THE REFILL COALITION TRIALS

Key Learnings for Industry

GO UNPACKAGED

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EXECUTIVE SUMMARY

The Refill Coalition is **Aldi UK**, **Ocado Retail Ltd,** supply chain solutions company **CHEP** and **GoUnpackaged**; convened in 2020 by **GoUnpackaged**, the UK's leading reuse experts, following a funding award from the Innovate UK (IUK) Smart Sustainable Plastic Packaging Challenge.

The project's aim was to prove that refill and reuse systems are viable and scalable across multiple product categories and retail formats when facilitated by an efficient supply chain; and that there is sufficient consumer demand for refill and reuse.

The Refill Coalition project trialled two new standardised supply chain solutions for in-store refill and online consumer returnables as a solution to the problem of the over consumption of single-use plastic packaging and its associated waste:

In-store Refill tested by Aldi

A reusable supply chain 'vessel' (equivalent to 24 single-use packs[1]) filled and shipped via the normal supply chain and fitted into a modular in-store refill fixture from which customers refill their own packaging.

Online Returnables tested by Ocado

The online 'consumer returnable' (equivalent to up to 5 single-use plastic packs [2]) is pre-filled with product and shipped to customers alongside the rest of their Ocado order, then returned to the Ocado driver when empty.

Aldi ran two in-store trials over 16 months at its Solihull and Leamington Spa stores; Ocado ran a trial out of 3 Customer Fulfilment Centres (CFCs) covering 65% of its customer base and continues to offer its current four reuse products to customers.

1. Based on a 500g pack of rice
2. Based on a 500g pack of rice

EXECUTIVE SUMMARY

Trial Key Learnings

The Refill Coalition project successfully trialled both solutions which are viewed as the **next generation models for refill and reuse**. While there are clear opportunities for further improvement, the practical roadmap to scale is clear.

The Refill Coalition is sharing the project learnings through this Industry White Paper using the project's key performance indicators (KPIs) reported by category - commercial, operational, customer, environmental and coalition.

Commercial: The solutions are driven by viable commercial business cases, including the additional wash and reverse logistics required. Demand is strong for both the in-store and online solutions: sales share for in-store refills reached a regular 30%, and as high as 56%, compared to single-use packaged alternatives. For online, reuse products are selling at an average 16% sales share, reaching as high as 43% in some weeks.

Operational: The Refill Coalition trial proved the concept of reusing supply chain vessels. The process is safe and hygienic – meeting retailers' high food safety standards and providing a viable returns process for in-store and online:

- In-Store: the in-store solution at Aldi was found to be simple and efficient, and staff reported quick and easy replenishment. The addition of tare-less[3] functionality will further speed up the process for customers and reduce dwell-time at the fixture.
- Online: The online trial at Ocado easily fits into the existing returns process and does not add significant time to existing operations. The Ocado target return rate for the first 6 months trial period was achieved, and is currently at 86%, and this is without any financial method used e.g. deposits. The returns number is continuing to increase.

Customers and Behaviour Change: The Refill Coalition trials proved that there is sufficient consumer demand for refill and reuse when powered by the right solution:

- In-Store Refill: 600+ Aldi customers were surveyed and, of those using the refill station, 97% found the process to be hygienic, 89% of customers found the refill station easy to use.
- Online Consumer Returnables: 490+ Ocado customers who have purchased the Reuse products were surveyed - 100% found the packaging to be clean and the product hygienic, 96% were likely to buy again in future (the Reuse products have consistently high customer star ratings 4.8-4.9/ 5 for rice and pasta on Ocado.com).

3. Tare-less means that the customer does not have to 'tare' or 'zero' off the weight of their container on a weighing scale before they refill.

EXECUTIVE SUMMARY

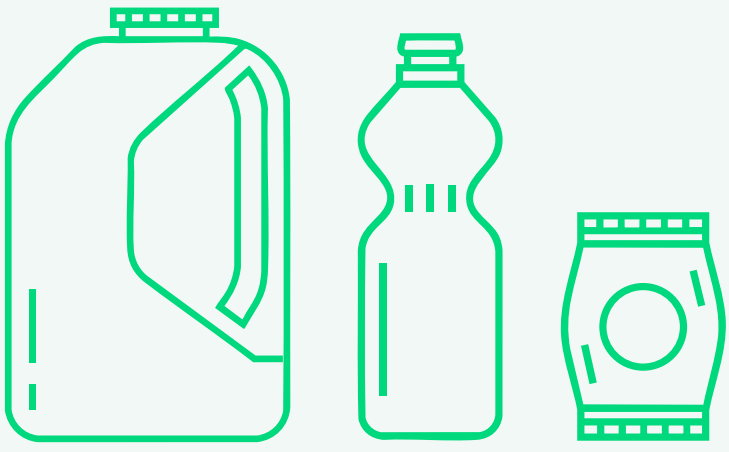
Environment: Independent Life Cycle Assessment (LCA) results showed that, at scale, both solutions perform better than the single-use alternatives - with seven out of eight products performing better across the environmental impact categories studied. LCA results show that the breakeven points of the vessels are between 5 and 20 rotations, which is achievable within the vessels' projected lifespans.

Collaborative Action through Coalition: The Refill Coalition project proved that competitors can collaborate legally, and successfully, on new reusable packaging solutions as collaboration reduces costs and risk for individual businesses.

Recommendations for Scale: Due to a lack of wider retailer engagement, the in-store trial was unable to test its solution at further scale, while Ocado's learnings continue as it scales its reuse offering.

There are key enablers that would further support scale up: filling automation and item level tracking using technology; reuse focused legislation as a driver for change; and a renewed focus by UK retailers on refill and reuse.

The learnings from this White Paper can be used for further implementation of these solutions at scale.



“We are extremely proud of our collective work to design and launch these new refill & reuse systems, which form a key part of the solution to tackling the single-use plastics crisis. The trial demonstrates the solutions’ operational efficiency, clear environmental benefit and scalability which are critical steps towards industry transformation. Additionally, the sales share and in-depth research provide evidence of the significant consumer appetite for refill & reuse as part of their regular shop. We look forward to seeing other retailers and brands taking up these proven solutions, enabling an acceleration towards a reuse future”.

A statement from the Refill Coalition

INTRODUCTION

Why reuse & refill?

UK supermarkets alone place over 90 billion[4] items of single-use packaging on the market annually.

Packaging is necessary to protect and transport goods, and the packaging industry is a key economic contributor to the UK. However, most modern consumer goods packaging is made of single-use plastic with significant environmental impacts - the over consumption of virgin resources, high levels of waste and pollution on land and in water.

Refillable and reusable packaging are seen as key solutions by industry, government and NGOs in the fight against single-use plastic packaging waste. If every household in the UK refilled just one item per week, this would eliminate over 1.4 billion items of single-use packaging per year[5].

About The Refill Coalition

The Refill Coalition is **Aldi UK**, **Ocado Retail Ltd,** supply chain solutions company **CHEP** and **GoUnpackaged**.

The Refill Coalition was convened in 2020 by **GoUnpackaged**, the UK's leading reuse experts, following a funding award from the Innovate UK (IUK) Smart Sustainable Plastic Packaging Challenge.

The Refill Coalition was supported by a group of leading equipment manufacturers: **Berry Global, Eden/ TradeFixtures** and **Digi Europe**. Previous members of the Coalition include M&S, Morrisons, Sainsbury's and Waitrose, who were involved in the pre-trial stage.

4. The Big Plastic Count 2024, Greenpeace & Everyday Plastic, thebigplasticcount.com/results

5. Based on 2022 ONS figure of 28.2 million households in the UK

THE REFILL COALITION PROJECT

The Refill Coalition project trialled two new standardised supply chain solutions for in-store refill and online consumer returnables. The project's aim was to prove that refill and reuse systems are viable and scalable across multiple product categories and retail formats when facilitated by an efficient supply chain, and that there is sufficient consumer demand for refill and reuse.

The challenge

In-store Refill

The core challenge of offering in-store refill is the significant store staff time requirement to manage the fixture, and the need for costly on-site clean rooms. Our hypothesis was that filling a newly designed in-store refill display '**vessel**' at the supplier and moving it filled through the supply chain would reduce the resource pressures in-store - the challenge was that this type of vessel and system didn't exist.

Online Returnables

Similarly, there was no viable '**consumer returnables**' solution for tier 1 online retail i.e. a reusable packaging format, filled by the supplier, delivered to the customers home, used and returned empty. As such, Ocado became a key member of the Refill Coalition from the outset and committed to developing an industry-standard consumer-sized returnable packaging format for online sales that multiple retailers could use.

THE REFILL COALITION PROJECT

The solutions

In-store Refill

The Refill Coalition designed a modular solution - a supply chain 'vessel' which could be filled with product and shipped via the normal supply chain. The vessel was designed to attach to a customer-facing dispenser and display in an in-store refill fixture. Customers could then bring their own packaging to refill, or purchase a container in-store, using an improved easy weighing system. Each reusable vessel replaces 24 single-use packs (based on a 500g pack of rice). Trial Product Range: Everyday Essentials Porridge Oats, Nutty Granola, Berry Granola, Strawberry Crisp, Nutty Muesli, Choco Pillows.

Online Returnables

The online 'consumer returnable' is pre-filled with product and shipped to customers alongside the rest of their Ocado order, then returned to the Ocado driver when empty. Each consumer sized vessel replaces up to 5 single-use plastic packs (based on a 500g pack of rice).

Trial Product Range: Ocado own brand Basmati Rice 2kg, Penne Pasta 1kg, Non-Bio-Liquid Detergent 2.7L and Blue Skies Fabric Conditioner 2.7L.

THE REFILL COALITION PROJECT

A modular solution for in-store refill

In 2019, GoUnpackaged developed the concept of a modular solution for in-store refill, designed to solve the challenges faced by retailers, and the supply chain, when implementing refill projects.

The core of the solution is the concept of filling the in-store refill display hoppers at source, and moving them filled through the supply chain, which reduces the resource pressures in-store - however, the existing hoppers were not suitable for this.

Our modular solution reconciled these competing imperatives:

- The customer-facing dispenser and display would remain in position, protected from the stress of supply chain logistics.
- The product itself would be contained in a modular "vessel" component that was more durable, hidden behind an interoperable customer-facing display.

THE REFILL COALITION PROJECT

Open standards

Both the in-store and online solutions were designed along the principles of open standards of interoperability. Our hypothesis was that if one solution provider owned the 'whole system', it would drive a plethora of competitive solutions within the market (e.g. different FMCG companies using different systems) which would prove too costly for retailers to manage, and too complex for consumers to use, ultimately slowing down take-up within industry.

Conversely, an open standards ecosystem would encourage healthy competition across the individual modules, but within the same overall system, to drive constant improvements. All parties agreed that, following the closed trial period, the interoperability of the system would be shared widely within industry to drive scale-up.

The trials

In-store Refill

Aldi ran two in-store trials over 16 months at its Solihull and Leamington Spa stores; the trial came to a close in line with the IUK-funded project's planned end date.

Online Returnables

Ocado ran a trial out of three Customer fulfilment Centres (CFCs) covering 65% of their customer base. Ocado will continue to offer its current four reuse products to customers.

External factors

Funding was awarded in 2020 and so the project faced a number of unprecedented external challenges - from COVID-19 to the cost of living crisis, as well as conflicts in Europe which lead to material scarcity and supply chain issues. This was coupled with the ongoing challenges faced by all reuse projects such as a lack of real data and evidence on which to make decisions; short-term commercial considerations amongst industry; a lack of understanding how the benefits of reuse can contribute to businesses' Net Zero targets; and a continued lack of focused regulation and legislation driving the transition to reuse.

TRIAL KEY LEARNINGS

The Refill Coalition project successfully trialled two new standardised supply chain solutions for in-store refill and online consumer returnables. The solutions are viewed by many UK retailers and brands as the next generation models for refill and reuse.

Below we share the learnings using the project's key performance indicators (KPIs) reported by category - commercial, operational, customer, environmental and coalition.

TRIAL KEY LEARNINGS

Commercial

The solutions are driven by viable commercial business cases, including the additional wash and reverse logistics required

Sales Share

Often the lack of a commercial business case is cited as a reason why businesses cannot offer refill & reuse. Therefore a key commercial metric for both Aldi and Ocado was sales share i.e. the proportion of the total sales achieved through the refill offering vs. the single-use packaged alternative, which shows customer desirability for the products:

In-store Refill

In the two Aldi stores, refill products regularly reached ~30% vs. the single-use packaged versions, reaching as high as 56% sales share in some weeks. The previous refill installation achieved 8-10% sales share, so improving on this was a key aim.

Online Returnables

For the Ocado trial, the sales share has reached as high as 43% in some weeks and averaged out at ~13% for dry goods and an average of ~19% for liquids sales share over the course of the trial. Some key barriers, which Ocado believe will be removed with scale, are: a lack of product choice, lack of national availability and that the majority of Ocado customers use the “favourites” function to fill their shopping basket and so the introduction of “reuse” requires them to move outside their regular lists.

TRIAL KEY LEARNINGS

Commercial

Cost to Serve

As well as proving customer demand, it was important to design a viable cost to serve (the total cost incurred to fulfil the demand for the product) for the refill and reuse products. In preparation for the trial, GoUnpackaged conducted a cost model comparison of traditional (manual) in-store refill vs our supply chain based solution in which staff time, and therefore cost, is significantly reduced. Subsequent remodelling using actual trial data showed that the in-store staff time required to manage the fixture is significantly reduced, by 86%, further building a viable business case.

Overall Trial Costs

A further challenge to building viable business cases for reuse is that the costs for trials are always higher than the at scale price, due to smaller production runs for the equipment and manual processes whilst the solution is being tested out.

For the Refill Coalition, this included:

- **Filling** - at suppliers, or co-packers, due to manual processing, as well as trial and error of new methods for filling and packing/palletising new reusable formats.
- **Transport** - smaller truck loads are not optimised.
- **Washing** - initial setup costs at the wash plant adds costs, as well as a higher wash cost per unit for smaller volumes.

Refill Coalition Consumer Education Animation

TRIAL KEY LEARNINGS

Commercial

Moving to scale

Beyond the expected higher trial costs, the solution is designed to ensure the costs reduce as scale increases e.g. optimised design for roll cages and pallets; as well as working closely with logistics partner CHEP on efficient reverse logistics and Packaging Services Europe (PSE) on the optimum wash process.

Subsequent modelling shows that, for both online and in-store, the economics of wash and return logistics have been proved out even at trial volume levels, which has resulted in more concrete estimates for a scaled volume unit pricing and provides further evidence that this solution is commercially viable at scale.

With the 2025 implementation of UK Packaging Extended Producer Responsibility (pEPR) fees, producers are increasingly bearing the full cost of waste management which will further build the business case for our reuse solutions. Additionally, the trial has allowed us to gain further clarity on the costs of running solutions such as these. Still to be understood are the at-scale costs to amend automated packing & palletising lines, and the potential impact on sales per square metre of retail space, compared to both single-use and other reusable solutions.

Industry scale up for both solutions would deliver the volume necessary for the per unit costs of equipment, filling, wash and reverse logistics to further decrease, becoming competitive with, and in some cases more cost-effective than, single-use.

TRIAL KEY LEARNINGS

Operations

The Refill Coalition trial proved the concept of reusing supply chain vessels, including washing to retailers' high food safety standards and providing a viable returns process for both in-store and online.

Products & Suppliers

The product categories selected for Aldi were based on sales volume and categories where supplier relationships were strong and suppliers were open to trialling a new way of working. Cereals are common products for in-store refill stations along with other dry goods, plus non-food categories such as household cleaning or personal care liquids. The Refill Coalition explored in-store liquid refills, however the technology was not available to deploy in the timeframe of the project.

For Ocado, the products identified for the trial were high volume in terms of sales and, in the case of the own-brand laundry liquids, a strong relationship with the product manufacturer was a key enabler. As such, Ocado was able to offer both food and non-food products.

Picking the right suppliers for reuse trials is very important as it requires the supplier to engage and be willing to experiment with new processes, as well as for retailers to ensure good communication of their expectations on lead times and order volumes.

Shelf Life

For both solutions, the product is filled into the vessels, capped and sealed at the manufacturer. For in-store there is a small moment of exposure to air during the attachment of the dispenser head to the vessel but this is minimal compared to current manual solutions. Shelf life testing was carried out by each supplier individually, and the suppliers involved in the trial have raised no concerns on the vessels' ability to preserve shelf life.

TRIAL KEY LEARNINGS

Operations

Designing Reusable Formats

There was very little experience in the market for manufacturing food grade reusable packaging, so all the partners were learning together. Developing such design innovation, it was essential to give sufficient collective focus to quality control during manufacturing - for example, a re-design of the handle was required when it became clear that the blow moulding process left a pin-hole in the handle which filled with water during the wash tests.

The project has proven that standardised High-Density Polyethylene (HDPE) reusable containers function well for in-store refill and online consumer returnables use; are durable enough to withstand the rigours of the supply chain; and can be washed and reconditioned to retailers' high food safety standards:

In-store Refill

Vessels needed to be a large size (14L) and have the strength and flexibility to withstand repeated handling in the supply chain. For the dispenser fronts, Triton (a BPA-free, durable copolyester plastic) was chosen as it is hard wearing whilst giving high clarity, maximising the appeal of the goods.

Online Returnables

Ensuring the return of the consumer returnables from customers' houses is key to make the system function. As such the Ocado container was designed to be 'functionally ugly' and messaged with return instructions to prompt customers to return them.

With scale, we expect suppliers to introduce rHDPE to improve on environmental sustainability and ensure UK Plastics Tax compliance.

TRIAL KEY LEARNINGS

In-Store Operations

The in-store solution at Aldi was found to be simple and efficient, with staff reporting quick and easy replenishment. The addition of tare-less functionality will further speed up the process for customers and reduce dwell time at the fixture.

In-store equipment & downtime

Aldi feedback on the in-store fixture is that the equipment is well designed and, with some minor improvements, is an ideal solution for in-store refill. Improvements include outsourcing the cleaning of the customer-facing dispenser fronts, and installing our tare-less functionality which removes the need for customers to weigh their containers first.

Wastage

Compared with other in-store refill solutions, wastage is low showing that the system is well designed and the products are priced well, avoiding customer 'till shock'. However, in terms of total in-store wastage targets, further improvement on reducing wastage is required.

Staff feedback

Staff feedback from operating the system has been positive - the replenishment of the vessels is completed in approximately 30 seconds and, for a new batch, the manual input of best-before dates takes a further 30 seconds - this would be further reduced with scanning.

TRIAL KEY LEARNINGS

Online Operations

The online trial at Ocado easily fits into the existing delivery and returns process and does not add significant time to existing operations.

Customer Fulfilment Centre (CFC) Setup

'Process variation to current' for the CFCs was a key operational metric for Ocado, and feedback from the CFC teams states that the solution does not add significant time to their processes as they manage the consumer returnables similarly to other returns, such as products that customers have rejected or damaged products.

Ocado Vessel Returns and Tracking

The Ocado target return rate for the first 6 months trial period was achieved, and is currently at 86%, which is very promising given this is without deposits or direct reminders to customers - and this number continues to increase. The decision was made not to add deposits to make it frictionless for customers and as easy to purchase as single-use; Ocado consider it important to ensure the reuse products are not sold at a higher price than the single-use versions. RFID is being used to track the vessels at an item level, and the data is currently primarily being used to identify the stock of vessels at each location. The first batch of RFID labels did not have the correct adhesive which resulted in some loss of labels - this is being addressed with a new adhesive. We've proven that if the label is well adhered to the vessel, it will not come off during the wash.

TRIAL KEY LEARNINGS

Reverse logistics

The small volumes being pooled[6] during the trial has meant the reverse logistics sit outside of standard processes, which has led to a more manual process for the collection of vessels. In future, a standing order to schedule a monthly collection would improve this process - removing the responsibility from the warehouse teams, and improving the efficiency of truck loads.

For both solutions, protocols are needed for palletisation to ensure pallets are accepted into the retailers' warehouses, as retailers will reject pallets due to instability. For the few retailers working predominantly with roll cages, the vessels are correctly optimised and no further improvements are needed.

Washing, Food Safety & Hygiene

The trials have proved that reusable packaging can be washed to retailers' high food safety standards. Due to the lack of agreed wash standards for reusable packaging, the Coalition worked with partners' compliance teams to define and implement stringent standards.

Once the wash site was set up (including improved HACCP and training), the wash validations (with Intertek lab allergen and microbiological testing) were completed successfully, which then allowed the production wash process to begin. HDPE was proved to be washable, removing allergens, microorganisms and odour to the necessary levels.

Further work is currently underway to increase the throughput of vessels per wash which will lead to cost savings - this will require further testing and validation to prove compliance with food safety standards.

6. Pooling is when assets are shared across the supply chain.

TRIAL KEY LEARNINGS

Customers & Behaviour Change

The Refill Coalition trials proved the project's original aim – that there is sufficient consumer demand for refill and reuse when powered by the right solution.

Through bespoke independent quantitative and qualitative consumer research, the project gained valuable insights into how customers engage with refill and reuse:

- A high level of communication is required and, importantly, needs to be sustained to educate customers and help them adopt new behaviours.
- Any issues need to be resolved quickly so that customers cannot 'fail' when engaging with refill and reuse.
- Retailers should share more data on how much packaging is saved through refill and reuse as this is motivating to customers.
- Both Aldi and Ocado customers (across a range of ages and shopper types) expressed very similar views about their feelings
  - all wanted more choice; they could see themselves using these types of systems across more products and categories.
  - all felt very positive about the environmental benefit.
  - all appreciated that the products did not cost more than their single-use packaged equivalent.
  - the vast majority found the systems easy, quick and hygienic to use.

"I would use Ocado more because it really is trying to help change the way in which we shop to be more sustainable and more environmentally friendly."

Ocado Customer

"Returning the containers is extremely convenient. All I have to do is hand them to the driver."

Ocado Customer

"It's a big challenge but ALDI has the opportunity to promote itself as the most forward thinking and sustainable supermarket so the world's their oyster! And the world needs saving!"

Aldi Customer

"I really like in the refill station that I don't have to buy the full package, so I can buy smaller amount but bigger variety."

Aldi Customer

TRIAL KEY LEARNINGS

Customers & Behaviour Change

"I like it because it's a great way of reducing packaging and helping the environment."

Aldi Customer

Aldi Consumer Research Findings

The refill product range

The Aldi customers surveyed expressed a preference to buy their cereals in refill, particularly as Aldi has made the products in the refill station cheaper than the packaged alternative by an average of 5%. However, many customers believed just cereals was a limited range and requested further types and product categories.

The refill station

Overall the participants were very pleased with their refill experience and felt it to be a positive addition. Our research[7] showed that the equipment successfully addresses the main concerns customers have shown towards in-store refill systems:

97%

of customers find the process of using the refill station to be hygienic

89%

of customers find the refill station easy to use

89%

of customers find the refill station quick to use.

"We have been to zero waste stores in the past, but it's just convenient to have it in the same place as all of our other groceries."

Aldi Customer

7. Wave 1: 303 respondents, Aldi Solihull, February 2024. Wave 2: 329 respondents, Aldi Solihull & Leamington Spa, November 2024 (Opinium).

TRIAL KEY LEARNINGS

Customers & Behaviour Change

Reusable Containers

For the in-store solution, we wanted to measure the number of customers using a reusable container. Whilst it's important to offer a paper bag to enable as many customers as possible to engage in refill, this is still an item of single-use packaging.

From the fixture scale data collected at the in-store fixture, it has been possible to analyse the types of packaging that consumers use at the Aldi refill stations:

21%

of sales of refill products were using customer containers - either the Aldi container purchased in-store, or a reused container brought from home.

79%

of purchases were completed using a free paper bag offered at the refill station.

It is difficult to compare the bring-your-own (BYO) packaging rate to other solutions as many trials do not publicly release results. The only other mainstream sector where customers often reuse - take away coffee - shows a <5% reuse rate, therefore 21% is considered a very positive result.

In order to increase this rate, messaging around the fixture, and in wider customer communications e.g. messaging printed on paper bags, can educate customers to the additional benefit of bringing their own containers. Additionally, as more retailers offer refill and reuse options, there will be more of a cultural norm around refilling which should see BYO container rates rise.

> "It looked fun, interactive and as we're a family that's very conscious of waste and recycling, so we decided that we'd give it a go... And, it felt like we were doing the right thing moving forward for the environment and also for us being able to control what we purchased and the volume that we purchased for home as well."
>
> **Aldi Customer**

> "The fact that it's reusable is what I like most about the reusable range that I'm not having to constantly recycle plastic as I hate plastic recycling."
>
> **Ocado Customer**

TRIAL KEY LEARNINGS

Ocado Consumer Research Findings

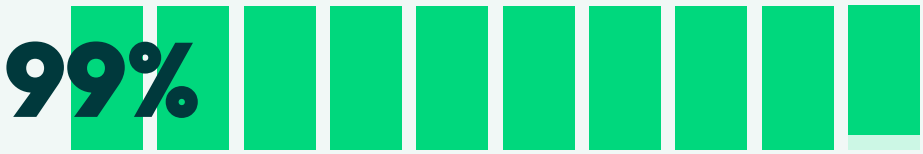
The trial has only been available to a subset of customers, as serviced by 3 specific CFCs, limiting Ocado's ability to communicate the new reuse offering more widely across national channels. Once launched in all CFCs, an accompanying nationwide campaign could significantly increase awareness and engagement with the solution.

Independent quantitative research[8] targeted at customers who had purchased the Ocado reuse products showed that customers overall are extremely pleased with the reuse concept:

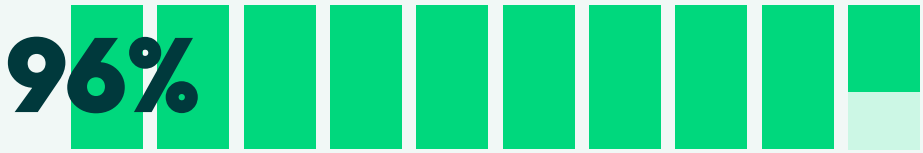
> "I think the current system of returning containers for refill works well... We just handed our container back. It was super simple."
>
> **Ocado Customer**

100% found the packaging to be clean

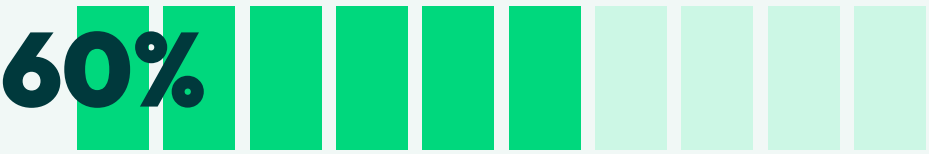
100% found the products hygienic



99% found it easy to order



96% likely to use again in future



60% happy with product choice available The reason given was with the limited choice currently being offered, showing further demand for a larger reuse range.

8. 493 Ocado customers who have purchased Refill-Reuse products, between Tuesday 7th and Tuesday 14th January, Opinium

TRIAL KEY LEARNINGS

Environmental

The Life Cycle Assessment (LCA) results have shown that, **at scale, both the in-store and online reusable vessels perform better environmentally than the single-use alternatives** - with seven out of eight products performing better across the environmental impact categories studied.

Background to the LCA

The goal of the Refill Coalition's LCA study was to quantify the difference in environmental performance of two reusable grocery systems compared to current single-use packaging systems, when the reusable systems are operating at-scale.

A trial cannot replicate the volume and efficiencies of an 'at scale' scenario and therefore comparing the environmental performance of a reuse trial against a mature and optimised single-use system is not a fair assessment. 'At scale' is defined as including the optimisations that would occur if these solutions are rolled out by retailers on a wider scale, and the wash throughput is optimised at the wash plant. A benefit of undertaking an early trial-stage LCA is in identifying the key 'hotspots' of the reusable systems to support future optimisation efforts.

The reusable vessels were compared to the following single-use packaging types:

- HDPE plastic bag inside a folding boxboard box, or white lined chipboard box, i.e. 'bag-in-box' (cereal, granola & muesli).
- Un-lined kraft paper bag (oats).
- PP plastic bottle (laundry liquid & fabric conditioner).
- HDPE plastic bag (rice).
- PP plastic bag (pasta).

The Refill Coalition contracted independent specialists Eunomia Research and Consulting to conduct a thorough LCA (using ISO 14044 standards) of the Refill Coalition's trial, peer reviewed by Dr. Stuart Walker (Research Fellow in Sustainability Assessment at Grantham Centre for Sustainable Futures). The full LCA "Comparative LCA of Reusable and Single-Use Packaging Systems for Grocery Items in the UK" is available to download on our website here.

TRIAL KEY LEARNINGS

Environmental

Key LCA findings

The results showed that the reusable formats reported lower environmental impacts than the single-use alternatives for products packaged in plastic film (pasta and rice), bag-in-box (granola, muesli and cereal) or plastic bottles (detergent and conditioner). The only format for which this was not true was for products packaged in single-use un-lined paper bags (oats).

A note on the single-use product comparisons: the choice of single-use packaging in the study was based on the exact Aldi or Ocado product and packaging format being replaced by the reusable packaging system. This is not necessarily representative of the market average - for example, the un-lined paper bag packaging is atypical for many products likely to be in scope for reusable formats as the plastic liner is required as a barrier against moisture, or to improve shelf life.

Table E- 3: In-Store Overall Results	Granola/Muesli		Oats		Cereal	
	Single -Use	Refillable	Single -Use	Refillable	Single -Use	Refillable
Climate change	0%	-46%	0%	+31%	0%	-55%
Resource use - fossil	0%	-30%	0%	+58%	0%	-41%
Particulate matter	0%	-48%	0%	-4%	0%	-30%
Resource use - minerals and metals	0%	-38%	0%	+28%	0%	-43%
Photochemical ozone formation	0%	-46%	0%	+22%	0%	-55%
Acidification	0%	-61%	0%	-17%	0%	-65%
Water use	0%	-57%	0%	-21%	0%	-56%

Table E- 4: Online Overall Results	Rice		Pasta		Detergent / Conditioner	
Climate change	0%	-35%	0%	-12%	0%	-88%
Resource use - fossil	0%	-22%	0%	+8%	0%	-86%
Particulate matter	0%	-12%	0%	-1%	0%	-76%
Resource use - minerals and metals	0%	-40%	0%	+23%	0%	-49%
Photochemical ozone formation	0%	-33%	0%	-19%	0%	-84%
Acidification	0%	-42%	0%	-36%	0%	-84%
Water use	0%	-47%	0%	-38%	0%	-74%

TRIAL KEY LEARNINGS

Environmental

LCA: Reusables Breakeven Points

The Life Cycle Assessment (LCA) results show that **the breakeven points of the in-store and online vessels are between 5 and 20 rotations, which is achievable within the projected lifespans of the vessels.**

It is important to understand the breakeven point of the number of uses (or rotations) a piece of reusable packaging needs to achieve to perform better than the single-use alternative.

The manufacturer of both vessels (Berry Global) estimates that each vessel has a lifespan of at least 60 uses.

In-store reusable vessels vs. single-use

With a breakeven point of fewer than 20 rotations, the supply chain reusable vessel system shows clear environmental benefits compared with single-use.

Online consumer returnables vs single-use

With a breakeven point of between 5 - 20 rotations compared with single-use, the consumer returnables system shows clear environmental benefits compared with single-use.

The key to any well functioning reuse system is to ensure high enough return rates to achieve the required number of rotations.

TRIAL KEY LEARNINGS

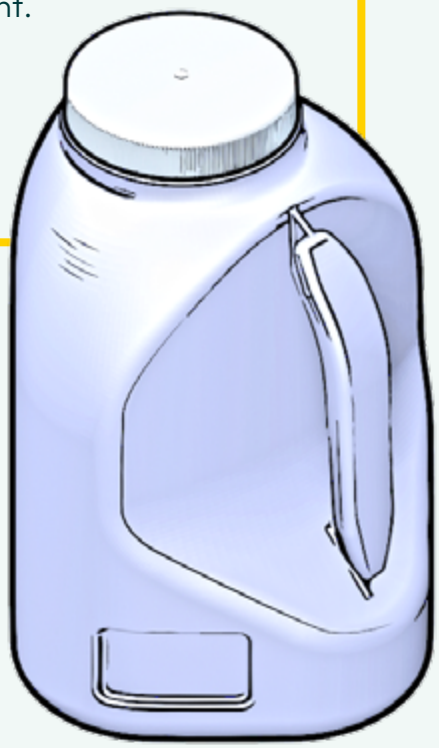
Environmental

Sensitivity Analysis

The high-level conclusion - **that an at-scale refillable/ returnable system could result in a lower climate change impact than a single-use system - was upheld throughout key sensitivity analyses conducted looking at transport, the wash plant and end-of-life.**

Recommendations for Minimising Reuse System Impacts at Scale

- **Raw Materials and Production:** Ensure a minimum of 25+ rotations for all reusables, introduce post-consumer recycled content, and refine the vessel design to further increase the amount of product per pallet.
- **Logistics:** Co-locate wash plants at the filling site to minimise transportation and its impacts.
- **Washing**: Maximise throughput of the wash plant.
- **End-of-Life:** All parties to ensure closed-loop recycling at the end of the vessels' usable lifespans.



These recommendations can be used by system providers to increase efficiencies and lower environmental impacts in any further deployment of the Refill Coalition's solutions.

TRIAL KEY LEARNINGS

Collaborative Action through Coalition

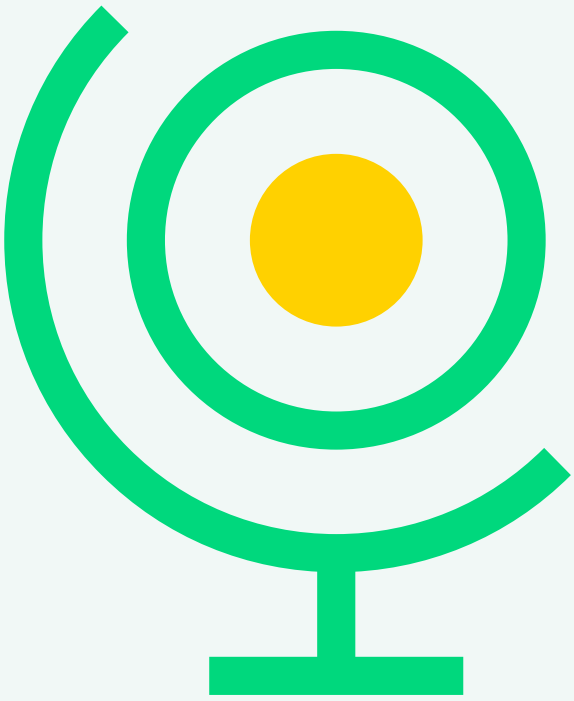
The Refill Coalition project proved that competitors can collaborate successfully on new reusable packaging solutions, as collaboration reduces individual costs and risk.

Key success factors when working as a coalition

Aldi, Ocado and CHEP had senior advocates within their organisations driving the necessary commitment over multiple financial cycles. This is essential as businesses have many competing internal and external pressures which can take focus away from longer-term innovative R&D projects and we needed each of the partner organisations to be committed for the duration of the trial.

The potential availability of grant funding from Innovate UK made the project more attractive to partners, and the credibility of all the partners was important for the project to win the Innovate UK funding competition.

The project benefited from the collective expertise of all partners, as no single company had all the answers. This required an openness to learning, as well as expert facilitation to help navigate difficult, but necessary, discussions and trade-offs.



TRIAL KEY LEARNINGS

Collaborative Action through Coalition

Successes

GoUnpackaged's role was critical in ensuring the coalition of 4 partners ran smoothly, with leads based in multiple geographies, for over 3 years. This included maintaining the safeguarding of confidential business information throughout the project.

As a trusted third party, that did not benefit financially from selling the equipment, GoUnpackaged could act as central change agents and facilitate collective decision making for the benefit of the project. Key to the success of the coalition was the co-design of two brand new solutions that have now been proven to work.

Within industry there are concerns around the risk of collaboration and Competition Law. GoUnpackaged ensured that all meetings were Competition Law compliant and no concerns were raised across the 5 years of work which, along with the UK CMA guidance[9] around collaboration, should give confidence that competition concerns are not a barrier to collective action to drive reuse.

Challenges

The project's viability was challenged by retailers leaving the Coalition. During the course of our project, a significant number of macro-economic factors affecting all the partners played a role in retailers' willingness to participate, as we have detailed earlier in the report. Credit should be given to Aldi, Ocado and CHEP for committing to lead the work from development to a real world trial under extremely challenging global circumstances.

9. https://www.gov.uk/government/publications/guidance-on-environmental-sustainability-agreements.

RECOMMENDATIONS FOR SCALE

With the support of Innovate UK, The Refill Coalition was able to conduct a trial which successfully proved out a range of commercial, operational, customer and environmental KPIs.

Our learnings show the need for a portfolio of products in refill and reuse. Whereas it makes sense from a sustainability lens to promote the most environmentally sustainable options, retailers should also focus on high volume and frequency items as these products help increase the appeal and usage of new refill and reuse formats for customers, which will accelerate the behaviour change required for these solutions.

Due to a lack of wider retailer engagement, the in-store trial was unable to test its solution at further scale, while Ocado's learnings continue as it scales its reuse offering.

The learnings from this White Paper can be used for further implementation of these solutions at scale.

In addition, there are key enablers that would further support scale up; please find these overleaf.

"We are extremely proud of our collective work to design and launch these new refill & reuse systems, which form a key part of the solution to tackling the single-use plastics crisis. The trial demonstrates the solutions' operational efficiency, clear environmental benefit and scalability which are critical steps towards industry transformation. Additionally, the sales share and in-depth research provide evidence of the significant consumer appetite for refill and reuse as part of their regular shop. We look forward to seeing other retailers and brands taking up these proven solutions, enabling an acceleration towards a reuse future".

The Refill Coalition

RECOMMENDATIONS FOR SCALE

Automation and technology

Filling automation introduced into the manufacturing lines for both the in-store vessels and online consumer returnables would significantly reduce the cost per unit to fill the vessels, whilst improving efficiency by removing the need for manual handling. In the online CFCs, the introduction of RFID gateway scanning would improve item level tracking and could support higher return rates, and an RFID tag inserted into the mould of the vessels would be more cost effective at scale.

Reuse-focused legislation as a driver for change

A system-level transition from a linear (single-use) to a circular (reuse) economy for packaging cannot be achieved by individual trials – a change in the regulatory environment is needed to support the introduction of viable solutions such as ours. This lies outside the scope of our work; however, if Governments can design the right package of interventions to support industry at large to begin this transition, refill and reuse will become even more commercially viable. This will lead to more retailers offering reuse products, which will make usage more of a social norm and further reinforce the viability of reuse.

The UK context

UK retailers are collaborating to launch a second major push on refill and reuse in a 'Plastics Pact Mark II' being drawn up by WRAP (the Waste and Resources Action Programme) who stated there is a "clear appetite" across the industry to agree on new standardised principles for reuse[10].

The Refill Coalition has high hopes for future implementation of these systems through a new industry-wide focus on reuse.

10. https://www.thegrocer.co.uk/news/supermarkets-to-sign-plastics-pact-mark-ii-to-ramp-up-reuse-and-refill/698077.article

APPENDIX:
About the Coalition Partners

GoUnpackaged is the UK's leading consultancy specialising in reuse and refill, helping clients across the supply chain to help reduce their single-use packaging footprint by transitioning to reusable and refillable packaging. Our multi-disciplinary team brings an unparalleled breadth of insight, knowledge and experience in making reuse a commercially and environmentally successful proposition.

Aldi UK is Britain's fourth-largest supermarket, with over 1,050 stores nationwide. The retailer is committed to operating responsibly while prioritising sustainability, actively reducing and eliminating unnecessary plastic and packaging from its products. It was the first retailer to remove shrink wrap from its soft drinks cans and opened its first eco-concept store in 2022 where it pilots innovative sustainability solutions.

Ocado.com (operated by Ocado Retail) is the world's largest dedicated online supermarket, and is a joint venture between Marks & Spencer Group and Ocado Group. Reaching over 80% of the UK population, more than 1 million active customers benefit from an unbeatable range of around 45,000 products (including big-name brands, more than 7,000 items from the M&S food and drink range and Ocado's Own-Range), unbeatable service with next-to-no substitutions, and the freshest produce. Ocado developed the first grocery shopping app in 2010 and continues to innovate, offering customers the best possible experience. Ocado Retail is also responsible for Zoom by Ocado, its rapid grocery delivery service.

CHEP is a global leader in supply chain solutions. Together with producers, manufacturers, retailers and logistics partners, CHEP advances the smart and sustainable movement of goods across more than 60 countries. Powered by its share, repair and reuse network of connected pallets, crates and containers, CHEP helps businesses optimise their supply chains to reduce costs and minimise the environmental impact of their operations. CHEP pairs its leadership in circularity, which helps tackle emissions, waste and single-use packaging, with a focus on resilience, to build future-ready supply networks through data, scale and collaboration.

UKRI's Smart Sustainable Plastic Packaging Challenge, delivered by **Innovate UK**, aims to establish the UK as a leading innovator in smart and sustainable plastic packaging, driving cleaner growth across the supply chain, and delivering a significant reduction in plastic waste entering the environment by 2025. The Challenge brings together academia, the full plastic packaging value chain and other key stakeholders and supports the delivery of the 2025 UK Plastics Pact targets.

For further information, please see:

www.refillcoalition.com

www.gounpackaged.com/solutions