

Sharing Best Practice in Industry

Recyclability By Design Case Study — Bacon and Meat Packaging





About RECOUP

RECYcling of Used Plastics Limited (RECOUP) is a charity and leading authority providing expertise and guidance across the plastics recycling value chain. Built on a network of valued members, collaboration is central to its activities. RECOUP is committed to securing sustainable, circular, and practical solutions for plastic resources both in the UK and world-wide.

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RECOUP works to maximise plastic recycling through stimulating the development of sustainable plastics waste management, including the improvement of plastics collection and sorting activities across the UK, undertaking research and analysis to identify good practices and remove barriers to the adoption of efficient recycling systems.

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Introduction

The product manufacturer – the forgotten element in packaging choices

As RECOUP membership increases from across the complete supply chain - from packaging manufacture, through waste management processes, to the manufacture of new products using recycled material – one very important contributor to this process, which is often forgotten is the product manufacturer; the packer-filler; the site which buys the packaging and packs the product. This is often operating under instruction from major retailers, who may have the final say on some aspects of design.

One unfortunate aspect of this is that work which the product manufacturer will carry out to improve the sustainability of the packaging may be at least unnoticed, or at worst lost completely. The staff at the manufacturer have the knowledge of packaging, which is suitable for the processes, while also conscious of the need to address wider issues, such as recyclability. When asked to change packaging for example, to achieve greater recyclability, the packer will work closely with the brand owner (their customer) and also their packaging and equipment suppliers. This can be a time-consuming process; after which experience gained in the process can be restricted to the packer-filler.



Introduction

RECOUP Case Studies

It seemed appropriate that RECOUP find a way to capture the most comprehensive and valuable information from the meat industry, sharing this knowledge through research reports and case studies with our members, detailing the journey towards improved recycling and recyclability, in particular areas such as the packaging process and associated efficiencies and financial considerations. Much of our work to date has focused on the recyclability of the pack itself but we appreciate this is only part of the story

RECOUP produce Case Studies as an effective way to promote good practice while educating packaging technologists and buyers as to the best combination of packaging materials for their pack. The experts in this case are the packer-filler and the packaging provider who produce answers and practical advice. This knowledge and advice often goes unappreciated and is of high value to a wider audience.

For this project, RECOUP used examples from previous case studies, as a guide to what is required. Following the procedure previously used, next steps are to request sample packs for fresh meat and cooked meat packaging, with specification details. These will be assessed for recyclability.

Where recyclability has been achieved; RECOUP will request details of any previous versions; and details of the changes made. This will include packing machine settings.



Introduction

Definition of Packaging

Packaging is defined as "all products made from materials of any nature to be used for the containment; protection; handling; delivery; and preservation of goods from the producer to the user or consumer."

The main function of packaging provides protection and reduces product wastage and must:

- Contain
- Protect
- Preserve
- Inform
- Identify

At the same time packaging must:

- Be cost effective throughout the life of the product and the disposal of the pack
- Be environmentally responsible by creating minimal disturbance to the environment

Sustainability remains high on most companies' agendas as they look to make the correct choices to benefit the environment and consumer while under pressure to reduce costs and comply with relevant legislation. There is a requirement to be greener; use less materials; and pack goods in packaging that can be fully recyclable. At the same time they must continue to perform the main function of any packaging; which is to protect the contents of the pack.



Product Protection First

The following is an extract from RECOUP Recyclability By Design¹

Global megatrends such as climate change and resource scarcity are changing the world we live in. Today's consumer is increasingly aware of the need to re-use and recycle to contribute to a more sustainable society. However, placing the onus on recyclability to meet rising targets (55% by 2025 for plastic packaging) and in response to the drive towards a circular economy should not come at the expense of a holistic approach to sustainable packaging design.

“Even as we continue to drive recyclability, we must recognise that the function of packaging is first and foremost to protect its contents, and by doing so effectively, it also creates a variety of environmental benefits.”

Yui Kamikawa, VP Sustainability, kp

According to WRAP, in the UK, over 2 million tonnes of fresh produce is lost or wasted each year in the supply chain alone. The use of modified atmosphere packaging (MAP) and vacuum skin packaging (VSP) ensures that meat reaches the supermarket shelf in an undamaged state, whilst demonstrating a shelf-life of up to 28 days. Without innovative, functional and resource-efficient packaging, most packaged food would not last more than a few days, resulting in significant food waste.

¹ <https://www.recoup.org/p/130/recyclability-by-design>



Today, the number of plastic packs re-entering the recycling chain at the end of their service life is increasing, thanks to growing consumer awareness. Whilst this is positive news, it presents its own challenges. For example, localised infrastructure constraints can impair the separating and converting of the individually recyclable components of multicomponent MAP and VSP formats for end-use.

If plastic packaging is recyclable, while also being innovative; resource efficient and sustainable, all good. But to demonstrate holistic environmental credentials that become a real catalyst for change it must stay true to its core protective; preservative; and display functionality first and foremost.



Background – Meat Packaging

The way meat is packed has changed significantly over the years, with new designs, use of different materials and colours seen on supermarket shelves in the last 5 years.

In the early 1990s a new development played a crucial role in reducing meat and other fresh food waste: modified atmosphere packaging (MAP). MAP is used to preserve and extend the shelf-life of a range of different food products. It removes atmospheric air from packaging and replaces it with alternative gases keeping the contents fresher for longer, it keeps meat red and prevents bacterial growth. Shelf-life in fresh chilled meats is normally 1-4 days but MAP extends this to 10-14 days. Typical MAP packaged meat products would include pork, beef, lamb, bacon and some poultry and now most processed meats like sausages and burgers.

Historically meat trays were produced from Polystyrene, PVC, or PVC/PE. Manufacturers and brands started to move away from these materials as it became more apparent, they were difficult to recycle, difficult to separate from PET, and less environmentally friendly. Trays produced to pack fresh meat are today mostly PET and would be carefully designed to meet the needs of the product.

Typically, a meat tray formed from PET would have a PE layer/adhesive to ensure the top film attaches and seals correctly. Meat trays are mostly made using the thermoforming process, either at a packaging manufacturer, supplying trays to the packer, or formed onsite using FFS (Form, Fill, Seal) machinery. The speed and ability to adapt tooling easily making this process ideal for producing large volumes of trays. Meat trays with a PE layer can contain an EVOH barrier, sandwiched between the layers of PE, to provide an oxygen barrier and to provide protection against bacteria. The combination of different, inseparable polymers makes this format difficult to recycle; PET/PE trays are classed as not recyclable. PET (mono) material options are available, without the PE layer. Depending on the type of packaged protein, thermoformed trays would also include an absorbent pad to collect the meat juices. As recycling and testing of packaging has developed it was realised, the absorbent pad is not always removed by the consumer meaning it is left in the tray, which can contaminate further recycling. New innovations in tray manufacturing in recent years has seen meat trays feature a new design where the base of the tray captures and retains the liquid without the need for the absorbent pad. This means the new PET tray can simply be rinsed and recycled.

RECOUP Case Studies highlight the way forward - 2017

RECOUP were tasked with producing case studies across the food industry. The first set produced included an illustration of the differences between a pack produced using a PET/PE laminate; and a pack using mono PET.

Case Study 1:

Tray with PE layer



One rule-of-thumb used across all guidelines is that use of single materials is the preferred choice for recycling. Where different polymers are used, and are difficult to separate at either the sorting or re-processing stage, this will cause problems. In the case of PET/PE; if PE is processed with the PET, there is a risk that the lower melt point of PE will cause imperfections in the finished product.

Also, as in this example from another retailer, the tray is black. Food products packaged in black or dark grey trays were seen as premium but were soon redesigned due to recyclability issues. Dark and black plastic packaging is typically coloured using Carbon Black pigments. Because this pigment absorbs Infra-Red light, the packs are not detected, and therefore not sorted, by NIR (Near Infra-Red) sorting equipment used widely in material sorting facilities (MRF's). Research into black plastic, including a forum led by RECOUP², resulted in some manufacturers and brands removing black plastic and Carbon Black pigments from their packaging.

² <https://www.recoup.org/p/173/recoup-reports>

Case Study 2:

Mono rPET base film (no PE sealing layer)



This Co-op pack, (produced by Coveris for Pilgrim's UK and Co-op), included removing the PE sealing layer.

Also; the base web is clear PET. Clear PET provides the greatest opportunities for the tray to be recycled back into packaging. Coloured PET packaging has limited end markets in the UK and although can be recycled tends to go into lower grade applications such as construction. This is due to current infrastructure and UK markets for waste materials.

Pilgrim's UK work to provide a recyclable solution



Background

As noted on the original RECOUP case studies above; in the case of PET/PE; if PE is processed with the PET, there is a risk that the lower melt point of PE will cause imperfections in the finished product. A mono PET (or rPET) is therefore preferred.

However, this is not as simple as it sounds. Mono materials are not as forgiving as PET/PE when sealing through contamination. To achieve a successful seal with mono PET base film, extra care is necessary to avoid contamination in seals. Pilgrim's UK staff were made aware of this and engaged into working towards a productive line using recyclable material. Using the same teams on-line where possible reduces the problems of seal failure.

Pilgrim's UK continue to trial other suppliers recyclable materials, ensuring we are giving every opportunity for recyclable material to succeed. This is partly because currently the kp MonoSeal® mono base web and top web supplied are more expensive than the PET/PE solution.

Co-op meat range

Co-op advised their plan to move all protein into recyclable packaging. Trials for protein (Cooked Meats, etc.) were done over a period of time and successfully launched. This formed part of Co-op's ambition to achieve 100% recyclable food packaging by 2021.

Retailers tend to take the final decisions on packaging issues. In this case, Co-op decided to take this on cost to enable them to give the recyclable packaging solution they promised.

Bacon was not to be part of that launch window but was progressed later.

Dry Cured Shingled Bacon




Figure 1: Co-op mono-pack

Trials for shingled dry cure bacon started in 2016. Due to the bacon being dry cured there was no brine ingress to cause problems and the trials were successful. Launch into the recyclable material was progressed with the Co-op Irresistible redesign mid-September 2019, using unprinted top web and sleeves. Co-op then decided to move away from sleeves into printed top web.

Wet Cure Bacon Trials

Pilgrim's UK found that the wet cure bacon was much more of a challenge. It took time to find a solution where the seals did not fail due to the brine ingress during storage and through the chill chain trials. Trials were carried out over a period of 3/4 years to find materials which worked with the problems associated with Wet cure bacon. As mentioned above; mono materials are not as forgiving as PET/PE when sealing through contamination. To achieve a successful seal extra care is necessary to avoid contamination in seals.



Trials were carried out by packaging suppliers optimising the film blend and/or seal performance to reduce the incidence of leakers. After many site trials, Pilgrim's UK found that the kp top web developed alongside their kp MonoSeal® base web with a PET Copolymer sealing layer, was the preferred option. (kp advised that kp MonoSeal® rigid base web film has improved sealing properties vs APET, sealing better with contaminated surfaces and at lower temperatures).

It was found that once a positive seal was established, (using kp MonoSeal® base web and their complementary top lidding film), the seal successfully resists the water/brine ingress which comes from wet cure bacon. Larger transit trials and online production runs were successful. In 2019 new Textor lines were installed at site. As a matter of course, kp MonoSeal® base web and complementary top lidding film were trailed along with full online production. The materials ran successfully on these lines also.

Move back into recyclable material

Products were moved to recyclable materials. During this period of change, sealing problems became apparent with the 300g back packs due to high demand and through-put during Covid lockdown. Unsmoked at this time appeared to be more of a problem than smoked. To ensure consistent supply, Co-op gave permission for Pilgrim's UK to move back to the PET/PE base web, although insisted that work continued to find a recyclable material. The Co-op deadline was June 2021, which meant that site needed to have moved back into recyclable films for production by the last week of April 2021.

Further trials were carried out over the following weeks; constantly monitoring temperatures, etc. Multivac (the sealing machinery supplier) were brought in to support and calibrate sealing temperatures and readings.

For an interim period, all Co-op 300g bacon were moved to line 2 at the Pilgrim's UK site. This line had been successfully used for Co-op unsmoked and smoked Twin pack in the recyclable film with no problems. Although reduced, there were still some sealing problems. To ensure there were no problems with product into Co-op, extra people were put on the end of line to check/reject packs before boxing.

During continuous monitoring on the line, it became evident that staff moving from different lines onto line 2 were not aware of how much contamination they caused by touching the film when placing the product into the cavities. The people had been working on lines which were using PET/PE and this contamination didn't cause a problem. Initially the same people, where possible, worked on line 2, the outcome of which was a lower pack failure rate.

Over time, production of Co-op bacon has been moved to other lines. Care has to be applied to the initial seal to avoid contamination at the time of packing. However, all staff are trained and constantly reminded of the importance of avoiding contamination. As a result, once a successful seal is established the seals remain intact throughout the storage and chill chain.



Figure 2: Co-op wet cured mono-pack



Figure 3: Co-op mono-pack label



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