

GREEN AUTOMATION IN AUTOMOBILE INDUSTRY IN INDIA

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Abstract:

The automobile industry is a significant contributor of carbon which leads to global warming and many others environment problems and has been facing immense pressure to transition to sustainable and environmentally friendly practices. In India, the government's push towards cleaner mobility with the help of electric vehicles and by rising awareness among consumers about the impact of fossil fuel-based transportation has led to a growing interest in green automation in the automobile industry.

This research paper aims to explore the concept of green automation in the Indian automobile industry and its potential to contribute towards a sustainable future. The report discusses the different technologies and practices involved in green automation, such as electric and hybrid vehicles, sustainable materials, and smart manufacturing which will help in reducing carbon footprint in the atmosphere and we will also analyzes the current state of the Indian automobile industry and the challenges faced by the sector in transitioning towards green automation. The report highlights the Indian government policy and regulatory initiative taken to encourage the adoption of green automation and the industry's response to these measures.

Introduction:

The automobile industry is a crucial sector that helps in economic growth and development in India. The Indian automobile industry is the fourth-largest in the world, with an annual production of over 26 million vehicles. The industry is a remarkable contributor to India's GDP, attributing for around 7.1% of the country's total GDP. However, the industry's growth is also responsible for increase in environmental problems, such as air pollution and greenhouse gas emissions. To challenge these problems the Indian government has taken several measures to promote green technology adoption like the National Electric Mobility Mission Plan and the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles scheme.

However in recent years, there has been a increasing focus on the adoption of green technology in the automobile industry to reduce its environmental impact in the environment Green automation technology is one of the solution that will help in improving the efficiency of the manufacturing process, reduce energy consumption, and can minimize waste production. This report gives an overview of the growing green automation in the automobile industry and how it will beneficial for the environment, government and the society and this report also gives an glimpse of barrier and other factors which is stopping it to grow on full potential.

Objective:

The objective of this research is to give an overview of the green automation technology in the Indian automobile industry. The research aims to:

- i. Explain the concept of green automation technology and its benefits in the automobile industry.
- ii. Analyze the current status of green automation technology adoption in the Indian automobile industry.
- iii. Identify the challenges and limitations of green automation technology adoption in the Indian context.
- iv. Implementation of green automation in the Indian automobile industry by Indian automobile industry.

Literature review :

Green automation is an vital aspect for better sustainable development, and one of the major sectors that can be beneficial from this green automation is automobile industry. India is a rapidly growing developing country so it is witnessing an exponential increase in automobile production and consumption. Therefore, it becomes necessary to adopt green automation in the automobile industry in India.

This literature review will reveal that the Indian automobile industry has been making remarkable efforts in adopting green automation to reduce the carbon footprint coming from automobile industry so that green automation can promote sustainable development. The major areas of focus include energy efficiency in making vehicles, waste reduction while making automobiles and emission control. The use of renewable energy sources such as solar and wind power has been rapidly increasing while manufacturing automobile ,and energy-efficient machines have been planted in the industry to reduce energy consumption. The adoption of green manufacturing practices has resulted in reducing waste generation and helped in improving utilization of resources .

The use of robotics and automation has been found to reduce energy consumption, improve efficiency, and minimize errors in manufacturing processes. The integration of smart technologies such as Artificial Intelligence (AI) has been explored to optimize production or manufacturing processes and while reducing energy consumption the Indian government has been taking many measures to promote green automation in the automobile industry. Policies such as the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) and National Electric Mobility Mission Plan (NEMMP) have been introduced to encourage the adoption of green technologies in the automobile sector. The introduction of BS-VI emission norms has also played a significant role in reducing air pollution caused by automobiles.

- **Automobile industry**

The Indian automobile industry is an important contributor to the country's economy, accounting for around 7.1% of the country's GDP and providing employment to over 35 million people. The industry is dominated by two-wheelers, which account for over 80% of all vehicles sold in the country. Passenger cars and commercial vehicles account for the rest of the market share. The Indian automobile market is highly competitive, with both domestic and international players vying for market share. The major domestic players in the industry include Tata Motors, Mahindra & Mahindra, and Maruti Suzuki. International companies such as Hyundai, Honda, and Toyota also have a significant presence in the Indian market.

- **Green automation**

Green automation is defined as the use of automative technology to optimize industrial and manufacturing processes with main focus on sustainability and reducing environmental impact. The main goal of green automation is to improve efficiency and productivity while reducing waste generation, energy consumption, and carbon emissions.

Green automation in the automobile industry involves several key factors, like the use of sustainable materials, energy-efficient production methods, etc.

One of the main reason for adopting the green automation is to reduce waste and emissions throughout the manufacturing process. This can be achieved through following ways :-

:- Intelligent automation

:-Autonomous manufacturing

:-Renewable Energy Sources

- **Green Automation in the Indian Automobile Industry:**

The Indian automobile industry is the third largest in the world in terms of manufacturing and is expected to grow rapidly in the upcoming years. However, the industry has been facing challenges in terms of environmental sustainability because the industry play a major role in causing air pollution and in emitting greenhouse gas emissions.

To fight these challenges, the Indian government has introduced various policies and initiatives to promote green automation in the automobile industry like :-

National Electric Mobility Mission Plan (NEMMP):

The National Electric Mobility Mission Plan (NEMMP) was launched by the Indian government in 2013 with the aim of promoting the adoption of electric and hybrid vehicles in the country. Under this plan, the government provides financial incentives to manufacturers to produce electric vehicles and to consumers to buy them.

Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles (FAME):

The Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles (FAME) scheme was launched in 2015 to encourage the adoption of electric and hybrid vehicles in India. The scheme provides incentives for the purchase of electric and hybrid vehicles, and for setting up charging infrastructure.

Bharat Stage VI Emission Standards:

The Indian government implemented Bharat Stage VI emission standards from April 2020, which is a step towards reducing the pollution caused by vehicles. These standards require the use of cleaner fuels and the implementation of advanced emission control technologies in vehicles.

National Green Tribunal (NGT):

The National Green Tribunal (NGT) was established in 2010 to handle cases related to environmental issues. The tribunal has played a significant role in regulating the automobile industry in India. The NGT has imposed heavy fines on automobile manufacturers for violating emission norms.

Automotive Research Association of India (ARAI):

The Automotive Research Association of India (ARAI) is an autonomous research and development organization established in 1966 by the Indian government. ARAI is responsible for conducting research and development activities related to the automotive industry in India.

National Institution for Transforming India (NITI Aayog):

The National Institution for Transforming India (NITI Aayog) is a policy think-tank established by the Indian government in 2015. NITI Aayog has been working on developing policies and strategies to promote the adoption of electric vehicles in India.

Make in India:

Make in India is a government initiative launched in 2014 to encourage companies to manufacture products in India. The initiative has played a significant role in promoting the manufacture of electric vehicles in India by providing financial incentives to manufacturers to set up production facilities in the country.

- **Industry initiatives in green automation of automobile industry in India :-.**

Electric vehicles :-

Electric vehicles (EVs) are becoming increasingly popular in India as the country aims to reduce its carbon footprint and dependence on imported oil. The Indian government has set an ambitious target of having all new cars sold in the country to be electric by 2030.

Hybrid Technologies:

Hybrid vehicles, which combine an internal combustion engine with an electric motor, have also gained popularity in the Indian market. These vehicles offer the benefits of both conventional and electric vehicles, such as improved fuel efficiency and reduced emissions. Toyota, one of the largest automobile manufacturers in the world, has been at the forefront of hybrid technology, with models like the Prius and Camry Hybrid.

Sustainable Manufacturing Processes:

Automobile manufacturing is a resource-intensive process, and traditional methods can have a significant impact on the environment. To address this issue, automobile companies in India have implemented sustainable manufacturing practices that focus on reducing waste, conserving resources, and minimizing the environmental impact of their operations.

Opportunities in green automation in automobile industry :-

Electric vehicles (EVs): EVs use electric motors powered by rechargeable batteries instead of traditional internal combustion engines, which significantly reduces greenhouse gas emissions.

Sustainable manufacturing processes: automation technologies can be used to optimize production processes, reduce energy consumption, and decrease waste generation.

Recycling and reuse: Automation technologies can also be used to improve the recycling and reuse of automotive parts and materials. Automated sorting and processing technologies can separate materials and components, making it easier to recycle or reuse them.

Autonomous driving: Self-driving cars can optimize routes, reduce idle time, and increase fuel efficiency. Additionally, autonomous driving can reduce the number of accidents, which can further reduce emissions from the manufacturing and repair of damaged vehicles.

Energy-efficient features: automated systems can control engine idling, optimize the use of hybrid powertrains, and improve aerodynamics to reduce drag and increase fuel efficiency..

Barriers for green automation in India:-

Lack of Infrastructure: The biggest challenges for the adoption of green automation is the lack of infrastructure to support the transition towards sustainable manufacturing practices. The industry requires significant investments in infrastructure such as charging stations, battery recycling facilities, and renewable energy sources.

Cost of Technology: The high cost of technology is a significant barrier to the adoption of electric vehicles, which are critical to reducing greenhouse gas emissions in the transportation sector.

Regulatory Environment: The lack of a clear regulatory framework and inconsistent policies create uncertainty for manufacturers and investors

Lack of Skilled Workforce: Manufacturers need to invest in training and development to build a skilled workforce capable of working with new technologies and sustainable practice.

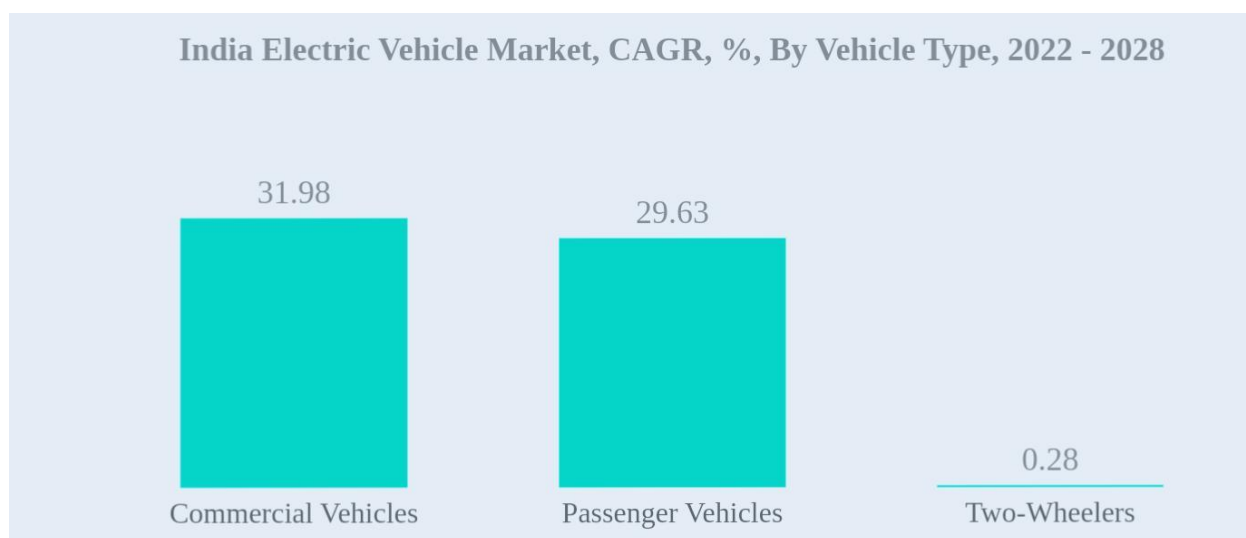
Dependence on Fossil Fuels: The Indian automobile industry is heavily dependent on fossil fuels, which provides for 70% of the country's energy consumption.

Consumer Preferences: Many consumers still prefer traditional vehicles over electric vehicles, which are more expensive and have limited range.

Limited Government Support: While the Indian government has announced several measures to promote the adoption of green automation in the automobile industry, there is a lack of consistent policy and funding support for manufacturers. This limits the ability of manufacturers to invest in green automation and some how limits the industry's transition towards sustainable practices.

Data analysis:-

Due to Green automation in automobile industry the electric vehicle market of India was valued USD 1.45 billion in 2021, and USD 3.21 billion in 2022 respectively and will touch the USD 113.99 billion mark by 2029 at a CAGR of 66.52% . The market is rapidly increasing due to the adoption of green automation in automobile industry which in turn led to growth of the electric vehicle (EV) market in India and green automation is being supported by several key factors, including government support, increased environmental awareness, and technological advancements. The Indian government has taken steps to promote EV adoption, offering tax breaks and subsidies for consumers, as well as investing in the development of charging infrastructure.



According to above Information, in the upcoming years more people will buy electric vehicles for their personal use and many businesses will also use electric vehicles because of the many benefits provided by the electric vehicles companies and the incentives provided by the government to both buyers and to automobile industry to promote green automation.

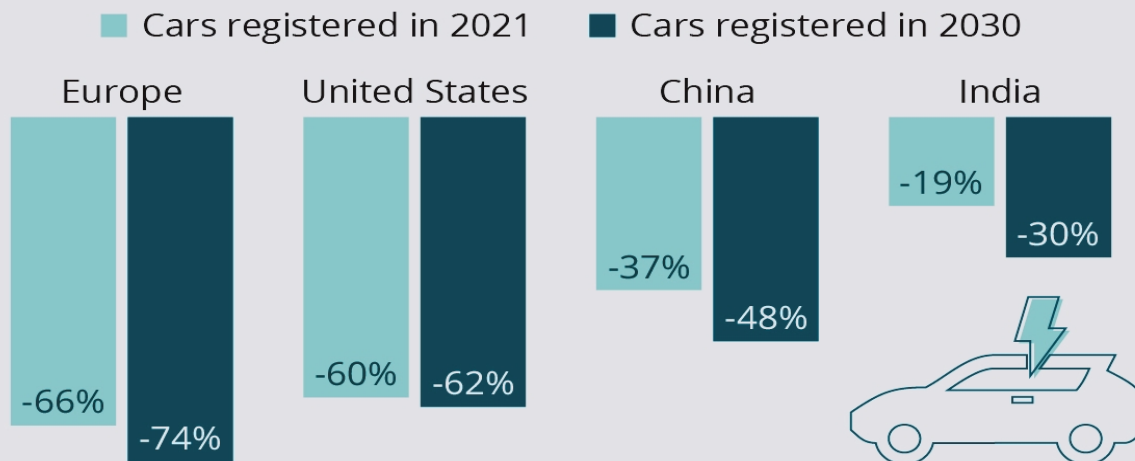
Market size of automobile companies in terms of sales of electric vehicles:-

Product	Market type	Body Type	Production type	FY 2021-22 Volume	Market share
Tata Nexon EV	Mass-market	SUV	Local	13,879	63%
Tata Tigor EV	Mass-market	Sedan	Local	5,227	24%
MG EZS	Mass-market	SUV	CKD	2,525	11.5%
Hyundai Kona	Mass-market	SUV	CKD	131	0.59%
Mahindra E-Verito	Mass-market	Sedan	Local	79	0.36%
Audi e-Tron	Luxury	SUV	CBU	73	0.33%
Jaguar I-Pace	Luxury	SUV	CBU	69	0.31%
Mercedes EQC	Luxury	SUV	CBU	30	0.14%
Audi e-Tron Sportback	Luxury	SUV	CBU	23	0.10%
BMW iX	Luxury	SUV	CBU	3	0.01%
				22,039	100%

EV car sales reached 0.7% of total car sales in FY 2021-22 ,MG and Tata motors captured 98% of the total EV market in which Tata motors captured 87% of the total EV market and the rest 11% by MG, followed by ' Hyundai and Mahindra' with one product each remained weak players in current ev car sales battle Luxury EV accounts for 0.9% of the total EV market Audi *leads* the luxury EV market in terms of offerings with a luxury EV market share of 48% . SUVs command 76% market share and the rest 24% are sedans where as Tata Nexon EV was the best-selling EV in the country with a 63% market share ,Tata Tigor EV with an all-new heart transplant (battery and motor) captured a 24% market share ,CKD MG ZS EV is the third best-selling EV with an 11% market share.

Electric Cars Found to Cut Emissions Drastically

Estimated reduction in life-cycle greenhouse gas emissions of new medium-size electric cars compared to gasoline cars*



* Life-cycle emissions include emissions associated with vehicle and battery manufacture, fuel/electricity production and consumption, as well as maintenance. Figures show lower bound of estimates based on electricity mix according to current policies.

We can say that from above information electric vehicles will reduce emissions drastically and will help in fighting pollution and It can be only done by green automation.

Conclusion:-

From the data analysis we can conclude that the green automation in automobile industry in India is a much needed change because the pollution due to traditional internal combustion vehicles is increasing day by day which in long run will harm the environment and to tackle this situation green automation will help India to produce electric vehicles which will lead to reduction in the pollution caused by non – electric vehicles which will also lead India to be less dependent on importing crude oil from outside the country to save lots of money and these money can be further used for promoting green automation in India. To promote green automation government and automobile industry both are doing their best by incentivising many measures and by making infrastructure suitable for electric vehicles by which customer can buy it without hesitation However the green automation in India have a very long journey to travel due to many challenges and barriers. But we can say that green automation in automobile industry in India will be beneficial for all.

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