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AUTOMOTIVE MANUFACTURING TECHNOLOGY

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Abstract - *As we all know that, the recent developments and technologies changes the automotive sector very drastically. Automotive industry is the main leading part in some developed countries such as Germany, Japan, USA etc. In a decade, Automotive manufacturing technologies changes according to our environmental condition. It moves toward the electric Vehicle powered by solar energy. Manufacturing research has find answer to increase quality of product, Customer behavior and new product technologies. In this paper, we discuss about the various manufacturing technologies and the present state of technologies. Moreover, highlighted the advantages and disadvantages technologies and future scope.*

Key Words: Automotive Industry, Manufacturing Technologies, Environmental condition.

1. INTRODUCTION

Technology is changing the definition of competitiveness and collaboration in the automotive manufacturing industry. Factories are becoming more digital, with smarter machines that produce smarter products. There will be greater competition from local companies with their sophisticated marketing and technology skills. Automotive manufacturing companies, at the same time, are realizing value through the adoption of new technologies. The new technologies will help to product innovation and more flexibility. The importance and revolution of the automotive industry for all major economies. However, this leading industry faces tough challenges due to emission limitations and public opinion, an unsustainable surge in petroleum consumption, high volatility, and low utilization of capacity. In the following, selected technological approaches are discussed and the current state of manufacturing technology and research are presented. Moreover, the benefits of this new manufacturing technology and their advantages, disadvantages with the working procedure illustrated.

2. MANUFACTURING TECHNOLOGIES FOR FUTURE AUTOMOTIVE PRODUCTION.

There are three type of technologies we discuss in this paper name as,

- Fuel cell technology and manufacturing.
- Hybrid technology in automotive.
- Battery system in automotive.

2.1 Fuel cell technology and manufacturing

In Fuel cell, Hydrogen and Oxygen are combined to generate electricity. It is an Electrochemical reaction, there is no any combustion taken place. Fuel cell are used in many types of applications like providing power to Household appliances and businesses, critical facilities like Hospitals and data centers and moving variety of vehicles including cars, buses, trains and many more.

It is reliable, efficient and clean source of power. It does not required charging again and again like batteries but to produce electricity it requires continues fuel supply.

Fuel cell contain an anode, Cathode and electrolyte membrane. Fuel cell works by passing the hydrogen atoms at the anode and oxygen through the cathode. In the anode, the atom is stripped of their electrons. The catalyst splits the hydrogen atoms into electrons and proton. The positively charged proton pass through the membrane to the cathode and negatively charged electron are forced through a circuit and generating an electric current and heat. After passing through this circuit, the electron combines with proton and oxygen to produce water molecules. There are no moving parts therefore it operates quietly with a great reliability.

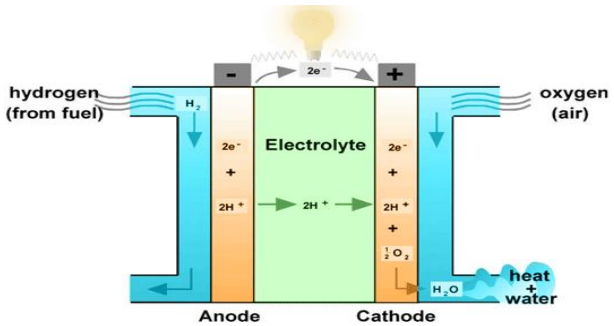

Fig -1: Working of Fuel cell

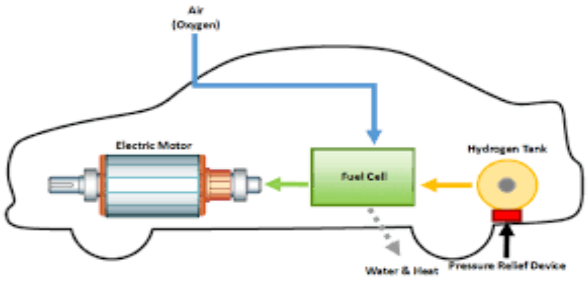

Fig -2: Fuel cell position in Vehicle

Advantages of Fuel cell

- Clean and Quite operation.
- No moving parts involve so, less maintenance require.
- High reliability.
- Higher efficiency than steam engine and internal combustion engine.
- It produces very low emission.

Disadvantages of fuel cell

- Continuous fuel supply is needed.
- Expensive to manufacture.

2.2 Hybrid technology in automotive

Hybrid vehicle is the combination of Electric power and Internal combustion Engine. An electric motor uses the energy stored in batteries. In HEV low speed electric motor is used specially in the city traffic. When vehicle work on electric power, there is no emission.

There are two types of HEV,

1) Mild HEV
2) Fully HEV

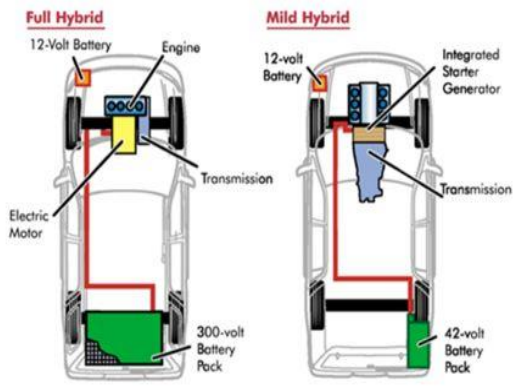

Fig -3: Types of Hybrid Vehicle

Mild HEV is also called as power assist hybrid. Electric motor is only use for support the Internal combustion engine during acceleration and cruising. It is equipped with internal combustion engine with electric motor allowing the engine turned off whenever vehicle is not in a motion. It restarts very quickly.

Fully HEV is also known as parallel hybrid. In this HEV, both the Internal combustion engine and electric power motor is used for drive the Vehicle.

Advantages of hybrid vehicle

- No emission when work on electric power.
- Less dependent on fossil fuel.
- Regenerative braking system is used in Hybrid vehicles.
- Light weight material is used.

Disadvantages of hybrid vehicle

- Low power.
- More maintenance is required.

2.3 Battery system in automotive

The main function of battery is to store electric energy and supply it whenever system want. Mostly hybrid and electric vehicle used Lithium-ion batteries. A battery is a pack of one or more cell, which has positive electrode and negative electrode, a separator and an electrolyte. The battery must be design to satisfy the requirement of vehicle utilities. Due to advanced technologies most of automotive manufacturer used rechargeable batteries. Most of the companies are constantly experimenting to make it cheaper, lighter in weight and more powerful.

The figure shows the types of process of manufacturing of batteries goes through and which types of materials we used to manufacture the lithium-ion carbide batteries.

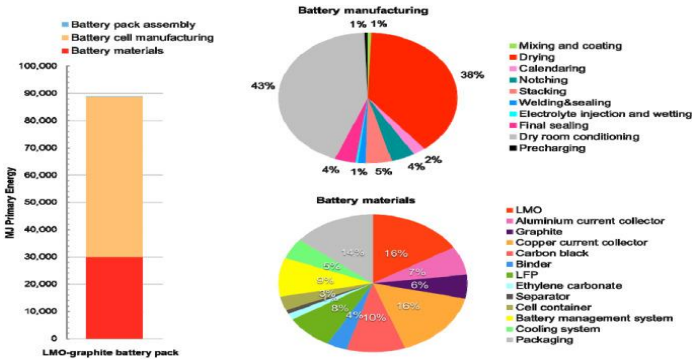

Fig -4: Battery pack production

EV Battery specification: - Voltages and Capacities

Fig -5: Battery system with individual cells in series

A common battery consists of 18-30 parallel cells in series to achieve require voltage. For example, a 400V pack will around 96 series blocks (as in Tesla model 3).

In hybrid/ plug-in hybrid vehicle, the range of battery voltage is from 100V to 200V and 400V to 800V for electric vehicle only. The reason behind high voltage is to allow more power to be transfer with less loss of copper cable.

Common battery capacity range are as follows,

Hybrid vehicle – 0.5 to 2 kWh

Plug-in hybrid vehicle – 4 to 20 kWh

Electric Vehicle – 30 to 100 kWh or more.

Advantages Electric vehicle which uses battery system: -

- Zero emission take place.
- No dependency on fossil fuel.
- Quite and smoothly operated, so require less maintenance.
- It generates high starting torque.
- Less running cost than gasoline powered vehicle.

Disadvantages Electric vehicle which uses battery system: -

- Quite Expensive.
- Time requires for recharging the batteries.
- Not for long range travelling.

3. CONCLUSION

The goal of automotive industry is to extend sustainability in term of being profitable, ecological and socially compatible. This paper presents a review of recent developments in industry and focus on manufacturing technologies in the automotive industry. Moreover, key technologies like aerodynamics and innovative sensors are not observed- also they could have impact on production.

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