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CIRCULAR ECONOMY BUSINESS CASE STUDIES IN SOUTHEAST ASIA

Fortune Parts Industry PCL

- Pathum Thani Province, Thailand
- Automotive parts
- www.fpiautoparts.com
- Analysis period: 2016-2023

Design and Manufacturing of Recycled Plastic Automotive Parts

Business Spotlight

Fortune Parts Industry Public Company Limited (FPI) manufactures plastic automotive parts for both original equipment manufacturers (OEM) and replacement equipment manufacturers (REM). FPI is committed to development of low carbon and sustainable products and operations to contribute to reducing greenhouse gas (GHG) emissions (Scope 1, 2, and 3) in support of the Paris Climate Agreement.

The eco-designed front bumper of a 1-tonne pickup truck is made of 98% recycled Polypropylene (PP) plastic and 2% of reuse plastic material, and has 25% weight reduction. In 2022, this eco-designed bumper received the Circular Mark label, which considers issues such as resource use, waste generation, greenhouse gas emissions, and other environmental impacts throughout the product lifecycle, following 12Rs: reduce, reuse, recycle, reclamation, recondition, recover, refurbish, remanufacture, repair, return, refill and redesing. FPI uses about 6,400 tonnes per year of recycled materials in the manufacturing of plastic automotive parts, which means 82% of total raw material use is recycled material. The company plans to increase recycled plastic material to 93% by 2027, including using recycled ocean-bound plastics and strengthening its value-adding practices with recycled materials following its own 7Rs: replace, reduce, reuse, recycle, repair, recover and remanufacture.

The company uses about 36% renewable energy from biomass and solar energy in injection, painting, and plating processes. In addition, the company is piloting the use of agricultural waste (pineapple fibre).

FPI rents out unused injection moulds to business partners, so that these are repurposed for a useful second life. This practice creates additional revenue of over THB 20 million (around EUR 509,000) and reduces resource and energy consumption from mould production. This also involves remanufacturing unused moulds to as new specifications.

The company has successfully expanded trade channels, developed value-added products and services with innovation, and using automated production technology.

FPI also introduced circular economy practices to subsidiary companies in India and Saudi Arabia by using recycled plastic material in the production process, increasing the use of solar energy and recycled water.

Keywords

Recycled plastics, Automotive parts, Circular design, Renewable energy

Innovation

Product/Service design, Manufacturing, End of Life Management, Resource circularity, Resource efficiency, Resource substitution

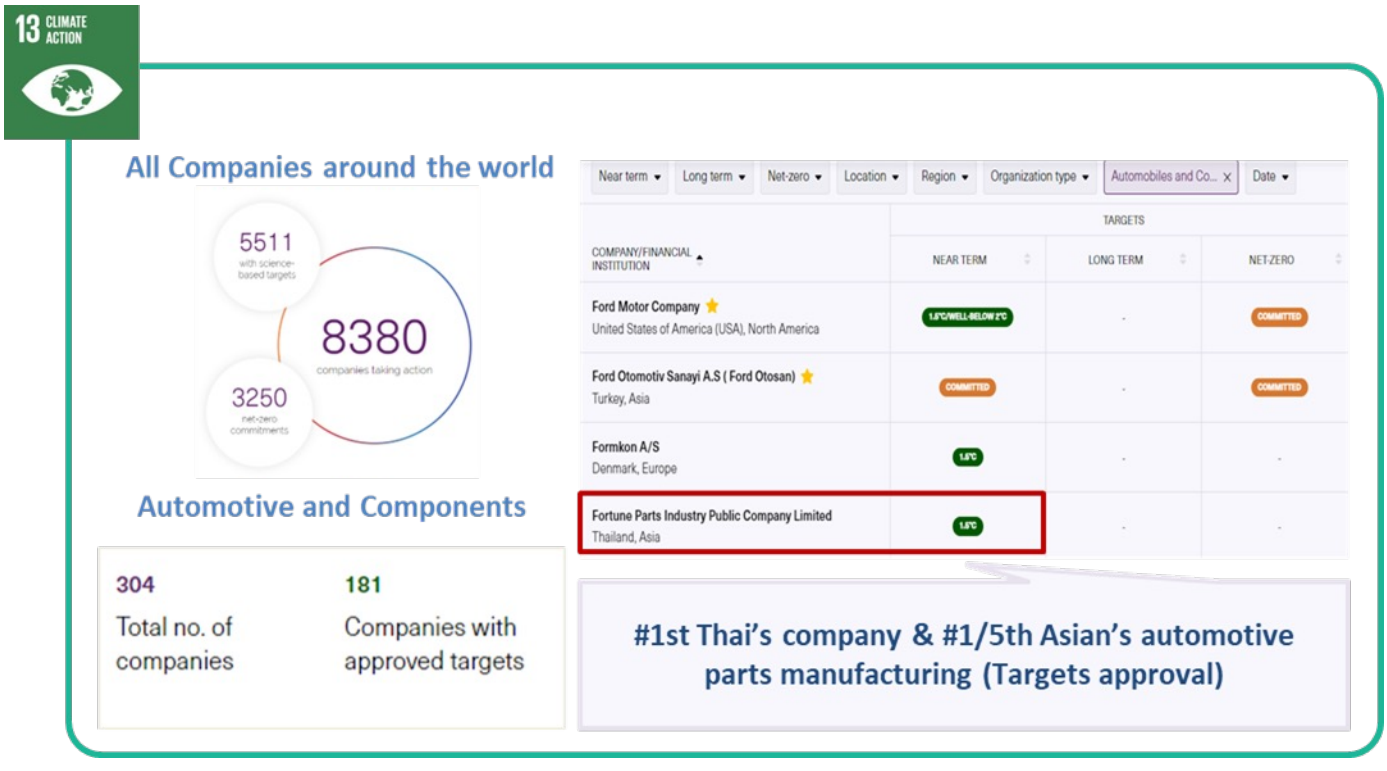
Analysis of Fortune Parts Industry PCL

Context and baseline

Fortune Parts Industry Public Company Limited (hereafter FPI), is a Thailand-based company providing one-stop service for automotive parts manufacturing for domestic and international markets. The company manufactures plastic automotive parts covering replacement equipment manufacturer (REM) products such as grille and headlamp doors, bumpers and valance panels, auto lamps and other accessories such as spoilers and skirt sets, among others. Original equipment manufacturer (OEM) products include front bumper guards, over fenders, side cladding, head lamp covers, tail lamp covers, mirror covers, electrical parts, and other accessories such as spoilers and skirt sets, among others. FPI also trades in automotive replacement parts. The company's services include plastic injection moulding, chrome plating, plastic painting, designing, three-dimension printing, mould rental, and sustainability advisory services.

FPI is committed to greening its products and operations to reduce greenhouse gas (GHG) emissions (Scope 1, 2, and 3) to contribute to the Paris Climate Agreement. The company has collaborated with global initiatives such as the Carbon Disclosure Project (CDP) and the United Nations (UN) to achieve the sustainable development goals (SDGs). In particular, the company focuses on contributing to SDGs, particularly SDG7 on affordable and clean energy, SDG9 on industry, innovation, and infrastructure, SDG12 on responsible consumption and production, and SDG13 on climate action and support. Other related company-supported SDGs include SDG4 on quality education, SDG6 on clean water and sanitation, SDG8 on decent work and economic growth, and SDG17 on partnership for the goals. FPI has committed to the Science Based Targets initiative (SBTi) and is the first Thai company and the fourth Asian automotive parts manufacturer that has had its short-term target verified and published by the SBTi, as shown below.

The company aims to increase earnings and profitability while reducing GHG emissions by some 40% and minimising environmental impacts. This leads to sharing and creation of economic value in response to various societal needs and challenges, aiming to create a low-carbon and sustainable society. Furthermore, this can increase eco-efficiency by creating economic growth with EBITDA as an indicator alongside reducing environmental impacts with GHG emissions as an indicator of enhanced sustainability performance. In 2023, their eco-efficiency increased to 80,835 THB per tonne CO_{2eq}, compared to 55,710 THB per tonne CO_{2eq} in the baseline year of 2016 (50% increase), and the company's sustainability factor was indicated at 1.45, 45% higher than the base year.



Innovation

FPI is transitioning to using recycled plastic pellets. One of their leading products, the front bumper of a 1-tonne pickup truck, is made of 98% recycled PP pellets and 2% reuse-plastic raw material, resulting in more than 95% recycled content for the bumper as a whole. FPI also decreased expanded polyethylene (EPE) thickness from 2 mm to 1.5 mm to reduce material use by 25%, and no boxes are used for package. The product received the Circular Mark label[1], which considers five aspects: resource efficiency, quality standard of product, circular product design, environmentally friendly production process, circular economy management system, and end-of-life product management.[2]

The company's raw material has been assessed by the Management System Certification Institute of Thailand to meet the requirements on Plastic Recycling Traceability and Conformity and Ingredient Assessment Recycling-Requirements.[3]

The company is in the development process for electric scooter spare parts using recycled material from ocean-bound plastic waste, such as fishing nets for European customers, which contributes to reducing marine plastic litter. Similarly, the company has undertaken collaborative research with the National Metal and Materials Technology Center (MTEC) on using agricultural waste such as pineapple fibre to mix with virgin plastic pellets.

The companany is committed to elevating waste management by transitioning to zero waste to landfill and waste to value through collaboration with business partners on the company's 7Rs. Examples include recycling palladium (Pd) and heavy metals, recovery of fly ash, drag-out etching and painting waste water by using as raw materials for other industries.

The company uses about 36% renewable energy from biomass and solar energy in injection, painting, and plating processes.

1 Detailed information about Circular Mark is available at https://www.tei.or.th/th/ourwork_project_detail.php?pid=172&aid=11
2 Detailed information is available at https://www.globalcompact-th.com/news/detail/891
3 มดช. 9-2565 - MASCI Standard Intelligence Unit

Circular Economy impact

FPI innovations support the transition to a circular economy through improved use of recycled materials (indicative of resource circularity), more efficient use of materials and energy (indicative of resource efficiency) and substitution of non-renewable by renewable materials and energy (indicative of resource substitution).

Resource circularity: the Company creates value-added products and reduces environmental impacts by increasing the proportion of recycled raw materials and decreasing the use of new (or virgin) plastic pellets for more efficient and circular materials utilisation. The use of recycled plastic attained 82% in 2023, equivalent to the use of 6,400 metric tonnes of recycled pellets, consisting of 98.18% recycled PP and 1.82% recycled ABS. Additionally, there is a 2% reuse of plastic internally in the production process. The company has developed circular products through collaboration with stakeholders in plastic recycling development. The target is to increase the use of recycled plastic to 93% by 2027. These practices support the company's policy on zero waste to landfill and creating value from waste.

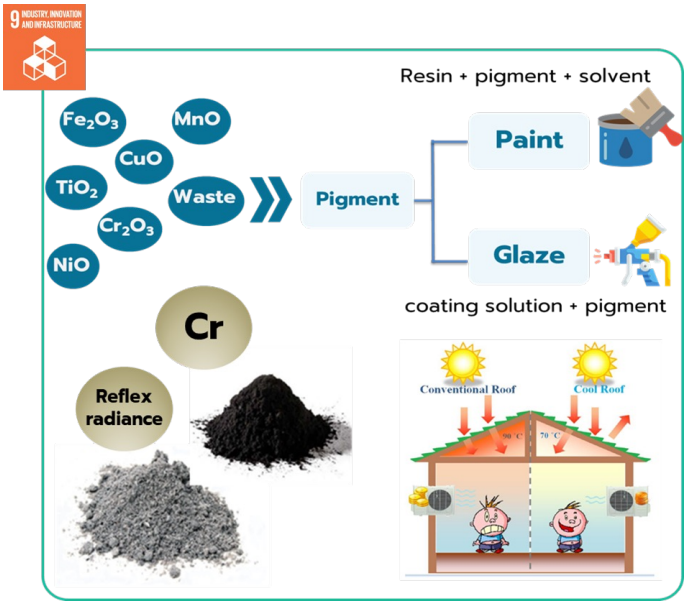
A further circularity initiative involves the renting out of the company's unused moulds to business partners, giving a second life to the moulds and avoiding the production of new moulds by the partners. Engaging consumers to use 3D printing as a replacement for creating mould prototypes can reduce energy consumption and steel import, which can decrease GHG emissions by 63%.

Resource efficiency: The eco-redesign of products from recycled pellets is accompanied by efforts to reduce material use in the product. The redesign of the leading product of the front bumper for 1-tonne pick-ups, for example, achieved a 25% dematerialisation, signifying that the same product functionality is achieved with 25% less material. Other products achieve different levels of dematerialisation, depending on geometry, size, and functional specifications.

In 2021 the company received certification on the ZWL-DIW:2564 Standard for Zero Waste to Landfill-DIW in recognition of having achieved zero hazardous waste disposal. Annually the company recovers 15 metric tonnes of heavy metals such as copper, chromium, and nickel for recovery and reuse in other industries. This hazardous waste is sent to an outsourcing factory type 106, which is a facility engaged in reprocessing discarded industrial products or waste from factories into raw materials or new products through industrial processing methods registered with the Department of Industrial Works.

Resource substitution: The company has already made significant progress in reduction of fossil energy use and greenhouse gas emissions by increasing the proportion of clean electricity through the installation of additional solar energy systems. In 2023, the company's energy consumption for production amounted to 92,967,749 MJ, divided as follows: grid electricity consumption of 59,262,473 MJ (63.75%), biomass energy consumption of 26,111,508 MJ (28.09%), and solar electricity consumption of 7,593,767 MJ (8.17%) or representing a proportion of renewable energy use of 36.26 percent of the total energy use.

As a further resource substitution initiative, the company is experimenting with the use of pineapple waste fibre for fibre-reinforced plastic parts and developing a reflective pigment from heavy metal sludge.



FPI is supportive of the global community's long-term target of limiting the rise in global temperatures by no more than 1.5 degree Celsius. In 2023, FPI achieved a 33.4% reduction in its greenhouse gas (GHG) emissions (Scope 1, 2, and 3) compared to the baseline year of 2016.

Business and market impact

The Company's circular and environmental initiatives are saving THB 60.9 million Baht (about EUR 1.5 million) per year on raw material, THB 13.4 million (about EUR 340,000) per year on energy consumption, and THB 4.7 million (about EUR 119,000) per year for waste management.

Efficient management of unused moulds that are rented can be used to avoid creating new moulds, adding value without the lessee having to invest in assets, but rather serving as market makers. This process already created additional revenue exceeding THB 20 million (around EUR 509,000) or THB 3.3 million (around EUR 84,000) per year.

Stakeholders

Business partners have transformed from competitors to collaborators by renting unused moulds from the Company. By shifting from producing moulds to renting unused moulds, resources are utilized more efficiently.

The company has generated employment for local workers by creating valuable jobs in the community with a local employment rate of 37.08% in Pathumthani Province, and generating and average income of THB19,848 (about EUR 505) per person per month.

Several suppliers provide recycled plastic material to the company. Another supplier and an intermediate polyester company provide recycled ocean waste material to the Company.

The National Metal and Materials Technology Center (MTEC) is conducting the laboratory work on using agricultural waste such as pineapple fibre with the company.

Implementation

FPI has benefitted from expanding trade channels, developing value-added products and services with innovation, and using automated production technology. As a result, the company plans to further increase recycled plastic material to 93.00% of its production by 2027, and to strengthen the practices for value creation from waste, following its own 7Rs:

1. Replacement: FPI is collaborating with suppliers to expand the capacity of the wastewater treatment plant from 250 m^3 to 450 m^3 per day through automated control systems and continuous flow treatment. These practices enhance treatment efficiency, reduce water pollutants from chemical usage, improve chemical dosing accuracy, and reduce environmental impacts by lowering BOD and Ni levels, resulting in higher-quality effluent water that meets or exceeds regulatory standards and increases water recycling.

2. Reduce: FPI is reducing energy consumption from fossil fuel by increasing the proportion of clean electricity by installing additional solar energy systems. In addition, they are reducing water consumption per production unit by adding a step for washing products in the plating line and changing the plating process to switch from Cr6+ to the less toxic Cr3+.

3. Reuse: the company is collaborating with business partners to increase the efficiency of waste management from defective, damaged, or unused products, and to return them back to the production process. They are also increasing the reuse of treated waste water in the plating process by at least 15% annually, having already achieved 19.16% water reuse in 2023.

4. Recycle: The company continues to develop circular products by maximising the use of recycled plastic through collaboration with stakeholders in plastic recycling development.

5. Repair: FPI is collaborating with customers to refurbish products that do not meet plating standards but are nevertheless of good quality, such as those with scratches and uneven colours from the plating process, through a repair process involving painting and selling them as refurbished products according to customer specifications. In 2023, the company repaired a total of 2,988.38 k of returned products.

6. Recovery: Collaborating with Matsumoto Sangyo (Thailand) Co., Ltd., FPI is recovering palladium (Pd) from rinsing water along with filters used in the plastic plating process, enabling the reuse of palladium. This initiative reduces hazardous waste and palladium recovery by approximately 0.04 tonnes per year, contributing to sustainable economic value addition in the industry.

7. Remanufacture: The company is collaborating with customers to take moulds that are unused or been discontinued, and making them available as remanufactured moulds. In 2023, the use of steel for mould production was reduced by 15 metric tonnes, which will have reduced GHG emissions by an estimated 24.57 tCO_{2eq}. Production costs were also reduced by THB 900,000 (around EUR 23,000 EUR).

From 2023, the Company is starting to introduce circular economy practices to its subsidiary companies in India and Saudi Arabia by using recycled plastic material in the production process, and increasing the use of solar energy and recycling of water.

Takeaways

Circular Living is a product design concept that focuses on extending the lifespan of product, using renewable material, and utilizing renewable energy. Automotive parts are accordingly designed to be compatible with multiple models, designed to be lightweight, and to reduce packaging usage. Products are repaired or refurbished during the manufacturing processs, and unused materials are recovered and reused. Upcycling resources or waste enhances value in the conversion of Waste to Value.

Acknowledgements

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