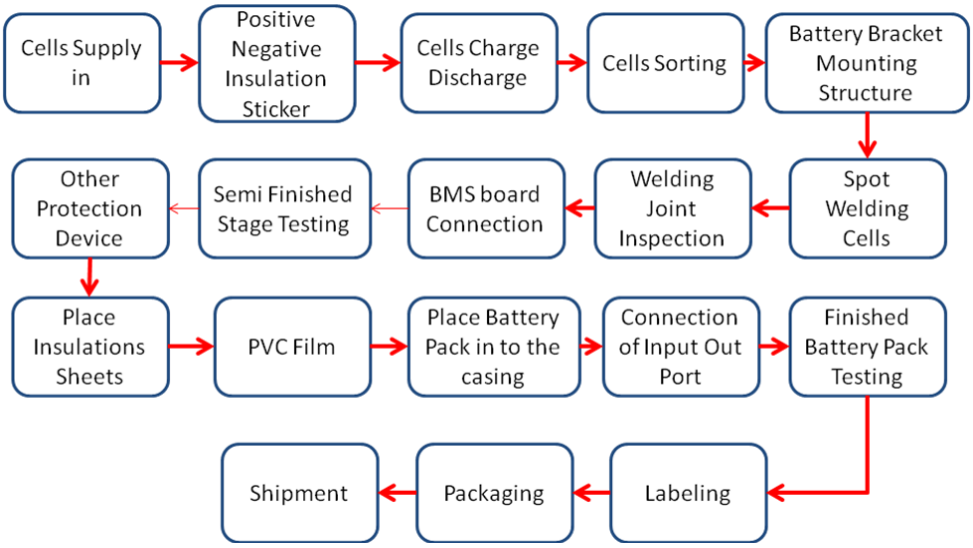

Figure 3: LIB manufacturing process flow **[1]**

IV. Major Machinery Used in Process [1]

1. Cell Grading & Capacity Tester

2. Cell Insulation Sticker pasting machine

3. Cell internal resistance shorting machine

4. Polarity Checking

5. Auto Spot Welder

6. BMS tester

7. Batter Pack performance Testing Machine

8. Battery Aging Machine

V. Indian Government Schemes for Start-Ups And MSMEs

Government of India has launched many schemes for start ups and MSMEs to be "ATMANIRBHAR BHARAT"

1. **Pradhan Mantri Mudra Yojana [5]**

This scheme was launched in 2015. The Mudra scheme covers MSMEs such as Small Manufacturing Units, Retailers, Wholesalers, Artisans, and more.

Categories of businesses are as follow,

2. **Credit Guarantee Trust Fund for Micro & Small Enterprises (CGTSME) [5]**

This was launched in 2000.Any collateral / third party guarantee free credit facility (both fund as well as non-fund based) extended by eligible institutions, to new as well as existing Micro and Small enterprise, including Service Enterprises, with a maximum credit cap of 200 lakh (Rupees Two Hundred lakh only) are eligible to be covered. Recently, guarantee coverage made us eligible to select NBFCs and Small Finance banks.

3. **Financial Support to MSMEs in ZED Certification Scheme[5]**

This was launched in 2016. It is to encourage all types of manufacturers which are registered under MSME to create better products. MSMEs will be given financial assistance/subsidies for obtaining ZED Certification Level.

An MSME unit will get subsidies as per the following structure, on the cost of certification:

Micro Enterprises: 80%

Small Enterprises: 60%

Medium Enterprises: 50%

An additional subsidy of 10% for the MSMEs owned by Women/SC/ST Entrepreneurs OR MSMEs in NER/Himalayan/Island territories/aspirational districts.

4. **Credit Linked Capital Subsidy for Technology Up gradation (CLCSS) [5]**

This was enforced with effect from 01.04.2017 till 31.03.2020 or till the time sanctions if the aggregate Capital Subsidy disbursed reach to Rs. 2360 crore, in which The Govt can give 15% subsidy on investment up to Rs 1 crore for upgrading technology.

Name of The Bank which is associated with this scheme.

1. Andhra Bank
2. Bank of Baroda
3. Bank of India
4. Canara Bank
5. Corporation Bank

6. Indian Bank
7. NABARD
8. Panjab National Bank
9. SIDBI
10. State Bank of India
11. Tamil Nadu Industrial Investment Corporation
12. Design Clinic for Design Expertise to MSMEs

5. **Design Clinic For Design Expertise To MSMEs. [5]**

The goal of this scheme is to help to link up MSMEs and design experts to design economical solutions through efficient change in the design of existing products.

The scheme is divided into two major parts:

a. Design Awareness- Seminars & Workshop	Funding
One day seminar	Rs. 60,000/- per program
For each workshop if 3 - 5 days	Rs. 3.75 lakh per program
b. Design Projects	
Awareness program on new Design strategies	@ 75% for micro, 60% for SMEs for the project range Rs. 15 lakh to Rs. 40 lakh
Students of UG/PG programs from institutions	@ 75% for the project cost of Rs. 2 lakh

Moreover, some technical institutions and universities are also funding new start-ups under their Incubation centre. Gujarat Technical University has an Incubation Center where technical students get funds for their efficient innovative ideas and R K University have also one segment which works for the Start-ups and Innovation project prepared by any students who approach them and provide guidance.

VI. Funding And Investment Required For Li- Ion Battery Manufacturing Plant

Sr. No.	**Particular**	**In Rs.**
1.	Land or Factory shade	50,000/- on rent (Monthly) or for Own Land Investment 1.5 Cr
2.	Primary Company/ Firm legal Registration	50,000/-
3.	Machinery	40,00,000/-
4.	Tools	50,000/-
5.	Software	1,00,000/-
6.	Furniture	3,00,000/-
7.	Flooring for Lab. Area	3,00,000/-
8.	Initial Raw materials	10,00,000/-
	Total Approx	Rs. 58 Lakh to Rs. 60 Lakh To Rs. 2.00 Cr.

RUNNING COST INVESTMENTS (MONTHLY)

Sr. No.	Particular	In Rs.
1.	Technical staff expenses	1,00,000/-
2.	Non technical Staff expenses	25,000/-
3.	Other expenses like Electricity bill ,Tax bill or any other Govt. Charges etc.	50,000/-
4.	Software renewal charges	5,000/-
	Total Approx	Rs. 1.80 Lakh to Rs. 2.00 Lakh

As per the commercial analysis and as per the schemes available for MSMEs and Start-ups the primary investment can be afforded and manageable. Out of the above listed, investment particulars may vary and depend upon the size of plant capacity; company associations like Partnership, LLP, Pvt. Ltd. Etc.

VII. Payback And ROI Plan For Li- Ion Battery Manufacturing Plant (By Simple Method) [1]

Sr. No.	Particular	Per Unit price in Rs.	Plant Unit capacity per month in Nos.	Total Turnover in month in Rs.
1	Approx 2 wheeler (low speed) battery pack price of 46.8 V/ 30 Ah	27,350	200	54,70,000/-
2	Approx 2 wheeler (high speed) battery pack price of 51.2 V/ 86 Ah	96,500	100	96,50,000/-
			Total	1,51,20,000/-
			Capital Investment	2,00,00,000/-
			Payback in Months	1.3 or 2 Months
			ROI (keep 2% Profit Margin)	3,02,400/-

Conclusion

The reform in the transport sector towards petrol vehicles to E mobility, which has most beneficial to boost employments in this new area, reduce emissions and also sustain the

beauty and peace of any country. In EV, nowadays Li-Ion batteries have the biggest market segment. Continuous decline of the cost price, advanced manufacturing technology, increased cycle life, low weight and high energy storage potential make Li-Ion batteries an optimal choice in this field. During the study here some financial schemes and investment segments were discussed which will benefit for anyone who ever wants to start business on EV segment. As discussed, EV market and particularly Li- Ion battery manufacturing is an emerging market which opens new opportunities for engineers. Recycle and reuse can be ways for batteries that come to the end of life (EoL). Recycle batteries also called as secondary batteries. This will give a big hand in reducing the impact on environment. Besides that, by comparing on increasing the lifespan. The use of batteries would be a better choice.

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