F.15 Closing Material Loops for Tertiary Transport Packaging (PAPACKS)

Recyclable transport packaging tray made from recycled moulded pulp

Nature of Case Study	***Switching to fully recyclable, biodegradable and compostable moulded pulp transport packaging made from recycled materials***
Packaging Sector	*Tertiary packaging (transport) for perfume flasks*
Packaging Material	*Moulded pulp*
Type of Stakeholder	*Perfume manufacturer & packaging producer*
Geographic scope	*Tray pallets are applied at COTY's factory in Cologne*
Date	*Concept was first developed in 2016, since 2018 tray pallets are integrated into the transport process*

Nature of Intervention

Efforts for minimising adverse environmental impacts of packaging were traditionally limited to consumer and retail packaging in the primary or secondary packaging sector; however, in recent years growing concerns over the environmental impacts of certain types of tertiary packaging have led companies to rethink their existing supply chains.[58] . Verghese & H. Lewis demonstrates how pursuing more sustainable packaging solutions along the value chain can be integrated into a company's production process. This is illustrated by the case study of COTY Inc, a leading perfume manufacturer. COTY shifted from an environmentally disadvantageous transport packaging solution used for the transport of perfume bottles to a more sustainable one: the PAPACKS tray pallet.

Prior to changing to the PAPACKS trays, perfume flasks were placed into transport packaging composed of two materials: first, a polymer based flat tray was used to hold the flasks in place, while a second component made out of cardboard ensured the structural stability of the transport packaging. This is illustrated in the figure 1 below. As COTY realised that this generated a large amounts of mixed packaging waste and always resulted in some of the packaging being incinerated at the end of life, its research department was tasked to search for more environmentally friendly packaging solutions. In 2016, the COTY engineering department approached PAPACKS, a sustainable packaging

[58] K. Verghese & H. Lewis (2007) Environmental innovation in industrial packaging: a supply chain approach, International Journal of Production Research, 45:18-19, 4381-4401, DOI: 10.1080/00207540701450211; accessed 29/04/2019 at https://www.tandfonline.com/doi/abs/10.1080/00207540701450211

company based in Cologne. Offering a combination of research & development, consulting services and production, PAPACKS was contracted by COTY to assess the technical feasibility of using trays based on moulded pulp. At the time PAPACKS had already worked on projects of integrating their moulded pulp technology into packaging concepts.

In a series of collaborative consultation meetings PAPACKS designed a concept tray which fit the technical requirements for transporting bottles to COTY's factory sites. As a result, they jointly developed the COTY tray pallet. As a material input for the moulded pulp, PAPACKS utilises a combination of scrap paper (including used PAPACKS trays), as well as plant based fibres from biogas plants, which are reclaimed from the solid phase of fermented residues. All the fibres originate from recycled plant residues, which can vary depending on the input composition of the biogas plant. Upon extraction, the fibres are then purified and directly utilised in the fibre casting process.

Figure 1 PAPACKS trays (left) compared to conventional packaging trays previously used by COTY (right)

The bottles are placed onto the trays, which are adjusted to each specific shape of the flasks and subsequently transported to the COTY factory sites, where the bottles are filled. Here the flasks are separated from the tray and the empty trays are brought to a shredding machine in a fully automated process. The shredded material is then used as input material for new PAPACKS trays or is fed into the recycling system as wastepaper. In this, the packaging materials continue to circulate in a closed-loop system. In principle, the trays could also be reused; in this case however, they would need to be transported back to COTY's production site. Due to the large volumes of empty trays, life cycle costing calculations suggest that it is less CO_2-intensive and more economical to shred the trays on site, press them into bales of secondary raw materials and send them back to the PAPACKS production site. This system could be further optimised by feeding the shredded tray materials into a fibre casting machine next to the shredder, from which new moulds could be produced on site. This would reduce CO_2 emissions even further and is currently considered for implementation by COTY.

The trays were integrated into COTY's production process in 2018. They are currently applied to all perfume-products in the factory site in Cologne. One of the more significant changes to the process line is the provision of trays by COTY directly to supplier of the bottles. This enables COTY to optimise the environmental impacts of the entire process chain, and results in a net decrease in contracting costs because the packaging and subsequent disposal services are directly provided by COTY. Consequentially, the successful implementation has led COTY and PAPACKS to explore expanding the packaging solution to other factory sites, thus replicating the current collaboration.

Direct integration saves additional water and CO_2. LCA calculations suggest savings of 706.97 tonnes of CO_2-eq per year by switching from PP-based trays to PAPACKS trays made from moulded pulp. For more information about the environmental benefits, please refer to table 1 below. According to production data provided by PAPACKS, the moulded pulp is also fully recyclable and compostable.

Table 1 LCA for COTY's packaging systems

Emissions per tonne of material				
Amount	Unit	Material	CO_2-eq	Unit
1	tonne	PP	1.6998	tonnes
1	tonne	PAPACKS	0.7996	tonnes
Emissions for COTY's annually required amount				
Material		CO_2-eq		
Plastic tray*		1,334.75 tonnes		
PAPACKS*		627.88 tonnes		
Savings		706.97 tonnes		

**weight of trays is comparable*

Reasons Driving the Change

At the core of the collaboration between COTY and PAPACKS was COTY's desire to redesign the packaging process in order to achieve higher standards of material efficiency and lower CO_2 emissions. COTY found that waste from packaging for transporting daily production amounted to three containers of mixed plastic waste.

From the start both COTY and PAPACKS were committed to develop more efficient transport processes, which would shift away from the use of single-use plastic material towards utilising secondary resources in a closed-loop fashion. Despite this intrinsic motivation concerns about compliance with potential upcoming legislative changes to the Packaging and Packaging Waste Directive (PPWD) also played a role in COTY's decision making. More specifically, expectations were that stricter obligations for packaging would be put in place with regards to recyclability and biodegradability.

Moreover, opportunities for cost reduction were identified and highlighted as an important reason for the implementation of moulded pulp trays in the process line. However, the savings potentials only emerged *during* the consultation meetings and subsequent design process. As such PAPACKS was able to achieve a decrease in total costs for packaging of 25%. This cost reduction stems from the reduced packaging waste and lower product cost. In addition, the potential for generating additional revenue by selling the shredded trays as secondary resources at end-of-life was highlighted.

An important factor which facilitated this change was that the PAPACKS tray could be easily integrated into the existing process line. Existing machinery, such as shredders, did not have to be specifically adjusted to the moulded pulp materials and were suitable to be used in the processing cycle of the new trays.

As the project demonstrated, the moulded pulp trays can be easily integrated into existing production lines and can have an immediate effect on the environmental impacts and further reduce packaging cost. Hence, COTY and PAPACKS both expressed that they currently strive to replicate the successful integration of the moulded pulp trays at COTY's other production sites in Europe.

Transferability to the Essential Requirements

Existing Essential Requirements by the PPWD and other legal frameworks only played a minor role in the decision making process.

The PAPACKS tray performs very well in regards to the life cycle impacts (specifically CO_2-emissions) when compared to alternatives. As of yet, life cycle assessments (LCA) are not yet integrated into the current Essential Requirements. According to PAPACKS representatives, considering the packaging's entire life cycle within the Essential Requirements would incentivise changes towards circular packaging options on a broader scale. Hence, integrating LCA results or at least some

elements of life-cycle-based thinking could support the use of moulded pulp trays in the tertiary packaging segment.

However, since the PAPACKS tray is exclusively used for transporting purposes, the environmental benefit on the life cycle of the end-product (e.g. the perfume) is not immediately evident. Therefore it would be beneficial if legislators acknowledged efforts to re-design specific components of the value chain to achieve complete circularity within their processes, through either the Essential Requirements or other legislative instruments. One frequently mentioned solution was the possible introduction of a European label for sustainable packaging, which could verify both the recyclability of the product and the fact that it originates from recycled material. This could serve as an indicator for packaging which is able to accomplish circularity by leveraging demand from customers of packaging solutions.

Notably, another legislative instrument which could support the circular approach of PAPACKS would be a carbon tax paid per product; this would disincentivise the application of carbon-intensive solutions (e.g. single-use plastics) and packaging, which cannot be reused or recycled at the end of life. At the same time low-carbon solutions (e.g. packaging made from recycled materials) would gain an economic advantage. Considerations for low-carbon packaging may also be considered for the revision of the Essential Requirements and would encourage transformations across the entire packaging industry.

References

Representatives from PAPACKs and COTY