

Achieving Environment Sustainability in Automobile Sector: Application of Circular Economy in India

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Abstract - The automobile sector is one among the other electrical & electronics, construction, and agriculture that has the largest growth potential and majority of household expenditure is on these sectors. The ownership of passenger cars is predicted to increase from 20 vehicles per 1000 to 175 by 2040. India is experiencing digital revolution and is going to be the third largest market for automobile by 2026. This sector has witnessed technological and manufacturing revolution and will provide the maximum resource efficiency, environmental and sustainable advantages through the application of circular economy and enablers like- tracking, sharing. This paper focuses on achieving environmental sustainability by studying the framework for different principles of circular economy and sustainable business practices that are followed in India. The main aim of the study is to understand the environmental sustainability through the application of circularity principle for Automobile sector in India.

Key Words - Environment, Environmental Sustainability Circular Economy, Waste Management, Sustainability, Business Model, e Waste

INTRODUCTION

The relevance to the circular model has gained significance long back, still there are not many researches in this area primarily because of the importance given to the linear growth models. The focus has been shifted from linear to circular after 2005 when a significant mismatch between future demand and supply had been investigated in a scenario with finite availability of resources. The Google search for circular economy clearly indicates the significant role a circular economy framework holds in the development of strategies and policies for sustainability by business entities and policy makers. A closed loop ECOSYSTEM is created by the circular economic model for effective consumption and utilization of resources.

The Ellen MacArthur Foundation has worked very hard at accurately defining circular economy as an industrial system which can be regenerated or restored by an intention and design. The definition provided by the Ellen MacArthur Foundation attempts to focus on three key pillars that together set the base for creating a closed system. This closed system would be one where materials are used in a manner

to ensure their highest utility along with minimal environmental damage. It also includes preserving natural capital while fostering effectiveness all across the entire system (Ellen MacArthur Foundation, 2015). Circular economy as a concept is the key in grouping different range of waste resource management approaches by very efficiently drawing the attention towards the capacity of prolonging resource use (Blomsma & Brennan, 2017). Circular economy is more of a holistic framework that attempts to unify different strategies for sustainability (Murray et al., 2017). The inclusive and comprehensive stance of circular economy model has allowed for it to be linked with sustainable development. It has also linked an economy which attempts to work in synchronization with the socioeconomic and environmental systems in which it is imbedded, for a better and sustainable future (Brundtland 1987; Webster 2013; Kirchherr et al., 2017).

Researchers have linked certain attributes that connect the circular economy model and the concept of sustainability. Both concepts have global reach; both include innovations and focus on new product designs, cooperation among the various stakeholders across different sectors (Geissdoerfer et al., 2017). The proponents of circular economy claim it to be a new paradigm for the industry as it is aimed towards improving the ecological, social and economic value of the environment, It attempts to provide a global solution for the issue at hand (Kopina & Blewitt, 2018). The basic idea of circular economy has been around since the 1970's, although the need for it did not exist at that time as there was a sufficient supply of natural resources at that time (Webster, 2013). The need for circular can be attributed to the following reasons:

- The scarcity of natural resources.
- The advancement of information technology that has enabled the tracking of materials within the loop.
- There has been a shift in the pattern of consumer behaviour which has made us more ready for access than ownership.

The world is on the edge of making a very important decision for the future. If we select the wrong option, there's a risk of the results being catastrophic for the global ecosystems (Larsson et al., 2011). In the present scenario there exists a combination of crisis in different areas of industries across the world.

AUTOMOBILE SECTOR IN INDIA

India is one of the largest manufacturers of automobiles with annual production of more than 25 million vehicles. Automotive sector contributes to 7% of GDP and 49% of nation's manufacturing GDP. India's automotive industry's supply chain is not simple but rather is quite complex. The vehicle comprises of approximately 20,000 components parts and about 1,000 sub-assemblies. The components are made up of steel (multiple varieties like conventional steel, stainless steel, and high strength steel), iron, Aluminum, rubber, glass, copper, brass, and zinc.

A study by TERI - GIZ-DA2016 revealed that is going to increase by 86 million tons by 2030. It means that the total demand for Iron, steel, aluminum, plastics & composite, copper, Zinc and Nickle would also increase by almost 80% and majority of these materials are imported in India. It is therefore important for the companies to be more resource efficient as the procurement challenges, price vitality and increased cost of transportation burdens the component manufacturing companies as well as original equipment manufacturers.

It is also known that the main enabler is going to be the “Resource Efficiency” which can be achieved through:

- a. Reduced cost of material because of the improvements in the processes
- b. Provision of minimum waste and its dispersal cost
- c. Less environment effect in each stage of value addition-
- d. Meeting customer specifications and requirement- reviewing purchase behaviors and practicing recycling
- e. Improving the image of organization through environmental sustainability and improving employee satisfaction.

Value Chain in Automotive Sector

1. Processing of Material and its supply
2. Designing of product
3. Automotive component manufacturing
4. Machine/ equipment manufacturing
5. Consumer using the product and after sales service
6. End of life

PRACTICES-RESOURCE EFFICIENCY IN AUTOMOBILE INDUSTRY IN INDIA

The resource efficiency in the automobile sector is the competitive advantage. The automobile sector ensures that the automobile sector conforms to the environmental regulations and standards along with the persuasion of resource scarce strategy. The companies in this sector are investing in R&D to understand and assess all types of impact possible across the value chain through either use of material or selection of eco design. In this sector manufacturers of equipment are focusing on natural fibers and biopolymers as they are cost effective, biodegradable, high strength, and renewability. UNIDO (United Nations Industrial Development Organization) along with ACMA (Indian Automotive Component Manufactures Association) Funded by Government of India and supported by FIAT initiated the programme for providing support to small and medium manufacturers in the automotive component industry. This program aimed to help small and medium enterprises in the sector to overcome challenges related to enhancing productivity, improving and maintaining quality, and scale of operations for achieving higher efficiency, reliability, and economy. Many companies in this automotive component manufacturing sector achieved high productivity, reduced wastage and zero rejections.

Kulkarni Engineers

The company despite success in terms of customers being Bajaj Auto ltd, Bosch Chassis Systems India Pvt Ltd, Endurance and Space along with the increase in output by 2.5 million per month component parts, the company faced a series of challenges arising from Customer’s complaint and returns. The other problems management had to deal with included in-house process rejections, underutilized machine capacities and high inventories. Due to lack of direction and guidance the company’s intensions wasted in vain. It was a blessing for Kulkarni Engineers to get associated with the UNIDO-ACMA partnership Programme. This Programme enabled the company to achieve higher productivity, improve the quality of their products and enhance the overall performance of the firm through greater employee involvement. The major achievement was reaching a productivity level of 700%. Majority of the results achieved were through design and operation innovations. As a result,

significant financial and Business results were achieved. The company's net worth was almost doubled and new 95 components and 40 new customers were added.

Micro Supreme Auto Industries (I) Private Limited:

One of the leading automobile company faced the greatest challenge of meeting the customers' demands on time with no break or interruptions in the supply chain. A series of hurdles were to be overcome to achieve this, which included low labor productivity and high in process rejection. Lack of proper planning had resulted in non-availability of materials and tools on time, blocking of working capital in inventory, poor data collection and reporting system. Manufacturing processes were not followed as per the standard operating procedures. The implementation of 306 Poka Yoke resulted in: Reduction of rejections at the customer end from 27,565 ppm to zero, in process non-conformance reduced from 49,285 to 2,216. Productivity increased by 22%, Overall Equipment Efficiency also increased from 60% to 83% and the accident severity rate came down from 113 to 0 and frequency came down to 0 from 56. Inventory turnover ratio increased from 7.6 to 32.35.

Original Equipment Manufacturers (OEM)

Original Equipment Manufactures play an important role in the automobile sector in promotion of resource efficiency like if recycled aluminum is used it will have dual advantage one the reduction in the energy consumption and second is the reduction in consumption of virgin material.

Maruti India

Maruti India is a company committed towards sustainable use of natural resources thereby reducing the impact of business operations and products on the environment. Maruti has taken a series of initiatives like reducing the use of raw material, nearly eliminating the use -of ground water, harnessing solar power for vehicle manufacturing, introduction of alternative fuel vehicles (CNG) and smart hybrid vehicles. The company does not use Substance of Concern (SoC) in its products and since 2018-19 it has adopted the globally acclaimed International Material Data Systems (IMDS). Maruti Suzuki also became the first company to introduce a range of BS6 Compliant vehicles, ahead of the government stipulated deadline.

Nissan

Nissan uses the recycled material which is around 25%of the total weight of the car. The recycled items include- recycled steel (major material), discarded cloth, soda bottles for the upholstery and recycled plastics.

PRODUCT MANUFACTURING

Electric Vehicles

In the India's growth force, Automobile Industry is the leading one, but it is also a major contributor to air borne pollution. The Indian Government is promoting the market for Electric Vehicles as an attractive alternative to the traditional vehicles (Internal Combustion Engine). It will not only help in reduction in import of crude oil as well as help in curbing pollution, Under the National Electric Mobility Mission (NEMM) in 2015 various policies have been adopted for the Fast Adoption of Manufacturing (of Hybrid) and Electrical vehicles in India (FAME, India)

In the budget of 2019, INR10,000 Crores is being allocated to FAME II schemes besides announcing the tax deduction of Rs1.5 Lakh on the interest paid on loans taken to buy Electric Vehicles. The GST

has also been announced to reduce from the rate of 12% to 5%. It has also been highlighted in the Economic Survey of India 2019 to emerge as an EV manufacturing hub.

FAME, I scheme was successful in increasing the share of hybrid and electric passenger from 0% in 2012 to 1.3% by 2016. In February 2019, Government announced subsidies of \$1.4 Billion for both buyers and manufacturers of EVs and to promote the indigenous automotive companies to manufacture EVs. Tata Motors and Mahindra were the only two Indian auto companies manufacturing these vehicles. Hyundai recently has launched the first electric vehicle (Kona). Kia Motors, a new entrant in the Indian Car market is developing electric fleets specifically in this segment for which MoU has been signed with the Andhra Pradesh Government. Last year to aid the growth of electric vehicles in the state. Many cities have already undertaken trials of electric buses which will soon be lying regularly. It is expected that 30% of the public transport in India will be electric by 2030.

END OF LIFE PHASE

Maruti Suzuki Toyotsu India Private Limited (MSTI) is established has set up its vehicle dismantling and recycling unit in Noida; Uttar Pradesh in 2020-21. MSTI is responsible to procure and dismantle End of Life Vehicles (ELVs). The Process will include complete solid and liquid waste management as per the Indian laws and globally approved quality and environment standards. The facility in Noida will be the first unit by MSTI and the Joint Venture will add more such units across India. The Unit will have an initial capacity to dismantle around 2000 vehicles per month. MSTI will source vehicles from dealers as well as directly from customers. the main motive behind this joint venture is resource optimization and conservation through recycling using systems and processes which are eco-friendly. The joint venture also aims to provide scrapping of old vehicles scientifically there by reducing pollution and make the roads safer.

CONCLUSION

Environmental Sustainability and resource efficiency in the manufacturing is an extension over the production innovation and process innovation which also includes the supply chain, across multiple product life cycles and end of life consideration. The concept of circular economy relates to reduce, re use (lifetime extension through maintenance or service, re-use, re-cycle, and re-manufacture (Agrawal et.al 2021, Sreekumar 2019). Several industry examples in the automobile sector the paper has illustrated the circularity concept there by achieving resource efficiency and environmental sustainability. Most important concept emerging in the area of environmental sustainability is Product Stewardship, which is a concept wherein the inner circles in the circular economy are promoted which leads to the development of sustainable business models [Jensen et al. 2017]. Product Stewardship can be developed through Government (through robust national policy) or Industry (through Extended Producer Responsibility) and collaborative efforts of both Government and Industry. The goal is to minimize the environmental impacts and achieve resource efficiency through-out the product life cycle.

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