15 Year Anniversary

Sustainable packaging initiatives

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Smarter packaging initiatives have been identified in research undertaken by the World Economic Forum as having the potential to deliver social, environmental and financial benefits within the supply chain.

The packaging industry has three goals:

- Meet consumer/business needs in terms of product protection, safety, handling and information.
- Environment: save more resources than are used in the manufacture of packaging
- Economic: save costs in distribution and merchandising of goods

Although packaging waste is regarded by many in the industry as a major problem, significant efforts have been made by the industry to increase its sustainability. According to the Industry Council for Packaging and the Environment (INCPEN), 60% of all packaging from industry, commerce and households is recovered and recycled. Indeed, a certain amount of packaging is required for consumer goods under EU law. The Packaging [Essential Requirements] Regulations 2003 sets out minimum weight and specifications for packaging, ensuring that it is fit for purpose and acceptable for safety and hygiene.

Although at face value the goal of reducing packaging would seem to be sensible, it has to be done in a way which reduces the risk of unintended consequences. Packaging exists to protect the product it contains and without sufficient or appropriate packaging a greater level of waste can be generated. A study by the US Chamber of Commerce concluded that a 1% increase in packaging resulted in a 1.6% decrease in food waste. For fresh meat, fish and salads, ‘controlled’ or ‘modified’ atmosphere packaging has led to a significant reduction in wastage of fresh product in shops and homes.

If assessed as part of the whole life of the products they are designed to protect, reduced packaging does not necessarily equate to lower carbon emissions. French fries, for example, which are prepared in a microwave have much higher packaging requirements than oven baked chips. However the microwavable chips only generate a tenth of the emissions from cooking compared with those prepared in an oven.

It is for this reason that an individual target of, for example, increasing the renewable component of packaging, is not regarded as the primary aim. Instead packaging’s overall contribution to reducing carbon emissions should be measured. For this reason there is no single way of measuring sustainability. For instance, any of the following factors could be taken into account when developing a metric.

- Renewable or non-renewable resource element
- Recyclable or not
- Biodegradable or inert

- Reusable or non-reusable
- Made from recycled or virgin material
- Lightweight or heavy duty.

However the main point is whether the packaging results in lower whole life emissions or not. That is not to say that efforts have not been made to increase the sustainability of individual elements of packaging, just that the bigger picture is more important.

SOLUTIONS FOR THE REDUCTION OF PACKAGING

The packaging material and design used in the storage and transportation of products is crucial to reducing both logistics costs as well as reducing carbon footprint and packing waste. Many US shippers were forced to look at more efficient packaging solutions in the mid-2000s when parcels companies introduced the principle of charging by dimensional weight (i.e. charging on the basis of the parcel's volume and not just its weight). This led to many companies reviewing how much air they were effectively shipping in their supply chains. At the time Wal-mart was believed to have reduced its packaging material volume by 3,425 ton, moving 727 fewer containers due to increased package density and consequently saved $3.5 million dollars in transport costs.

Apple managed to reduce the amount of plastic it used in the packaging of its 20 inch iMac by 66% and the amount of paper it used by 42% whilst reducing the space it took up by 41%. The reduction in the size of its 6th generation iPod packaging allowed it to ship 140 more units per pallet than the 4th generation version.

PACKAGING OF GOODS FOR E-RETAIL

The e-retail phenomenon has created an additional challenge for packaging companies. Whereas previously consumers would collect a product from the shops themselves, much of the retail sector is now characterized by the shipment of high volumes of small packages from distribution centres. In the first place this has increased the cost of packaging (many products are now individually wrapped in an inner and outer packaging case). Secondly the cost of the transport is inflated by the weight and volume of the packaging. Thirdly there are environmental costs related to the production and re-cycling of the additional packaging. Too much packaging and the costs of the logistics (both in financial and carbon emissions terms) are incrementally too high; too little packaging and the product can be damaged in transit, which means that the entire amount of energy invested in design, production, storage, packaging and transport has been lost.

E-retailers can minimize packaging costs by looking at the following factors:

- Minimizing packaging layers. Whereas most e-retail packages contain inner and outer layers it may be possible to develop packaging which eliminates the second layer.
- Use of sustainable packaging materials from certifiable sources
- Use of recyclable content where this uses less energy than virgin materials
- Minimization of application of printing inks or adhesive labels where these compromise recyclability
- Designing packaging to be reused (e.g. for returns)

In order to assess the sustainability of a packaging strategy it is advisable to measure:

- Spend on packaging
- Pack weight per parcel
- Proportion of goods returned as damaged

Case study: Lakeland reduces packaging waste through automated packing solutions

UK home products retailer, Lakeland, has been using an automated packing solution for 70% of the products it dispatches for its home shopping output for a number of years. The remaining output has been packed manually into 13 different box sizes, mainly smaller, oddly shaped and larger parcels. As the proportion of smaller orders and back orders was on the increase as a result of participation in a number of UK and international e-commerce marketplaces such as Amazon and eBay, they searched for an automated packing solution that could handle smaller orders.

The aim was to optimize the packaging process by eliminating the stock of different size boxes and its inventory management, improving efficiency, reducing the cost per box and avoiding any void fillers. Lakeland also needed a solution that was scalable in order to cope with volumes of complete parcels fluctuating from regular daily output up to requirements during peak period such as Christmas and Black Friday. The solution also needed to be able to combine marketing information enclosed within the carton.

There are several solutions on the market that cut cardboard to the right size for the items in the order but these still require manual parcel creation, packing, sealing and labeling. Instead Lakeland chose to work with CMC Machinery packaging technologies to implement a fully automated packing solution for small orders which resulted in improved efficiency, reduced cardboard cost and improved trailer fill.

The technology scans each individual order / product and produces a flat carton. The machine then packs the order with no void fill to the size of the products and inserts invoices and additional marketing material inside the carton based on the country of the order origin. The carton will then be labelled with a final dispatch label.

This is completed at a rate of 1000 parcels per hour. Lakeland took the opportunity to integrate the solution with catalogue/marketing media and dispatch note inserters to further reduce the need for any manual intervention during the packing process.

Based upon anticipated volumes over the first few years, the cost of the machine and the reduced labour requirement, the project will provide a return on investment within less than 2 years. Lakeland has also been able to reduce volumetrics in both weight and size of the cartons which means there is no longer the need to fill empty space in the box with void fill products. The impact on producing cartons the actual size of the product means a greener footprint for the company due to being able to dispatch the same number of parcels in fewer shipping containers.

Lakeland has also experienced the knock on effect of savings in inventory as they no longer need to stock numerous different sized boxes and now only have to stock pallets of fan-fold cardboard, from which they can produce any size box, personalized and robust. The cardboard is also totally recyclable.

Lakeland sees the packing solution as an important investment to support its growth and to enhance its service proposition for years to come.

PRODUCT LIFE CYCLE ASSESSMENT

Life Cycle Assessment (LCA) has been defined by UNEP as ‘a quantitative evaluation of the environmental performance of a product system across its life cycle.’ Although of course there are many conclusions which could be drawn by an LCA from an economic and social perspective, there has been much focus on packaging and the impact which this has on the environmental performance of a product across its entire life. In some respects the development of the concept of LCAs as a rigorous methodological exercise has been a response by manufacturers, retailers and packaging companies to convince regulators and policy makers that a nuanced approach is required to the problem of packaging waste.

As discussed earlier, although it may seem sensible to introduce schemes to reduce packaging waste from the perspective of mitigating CO2 emissions, unless full product Life Cycle Assessments are undertaken, there is a risk that decisions based on narrow metrics may be counter-productive. An LCA approach encourages supply chain partners – and politicians and regulators – to avoid making decisions which shift environmental burden from one part of the product life cycle to another. This means that it is rarely straightforward to make an assessment of the most sustainable approach to packaging and generalizations are unhelpful. As a report by UNEP asserts, 'The optimal packaging design from an environmental performance standpoint will vary according to packaging system characteristics such as raw materials chosen for use, the specific product being packaged, and the corresponding supply chain.'

In reality packaging decisions are based on a number of trade offs between 'least worst' options. For instance, when analyzing the implementation of an EU packaging directive, one study concluded that no type of packaging was always better or worse for the environment, irrespective of all assumptions made.

An example of this is the refillable bottle sector. Studies have shown that when the capture rate is high (as in a closed loop supply chain) and distances involved are low, refillables do have a lower carbon footprint. However this is not conclusive when capture rates are low even when transport distances are local. Certainly over longer distances single trip packaging generates lower greenhouse gas emissions.

The main reason for this is that the packaging needs to be stronger and heavier if it is going to be re-used, therefore adding to transport costs and CO2 emissions. If the packaging is designed for multi-use, but is only used once by the consumer before it is disposed of, then it may well be worse for the environment. If a lighter, single-trip package is used, it may generate a smaller carbon footprint especially if the consumer then recycles the packaging rather than sends it to landfill.

LCAs typically can be limited to the packaging itself or be extended to a wider product system to understand how it impacts on the product in overall terms.

If limited to the packaging, an LCA will evaluate:

- The materials used in the primary packaging (that which immediately protects the product) such as plastic granulate or cardboard. These materials could be virgin (either renewable or non-renewable) or re-cycled.
- The secondary or tertiary packaging (such as totes, corrugated cardboard packaging or pallets). These may be re-used, re-cycled or disposed of. In some cases they may have to be cleaned. If for instance bulk transport is used, tankers would need to be cleaned, probably with chemicals, which would add to the environmental impact of the product.
- The subsequent re-use, recycling or disposal of the primary packaging material by the consumer once the product has been used or consumed.

Generally, it is true that when one packaging is compared to another of similar weight and of the same material, the lighter the packaging the better. This is called in the industry 'lightweighting'. However this only works if the product is protected to the same degree by the lighter packaging with no diminution of its life. A further factor, of course, is that the packaging needs to be kept in a state which is not harmful to the consumer – a primary and fundamental function of packaging.

However of course in the real world, scenarios such as this rarely exist. In order to be lightweight and retain resilience, it may be necessary to use other raw materials which could have a completely different set of environmental disbenefits and trade offs. As the report by UNEP concludes, 'Conducting cross-material comparisons that emphasize minimizing solid waste can potentially lead to packaging designs that are associated with minimal waste, but when evaluated using LCA lead to increased energy demand from raw material production or other life cycle stages.'

Even re-cycling rates are not a clear indicator of the overall impact of packaging on the environment and as with packaging weight should only be used as one of a number of factors in decision-making. This is because ensuring that a type of packaging is recyclable can result in higher raw material burden. A study by packaging manufacturer Tetrapak found that 1 litre cartons produced using certain materials could environmentally outperform a functionally equivalent carton using alternative materials despite lower levels of re-cycling of the former.

As mentioned above, a holistic approach includes the impact of the packaging on the product. For example a cucumber bought shrink-wrapped lasts three times as long as one bought 'loose' without packaging. If the shrink wrap results in a significant reduction in food waste, then there will be a considerable saving in the amount of energy, water and greenhouse gases emitted. As outlined in the book 'Why Shrink-Wrap a Cucumber: A Complete Guide to Environmental Packaging' (Miller & Aldridge, 2012) an unwrapped cucumber loses 3.5% of its weight in three days due to evaporation of water content. This contrasts with the shrink-wrapped version which loses just 1.5% of its moisture content over two weeks. Keeping product fresher for longer means less food waste and consequently:

- Less fertilizer used to grow the product
- Less energy used in greenhouses and poly-tunnels
- Less water required to grow the product
- Lower levels of pesticide and herbicide used in growing replacement products for those which spoil in fridges
- Lower CO2 emissions generated by the transport of ultimately wasted products
- Less methane produced by products rotting in waste landfill sites.

Finally it is not always the case that renewables necessarily have less of an environmental impact than petro-chemicals, however counter-intuitive this may sound. Much depends on the carbon intensity of the process required to collect and process used packaging.