RECOUP

Refill Packaging Case Studies

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About RECOUP

RECOUP, is the UK's leading independent authority and trusted voice on plastics resource efficiency and recycling. As a registered charity, our work is supported by members who share our commitments including a more sustainable use of plastics, increased plastics recycling, improved environmental performance and meeting legislative requirements. We achieve these by leading, advising, challenging, educating and connecting the whole value chain to keep plastics in a circular system that protects the environment, underpinned by evidence and knowledge.

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Introduction

Demand for reusable packaging is growing.

During the last decade, the interest in reusable packaging has shifted from very niche consumer groups and smaller retailers to much wider audiences. A number of regulatory and voluntary agreements reflect this trend.

All four <u>UK Plastic Pact targets¹</u> are relevant to reusable packaging, with target 2: **"100% of plastics packaging to be reusable, recyclable, or compostable"**, being reuse-specific. Many signatories, such as brands and retailers, are already trialling the return and refill schemes in-store or offering refill products to meet this target.

Reuse is promoted in the <u>EC Circular Economy Action</u> <u>Plan</u> (2020)², while Single-Use Items Bans (Scotland, from June 2022³, EC from July 2021, England, Wales, and Northern Ireland, under development) will inevitably stimulate the adoption of reusable alternatives.

The importance of sustainable design for reuse, remanufacturing and recycling is also clearly stated in the outline of the End of Plastic Pollution Resolution UNEP⁴, March 2022.

These tendencies are supported by growing consumer interest. A poll by Hubbub showed that 63% of people are open to borrowing and returning a reusable container for a takeaway meal⁵ and 83% of respondents found Refill-at-home schemes appealing, according to the IGD Sustainable Packaging Systems Report⁶. Attention to the environmental credentials of packaging, interest in zero-waste shopping, and consideration of reusable packaging options among the public create a good starting point for the adoption of reuse at scale.

Plastic is an excellent choice for reusable containers due to its versatile properties.

Despite plastic having received bad publicity for pollution problems and resource use, these are mismanagement issues rather than material ones.

Lightweight and durable, with a range of barrier properties for water, light and oxygen, suitable for use in a range of temperatures from oven to freezer, including microwave, offering versatile visual characteristics, rigid and flexible options, with established reprocessing routes - plastic is an excellent choice for reusable packaging. These properties form a solid foundation for functional packaging that is easy to use throughout the supply chain and helps deliver environmental benefits for the whole reusable packaging system.

 ¹UK Plastic Pact
²Circular Economy Action Plan
³Single-Use Plastic Bans
⁴End Plastic Pollution: Towards an internationally legally binding instrument
⁵Hubbub. Reuse systems unpacked
⁶IGD. How to help consumers adopt reusable packaging

Introduction

Major challenges

Introducing a reuse system in place of or alongside singleuse requires new logistic solutions, additional washing/reuse preparation steps, and changes in consumer behavior.

The efficiency and economics of reverse logistics and preparation for reuse are crucial to the cycle. Systems serving single-use packaging were polished over years of operation; it is often challenging for newly established systems to compete. That's why collaboration is vital. Return rates and the number of reuses are equally important challenges. How many times can the container be washed and reused before it needs to be replaced? How simple and economical is it for the consumer to return the packaging? Looking at the reuse experience from the consumer's point of view will lay a good foundation for high consumer participation rates.

Circular Economy for Plastics

Reuse is the primary strategy to keep materials in circulation at their highest value. Each reuse cycle not only substitutes the production, transportation and distribution of the new single-use item but also allows to avoid the burden of end-of-life management that would have been associated with this item. Even with the best design intentions, a typical number of reuses will usually range from five to twenty; after that, the container will enter the waste management system.

Therefore, it is essential to look at reusable packaging through the life cycle perspective and ensure it is designed to be recycled when it can no longer be reused to maximise the environmental benefit.

Focus

This case study provides an overview of refillable packaging options available for direct consumer purchase off the shelf and online.

Previously, bulk refills were purchased for commercial needs and cost efficiency measures, but growing concern about the environmental impact of packaging makes refills an attractive option for usual household shopping. More brands are offering refillable products to meet customer demand and achieve companies' sustainability targets.

Widely adopted by the industry, the Ellen McArthur Foundation classification of business to consumer reuse suggests four reuse categories:

- Refill at home
- •Refill on the go
- •Return from home
- •Return on the go

These categories are based on ownership of the container (including who does the washing and preparation for reuse) and reuse location - either at home or on the go. This case study will look at reusable packaging for fast moving consumer goods that can be purchased and owned by the consumer. This packaging can be refilled at home using separately sold refills. These scenarios fall under the category of Refill at home.

This case study will investigate the_materials used in packaging designed for reuse and their suitability for reuse applications and recycling and research the various refill formats. The case studies will consider what works well and where challenges and possibilities for future innovation exist to support further development and collaboration in the reuse arena.

The following definitions will be used across the case study: **Reusable container** – a container used multiple times for dispensing the product for use by the consumer. This container can be purchased from a retailer empty or containing a product, or the consumer can repurpose another container to suit their needs. Usually durable and functional.

Refill container – a container used for transporting the product and decanting it into the reusable container. Usually lightweight, with a pouring/dispensing aid.



Reuse models by EMF classification

Splosh

Product:

A range of cleaning products (personal care, laundry, dishwashing, home cleaning) is offered on a subscription model or as payas-you-go

Reusable container: HDPE bottles with dispensing mechanisms, or consumer can use their own.

Refill container: Three types of pouches are offered: compostable pouch, refillable and recyclable via closed-loop pouch, resealable laminated pouch. Once the customers return refill pouches, pouches are washed and prepared for reuse by the company. If the pouch is still suitable for reuse, it is sold as a Crinkly pouch with a 10p discount.

Environmental message:

"Don't recycle - reuse & refill", "We cut plastic waste from your household bottle use to ZERO!" - Splosh website.

Design for reuse:

The reusable container is designed for life and can be returned for replacement if required. A route where the refill pouch is being cleaned and reused is preferable. The system is easy and intuitive to use and, once established, can become a habit for the customer who likes the formulation of the product. Reusing sturdy containers as many times as possible and recycling either via kerbside or company closed-loop recycling can provide tangible environmental benefits.

Recyclability:

Reusable bottles are recyclable via the household recycling stream; however, the pump can be an issue depending on whether it contains a metal spring. Pouches can be returned to the company for reuse or recycling if appropriate. Pouches are not recyclable via kerbside.

RECOUP comment:

Reverse logistic and end-of-life scenarios for refill pouches heavily depends on customer participation. The design of the refill pouches can be improved to make them recyclable via a household recycling system and optimised to increase the potential number of reuses. While flexible packaging is lightweight and undoubtedly provides benefits for logistic purposes, without being designed for reuse, it won't perform up to described refill scenarios and is most likely to end up in the general waste stream/or recycling scheme if a user is willing to participate. Using recycled content for both pouches and reusable containers would add additional environmental benefits.



Customer feedback:

"As a family we are passionate about the environment! Think we've almost saved 300 bottles in about 18 months. AND, the packets get reused as we post them back for free! Win win"

"I fear this company is greenwashing. The majority of the pouches are made from virgin material and despite saying for a good couple years they are making something out if returned pouches all they keep informing me of is ice scrappers. For me splosh don't seem to have grasped the concept of a circular economy as much as they claim."

Splosh product reviews



Carex

Product:

Liquid hand soap.

Reusable container:

The 250 ml hand soap dispenser is made from transparent PET with a PP pump. The pump has PE tubes and a metal spring in the head.

Refill container: Flexible 1L pouch with rigid PE closure. 5 L HDPE jerry can.

Environmental message:

"75% less plastic" (pouch vs the standard pump dispenser)

Design for reuse:

The dispenser has not changed from the standard bottle. Rather than recycling the bottle each time, refill pouches can be used to refill the bottle saving on plastics used for bottle production.

Recyclability:

The PET dispenser bottle can be recycled at home in kerbside collections. The pump contains a metal spring which means that ideally, it should be removed from the bottle before recycling and placed in general waste. The pouches can be recycled through some of the front-of-store flexibles collection points. There is an instruction on the pack to cut the spout and cap off to be disposed of separately.

RECOUP comment:

Brands are constantly working on improvements to the recyclability of their pumps, with a move to mono-PP pump construction removing any metal springs or glass bearings. These are common pitfalls when it comes to pump or trigger recycling. Mono-material pumps are suitable for recycling and do not need to be removed from the bottle. They can be separated during reprocessing and boost capture rates if recycled together.



Customer feedback:

"I like too that you can buy it in the pouch and reuse existing bottle, therefore cutting down on single use plastics." "Not as cheap as it should be."

"There's nowhere near us to recycle these so they are not so good to the environment."

"Good value for money but more importantly cut down on plastic so helping with climate change"

Carex product reviews



Palmolive

Product:

Handwash

Reusable container: Clear 300ml PET bottle, PP pump with metal spring

Refill container: Clear 750 ml PET bottle with PP cap, also available in a 1L pouch format

Environmental message:

The product is described as an "Eco refill". However, there is no explanation of what is behind this claim. "40% less plastic" and "100% recycled plastic bottle" on PET container and "80% less plastic" on the pouch.

Design for reuse:

Both PET containers are well suited for reuse; refilling is easy and intuitive. The flattened shape of the refill bottle is suitable for storage, and refill volume will work for various needs – either refilling two - three containers at once or one for 2.5 times.

Recyclability:

The reusable container is clear PET and recyclable. The pump is not recyclable due to its metal component. The refill container is also clear PET and recyclable via mainstream recycling; however, label covering more than 40% of the container can cause identification issues during the sorting phase at a Materials Recovery Facility. The pouch is not recyclable via kerbside collection.

RECOUP comment:

The main advantage of this refill scheme is that both PET containers are easily recyclable via kerbside collections and most likely will get recycled if placed in the right bin by the consumer. Although material savings for the refill container cannot be as significant as in the pouch option (also offered for this product), if both containers get recycled, this is beneficial for the sustainability of the whole system.



Customer feedback:

"Didn't really get the point of this since it doesn't really look like that much less plastic. But it actually does save a bit since the pumps keep working for ages. And it's really just quite convenient"

" It's cheaper per millilitre compared to the smaller bottles. Also, buying a few large refill bottles is better than buying lots of smaller plastic bottles."

Palmolive Product Review

RECOUP

Lidl W5 Refill

Product: Washing up liquid.

Reusable container: 1L PET bottle with PP flip cap or customer can use their own.

Refill container: 2L refill pouch made from PE with PE screw on lid.

Environmental message: 57% less plastic is used for the pouches.

Design for reuse:

The dispenser has not changed from the standard bottle. Rather than recycling the bottle each time, refill pouches can be used to refill the bottle saving on plastics used for bottle production. The flip cap is easy to unscrew, and the opening size fits the refill spout well. The 2L pouch will allow multiple refills saving the store journeys for the customer.

Recyclability:

The PET dispenser can be recycled at home through kerbside collections. The PP Cap should be left on the bottle as this will be separated in the recycling process. The pouches can be recycled through some front- of-store flexibles collection points. The label on the pouch states "Recycle" without specifying the collection route.

RECOUP comment:

The 2L refill container allows up to 4 refills of the reusable container (depending on the container size, typical dishwashing liquid bottle is 500ml), which is beneficial for the reusable system due to more efficient material use. The label on the pouch needs to be more specific about the intended collection and recycling route. For example, recyclers of flexible PE require the spout (rigid part) to be removed for recycling.



Nescafé Gold Blend Refill

Product:

Instant coffee

Reusable container:

Glass jar with a plastic PP lid designed to fit 200 g of coffee.

Refill container:

The 275g refills use a multi-layer PET pouch with an aluminium barrier, PE inner sealing layer and BOPP outer print layer.

Design for reuse:

The jar is made from glass which is heavy to transport and fragile if dropped. The jars, if maintained well, will stand up to the test of time and may be refilled for several years. Glass, in this case, provides a suitable barrier property for the storage of aromatic products such as coffee and as the jar is very material intensive, offering the refill in the lightweight packaging is beneficial for the logistic, storage and transportation. It is also easier for customers to bring refills home without the risk of breakage and due to lighter weight. The refill volume is higher than a standard jar volume, which can sometimes make it challenging to decant and compare the cost.

Recyclability:

The message on the pouch says, "Not yet recycled." The pouches' multi-layer design means that the pack is not suitable for kerbside collection and may only be recycled using front of store collections. Currently, there is no evidence that the pouches are circular and require virgin materials for each new pouch. The glass jar and the plastic lid are both recyclable via kerbside collection.

RECOUP comment:

Some space on the refill packaging could be dedicated to introducing reuse and explaining the refill process. The development of the refill pouch toward better recyclability will benefit the whole reuse system. Adjusting the volumes of the reusable container and refill pouch (to a single or double refill) might simplify the comparison for the customers and ease the refill process.





Customer feedback:

"I would like to buy the refill as I hate throwing the jar away, but it does not encourage anyone to buy a refill when they are constantly priced more than the jars."

Nescafé Product Review

RECOUP

Kenco Smooth Refill

Product:

Instant coffee

Reusable container: Glass jar with PP lid designed to fit 200g of product

Refill container: The 150g refills come in a multi-layer laminated PET pouch with an aluminium barrier with zip closure.

Environmental message: Refill packs use 97% less packaging weight than the complete jar.

Design for reuse:

The jar is made from glass which is heavy to transport and fragile if dropped. The jars, if maintained well, will stand up to the test of time and may be refilled for several years. Emptying the pouch into the jar can be tricky.

Recyclability:

The pouches' multi-layer design means that the pack is not suitable for kerbside collection and may only be recycled using front of store collections. No information regarding recyclability is mentioned on the pouch although Kenco state that "All Kenco products are technically 100% recyclable" kenco.co.uk/faq/

RECOUP comment:

The main benefits of using a pouch for this system are its light weight (especially compared to the glass jar) and barrier properties (there are specific requirements for long-term storage of coffee, which are sometimes challenging to meet with mono-polymer design). The refill system can be developed further by improving the communication about the refill process and refill benefits, optimising both container types for reuse and recycling and maximising environmental wins, and introducing the cost initiative for the refill, as currently, the new jar can be cheaper than refill depending on the promotions.



Herbal Essences Shampoo

Product:

Liquid shampoo

Reusable container:

An aluminium bottle with a plastic pump (430 ml) or clear PET bottle with flip on lid (400 ml)

Refill container: 480 ml flexible pouch

Environmental message: "I love nature, I reuse." "60% less plastic."

Design for reuse:

The dispenser is made from sturdy aluminium, but it is prone to damage and our sample was dented during transit before being used. Rather than recycle the bottle each time, refill pouches can be used to refill the bottle saving on plastics used for bottle production.

Recyclability:

The aluminium dispenser may be recycled at home in kerbside collections. The pump contains a metal spring which means that ideally it should be removed and placed in general waste. PET container and lid are recyclable. Pouch messaging suggests recycling via Terracycle scheme.

RECOUP comment:

The aluminium reusable container in this scheme is well accepted by customers due to novel design and sturdiness, hopefully encouraging increased number of reuses. At the same time the PET bottle even though it is not promoted as a reusable container can still be easily refilled and fully recyclable at the end-of-life.



Customer feedback:

"Just loved the colour and design of the bottle and smell great and hair feel so clean fresh and soft" "I got this a while a go now and its brilliant. I love that its refillable, helping the environment is something I feel strongly about for the future of my kids and family." <u>Herbal Essences Product Review</u>

RECOUP

Recyclability

There are several challenges related to the recyclability and reprocessability of pouches.

- Multi-material/multi-polymer. Often pouches are multipolymer or multi-material formats. This combination of materials is required to provide mechanical and barrier properties, however presents a challenge for recycling.
- Flexible and rigid plastics. Closures, such as a zip lock or dispensing mechanisms, such as a spouts, are rigid plastic components, making the pouch a mixture of flexible and rigid plastics. These two material types have different reprocessing requirements and must be separated to achieve the best recycling outcomes. Separation of the rigid and flexible parts of the current pouch design is nonviable in the current recycling system set-up. Sometimes, it is suggested to the consumer to separate the elements. However, this is not a reliable approach on a larger scale.
- Lightweight, 2d object. After decanting the product, the

pouch becomes a light and 2-dimensional object. This undoubtful advantage during the transportation phase creates a challenge if a potentially recyclable pouch (e.g., mono-material) travels through the Material Recycling Facility sorting system. Light pouches are separated early on in the process with other 2D objects such as paper, cardboard and films. While 3D objects fall down into the 3D fraction, 2D objects are carried up a belt where they are sorted into mixed plastic films, paper and cardboard. This means that pouches are generally lost into mixed plastic films, of which there is little chance of being recycled.

 The type of printing inks (for decoration) and adhesives (for the lamination process) can affect the recyclability of the pouch.

Several developments in the industry aim to overcome these challenges. Mono PE pouches have both flexible bodies and rigid closures made out of the same polymer creating a potential for easier reprocessing if collected. Mono PP pouches with specifically designed closures have been shown to be compatible with the rigid PP recycling stream.⁷

Demonstrated dedication to solving recyclability issues can benefit from a collaborative and systemic approach.

According to the RECOUP UK Household Plastics Collection Survey in 2022, the estimated collection rate for films and flexibles for recycling at kerbside was 7%, with just 13% of the 374 UK local authorities collecting films and flexibles. Even if the council provides a collection of films and flexibles, pouches are excluded from this service due to the beforementioned challenges. For example, 24% of local authorities who collect plastic film only accept carrier bags.

⁷Recyclass. PP-based pouch

Acceptance of pouches via Front of Store Flexible Plastic Collection is also limited. Pouches are mentioned as part of the film collection offered by Sainsbury, Tesco and M&S. Morrisons, Co-op, and Asda soft plastic collections do not give specific information about the acceptance of pouches. Limited closedloop schemes are offered for pouches. As part of Terracycle and Splosh schemes, customers can post pouches by certain brands for recycling. It is only sometimes possible to understand the end market of the recyclate in these schemes. E.g. Splosh recycles their pouches into ice scrapers, and Terracycle shares a list of potential applications from outdoor furniture to bins and surface covers. However, reverse logistics costs, small volumes due to light weight, and limited application of pouches' recyclate can make these schemes challenging to scale.

There was no information regarding recycled content on the pouches analysed in these case studies. It is important to consider including recycled content where possible to support the circularity of the recycling system and comply with the requirements of the Plastic Packaging Tax.

Communication

Communication on the pouches follows the pattern of inconsistency displayed in their recyclability and collection. Messages on the pouches can vary from *'Recycle'*, *'Recycle at the front of the store'* (which we could see is only applicable to some collection schemes), *'Recycle after Spout is cut'* to *'Not Yet Recycled'* or no messaging at all. People often rely on labelling to make their recycling decisions, and this variety of

RECOUP UK Household Plastic Packaging Collection Survey 2022 Splosh Zero Waste

Terracycle - Discover Our Recycling Process

messages is very confusing.



Lightweight

While there are many challenges, pouch packaging formats have one strong advantage: they are lightweight and material efficient. Pouches can deliver the same amount of product using less than half of the material used for rigid containers. This makes logistics more efficient, reduces storage needs, and reduces transportation's environmental impacts.

The lightweight format also offers the customer a more manageable load if purchasing off the shelf and gives more flexibility for home storage.

However, it is essential to remember that most pouches are single-use and hard to recycle and if the material is lost from the system at the end of life, it contributes to pollution and global warming issues. That is why looking at pouch refills from a life cycle perspective is important.

Product	Volume/ weight of product (pouch)	Weight of the pouch with spout	Material /product ratio (pouch)	Volume/ weight of product (standard packaging)	Weight of the packaging	Material/ product ratio (standard pack)
Carex Hand Soap	500 ml	12.06 g	0.02	250ml	32g	0.13
Herbal Essences Al	480 ml	19.51 g	0.04	430 ml	85.17 g	0.2
Herbal Essences PET	480 ml	19.51 g	0.04	400 ml	47.35 g	0.12
Palmolive	1000 ml	28.72g	0.03	250 ml	32.88 g	0.13
Lidl Washing Up Liquid	2000 ml	33.56 g	0.02	500ml	24.36 g	0.05
Nescafe	275g	11.05g	0.04	200g	450.80 g	2.25

Table: Weight of the pouch vs weight of the traditional format.

Spout

Most pouches on the market are equipped with a spout (usually HDPE) to ease the decanting and allow secure storage of the remaining refill amount. However, including hard plastic elements makes recycling the flexible pouch challenging. As one of the ways to address this issue, Carex suggests that customers cut the spout off before recycling the flexible component of the pouch. In contrast, others either deem the whole pack unrecyclable through the existing system and offer customers a TerraCycle collection or communicate that the pouch can be recycled with the spout. This is a potential area for innovation to provide a flexible closure that can fulfil the function of the spout. This will allow pouches to satisfy the requirements of the flexible plastic kerbside and front of the store collections, avoid wasting the rigid part of the packaging or contaminating the flexible material recycling stream and come one step closer to a genuinely circular system. Another alternative is to move the whole pack to a semi-flexible mono-material bottle format⁸, which combines the lightweight benefits of the pouch with recyclability at the end of life.

Single-use pouch/reusable pouch

Splosh brand offers reusable pouch schemes for some of their products⁹. A small pouch with a spout holding 400g of concentrated Refill (e.g. four bottle equivalents of bathroom cleaner) can be sent back to the company for reuse. The pouch is inspected and washed for further reuse if suitable; otherwise, the pouch is recycled. Customers who choose the reused pouch get a 10p discount on future purchases. This is a move in the right direction by increasing resource efficiency even further and easing the reverse logistics due to the pouch being lightweight and easy to transport either in small amounts or bulk by various means. However, washing and quality control for further reuse can be challenging.

A similar scheme is also offered by Miniml where alongside 5L refills customer can purchase 1L refill pouch PET/PP and return it by post to be reused¹⁰. Pouches are cleaned via a non-thermal sanitation process which involves UVC light which supports longer service life.

In October 2022 Lidl GB in partnership with Algramo

introduced a refillable pouch solution for laundry detergent¹¹. Customers can refill pouch using the refill machine in store and receive a 20p discount as the pouch is tech-enabled. Light weight of the pouches is beneficial for this refill in store scenario as it makes it easier for the consumer to bring a pouch or even multiple pouches to the store for refill. Pouch reuse is an evolving area, and the pouch format needs to be redesigned to meet the requirements of the reusable packaging system and to fulfil all the potential of this refill format.

<u>*Semi-flexible mono-material bottle format</u>
<u>*Splosh Reusable Pouch</u>
<u>*10Miniml Reusable Pouch</u>
<u>*11Lidl reusable pouch</u>

Conclusion

The pouch is the most represented format of refill packaging in the Refill at home category. It is appealing to brands because of its material efficiency which allows claims such as "X% less plastic" and logistic advantages. It is also popular among customers as it is convenient and the appealing environmental messages.

There are still multiple challenges for pouches to become a truly circular solution, and industry cooperation and innovation will play a significant role in developing this format further.







GOSD REFIL









Cif Kitchen Spray Refill

Product:

Kitchen cleaning spray.

Reusable container:

The Cif kitchen cleaner is packaged in a 700 ml HDPE bottle with a PP sleeve. The trigger is PP/PE.

Refill container: The concentrated refills come in 70ml HDPE bottles with full PP sleeves.

Environmental message:

The refill containers claim to use 75% less material compared to a new bottle. Reusable bottles are currently made from 50% recycled plastic.

Design for reuse:

The bottle is made using HDPE with a PP/PE trigger mechanism. The materials are sturdy and robust enough to withstand multiple usage. Cif says they will replace any broken triggers or bottles free of charge by calling the Cif careline, but they claim the bottles should last a lifetime. The sizes of the opening of both containers match to ease refill. The refill and dilution processes are clearly communicated.

Recyclability:

The dispenser is made using a HDPE bottle with a full PP sleeve. The bottle and trigger are labelled as recyclable, with the sleeve being labelled as don't recycle. The sleeve should be removed before disposal because it covers 100% of the pack and made out of different polymer from main bottle body, which can cause incorrect sorting by polymer type (bottle will be identified as PP instead of HDPE) at Material Recycling Facility.

RECOUP comment:

Concentrated refills offer multiple benefits including ease of storage and transportation. Both containers are potentially recyclable. However, sleeve/labelling requires some developments to ensure maximum material circularity.



Customer feedback:

"Economical and ecological."

"The only frustration is when the bottle you keep to make it more economic doesn't last very long."

"The single-use plastic pod ...can only be used with CIF brand bottles of any kind. " "it is easy to refill the original spray."

<u>Cif Product Review</u>

RECOUP

Tesco Antibacterial Kitchen Surface Cleaner Refill

Product: Household cleaning liquids - kitchen, bathroom, shower, multi-purpose cleaner.

Reusable container: White 750 ml HDPE bottle with spray trigger(PP/PE), or customer can use their own.

Refill container: The cardboard box holds one refill capsule, which is packaged in polyvinyl alcohol.

Environmental messaging: Reduces single-use plastic bottle use.

Design for reuse: The refill bottle is sturdy and will withstand multiple uses. There is a sign on the bottle communicating the refill option. White HDPE is also a good choice, firstly as it is a suitable polymer to be in contact with a more concentrated chemical during dissolving, secondly, as a white bottle it can mask wear signs better than clear and accommodate the variation of refill solution appearance compared to ready-made. However, the non-transparent bottle can make monitoring capsule dissolution challenging. A small refill format, such as a capsule, is ideal for storage and transportation. Several consumers commented on necessity redesigning the trigger and closure of reusable containers for multiple uses. The closure is too hard to unscrew, and the spray trigger stops working before the desired number of reuses is reached.

Recyclability: The bottle is widely recyclable, and HDPE is a target material for kerbside recycling. Recyclability is clearly communicated on the label. Cardboard packaging for refill is also recyclable if not contaminated. Spray trigger can be recycled together with the bottle.

RECOUP comment:

Design adjustments are required for the trigger and closure to be suitable for reuse and recyclability. Additional information about the intended refill scenario and the advantages of refilling on the refillable bottle would be beneficial. Replacement product labels are provided with a refill capsule as a default; however, these labels are unnecessary for customers reusing the original container and, therefore, can be supplied as an option.



Customer feedback:

"Shower refills really work well as there also cheaper too but my only down fall is that using the original shower spray bottle only lasts maybe twice then the pump won't work then your back to buying shower spray as before" <u>Tesco Product Review</u>

Nivea Hand Soap Eco Refill

Product:

Liquid hand soap and dry refill tabs.

Reusable container:

Clear 250 ml PET bottle, made from 100% recycled PET. The pump is a combination of PP, PE and metal springs.

Refill container: Cardboard box holding three i

Cardboard box holding three refill tabs.

Environmental message:

The product is called "eco-refill"; communication says the product is "100% climate neutralised".

Design for reuse:

The reusable bottle is durable and fit for multi-use. At the same time, material use is not excessive, being close to traditional single-use containers as additional robustness is not necessary for the refill at home scenario. Instructions for reuse are provided on the outer packaging of both the bottle and refill pack. The pump dispenses foam and is designed to work well with the formulation of the refillable product; the foam dispenser also allows more economical use. Reuse experience for the customer is very smooth and mimics the single-use experience. The only extra step is dissolving the product, which can be novel at the beginning. The dry refill tab format comes with the additional benefit of saving storage space.

Recyclability:

Information on the reusable bottle states that the bottle is recyclable, and the pump is not. This reflects the current kerbside collection situation. Cardboard refill packaging is also recyclable, providing it is free from contaminants. The reusable bottle is clear recycled PET with a label covering less than 60%, aiding the Near-Infrared scanning and helping to make sure this target material is sorted and recycled.

RECOUP comment:

Well-designed refill scheme. Dry refill is most likely to deliver environmental benefits due to reduced weight of both product and packaging and reduced waste. An alternative solution for the pump that can be recycled will provide an additional advantage. Environmental claims on the pack would benefit from being evidence-based or a part of existing certification and labelling familiar to the consumer rather than referring to carbon-neutralised products, which is not a widely recognized claim.



Customer feedback:

"Instructions were easy to follow. It took a while for the tab to completely dissolve but was ready to use after 5 minutes. The reusable bottle is sturdy with a good solid pump dispenser. Only minor critique is it really doesn't look great! It looks like leftover dishwasher, so it doesn't look very appealing and doesn't make you think it'll work - but it does! It would be much better and more appealing in a non-see-through bottle."

Nivea Product Review

RECOUP

Johnson's Baby Range Products Refill

Product:

Liquid baby care products

Reusable container: 500 ml PET clear bottle with PP closure

Refill container: 1L plastic/paper laminate with HDPE screw lid

Environmental message:

90% less plastic

Design for reuse:

The reusable container is a sturdy PET container that will last several reuse cycles without any wear problems. The container is not overengineered to be reusable, as refill at home does not involve multiple transportation and industrial cleaning, there is no requirement for the container to have extra durability. The container is clear, easing the monitoring of any possible contaminations/residue build-up. The reuse process is communicated via pictures and is intuitive. However, a refill container of double volume might require the user to have an additional space to store the carton for the second refill, which can be an issue for some households.

Recyclability:

The reusable bottle is recyclable via the kerbside collection system. It is clear PET with less than 40% label coverage and is a target material. The refillable carton recyclability is limited due to the mixed material main body and plastic closure. Advice on the packaging carton suggests recycling at the recycling point or checking home collection. This message by itself highlights the challenges of carton recycling and requires high consumer awareness and participation to achieve advertised environmental benefits. Kerbside collection of cartons is offered by approximately 66% of local authorities and there are limited reprocessing facilities in the UK for the material. <u>ACE UK</u>

RECOUP comment:

The reduction of plastic alone does not communicate an environmental benefit, as it is essential to look at the whole life cycle. Generally, higher volume packaging (1L vs 500ml) will have a lower impact due to the lower material/product ratio. The choice of the refill container affects the environmental performance of the whole system. For a single-use carton, the system's environmental benefits will depend, among other factors, on the consumer understanding and following correct recycling instructions and the availability of collection and reprocessing facilities producing high-quality recyclate.



Customer feedback:

"As much as I approve of ways forward for better living to improve our environment, it boggles the mind that it is still significantly more cost effective to buy two 500ml bottles at £1.49 each on Amazon (which I imagine comes with higher manufacturing costs in packaging), than it is to buy this 1 litre recyclable carton priced at £4.50. Unfortunately, I think the price points lets down what this product is trying to achieve in the current climate."

"To be honest, this kind of packaging is very easy to confuse milk packaging, and it is recommended to stay away from the place where children come into contact with it. When children see the colourful packaging, they think it is some kind of beverage." Johnson's baby product review



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Fussy

Product: Refillable deodorant.

Reusable container: Body and components are made from a blend of ABS and PP.

Refill container: Pulp-based polymer.

Environmental message:

"Plastic-free, compostable refills keep mother nature happy." "By using Fussy, you'll save at least 250 single-use plastic deodorants from ever existing!" "Our case is 100% recyclable and better yet, our refills are 100% compostable and made from waste material themselves."

Design for reuse:

The case is made of ABS and will stand up to long-term use. The case is also dishwasher safe, though the manufacturer says a damp cloth is sufficient to clean the exterior.

The refills are easy to insert and remove when empty but are disposed of in the general waste.

Recyclability:

The reusable container body is ABS/PP, so it is not recyclable via household collection. The refill packaging is advised to be either home composted or disposed in general waste. It was identified as cellulose by a near infrared equipment.

RECOUP comment:

The body uses a 50:50 ratio of ABS and PP, complicating recyclability as ABS is not collected from the kerbside. While blended with PP, the materials cannot be separated easily for reprocessing. A switch to PP may improve it, this may reduce the case's lifespan but will mean that the case will be kerbside recyclable when the time comes that the case will inevitably need to be disposed of. The sugar cane pulp refills claim to be compostable.



Customer feedback:

" I tried fussy refillable deodorant. The scents are okay, but the container is plastic and HUGE compared native. " "I love it that I am not producing so much non-recyclable trash with my cosmetic worries. I love the look of the design even though I would have wished it was easier to understand which side is the lid and also easier to grab and pull the lid." <u>Fussy Product Review</u>



Miniml

Product: Eco Toilet Cleaner

Reusable container: 100ml PET with flip closure or 1L HDPE with a child-resistant closure, or customers can refill their own container.

Refill container: 5L or 20 L Jerry Can HDPE Refill, 20L container has a refill tap, 5L Jerry can has a screw-on cap, the pump can be purchased separately. Also available in reusable pouch format.

Environmental message: Closed Loop Supply Chain – "Our refill containers are designed to be returned to Miniml HQ to be cleaned and re-used again and again...and again!"

Design for reuse:

All elements of this reuse system are durable and made to last – both reusable containers and refill containers. A range of reusable containers are offered: smaller 100ml format, larger familiar toilet cleaner format, and for some products, a glass container is also provided. The company offers a variety of refill options: customers can purchase a small volume container and return it to the point of purchase; customers can refill their container in-store or buy a refill and then return the refill container to the store or post it back to the company. The company also offers a collection for wholesale customers. Posting and paying for the return of empty jerry cans is a barrier, as this action can be expected only from dedicated customers.

Recyclability:

All elements of this refill system are recyclable. HDPE and PET bottles can be recycled via kerbside collection when they can no longer be reused. There is an issue with HDPE bottles marked as PET on the sticker which can confuse consumers. It won't affect recyclability as it will be sorted correctly at the MRF however it is important to make sure that information is consistent. Refill containers can be recycled but are too bulky for kerbside recycling. They can be returned to the company or be taken to a household waste recycling centre (HWRC) for recycling.



Customer feedback:

"I brought a 500ml glass bottle and also a 5L so bulk buy I find it a lot better this way Then can send back and get it refilled so no more plastic bottles for me it smells amazing and cleans great too".

Miniml Product Review

RECOUP

RECOUP comment:

By offering a variety of reuse and refill containers by volume, material, and closure type, the Miniml system achieves suitability for different refill formats such as refill at home and refill at the store, also serving individual customers, small zero waste businesses and wholesale clients. This diversification is suitable for providing an independent refill scheme with sustainable volumes. If the customer is willing to invest time, storage, or extra money to return a 5L refill container, then this scheme can be genuinely a closed loop.

Black Pepper Refill and Sea Salt Refill

Product: Sea salt refill

Reusable container: The sea salt can be decanted into a salt mill or alternate storage container at home. A typical container for salt is a glass container with plastic closure holding 100g of salt.

Refill container: The refills come in white 200g PP tubes with paper labels.

Design for reuse: The containers will vary depending on the household. The tube could be reused at a refill store or recycled through kerbside collection. The tube holds double the amount of salt volume reducing the buying frequency while protecting from air and moisture. This justifies the material choice for this refill, as if the refill were packaged in a flexible bag or paper, it would be harder to protect the remaining amount of salt from losing its properties due to contact with the elements.

Recyclability: The tubes are made from PP, which is widely recycled. The tube size is suitable for sorting into the PP stream at a Material Recycling Facility. The paper label does not interfere with the Near infra red detection of the main polymer, however separation of the paper label from the tube can present a potential challenge during the washing phase of recycling.

RECOUP comment:

Salt and spices refill is not a new offering in the market and most people are familiar with salt refills sold in tubes, bags or boxes, and spices refills in paper/plastic bags or glass containers. Assuming that refilling the salt and pepper mill is a habit for many households, this would be an ideal situation to communicate the environmental benefits of refill. This will allow consumers to notice that they have already engaged in reuse behaviour and might encourage them to try refill options for other products.

Product: Black peppercorn refill tube.

Reusable container: The pepper can be decanted into a pepper mill (50g) or alternate storage container at home.

Refill container: The refills come in white 100g PP tubes with inmould labels. Also available in clear 275 g PET jar.

Design for reuse: The containers in the home will vary depending on the household. Single-use mills are material-intensive, and their elements are non-recyclable. The tube could be reused at a refill store and recycled through kerbside collection.

Recyclability: The tubes are made from PP, which is widely recycled and should be sorted successfully into the PP stream at a Material recycling facility due to the tube size. PET jar is also recyclable.





Canderel Sweetener Refill

Product:

Sweetener tablet

Reusable container: Polypropylene dispenser with 100 or 300 tablet capacity.

Refill containers: The refills come in small sachets (5*100 tablets) in a larger paperboard box.

Design for reuse:

The container is made from PP, a material suitable for multiple uses. The container is easy to open for a refill. The picture on the sachet pack clearly demonstrates the intended use.

Recyclability:

Both paper sachet and plastic dispenser are potentially recyclable via corresponding recycling stream. However due to their small size there is a high chance that these items won't be captured during sorting unfortunately.





Customer feedback:

"These refill packs are perfect, as less packaging and it is very easy to refill the plastic dispenser. However, the plastic suspenders are of poor quality, and I have nothing but trouble dispensing the tablet sweeteners, with the tablets often getting jammed. I even contacted Canderel and raised this issue, but the dispensers they sent me were of equally poor quality." Canderel product review



RECOUP comment:

The dispenser provides enough protection for the contents so the need for the extra plastic/paper packaging can be reviewed. Introducing the refill sachets requires reconsidering dispenser construction to make its mechanisms suitable to last several refills. There is no significant cost initiative to buy a refill pack, no environmental information is provided to indicate the benefits of refill, which can make customers choose the familiar option with dispenser rather than refill.

Refillable packaging design considerations

A refillable packaging system aims to deliver the product to the consumer and reduce environmental impact at the same time. To identify the areas where improvements can be made, it is essential to look at the whole packaging lifecycle while still considering convenience for the consumer.

• Material choice

The refillable packaging will mimic single-use in terms of storage requirements, compatibility with the product and endof-life scenario. The main difference is the reuse cycles in between. Therefore, polymers widely used in a single-use sector are equally beneficial for reusable applications as they provide required barrier properties paired with recyclability.

Transparent. Widely recyclable mono-material such as PP, PET and PE. With recycled content.

Format

A suitable packaging format enables reuse and provides

additional benefits to the consumer, such as ease of ordering, reduced trips to the shop due to purchase of bulk quantities, less weight to carry, and reduced storage space required at home in the case of refill concentrates. The reusable container is recommended to mimic the single-use experience where practical, e.g., soap dispenser. On the other hand, the refill container can be presented in more lightweight, higher volume/packaging ratio formats and simplified closures to deliver material reduction and transportation benefits.

Reusable container: sturdy and functional. Refill container: lightweight, designed for efficient logistics.

• Clear communication of reuse process and ease of use.

The refill process must be intuitive and relevant stages communicated on both reusable containers and refill packaging.

Step-by-step guide on both containers.

Reuse labels offered by OPRL can be one of the ways to inform the customers about the intended reuse route. The public is already familiar with this format for recyclability information.

To qualify for the label, packaging should fulfil the following rules:

- designed for reuse a minimum of ten times
- refill systems available to 75% of the UK population for a minimum of 3 years¹²



¹²OPRL Reuse Label

ECOUP

Refillable packaging design considerations

• Recyclability of reusable and refill containers and their elements.

Maximising the capture of valuable materials at the end of use is essential and can significantly affect the overall sustainability of the refill scheme. The switch to packaging with limited recyclability should be carefully considered and backed up by solid evidence. Closing and dispensing elements often provide another recyclability challenge. Avoiding metal elements, such as springs, glass balls, multi-material construction, silicon and other seal materials will allow the whole pack to be recycled via kerbside collections.

Recyclable containers with recyclable closures.

Durability and design for reuse

The longevity and functionality of the elements such as pumps, triggers, hinges, and closures is a top priority for reusable containers. These elements will be susceptible to residue buildup due to multiple uses, so they either should be modular for cleaning or have other mitigation mechanisms in place. To enable a successful refill, the container must be designed with the refill process in consideration such as closure type and opening size.

While it is perceived that higher durability is required for reusable packaging, containers refilled at home do not go through the additional strains of industrial washing and preparation cycles required for some return systems. In some cases, the inbuilt durability of single-use packaging formats can be enough to support multiple-use cycles when refilled at home.

Durable closing and dispensing mechanisms.

 Environmental benefits of the refill system over a singleuse system

Looking into the overall impact and all life cycle stages of the packaging is essential. For example, reducing the amount of plastic will not always translate into environmental benefits without a systematic approach. Packaging impact will vary in different categories, such as waste production, energy and resource consumption, greenhouse gas emissions, and ecosystem and health effects. Naturally, achieving improvements in all categories can be complex.

Production of reusable packaging is one of the most impactful lifecycle stages; therefore, strategies such as efficient material use [e.g., container design not over or under engineered] and inclusion of recycled content remain relevant. The primary approach to minimising the use stage's impact is to provide a durable and functional container that can withstand multiple life cycles. Ensuring recyclability is key for end-of-life management.

Efficient material use, durability, and recyclability.

Conclusion

- Refillable packaging analysed in this study, while not always a fully circular solution, plays a vital role in normalising reuse and raising customers' involvement in refill schemes. Refill at home is easy to use, requires minimum extra steps from the participant, and often offers cost benefits. Hygiene concerns are also reduced as reusable containers can be cleaned per personal requirements. With low barriers for entry, these options are the foundation for further customer acceptance of the return schemes requiring higher involvement.
- Refills are widely offered in the household/personal care market especially for products such as soap, shampoo, and various cleaning liquids. There are some examples available among food products, but representation is still limited. Markets such as pet care, gardening supplies, and automotive care have the potential to introduce similar refill schemes.
- Various formats for the refill containers, such as pouches, bottles, tubes, sachets, jerry cans, and cartons, are available. There are also options for concentrated refills and refills in tablets or capsules. Pouches are the most popular option for off the shelf personal care products, while refills that require dilution are more common for cleaning products both off the shelf and online. All formats will have their benefits, and the complete refill system must be considered to identify which design is suitable for which products and offers sound environmental benefits.

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- PET, PE and PP are the primary materials used for reusable and refill containers. The performance of these materials has already been tested by a single-use system and provides all necessary properties for Refill at home.
- Customer feedback shows that the reusable container for home refill might not need extra sturdiness and material

use, and sometimes single-use bottles can serve the purpose well. At the same time, closures and dispensers tend to be the packaging component that fails first and need to be redesigned to withstand multiple uses and provide an easy refilling experience.

Recyclability of all system elements is also often a challenge and must be addressed at early design stages. Careful consideration should be taken when recyclability is sacrificed for the purpose of material reduction, as this is not always the most beneficial option.

Conclusion

- Communication: most of the schemes communicate the material, especially plastic reduction, as a primary benefit of the refill schemes. While efficient material use is undoubtedly playing an essential role in the environmental footprint of the packaging, refill is also a move towards circularity of packaging, and it is important to communicate this to the consumer as well. This can be done, for example, by providing information about carbon emissions saved from reusing containers multiple times compared to just recycling them after the first use. Also, adopting labels helping to identify refill products in the store can be helpful in the promotion of such options.
- Reduced cost when buying a refill pack is a strong incentive for the customer , and this has to be considered when pricing the refill especially in the current economic climate. Our cost comparison exercise showed that refill is not always cheaper, or cost-benefit is challenging to identify due to format/volume differences.
- Overall, packaging that can be refilled at home is a positive trend on the market. There is a clear direction for development and innovation in this area that will need to address the challenges such as closure design and increase circularity via maximizing reuse and recyclability. Raising the percentage of renewable and recycled content can be logical next steps as well.

Product	Standard container	Refill container	Refill is	
Nescafe	£3.38/100g	£2.91/100g	cheaper	
Kenco	£2.62/100g	£2.73/100g	more expensive	
Canderel	1.03p/tablet	1.02p/tablet	the same	
Herbal essences	£2.33/100ml (aluminum)	£1.13/100ml	cheaper	
	£1.58/100ml (plastic)			
CIF	£2.86/L	£2.14/L	cheaper	
Palmolive	33p/100ml	29p/100ml(bottle) 30p/100ml (pouch)	cheaper	
Lidl washing up liquid	74p/L	73p/L	cheaper	
Carex soap	£0.40/100g	£0.34/100g	cheaper	

*Price comparison was correct at the time of referencing, subject to change by the retailer.

RECOUP

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