

## CIRCULAR ECONOMY BUSINESS CASE STUDIES IN SOUTHEAST ASIA



## Thai Wacoal

Bangkok, Thailand

Garment

[www.wacoal.co.th/en](http://www.wacoal.co.th/en)

Analysis period: 2021-2023

## Towards Fashion Circularity through Material Substitution

### Business Spotlight

As a subsidiary of Wacoal Japan, Wacoal Thailand committed to the group's sustainable development goals, and to the adoption of climate friendly sustainable production. In 2021 Thai Wacoal, a leading manufacturer of undergarments, innerwear and lingerie, initiated its Wacoal We Care initiative based on introducing transformative changes to implement circular economy in production. Actions addressed three separate product lines with material substitution of the components for the Eco Bra using ecofoam and recycled PET fabric, for the Sport Bra with regenerated nylon, and for Latex with rubber substitution for metal wire.

Recycled fabric still costs about 20%–30% more than non-recycled fabric, but the company operates at an economic scale that enables cost recovery. The company is on track now to use raw materials sourced from bio- and circular-economy businesses up to the equivalent of 30% of its finished products sales in Thailand.

### Keywords

Circular material substitution, Circular fashion, Recycled fabric

### Innovation

Product design, Manufacturing, Distribution, Use and maintenance, End-of-life management, Resource circularity, Resource efficiency, Resource substitution



## Context and baseline

As a subsidiary of Wacoal Japan, Wacoal Thailand joined the group's commitment to its sustainable development goals and the adoption of climate-friendly, sustainable production and the promotion of sustainable consumption.

Since 2002, Thai Wacoal has increasingly adopted Kansei Engineering<sup>1</sup> in its product development to better meet customer use expectations. As part of this strategy, every five years Wacoal conducts a customer survey on the appropriate size of bra and underwear partnering with the Thai Industrial Standards Institute and the Ministry of Industry. Over time, designing and producing to Thai sizes has significantly improved production and sales forecasts, resulting in reduction of stock keeping or unsellable stock going to waste. The company's current design strategy aims at *'being confident outside and comfortable inside'*.

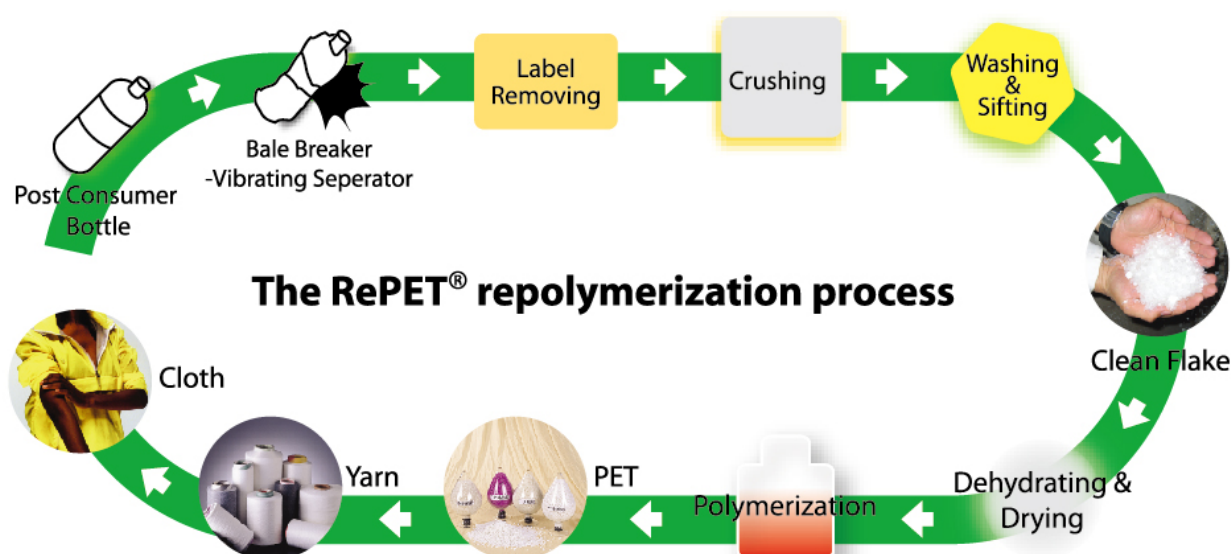
Guided by corporate commitments, Thai Wacoal participated in various government-led initiatives, including carbon footprint and cool mode innovation products in 2009, Green Industry Certificate (Level 4) of the Department of Industrial Works in 2018, and Circular Economy Management System of Thai local Bureau Veritas Certification in 2023. Most recently the internal research and development group of Thai Wacoal developed the circular economy solutions for selection and use of circular materials for bra components with the support of its headquarters in Japan.

## Innovation

Wacoal's circular economy innovations are based on a careful selection of alternative eco-friendly materials to ensure these have equal material qualities, and are suitable for new bra product designs that meet the company's philosophy of Fitting, Function and Fashion. Thai Wacoal procures the textile fibres for the EcoBra from polyester, produced from recycled PET bottles manufactured by Indorama Polyester. The company thereby reduces the use of virgin cotton material by replacing with alternative materials. In addition to the recycled PET fabric, other alternative materials used are recycled nylon fabric (from used fishing nets), eco-foam (with 10% palm oil-based polyol) and latex (a natural rubber product as a substitute for bra wires).

Furthermore, products are increasingly designed with neither hooks nor straps, which reduces material diversity and thereby facilitates end-of-life management. Wacoal is offering improved user instructions for product longevity with the target of 100 times of use within 2 years after purchase through hand washing without bleaching or wringing, and drying naturally in the shade.

In production and distribution, the company is increasing the use of renewable energy and reused packaging. Specifically, the company stopped using LPG in its dyeing plant, installed solar energy equivalent to 30% of electrical system, started using 100% recycled pulp packaging and reuse of packaging, started using LPG fuel for trucking in the distribution and logistics system, and started using diesel B7 in the steam cleaner.



<sup>1</sup> Kansei engineering is an ergonomic consumer-oriented technology for new product development to match new product designs to consumer product preferences and product use experiences.

Wacoal offers a bra-repair service to extend the product use time, which was used 1592 times in 2021 and 2004 times in 2022. Wacoal also collects used bras for end-of-life management (waste to energy) through bins in major shopping malls which are supported by an annual campaign, termed Braday, and using a free-of-charge return mail service. Wacoal transfers these end-of-life bras to third party for production and use of Refuse Derived Fuel (RDF). This started off with about 500 kg in 2012, increasing to 20,120 kg in 2023, and cumulatively totaling 92,186 kg over the 13 years.

## Circular Economy impact

These innovations of Thai Wacoal are supportive to the circular economy transition by their more circular and efficient use of materials and resources and switching to renewable alternatives.

Most profoundly, the company contributes to the more circular use of materials by using post-consumer recycled polyester and nylon fabrics in bra components, which has diverted these wastes from landfill or incineration and avoids using virgin materials and the environmental impacts associated with their production. With its Braday and related initiatives, Wacoal also supports source segregation of end-of-life bras, at a rate of 20 t annually in 2023, and facilitates their environmentally sound disposal for energy recovery. It also encourages communities within close proximity of the manufacturing plant to collect their plastic waste, an average of 3 metric tonnes monthly, which the company then forwards for energy recovery.

The company's innovations also improve the efficient use of materials, energy, and water, both in its own operations as well as in the use cycle of its products. As a recent initiative, the company more than doubled its use of multiple-use boxes in distribution to 67% from July to December 2023. The company thus reduced single use cardboard boxes at a value of THB 256,000 per month (approximately EUR 6,500). The company's care instructions are enabling extended use of the bra-products, up to 100 times in 2 years, which reduces both end-of-life bra waste as well as energy and water use during successive use and laundering cycles.

Moreover, the company achieves substitution of non-renewable energy by renewable energy through its roof-top solar system. This already provides 27% of electricity used for inverter and 34% used in associated electrical system. Moreover, using eco-foam as bra-material achieves a partial substitution to renewable materials use as the eco-foam includes 10% palm oil-derived materials.

## Business and market impact

Material from recycled fabric costs about 20%-30% more than non-recycled fabric, but the company operates at an economic scale that enables cost recovery. Wacoal intends to be a model for Thailand in circular manufactured bras, and intends to outsource these products as an original equipment manufacturer (OEM) for other Wacoal markets such as India.

In its production, the company plans to increase renewable energy to 50% along with energy efficiency, achieve reduction of fuel and water use and increase PET bottle recycling. By 2050, Thai Wacoal aims to have become a net zero company.

The company is on track to use raw materials sourced from bio- and circular-economy businesses up to an equivalent of 30% of finished products sales in Thailand.

The company is also influencing the bra-market as its annual braday and its extended care instructions have a ripple effect on the use and end-of-life management of competitors' products.

## Stakeholders

Wacoal's CE initiative has been significantly facilitated by strengthening its local supply chains. Most importantly, Wacoal uses high-quality recycled PET manufactured by Indorama Polyester from recycled PET bottles. This recycled PET is in turn used by technical textile manufacturers to produce recycled fabric for use by Wacoal. Wacoal also sources recycled nylon from Nyl-One which collects discarded fishing nets, processing them into fabric. Wacoal has benefitted from collaboration on product development with the Environmental Design Creative Center, Faculty of Architecture, Kasetsart University.

Moreover, Wacoal is aware of information on marine plastic waste reported by the Department of Pollution Control and the Department of Marine and Coastal Resources, which helped setting the overall context and motivation for Wacoal's efforts.

TPI Polene Power Public Company Limited (TPIPP) functions as a waste sorting plant for the end of life of the company's products by transforming these into refuse-derived fuel (RDF) products.

From April 2021 to April 2023, about 36 tons of waste (mainly PET bottles) were collected by communities within 5 km of the factory. The communities sold recyclable waste to the company, which brought them to PET recyclers. Recyclable waste generated THB 382,193 (around EUR 9700) as supplementary household income.

## Implementation

With the full support of all government stakeholders, the company has not faced technical challenges in setting up new supply chains, but the available volumes of quality recycled fabric in Thailand is still relatively small and its cost is relatively high. Therefore, the company will continue to increase the sales of circular economy-based eco-bra products.

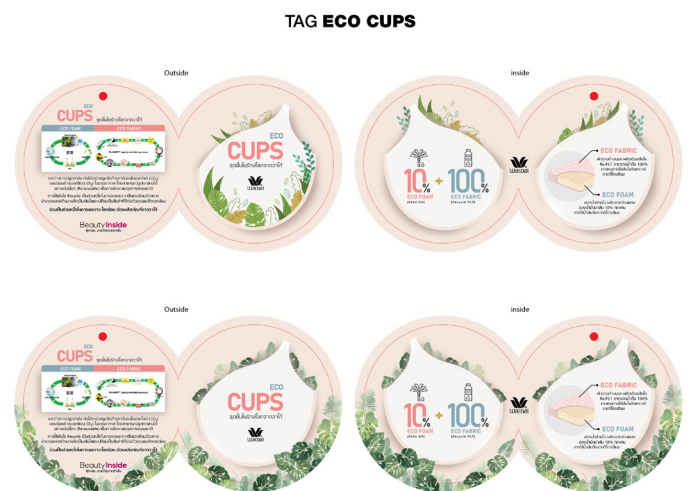


The company has not had to face any difficulties due to changes in machinery, skills, and manufacturing processes with regards to the new CE materials (recycled material) and bio materials (latex and eco-foam), because the new materials have been selected for having similar specifications as the virgin materials they are replacing.

The CE products have been introduced to customers under the collection of 'Wacoal Love Earth' and customers have thus far responded positively. In addition, Thai Wacoal raises customer environmental awareness through its Braday campaign for end-of-life management.

## Takeaways

Based on the circular economy lessons learnt from substituting materials in their products, Thai Wacoal recommends that eco-labels should clearly identify products that have been produced in a circular manner to increase consumer awareness and – eventually – market size. Eco-label standards for such products should be defined and formalised, e.g. to address flammability concerns. Moreover, circular economy uptake can be further promoted by inclusion of circularity elements in Environment, Social and Governance (ESG) reporting. Laws banning open burning, including of unused and discarded clothes, should be strictly enforced.



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