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Environmental Sustainability through Sustainability Entrepreneurship – A Case Study of Apollo Tyres Ltd.

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Abstract *The rise in global population has resulted in overexploitation of natural resources. Overall, increase in the consumption pattern due to globalization has resulted in improved living standards, higher rate of infrastructure development, and rapid technological innovations. Deforestation, using the land for intensive farming with the help of chemical fertilizers, pollution caused by the products and industries, and so on, have altered the natural balance, resulting in global warming, climate change, extinction of species, loss of habitats, and depletion of drinkable fresh water. The pandemic COVID-19 is an eye-opener, which emphasizes on the requirement to rethink and reestablish the harmony between man and environment. We cannot think about a world without the technology, products, and infrastructure that we have today. Economic activities cannot be curtailed for the protection of the environment. This is where the importance of the concept of sustainability comes into the picture. This is the time, when it is not too late, to think about converting all economic activities into an environmentally sustainable one. Sustainability entrepreneurship is the process in which a company solves the social and environmental problems caused by their business activity through certain practices adopted by them. The author studies one of the leading tire manufacturing companies in the world, Apollo Tyres, as a part of his summer internship for a Master's degree in Business Administration. The study tries to expose the different practices followed by the company to protect the environment, reduce the negative impacts upon the environment, and to be environmentally sustainable.*

Keywords *Environmental Sustainability, Sustainability Entrepreneurship, Preventing Pollution, Sustainable Resource Use, Climate Change Mitigation, Environment Protection*

INTRODUCTION

Sustainability entrepreneurship solves the social and environmental problems caused by a company's actions through innovative practices in business. The concept considers environment and society to be the key stakeholders of the business. Thus, it makes contributions to environmental protection (Tilley et al., 2009). Entrepreneurs realize that consumers have serious concerns about the environment and there is tremendous opportunity for companies focusing on environmental sustainability. The methods they adopt to make their products, services, and processes environmentally sustainable provides value not only to the consumer, but also to nature, as the focus is to improve the quality of life ethically (O'Neil et al., 2009). The ultimate aim of sustainability entrepreneurship is to provide goods, services, and adopt methods or processes that reduce detrimental activities toward the environment and society.

Environmentally sustainable businesses improve human welfare by protecting raw material sources and preventing harm to humans by ensuring that the sinks for wastes are not exceeded (Goodland, 1995). All resources are obtained in a sustainable manner from sustainable sources like renewable materials and recycled or reused materials. Environmentally sustainable businesses do not consider the environment as a sink. No harm befalls the environment or all the biotic and abiotic elements in the ecosystem. Environmentally sustainable businesses address the waste generated and pollution caused by their activities.

Apollo Tyres, headquartered in Gurugram, Haryana, is one of the largest tire manufacturing companies in the world. The company was incorporated in 1972. Apollo set up its very first manufacturing unit in Perambra, Kerala, in 1977. In 1982, a dynamic new management team, under the leadership of Vice-Chairman and MD, Mr. Onkar Singh Kanwar, turned around Apollo Tyres. The company currently produces automotive tires, industrial tires, and specialty application tires from its manufacturing locations across the globe.

The company, with its manufacturing presence in Asia and Europe (Corporate Presentation, 2018-2019), considers environment as a key stakeholder and works toward ensuring environmentally conscious operations (Apollo Tyres – Sustainability Report, 2018-2019).

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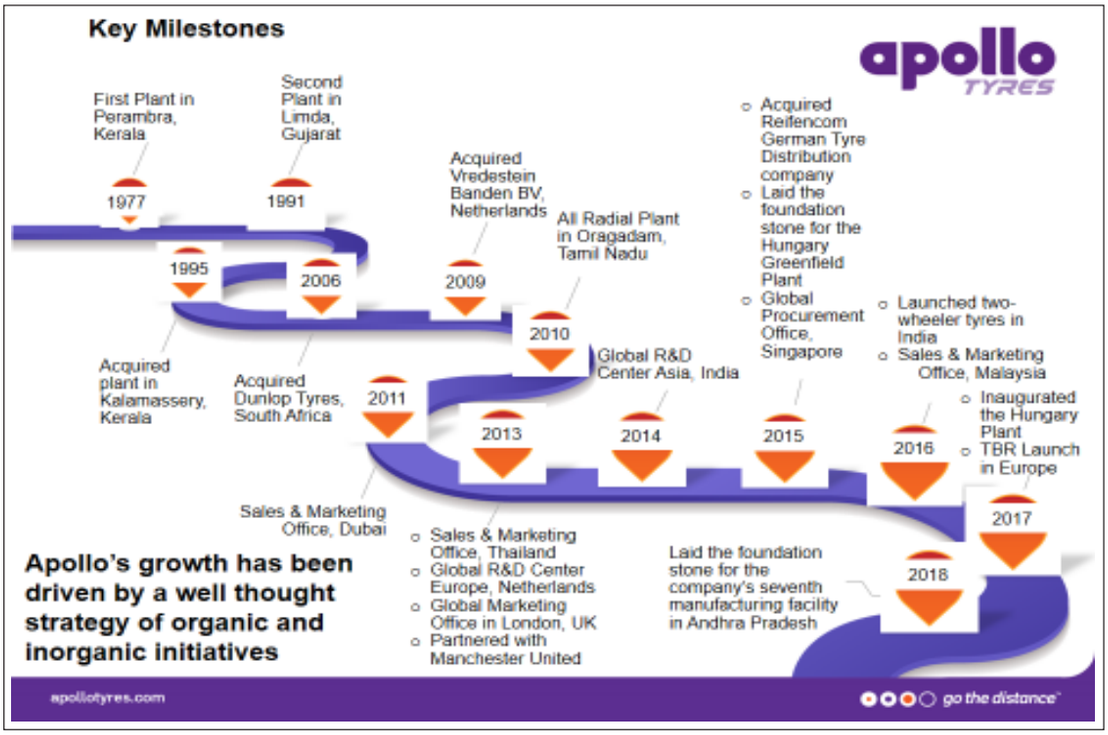
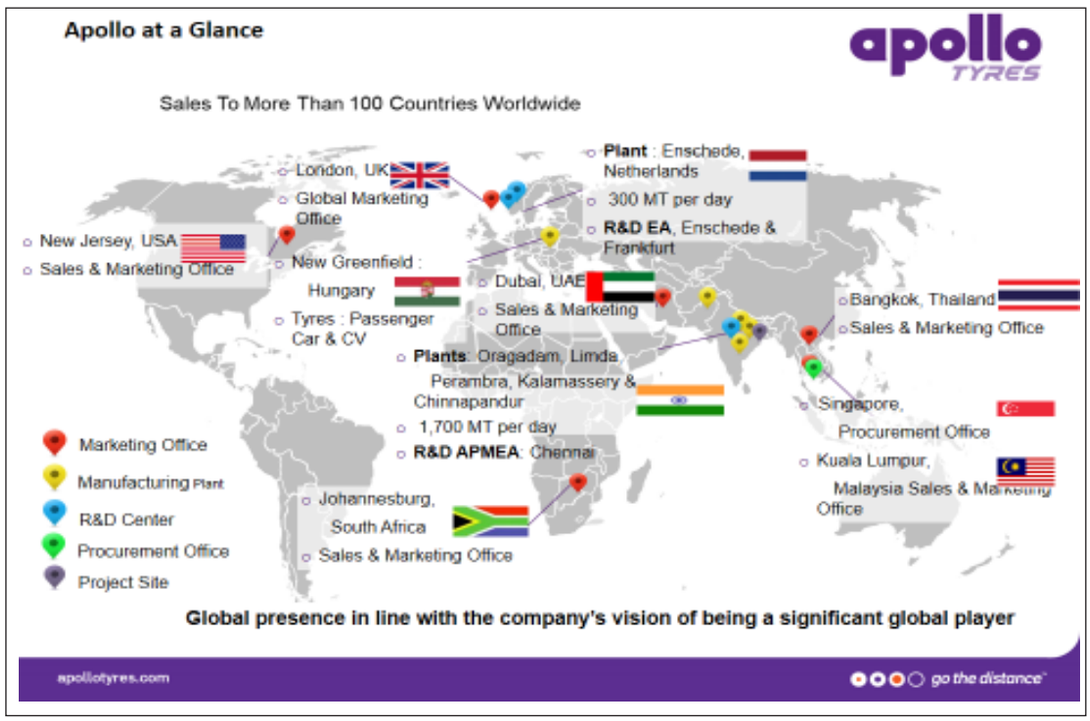


Source: Prepared from the Corporate Presentation, 2018-2019, available at https://corporate.apollo tyres.com/about-us/company-presentation/

Fig. 1: Key Milestones of Apollo Tyres



Source: Prepared from the Corporate Presentation, 2018-2019, available at https://corporate.apollo tyres.com/about-us/company-presentation/

Fig. 2: Global Presence of Apollo Tyres

The objective of this paper is to understand the environmentally sustainable practices of Apollo Tyres Ltd., and to reveal the different measures taken by the company to reduce the environmental impact of its products, thus making its manufacturing process environmentally benign.

ENVIRONMENT – THE KEY STAKEHOLDER

The three main pillars of sustainability are environmental, social, and economic factors (UN Report, 2002). A sustainable business model encompasses different elements of performance along with contribution to environmental and social progress (Klettner et al., 2013). An important role in achieving the sustainability of a business is played by environmental protection (Stojanovic et al., 2018). The recent COVID 19 pandemic has forced businesses to rethink about the relation between man and environment.

In order to understand how the company ensures environmentally conscious operations, the author picks key points from the Sustainability Report, 2018-2019, of Apollo Tyres.

ENVIRONMENTALLY CONSCIOUS OPERATIONS OF APOLLO TYRES

"Environment management is integral to the sustainability strategy of Apollo Tyres. The Company is relentlessly focusing on reducing the environmental impact of its products and making its manufacturing process environmentally benign." (Apollo Tyres – Sustainability Report, 2018-19). The company addresses four environmental issues.

Environmental Issue 1: Preventing Pollution

Pollution has existed from the time humans organized societies and started carrying out various economic activities, though it has varied massively in time, type, and seriousness (Speth, 1988). In tire manufacturing, the primary environmental concerns are fugitive air emissions, solid wastes, wastewater, and hazardous wastes (Bradley et al., 2000).

Light naphtha, made of aliphatic hydrocarbon (nhexane) and aromatic hydrocarbons (benzene, ethyl benzene, toluene, xylene, and cumene), is used as a solvent in the tire production processes (Norazura et al., 2011). Exposure to these organic solvents either through skin contact or inhalation of the volatile vapors can affect the health (Zailina et al., 2009). The International Agency for Research on Cancer (IARC) labeled the rubber industry as belonging to group 1 carcinogenic (Lee et al., 2012). Primary pollutants like CO_2, CO, SO_2, NOX, particulate matter, and so on are formed directly by the emissions from the rubber industry plants (Arachchige et al., 2019). These air pollutants mainly affect fog and smog formation, and cause acid rain (Arachchige et al., 2019).

Four grades of carbon black (CB) products (N-220, N-330, N-339, and N-660) are used in different tire products; it was found in a study in Taiwan that several farmlands and irrigation rivers of agricultural land are affected by CB emissions near the tire manufacturing plants (Lai et al., 2018).

In a study conducted in a tire manufacturing complex in Iran, the results concerning personal exposure to occupational noise of the units showed that the workers were exposed to continuous noise that was above the standard limit. Highest dose of exposure to noise was in the curing unit (147%) which is regarded as the most dangerous area with respect to the degree of noise pollution (Hassanvand et al., 2019). Thus, tire manufacturing units are considered to be a hub that causes pollution in different forms.

To address the issue of pollution the company has taken two major initiatives. They are as follows.

Emission Reduction – Efforts were made by the company, with the help of state-of-the-art technology, to ensure that the concentration of air emissions across the plants was within the prescribed limits throughout 2018-2019 (Apollo Tyres – Sustainability Report, 2018-2019).

Waste Management – In a tire manufacturing unit, waste generated from operations include solid and liquid forms, and hazardous and non-hazardous waste. Arachchige et al. (2019) categorized solid wastes in tire manufacturing units as follows:

- *Rubber* – Tires rejected in experimental tests and quality control, as well as the molding waste.
- *Metal* – From wire bead, steel cord, and belt processing.
- *Textiles* – Components in reject tires like fabric cord and belt.
- *Rubbish* – Containers of contaminated raw material.
- *Plastic or polythene* – Packing and finishing.

Waste water is generated from the cooling, heating, vulcanizing, and cleaning operations (Bradley et al., 2000). The liquid waste have contaminants like anti-tack agents, oil, grease, rubber fines, and so on, which when disposed in water bodies contributes to eutrophication, that is, the acids used in latex coagulation varies the pH level of the water body (Arachchige et al., 2019).

In Apollo Tyres, the total solid waste generated during 2018-2019 was 27,203 Metric Ton (MT). In the Asia Pacific, Middle East and Africa (APMEA) operations, 688 MT of hazardous and 18,983 MT of non-hazardous solid wastes were generated. The generated hazardous liquid waste was 21,236 KL. In the Europe region, a total of 448 MT hazardous and 7,084 MT non-hazardous solid wastes were generated during 2018-2019 (Apollo Tyres – Sustainability Report, 2018-19).

Reducing the amount of waste generated and treating the waste properly, especially hazardous wastes, should be of prime concern to the company.

Environmental Issue 2: Sustainable Resource use

The company promotes sustainable use of resources through saving energy, recycling or reusing water, and using recycled raw materials.

Energy Saving – Apollo Tyres uses both direct and indirect energy sources with a mix of renewable and non-renewable fuel types.

The main source of direct energy for Apollo Tyre manufacturing units in India continues to be coal, followed by furnace oil, which is a recycling product of mineral oil (Mazumder, 2017). These sources have led to the clearing of large forest areas for digging mines. Overexploitation of mineral oil and natural gas reserves has resulted in the erosion of the environment, irreversible damage to nature, and environmental pollution (Lakatos et al., 2011). Among fuels, compared to oil and natural gas, coal is an inconvenient fuel to mine, handle, transport, and burn at the end-user level; it causes relatively more environmental pollution (Mumtaz et al., 1986). It is really a blessing to note that Apollo Tyres in India is using solar and wind power as other direct energy sources, while indirect energy sources comprises grid electricity, wind, and solar energy.

In manufacturing units in Europe, direct energy is sourced from natural gas, while in the Netherlands, electricity is the primary source of indirect energy. Natural gas cannot be considered an environmentally sustainable source of energy. Natural gas is often found within the shale deposits located at significant depths much below the level of the water table; and through the borehole drilled, water at high pressure, containing a variety of chemicals which include biocides such as glutaraldehyde, surfactants, friction reducers, electrolytes, breakers such as sodium chloride, corrosion inhibitors, iron control agents, oxygen scavengers, and scale inhibitors and a propping agent, is injected into the shale to break it apart and allow the release of the gas (Carpenter, 2016).

Up to 40% of the massive volume of water injected into the well comes back as produced water, containing chemicals, unusually high salt concentrations from primeval deposits, and naturally-occurring radioactive materials, making the disposal of this produced water a major problem, as conventional wastewater treatment plants are usually not capable of removing the chemicals or radioactive compounds in it (Carpenter, 2016). This will result in the contamination of ground and surface water (Warner et al., 2014) with methane (Osborn et al., 2011), radium (Carpenter, 2016), and so on.

The total energy consumption (both direct and indirect) for 2018-2019 was 5,939 TJ vis-à-vis 5,093 TJ in FY2018. The share of direct energy was 70.3% (4,174 TJ) and indirect energy (1,765 TJ) accounted for the balance (29.7%). It is important to note that non-renewable energy sources contributed to the major share in the total energy consumption of the company, whereas coal remained the leading source of direct energy at 3,296 TJ, accounting for almost 79% of direct energy consumption. However, the company's initiative in India, during 2018-2019, in which the Limda and Chennai facilities contributed captive capacities of solar energy to the renewable sources portfolio, gives a clear picture of its commitment to be environmentally sustainable. The company continues to make efforts to achieve energy efficiency through improvements in process design, conversion and retrofitting of equipment, and use of energy-efficient equipment. Several initiatives were undertaken during 2018-2019, which resulted in energy savings of 22,800 GJ (Apollo Tyres – Sustainability Report, 2018-19).

Managing Water – The primary water source during operations is surface water, which accounted for 97.4% of total water consumption during 2018-2019. Other sources include ground water and municipal water.

The APMEA operations conducted several initiatives to conserve water in 2018-2019. These included:

- Improvements in quality of curing trench water to reuse as process water.
- Recycling water; recovery up to 95% of fresh effluent through a three-stage reverse osmosis process.
- Provided cooling tower water to bead extruder TCU instead of freshwater
    - Total recycled or reused water 8,10,164 M3
    - % of water recycled/reused in FY2019 was 12.6
    - % of water recycled/reused in FY2018 was 9.18

In the APMEA operations, the total annual water withdrawal was 22,92,820 M3, of which 8,10,164 M3 (35%) was recycled or reused. Thus, the company is taking sufficient

measures to manage water by increasing the percentage of reused/recycled water (Apollo Tyres – Sustainability Report, 2018-19).

Raw Material Management – The three primary constituents for manufacturing tires are natural rubber, synthetic rubber, and carbon black.

Total raw material consumed across operations: 9,67,609 MT.

Total recycled material: 6,254 MT.

In the APMEA operations, the total raw materials consumed was 8,86,773 MT and the total recycled material was 5,538 MT.

In the Europe operations, the total raw materials consumed was 80,836 MT. The total recycled material was 716 MT (Apollo Tyres – Sustainability Report, 2018-19).

Scrap tires collected through dealers can be converted to reclaimed rubber and crumb rubber, which can be used in manufacturing new tires (Rouse, 2005). Reclaiming is done through devulcanization method (Fukumoria et al., 2002) and crumbing is done through removing steel belts, bead wire, and fabrics, to produce tire chips, which are processed to produce finer particle sizes and super fine powder that can chemically bond with the virgin rubber in the vulcanization process (Sunthonpagasit et al., 2004). It is estimated that every year, around 1.5 billion tires are dumped into the environment (Su & Zhao, 2009). So, adopting the strategy of collecting scrap tires through dealers and using them as raw materials will bring great relief to the environment as this will reduce the amount of used tires, which are non-destructible and non-biodegradable, being dumped as waste, causing severe environment hazards (Aslan et al., 2017).

The company takes a positive initiative to include recycled materials, along with the raw materials, without compromising the quality of the product and reducing the negative impact upon the environment by the extraction of raw materials.

Environmental Issue 3: Climate Change Mitigation and Adaptation

To promote a climate-adaptive manufacturing set up, the company has invested in renewable energy, as well as various energy-saving initiatives.

The energy used to manufacture a new tire is 103MJ/Kg, which translates to greenhouse gas emissions of 6.9 kg of CO_2 per kg tire manufactured (Pehlken et al., 2005). Since the company's operations are mostly dependent on non-renewable energy sources, GHG emissions are present. With the addition of the manufacturing facility at Hungary, the footprint has increased. Apollo Tyres, in FY2019, made its GHG footprint estimations more comprehensive by including emissions from upstream supply chain and downstream logistics to employee air travel as well (Apollo Tyres - Sustainability Report, 2018-19).

By embracing renewable energy sources and greener technology, the company can reduce GHG footprint in the future.

Environmental Issue 4: Protection of the Environment, Biodiversity, and Restoration of Natural Habitats

During 2018-2019, as part of the company's environment program, Habitat Apollo, several initiatives were taken to enhance biodiversity. While some of these activities were directly aimed at biodiversity conservation, others had indirect benefits (Apollo Tyres – Sustainability Report, 2018-19).

Formal risk and impact assessment studies to measure the impact on biodiversity in the manufacturing locations were conducted by third-party agencies. As an outcome of this study, biodiversity conservation projects were initiated at the company's Cochin plants (Apollo Tyres – Sustainability Report, 2018-19).

At the Kalamassery plant, the activities included maintaining the existing theme gardens such as butterfly garden, snake repellent plant belt, and fruit garden, to enhance the biodiversity and increase the species of flora and fauna. Apiculture, for collection of honey within the premises, was also continued at Perambra during 2018-2019. Additionally, the company initiated an organic farming project within the plant premises in Limda, Gujarat (Apollo Tyres – Sustainability Report, 2018-19).

CONCLUSION

The pandemic COVID-19 has helped one peep into the strategies adopted by Apollo Tyres to be environmentally sustainable. Sustainability is a concept that has attracted relatively more attention during this crisis. The Sustainability Report, 2018-2019, of Apollo Tyres, reveals that the company addresses four issues, namely pollution, resource use, climate change mitigation, and protection of the environment. The company considers environment as a key stakeholder and addresses these four issues progressively to be an environmentally sustainable firm. The company holds the emissions within the prescribed limits, possesses proper waste management technologies, promotes the use of solar and wind power as direct energy sources, takes initiatives to conserve water, manages the raw materials by including recycled materials, adopts steps to reduce GHG emissions,

takes initiatives to enhance biodiversity, and promotes organic farming. Through these practices, the company will be able to mitigate the environmental problems caused by their actions, which reflects sustainability entrepreneurship.

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