

# **REPORT ON 1 WEEK INTERNSHIP IN NSIC**

## **ELECTRIC VEHICLE**

Submitted in partial fulfillment of the requirements for the completion of

PROFESSIONAL TRAINING

BY

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**DEPARTMENT OF ELECTRICAL AND ELECTRONICS  
ENGINEERING**

**SCHOOL OF ELECTRICAL AND ELECTRONICS**

## **SATHYABAMA**

**INSTITUTE OF SCIENCE AND TECHNOLOGY  
(DEEMED TO BE UNIVERSITY)**

**Accredited with grade “A++” by NAAC**

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## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

### BONAFIDE CERTIFICATE

This is to certify that this Internship Report is the Bonafide work of **MADHUMTIHA S (41140047)** who did the internship program in "**ELECTRIC VEHICLE**" in partial fulfilment of the requirements for the subject **PROJECT TRAINING – 1** of the Degree of Bachelor of Engineering in Electrical and Electronics Engineering under our supervision from June 2023 to November 2023.

Internal Guide

Head of the Department

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Submitted for Viva voce Examination held on \_\_\_\_\_

Name:

Signature

Internal Examiner

External Examiner

# DECLARATION

I'm **MADHUMTIHA S (41140047)** hereby declare that the internship Report entitled "**ELECTRIC VEHICLE**" done by me under the guidance of **NSIC(NATIONAL SMALL INDUSTRIES SERVICES)** is submitted in partial fulfilment of the requirements for the subject **PROJECT TRAINING-1** of the Degree of Bachelor of Engineering in Electrical and Electronics Engineering

DATE:

PLACE:



SIGNATURE OF THE CANDIDATE

## ACKNOWLEDGEMENT

I pleased to acknowledge our sincere gratitude and appreciation for the opportunity to intern at **NSIC** as part of the **ELECTRIC VEHICLE** internship program. I am truly honored to have been selected for this valuable learning experience. I would like to extend my thanks to you and the entire **NSIC** team for providing me with the chance to gain hands-on experience in the field of electric vehicles. The Internship has been an incredible opportunity for me to apply my academic knowledge to real-world projects, learn from industry experts, and develop essential skills that will undoubtedly shape my future career. Throughout my time at **NSIC** have been impressed not only by the cutting-edge work being done in the **EV** sector but also by the supportive and inclusive work environment. I have had the privilege of working on , which has broadened my understanding of the **EV** industry and allowed me to contribute to the company's mission. I am leaving this internship with a wealth of knowledge and experiences that will serve as a solid foundation for my future endeavors in the **EV** field. I am excited about the possibilities that lie ahead and am confident that the skills I have acquired during this internship will be a valuable asset to my future career.

## **ABSTRACT**

The global automotive landscape is undergoing a significant transformation driven by the rapid adoption of **ELECTRIC VEHICLES**. This abstract explores the key facets of electric vehicles, encompassing their environmental benefits, technological advancements, market trends, and the societal shift towards sustainable transportation. Electric vehicles have emerged as a vital solution to mitigate the environment impact of conventional internal combustion engine vehicles. Their zero-emission nature, enabled by electric propulsion systems, promises to reduce greenhouse gas emissions and combat air pollution, fostering a cleaner and healthier planet. The abstract provides an overview of the electric vehicle landscape, touching on key aspects of their significance and impact.

# **CHAPTER 1**

## **ABOUT THE COMPANY**

National Small Industries Corporation (NSIC) is an ISO 9001:2015 certified Government of India Enterprise under the Ministry of Micro, Small, and Medium Enterprises (MSME). NSIC has been working to promote aid and foster the growth of micro, small, and medium enterprises in the country. NSIC operates through a countrywide network of offices and Technical Centers in the Country. In addition, NSIC has set up Training cum Incubation Centre managed by professional manpower

### **1.1 SCHEMES OF NSIC**

NSIC facilitates Micro, Small, and Medium Enterprises with a set of specially tailored schemes to enhance their competitiveness. NSIC provides integrated support services under Marketing, Technology, Finance and other Support Service.

### **1.2 MARKETING SUPPORT**

Marketing has been identified as one of the most important tools for business development. It is critical for the growth and survival of MSMEs in today's intensely competitive market. NSIC acts as a facilitator and has devised several schemes to support enterprises in their marketing efforts, both in domestic and foreign markets. These schemes are briefly described as under:

#### **1.2.1. TENDER MAKING**

Small Enterprises in their capacity face problems in procuring & executing large orders, which deny them a level playing field Vis-a'-vis large enterprises. NSIC forms consortia of Micro and Small units manufacturing the same product, thereby pooling in their capacity.

NSIC applies the tenders on behalf of a single MSE/Consortia of MSEs to secure orders for them. These orders are then distributed amongst MSEs in tune with their production capacity.

### **1.2.2 SINGE POINT REGISTRATION**

NSIC enlists Micro and Small Enterprises (MSEs) under the Single Point Registration Scheme (SPRS) for participation in Government Purchases. The units enlisted under the Single Point Registration Scheme of NSIC are eligible to get the benefits under the Public Procurement Policy for Micro & Small Enterprises (MSEs) Order 2012 as notified by the Government of India, Ministry of Micro Small & Medium Enterprises, New Delhi vide Gazette Notification dated 23.03.2012 and amendment vide order no. S.O. 5670(E) dated 9th November 2018. The enlistment under SPRS is completely online. Login: [www.nsicspronline.com](http://www.nsicspronline.com)

- Issue of the Tender Sets free of cost.
- Exemption from payment of Earnest Money Deposit (EMD),
- In tender participating MSEs quoting price within a price band of  $L1+1\%$  shall also be allowed to supply a portion up to 25% of the requirement by bringing down their price to L1 Price, where L = non-MSEs.
- Consortia facility for Tender Marketing.

### **1.3 INTERNATIONAL CONSULTANCY SERVICES**

For the last five decades, NSIC has acquired various skill sets in the development process of small enterprises. The inherent skills are being networked to offer consultancy services for other developing countries. The areas of consultancy are listed below:

1. Capacity Building
2. Policy & Institutional Framework
3. Entrepreneurship Development
4. Business Development Services

## CHAPTER 2

### NATURE OF WORK DONE

What is an electric vehicle?

An EV is defined as a vehicle that can be powered by an electric motor that draws electricity from a battery and is capable of being charged from an external source. An EV includes both a vehicle that can only be powered by an electric motor that draws electricity from a battery (all-electric vehicle) and a vehicle that can be powered by an electric motor that draws electricity from a battery and by an internal combustion engine (plug-in hybrid electric vehicle).

Evolution of electric vehicle:

Electric Vehicle was first popularized as a term in the early 1800s, but the EV has been around much longer. William Morrison of Des Moines, Iowa, invented the first practical electric car in the United States. His automobile is hardly more than an electrified wagon, but it captivates people's curiosity about electric vehicles.

It was in 1901 that many inventors were taking note of the electric car's huge demand and working to enhance the technology. For example, Thomas Edison believed that electric cars were the superior means of transportation and tried to develop a better battery.

- **1908 -1912:** Electric vehicles became popular in the United States around the turn of the century,
- **1968 – 1973:** Over the following 50 years or more, cheap, abundant gasoline and ongoing advancements in the internal combustion engine reduced the necessity for alternative fuel vehicles. However, throughout the 1960s and 1970s, petrol costs climbed, boosting interest in electric cars.
- **1973:** Many large and small automakers began to investigate alternative fuel vehicle possibilities. For example, General Motors created a prototype for an urban electric automobile, which it displayed at the First Symposium on Low Pollution Power Systems Development in 1973.
- **1974 – 1983:** Sebring-CitiCar vanguards are a successful electric vehicle at that moment. More than 2,000 CitiCars are manufactured by the firm, which is a wedge-shaped small automobile with a range of 50-60 miles. Due to its

popularity, Sebring-Vanguard became the sixth-largest carmaker in the United States by 1975.

- It was the same period when hybrid versions of EVs were released. As EVs gained popularity in the United States in the 1900s, the total EVs comprised 33% of the automobile industry. However, it was also the time when its popularity began to decline. Because, at that time, EVs failed to over long-distance and were less advanced, the liking for motor cars increased. Roads and transportation became better, and because of slower speed and range, fuel cars took over EVs.
- But later in the early 1960s and 1970s, the need for electric vehicles started increasing slowly because of increasing fuel prices and environmental concerns. However, it was not until the 1990s when the EVs finally got a noticeable push.

### EV Revolution today

In today's era riddled with issues of global warming and emphasis on cutting carbon emissions, the increased production and uptake of EVs looks inevitable.

According to a McKinney study, the EV industry will explode by 2030, with the US seeing a 32% increase in its sales, China from 7% to 34%, and Europe will see a 5 to 6 times increase in its sales. And in the case of India, we can expect 30% of vehicles to be electric by 2030.

EVs today have penetrated the automobile industry and come in two-wheelers, three-wheelers, and four-wheelers. There are many prime electric leaders in the industry, setting the pace for the EV evolution.

Today's EVs are more advanced than their previous versions. The price of batteries is reducing every year, which has also made them more accessible and in demand.

Additionally, some vital drivers like conducive government policies and incentives and infrastructural development have further ramped up EV production and penetration in the last decade. And hopefully, we will continue to see EVs evolve for affordable mobility in the future.

## **CHAPTER 3**

### **METHODS AND PROCESSES**

#### **3.1 ELECTRIC VEHICLE DESIGN**

There are numerous differences in how EVs are manufactured when compared to ICE vehicles. The focus used to be on protecting the engine, but this focus has now shifted to protecting the batteries in manufacturing an EV. Automotive designers and engineers are completely rethinking the design of EVs, as well as creating new production and assembly methods to build them. They are now designing an EV from the ground up with heavy consideration for aerodynamics, weight, and other energy efficiencies.

The single biggest modification of the car is the underbody. While this structure has been very similar in the past, with EVs there is no engine and there are no exhaust systems needed. There is an aerodynamically designed full belly pan under the EV that contains trays where the battery pack is placed. With more and more variations and shapes of battery packs available for different models, the challenge is to be able to make these variations on one Flexible Manufacturing System (FMS). Since all EV battery cells are quite heavy, flexible robotic lines are necessary.

In addition, FMS production lines must accommodate many new robotically performed joining methods. In many instances, spot welding is being replaced by increased use of self-piercing rivets, gluing, sealing, flow drilling, and laser welding — and are specifically chosen depending on the tray used for each particular type of battery cell.

The EV's inner structure is called a "space frame" and is made of strong, lightweight aluminum — and for additional weight-savings; the wheels are also made of aluminum instead of steel. Using manufacturer's molds, these aluminum parts are poured at a foundry. In addition, the steering wheel and seat frames are made of magnesium, a strong, lightweight metal. Even the body panels are made of lightweight aluminum or an impact-resistant composite plastic. Both materials are recyclable, providing long-term disposable advantages.

#### **3.2 Manufacturing process**

Automotive engineers, as well as manufacturing professionals, have given the EV manufacturing process as much design consideration as the overall design of the vehicle itself. To illustrate how EV manufacturing can be accomplished we've taken a brief look at how Tesla builds its EVs using many high-tech robotic approaches.

Tesla's goal to sell 20 million vehicles by 2030 will undoubtedly be realized. With EV sales projected to hit 300 million by 2030, Tesla and other manufacturers will be working at a break-neck pace to meet consumer demand.

### **3.2 .1 BODY ASSEMBLY**

The body assembly process begins with coils of aluminum of different gauges, which are uncoiled into a blanking machine that flattens the metal into blanks. The blanks are then fed into an enormous stamping press. At this stage, large custom-made dies form the body panels, which are then transported to the body center.

This is where the EV begins to be assembled — starting with the underbody, which is the main floor system of the EV where the batteries are seated. The body sides are then added to provide internal reinforcement as well as the outer skin. Inside the framing is where the body sides, the underbody, and the front end of the vehicle are all married together.

### **3.2 2. GENERAL ASSEMBLY**

The Tesla EV is assembled from the inside out. Automation is used to the fullest — as the same robot that installs the seats, then changes tools to position the windshield, apply adhesive, and seat it on the vehicle. In total, about 1,000 robots perform very diverse tasks in the production of the Model 3. Since robots are extremely good at repeatability and accuracy of motion needed, employees are utilized in more flexible situations where human intelligence is required.

EV manufacturing is unique in that many of the components are completely different than for traditional ICE-powered vehicles, including the drive units, battery pack, and battery modules. Many of those components did not previously exist, which required Tesla to build them. However, there are also thousands of fewer components in an EV, so it only takes about two days for a Tesla Model 3 to go from raw material to a completed vehicle.

## **CHAPTER 4**

### **KNOWLEDGE AND EXPERIENCE**

#### **4.1 KNOWLEDGE ABOUT EV**

##### **4.1.1 TYPES OF EV**

- Battery electric vehicle (BEV)
- Hybrid electric vehicle (HEV)
- Plug-in hybrid electric vehicle (PHEV)
- Fuel cell electric vehicle (FCEV)

##### **4.1.1.1 BATTERY ELECTRIC VEHICLE**

BEVs are also known as All-Electric Vehicles (AEV). Electric Vehicles using BEV technology run entirely on a battery-powered electric drivetrain. The electricity used to drive the vehicle is stored in a large battery pack which can be charged by plugging into the electricity grid. The charged battery pack then provides power to one or more electric motors to run the electric car.

##### **4.1.1.2 HYBRID ELECTRIC VEHICLE**

HEVs are also known as series hybrid or parallel hybrid. HEVs have both engines and electric motors. The engine gets energy from fuel, and the motor gets electricity from batteries. The transmission is rotated simultaneously by both the engine and the electric motor. This then drives the wheels

##### **4.1.1.3 PLUG-IN HYBRID VEHICLE**

The PHEVs are also known as series hybrids. They have both an engine and a motor. You can choose among the fuels, conventional fuel (such as petrol) or alternative fuel (such as bio-diesel). It can also be powered by a rechargeable battery pack. The battery can be charged externally.

##### **4.1.1.4 FUEL CELL ELECTRIC VEHICLE**

FCEVs are also known as Zero-Emission Vehicles. They employ 'fuel cell technology' to generate the electricity required to run the vehicle. The chemical energy of the fuel is converted directly into electric energy.

#### 4.1.2 COMPONENTS OF EV

1. Traction battery pack
2. DC-DC converter
3. Power inverter
4. Charge port
5. Onboard charger
6. Controller
7. Auxiliary batteries
8. Thermal system
9. Transmission

**TRACTION BATTERY PACK:** A traction battery pack is also known as an Electric vehicle battery (EVB). It powers the electric motors of an electric vehicle. The battery acts as an electrical storage system. It stores energy in the form of DC. The range will be higher with increasing kW of the battery.

**DC-DC CONVERTER:** The traction battery pack delivers a constant voltage. However different components of electric vehicles have different requirements. The DC-DC converter distributes the output power that is coming from the battery to a required level. It also provides the voltage required to charge the auxiliary battery.

**POWER INVERTER:** It converts DC power from the batteries to AC power. It also converts the AC generated during regenerative braking into a DC. This is further used to recharge the batteries.

**CHARGE PORT:** The charge port connects the electric vehicle to an external supply. It charges the battery pack. The charge port is sometimes located in the front or rear part of electric vehicle components.

**ONBOARD CHARGER:** The onboard charger is used to convert the AC supply received from the charge port to a DC supply. The **onboard** is located and installed inside the car. It monitors various battery characteristics and controls the current flowing inside the battery pack.

**CONTROLLER:** A power electronics controller determines the working of an electric car. It performs the regulation of electrical energy from the batteries to the electric motors.

**AUXILLARY BATTERIES:** Auxiliary batteries are the source of electrical energy for the accessories in electric vehicles. In the absence of the main battery, the auxiliary batteries will continue to charge the car.

**THERMAL SYSTEM:** The thermal management system is responsible for maintaining an operating temperature for the main components of an electric vehicle (EV) such as an electric motor, controller, etc. It functions during charging as well to obtain maximum performance.

**TRANSMISSION:** The gearbox transfers the mechanical power from the electric motor to the wheels. The advantage of electric cars is that they do not require multi-speed transmissions. The transmission efficiency should be high to avoid power loss.

## **4.2 EXPERIENCE**

Gained practical experience in working on motors and batteries in EVs.

### **WORKING OF MOTOR:**

In an electric vehicle, when the driver applies the accelerator, the battery in the car supplies electricity to the stator, causing the rotor to turn, and subsequently provide mechanical energy to turn the car's gears. Once the gears are rotating, the wheels turn too. All this happens in the blink of an eye and without fossil fuel combustion.

Alternating current (AC) and direct current (DC) are two different types of electric flow. As their names would suggest, direct current is when the electric charge flows in only one direction, while alternating current periodically reverses direction.

Motors powered by direct current can be found in an electric vehicle, but only as small, mini motors used, for the windshield wipers and electric windows, for example, but not to drive the vehicle itself. For the traction of an electric vehicle, an alternative current motor is used.

### **WORKING OF BATTERIES:**

The principle behind the lithium-ion battery is to circulate electrons by creating a difference in potential between two electrodes, one negative and the other positive, that is immersed in a conductive ionic liquid called the electrolyte. When the battery is powering a device, the electrons accumulated in the negative electrode are released via an external circuit to travel to the positive electrode: this is the discharging phase. Conversely, when the battery is charging, the energy supplied by the charger sends the electrons back from the positive electrode to the negative.

## CHAPTER 5

### SUMMARY AND CONCLUSION

#### 5.1 SUMMARY:

##### PROS:

**Eco-friendly:** Because electric vehicles do not utilize fuel for combustion, there are no emissions or gas exhaust. Vehicles that run on fossil fuels contribute significantly to hazardous gas accumulation in the environment, thus driving an electric car can help contribute to a cleaner environment.

**Renewable energy source:** Electric vehicles run on renewable power, whereas conventional automobiles function on the combustion of fossil fuels, which reduces the world's fossil-fuel stocks.

**Less noise and smoother motion:** Driving an electric car is significantly smoother. Because they lack fast-moving elements, they are quieter and produce less noise.

##### CONS:

**High initial cost:** Electric vehicles continue to be quite expensive, and many buyers believe they are not as inexpensive as traditional automobiles.

**Charging station limitations:** People who need to travel long distances are concerned about finding adequate charging stations in the middle of their journey, which are not always accessible.

**Recharging takes time:** Unlike conventional automobiles, which require only a few minutes to replenish their gas tanks, charging an electric vehicle takes many hours.

**Limited options:** Currently, there aren't many electric car models to pick from in terms of appearance, style, or customized variations.

#### 5.2 CONCLUSION:

We have seen massive changes, particularly in terms of technology, but also in terms of people's attitude towards cars' environmental impacts and other mobility solutions, from the first electric car established in 1837 up to the present time. Although the electric vehicle market is currently a lucrative goal for companies and start-ups in India, several obstacles remain to be addressed for EVs to be ready for mass adoption. High-cost barriers include, for example, manufacturing electric vehicles domestically.

Similarly, battery manufacturing is essentially a costly venture. The Indian Government must concentrate its energies on promoting technological disruption to resolve these challenges. The government would also need to provide enhanced tax incentives and subsidies to potential car owners and suppliers for quicker adoption.

