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CASE STUDY

Patagonia: Closing the Loop on Packaging Pollution

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Patagonia: Closing the Loop on Packaging Pollution

Plastic takes centuries to biodegrade in the environment and is a major disruptor in our planet's ecosystems. If left unchecked, plastic will have a dire impact on the future of humanity.

—DOUG FREEMAN,
CHIEF OPERATING OFFICER, PATAGONIA

Between San Francisco and Hawaii swirls the Great Pacific Garbage Patch, a vortex of floating plastic debris, just one example of the trash polluting our world's oceans. In Yellowstone National Park, a dormant geyser awoke for the first time in decades, spewing forth trash.¹ China recently stopped admitting most plastic waste into its country resulting in tons of “displaced” plastic now found in ditches and landfills.²

Today, single-use packaging waste is invading all corners of the world. Wholesale change is urgently needed to create packaging that does not wreak havoc on our planet. Due to complicated and global packaging supply chains, the quest for viable and sustainable improvements requires collaboration, innovative technologies, forward-thinking companies, consumer demand, and new government incentives and laws.

¹ <https://www.npr.org/2018/10/10/656079696/yellowstones-ear-spring-geyser-erupts-spewing-decades-old-trash>

² <https://www.smithsonianmag.com/smart-news/chinas-plastic-ban-will-flood-us-trash-180969423/>

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Single-use packaging is integral to the apparel and food industries. Patagonia believes a call-to-action is needed throughout the broader business community to not only innovate more environmentally responsible packaging solutions, but to share those solutions to solve a near irreversible crisis.

Patagonia has been a responsible business pioneer since its founding in 1973. Patagonia creates apparel, outdoor gear, and food products consistent with its mission: “We are in business to save our home planet.” It is a philosophy evident throughout Patagonia’s apparel business, Provisions food business, and corporate venture capital fund, Tin Shed Ventures. From creating outerwear with recycled soda bottles to organic buckwheat breakfast grains, Patagonia has been a successful business by staying true to its core values.³

Patagonia is searching for solutions to mitigate its own contributions to the single-use packaging crisis. However, it is critical to keep in mind the purpose and application of packaging when seeking solutions. The primary job of a package is to protect what is inside. Packaging exists for health and hygiene reasons—to keep products separate, to block moisture from leaking out, and to prevent bacteria from contaminating food. It also exists to transport goods safely without damage and to look appealing for marketing reasons.

Questions which Doug Freeman, Patagonia’s Chief Operating Officer, is actively seeking answers to include: Why aren’t there more biodegradable, recyclable, or reusable packaging options for manufacturers and consumers? Are there non-extractive feedstocks which could be scaled into new responsible packaging solutions? How can composting be expanded through industrial facilities and backyards that will allow packaging to have a smaller environmental impact? Who is going to collect, recycle, and reuse new packaging materials? Is it reasonable to expect the consumer to know how to properly dispose of single-use packaging?

To tackle this, “Patagonia is leveraging the power of open innovation because the likelihood of the solution existing inside the R&D department of one company is extremely low. The chances that we can meet our greatest sustainability challenges through collaboration is much greater. A collaborative systems approach is what is required,” said Robert Strand, Executive Director, Berkeley-Haas Center for Responsible Business.

Patagonia: A History of Innovation and Sharing

Patagonia began with ideas still core to the company today—reusability and quality. In the 1960s, young rock climber Yvon Chouinard learned blacksmithing to create reusable steel pitons for climbs in places like Yosemite without littering rock faces with permanent rope supports. The demand and reputation of Chouinard’s gear grew as he produced hardware of the highest quality for him and his friends to tackle countless first ascents. By 1970, Chouinard Equipment became the largest supplier of climbing hardware in the U.S.⁴ As climbing grew in popularity, the hardware he created was damaging the rock faces as the reusable steel pitons were hammered in and pulled out of heavily trafficked routes, causing ever growing cracks and fissures. One great environmental solution led to another problem. Thankfully, Chouinard did not stop there. After recognizing the damage of his reusable steel pitons, he developed aluminum pitons that could be inserted by hand, instead of by hammer. The new pitons could still be reused for another climb,

³ <https://www.patagonia.com/company-info.html>

⁴ <https://www.patagonia.com/company-history.html>

but unlike their steel predecessors, they left little to no trace of a climber, protecting the environment Chouinard and his friends revered.

The company's transition to apparel was unintentional and simply began to support the marginally profitable hardware business.⁵ Chouinard quickly recognized that the apparel industry was an even greater contributor to the environmental crisis than his pitons, and he made it his mission to use his newly-founded business, Patagonia, to find solutions.

Today, Patagonia's clothing and apparel are ranked among the highest performing gear on the market. The company's consideration for the environment has steered every part of the business. Patagonia has looked deeply into the origins of its products to determine the environmental impact of each product's supply chain. In the 1990s, Patagonia switched to 100% organic cotton after realizing that 10% of all agriculture chemicals in the United States were used to grow cotton on just 1% of all major agriculture land.⁵ In 1993, Patagonia became the first outdoor clothing manufacturer to use 100% recycled polyester for fleece, allowing the company to reduce its fossil fuel consumption while also mitigating waste.⁶

Each year, while Patagonia's materials innovation team has continued to replace virgin materials with recycled materials, polybags have been a pain point for the business. Plastic polybags are used to package Patagonia's individual apparel products. Their function is to protect products during transit from manufacturers to distribution centers, as they move through Patagonia's distribution centers, and as they travel to stores and customers. A polybag—or some form of packaging—is crucial for a product traveling through the supply chain to prevent damage. Patagonia currently recycles all the polybags collected in Patagonia's retail stores and distribution centers, but some leave the Patagonia system so they are not recycled.

Patagonia has investigated the possibility of eliminating polybags but found that 30% of garments that went through its Reno, Nevada, distribution center without packaging were damaged beyond the point of being sellable. Since determining that polybags are essential to Patagonia's logistics system, the company has identified two important ways to reduce polybags' environmental impact: 1) changing how products are folded can result in a 50% reduction in plastic packaging per product and 2) using more recycled content in polybag manufacturing. Near term, Patagonia will continue its polybag recycling efforts and will work towards using 100% recycled content polybags. Long term, Patagonia is exploring reusable and biodegradable polybags.

This is a good start, yet not enough for Freeman and Patagonia employees. Patagonia is still using plastic packaging for apparel and Freeman is wondering why the industry has become so dependent on polybags and has not found a better alternative.

“We rely on a network of raw material suppliers and sewing factories to bring us options that are environmentally responsible,” said Freeman. “So, in the example of polybags used to package our apparel products, we don't have a supply chain option that can make a post-consumer recyclable or 100% recycled polybag, and that's an issue. Why aren't supply chains doing that and how can we leverage our business to help develop more responsible solutions?”

⁵ <https://www.patagonia.com/organic-cotton.html>

⁶ <https://www.patagonia.com/recycled-polyester.html>

As Patagonia's apparel business continued to seek alternative packaging solutions, Chouinard looked towards new frontiers. His work with organic cotton shed light on environmental challenges in the agriculture industry and he saw the food industry as a space desperately needing more responsible business approaches. Patagonia Provisions, led by Managing Director Birgit Cameron, is Patagonia's in-house food business that reexamines best practices in food sourcing, utilizes organic regenerative growing methods, and works with like-minded advocates and producers to find solutions to the important environmental issues facing the food industry.⁷ Patagonia Provisions purchased 80,000 pounds of wild salmon in 2014 and officially launched its wild sockeye smoked salmon. From salmon caught using reef nets, an ancient selective harvesting technique, to Long Root Ale®, the first beer made from Kernza®, a perennial grain with a root system that grows up to ten feet long and thrives without tilling,⁸ Provisions engages with all aspects of the food's supply chain, building relationships with farmers, fisherman, and ranchers. For food to reach Provisions' customers with the same quality and assurance, the food needs to be protected.

Yet again, Patagonia stumbled on a packaging problem.

Evaluating Single-Use Packaging Solutions

How can Patagonia Provisions produce a package as green as the product inside? Although there isn't one equation to rank which single-use packaging options are better on the environmental scale than others, an ideal solution would consist of the following features: 1) made from renewable raw materials, 2) performs acceptably on current packaging and processing equipment, 3) provides adequate shelf life, 4) available at a reasonable cost achieved through scaling volume over time, and 5) is either easily reusable, biodegradable, renewable or recyclable using current technology or newly proposed technology. At present, a solution covering all these features is not readily available and Patagonia recognizes that successful solutions will be ones that can scale over time on costs. At the current status of the single-use packaging industry, the company needs to thoroughly investigate every solution that appears to have merit (see **Exhibit 1: Patagonia Provisions' single-use packaging for products**).

Paper or Plastic?

This common question at the checkout counter points out the difficulty of evaluating the environmental impacts of various types of packaging.

In 2018, Trader Joe's introduced new produce bags with the message, "100% compostable and will biodegrade in 180 days" which sounds like a good green option. Biodegradable and compostable implies a material that breaks down in a natural environment at a reasonable rate. What permits these bags to have the biodegradable label is that they include additives designed to make them decay faster than traditional bags.⁹ However, if consumers read the small print on the bag, they'll see "ASTM D6400" which refers to the American Society for Testing Materials which specifies this type of bag is "designed to be composted in municipal and industrial aerobic composting facilities."¹⁰ There are a limited number of facilities across the U.S. which accept

⁷ <https://www.patagoniaprovisions.com/pages/why-food-essay>

⁸ <https://www.patagoniaprovisions.com/pages/long-root-ale>

⁹ <https://www.epa.gov/trash-free-waters/frequently-asked-questions-about-plastic-recycling-and-composting>

¹⁰ <https://www.astm.org/Standards/D6400.htm>

biodegradable materials.¹¹ And, even if this bag was designed to compost in the lower temperature of a backyard bin, it's estimated that 72% of Americans do not compost at home.¹²

These limitations may leave people thinking that returning to paper bags is the answer. However, paper bags are also problematic because the materials require deforestation and producing paper bags emits greater greenhouse gases than producing plastic bags.

Remove Chemicals of Concern

One way to rank different packaging options is if they involve fewer potentially harmful chemicals such as phthalates and Bisphenol A (BPA), both used in the production of plastics. Marty Mulvihill, PhD, General Partner with materials-focused investment group, Safer Made, said that there are potentially toxic chemicals found in can liners, paperboard and plastic. He adds that government bodies, including the EPA and FDA, do not all agree on defining chemicals of concern and the food industry should set a high bar. Mulvihill relies on the Food Packaging Forum, an organization based in Switzerland that provides independent, science-based and balanced information about chemicals in food packaging for all stakeholders.¹³

There have been several occasions when harmful chemicals have been quickly replaced with a new chemical without time to ensure that the new chemical is benign or safe. In 2008, REI announced it would begin clearing its shelves of polycarbonate Nalgene bottles containing BPA.¹⁴ BPA is dangerous because it mimics estrogen and can seriously effect newborns and fetuses.¹⁵ When the danger of BPA was publicized, REI was quick to strip the bottles from its shelves and look for a replacement. REI partnered with SIGGS and sold aluminum water bottles, but in 2009 the CEO of SIGG sent out an apology saying that on the interior of the aluminum bottles was an epoxy liner containing BPA.¹⁶ REI took matters into its own hands and produced BPA-free bottles and containers with a chemical called Tritan, a copolyester made by Eastman Co. Unfortunately, Tritan is a trade name for bisphenol S or BPS which was later discovered to be just as dangerous as BPA. REI eventually switched to Klean Kanteen, a stainless steel water bottle. This one example shows that while seeking alternatives with a smaller environmental footprint is urgent—it still requires time and research to weigh the pros and cons.

For short-term adoption, it is important that materials used for packaging are recognized as a qualified Food Contact Substance (FCS). Section 409 of the Food Drug & Cosmetic Act defines an FCS as “any substance that is intended for use as a component of materials used in manufacturing, packing, packaging, transporting, or holding food if such use of the substance is not intended to have any technical effect in such food.”¹⁷ The FDA supplies an inventory of effective FCSs¹⁸ and “guidance” on considerations when making “significant process changes.”¹⁹

Packaging solutions tied to novel materials may take longer to be approved due to inherent risks and necessary FDA testing.

¹¹ http://bioselect.com/wp-content/uploads/2011/01/USCompostingFacilities_pdf.pdf

¹² <https://www.prnewswire.com/news-releases/national-waste-recycling-association-survey-finds-most-americans-would-compost-if-it-was-more-convenient-in-their-community-239232261.html>

¹³ <https://www.foodpackagingforum.org/>

¹⁴ <https://sgbonline.com/rei-and-nalgene-to-phase-out-bpa-bottles/>

¹⁵ <https://www.niehs.nih.gov/health/topics/agents/sya-bpa/index.cfm>

¹⁶ https://www.huffingtonpost.com/steve-wasik/sigg-ceo-im-sorry_b_278291.html

¹⁷ <https://www.fda.gov/food/ingredientspackaginglabeling/packagingfcs/default.htm>

¹⁸ <https://www.fda.gov/Food/IngredientsPackagingLabeling/PackagingFCS/Notifications/ucm116567.htm>

¹⁹ <https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ucm300661.htm>

Novel Materials Aren't Always Better

What if a snack brand introduced a new biodegradable chip bag made with polylactic acid (PLA), a bio-based renewable material? It sounds better than nonrenewable, petroleum-based material. But what if the plant-based material was grown under chemically-intensive agricultural conditions or was made from genetically modified corn rather than organic corn?

New materials and chemicals come on the market daily—and their potential for danger is not always obvious. Synthetic biology and genetic modification are budding industries; however, the benefits and consequences are controversial. Patagonia Provisions' products do not contain any genetically modified organisms (GMO), and there are no plans to switch to GMO sources in the future. Patagonia is eager for biodegradable and bio-based materials to replace non-renewable, petroleum-based plastic, however, much of the research around biodegradable, bio-based materials involves GMOs.

Patagonia recognizes the dangers of introducing GMOs into agriculture, an uncontained environment. The company is working to foresee and determine the risk of GMOs produced in a contained environment to provide a solution to the plastic pollution crisis without introducing a danger to the ecosystem.

Is Glass “Good” or “Bad”?

Many American families relied on the milk man to deliver milk from local creameries through the 1950s before reliable refrigeration replaced iceboxes. Glass milk bottles that were rinsed, put outside for pick up, and re-used, provided a functional example of a closed-loop system. In the United States this closed loop remains in some elite markets, but otherwise has become non-existent. Patagonia is searching for packaging with potential reuse markets. Recycled materials require processing, whereas reused materials are simply used for the same purpose or a new purpose rather than modified mechanically or chemically.

While glass provides advantages, such as being an excellent food barrier and easy to reuse at home, it comes with several problems including fragility which could result in broken glass shards contaminating factories and food. Glass is heavier than traditional cans so transporting products packaged in glass requires more energy, producing more greenhouse gases than plastic and paper alternatives.²⁰

Patagonia is a global brand with a customer base rooted in the outdoors. So, packaging must be easy to transport from manufacturer to distributor to customers, as well as easy for customers to take on their travels. Although glass is not ruled out by the company due to its promising reusability possibilities, it has yet to be a viable solution.

A Wrapper is Complicated

Patagonia Provisions has been working for several years to improve the environmental impact of its fruit bar wrapper. The bar is sourced with environmentally-friendly organic fruit, nuts, seeds, and juice. But the wrapper doesn't meet the company's sourcing expectations and can only be

²⁰ <https://www.wastedive.com/news/what-chinese-import-policies-mean-for-all-50-states/510751/>

disposed of in the trash. Patagonia Provisions experimented with biodegradable wrappers and found encouraging results but no acceptable alternatives. Patagonia Provisions is actively seeking improved packaging for its fruit bars and is also working towards better packaging solutions for its more unstable products too (see **Exhibit 2**: Qualities required for each Patagonia Provisions product).

“The answer is that as soon as the science is available, we will move to better packaging,” said Cameron. She added that their food products themselves are “at the highest bar of what we can do in terms of people and planet considerations” but they are still seeking innovation to improve the packaging.

While the consumer only sees a single wrapper, the construction of the current wrapper structure has multiple layers: one or more sealant layers to melt and seal the film together, a barrier layer to bar moisture and oxygen, a structure layer to provide rigidity and puncture resistance, and a printed layer to provide a substrate for marketing materials and FDA-required information. This multilayer system complicates traceability, recyclability, and the ability to integrate innovation.

“Each layer has its own separate manufacturing step in the supply chain, and each step is conducive to the next,” said Bart Bromberger, Finance and Operations Manager, Patagonia Provisions. “Each layer must seal together properly and run through the plant smoothly without ripping or clogging machinery.”

Patagonia Provisions has been running biodegradability trials with Elk Packaging, a southern California company committed to new environmentally-responsible packaging solutions.²¹ Trials have been focused on producing a biodegradable film structure with partner Futamura using its NatureFlex™ bio-film, which is biodegradable and cellulose-based.²² Trials include printing the logo on the wrapper to test the print quality on the new film. In the first trial, the film structure ran too slowly through the machines; the team identified the sealant layer as the problem and have been working to improve it. When biodegradable and bio-based solutions slow down machinery at the production facility it increases the cost of the package and makes the solutions difficult to adopt (See **Exhibit 3**: Patagonia Provisions team tests a new energy bar wrapper).

Time to market is dependent on whether new solutions can run through existing packaging facilities or if entirely new packaging machinery needs to be designed, built, tested and integrated into the production line.

“If you’re going to make a viable packaging solution, it probably has to be compatible with the current infrastructure. Theoretically, if you come up with something completely new that the world hasn’t ever thought about—to make it happen in the next five or ten years, it’s got to be able to go on a packaging line that exists,” said Jan Matsuno, Certified Food Scientist, who consults with Patagonia Provisions. (See **Exhibit 6**: Packaging life cycle considerations)

Provisions knows that most grocers desire six months of shelf stability for packaged products, and that one or two months can be lost while bars sit in a warehouse and move through distribution, so the wrapper needs to provide a food safe barrier for a minimum of eight months. The company refuses to add stabilizers or preservatives to its food products to extend shelf life – so the wrapper must keep food safe.

²¹ <http://www.elkpackaging.com/>

²² <http://www.futamura.com/divisions/cellulose-films/products/natureflex/>

To measure the shelf life, Patagonia Provisions puts new packaging through an accelerated shelf life study as part of the development process. The wrapped bars sit in a chamber where testing includes pressure testing to determine leaks in the film seal. The chamber provides a three-to-one timetable, so four months represents one year. After time in the chamber, Patagonia Provisions conducts sensory and microanalysis to determine how the bar survived. (See **Exhibit 4**: Patagonia Provisions wrappers go through extensive testing)

Patagonia Provisions packaging costs range from three to ten percent of the total product cost depending on the category, such as soup, wild salmon or cereal. The company is willing to spend more for a scalable solution that is more environmentally sound and also offers a safe food barrier and sufficient shelf life. (See **Exhibit 5**: Barrier properties)

Single-Use Packaging Supply Chain Challenges

For Patagonia and all shelf-stable food producers, the single-use packaging supply chain is not only complicated, but the links vary depending on the type of packaging being created such as wrappers, boxes with liners, cartons, or pouches. Generally packaging begins as plastics, foils, and other complex chemical materials that are manufactured into containers and then printed or labeled. Then products are boxed and transported to stores or online warehouses for consumers to buy.

The last step is key—the end-of-life of the package. Today, few food packages can be recycled because they are made of multiple layers to maintain freshness. But if a package *is* designed to biodegrade or be recycled, how often does that actually happen? Can it be disposed of through an existing waste stream or are new recycling infrastructures needed? Is the consumer educated to know how to dispose of packaging?

One green chemistry expert said the main challenge to designing a more environmentally-responsible supply chain for single-use packaging revolves around traceability. As the packaging product is developed throughout the supply chain, information about the raw materials is easily lost, reducing the ability to reclaim the value of those materials. In short, the packaging supply chain lacks transparency.

“At the very beginning you have valuable, complex materials combined or molded into a functional package and by the end of its life people don’t know what was used to make it in the first place—so it makes it very hard to reclaim those same valuable or functional materials,” said Mulvihill.

For example, the common water bottle creates problems in recycling streams because bottles and caps are made from different polymers. Safer Made is tackling that problem by investing in Ecologic,²³ a sustainable packaging company that has designed the “world’s only commercially viable paper bottles made from recycled materials.” The shell of these paper bottles is made from recycled cardboard and newspaper which can be recycled again, and its liner is made from recycled plastic. The paper bottles, used by Seventh Generation and L’Oréal, were designed to go through materials recovery facilities (MRFs) and break apart so the paper sorts with paper and the plastic sorts with plastic. Mulvihill calls it a great closed-loop story. Ecologic put a bunch of

²³ <https://ecologicbrands.com/>

these bottles randomly in curbside recycling bins and then went to the MRF to watch what happened through the lifecycle. This packaging wasn't just designed for the consumer; it was designed to successfully run through the system, an improvement which took several years to achieve.

Mulvihill thinks there are real opportunities for innovation in three areas: 1) design packaging to disassemble or degrade, 2) produce packaging out of single component materials, and 3) create packaging using materials that are easily separated and sorted into valuable streams. Technology aimed at greener solutions needs to be applied throughout the supply chain, from the front end through the back end, to ensure materials can be reclaimed.

Patagonia is concerned about a lack of recycling infrastructure even after customers dispose responsibly. So the company has been collaborating with the Sustainable Packaging Coalition (SPC), whose mission is “to use thorough research and science-based approaches to help advance and communicate a positive, robust environmental vision for packaging and to support innovative, functional packaging materials and systems that promote economic and environmental health.”²⁴ Patagonia is working toward developing labels for all of its apparel, polybags, and food packaging that educate customers on how to dispose of those items.

Open (or Broken) Links

Even if a package is manufactured to be recycled, there's no guarantee it will be recycled at the end of its life. Of the seven Society of the Plastic Industry Resin Identification Coding System Symbols (SPI Symbols),²⁵ community recycling centers typically accept only a few types of plastic. Many consumers toss recyclable packaging in the trash because recycling capacity is not available at their local recycling center or they may not be educated in what is and isn't recyclable. Also, recycling facilities require consumers to sort and clean recyclables to avoid contamination. Many recyclable items are not recycled because one contaminated piece of plastic or cardboard can compromise the whole batch. Also, American recycling facilities must now find new markets after China stopped importing “foreign garbage.” The result is that only 9% of recyclable plastics are actually recycled.²⁶

The 2017, End of Market Demand for Recycled Plastic by the research company More Recycling²⁷ concluded that for recycling rates to increase, demand for recycled content will need to increase to absorb that supply. Without adequate end-use demand, there are fewer investments in maintaining collection, separation, and processing operations. To ensure the longevity of the plastic recycling sector in the United States, we must find ways to support the recycling system while the economics of recycling are stressed. It requires a collaborative effort by municipalities, manufacturers, packaging suppliers and consumers.²⁸

Some recyclable material that could not be processed on the local level was shipped off to areas with a more robust recycling infrastructure, primarily in Asia. China had been the world's largest importer and recycler of scrap metals, plastic and paper. In 2012, China received nearly half of

²⁴ <https://sustainablepackaging.org/wp-content/uploads/2017/09/Definition-of-Sustainable-Packaging.pdf>

²⁵ <https://www.epa.gov/recycle/how-do-i-recycle-common-recyclables>

²⁶ <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data>

²⁷ <https://www.morerecycling.com/view/home>

²⁸ http://www.plasticsmarkets.org/jsfcode/srvyfiles/endusedemand_report_v8_1.pdf

all the plastic waste that Americans sent abroad for recycling and about one-third of the European Union's plastic waste exports. Chinese leaders became concerned about being viewed as the world's dump heap, especially after a movie titled Plastic China highlighted an 11-year old girl and her family sweating through the dirty work of sorting mountains of recycling.²⁹ In July 2017, following the media spotlight and the globe's growing plastic consumption, China announced it would ban 24 types of scrap, or "foreign garbage," to reduce the country's environmental pollution.³⁰

"Global recycling markets are easily prone to disruption, and developed countries have underinvested in recycling infrastructure for years," said Kate O'Neill, Associate Professor, Global Environmental Politics, University of California, Berkeley. O'Neill is the author of Waste, a forthcoming book about the global politics of waste.

O'Neill added that China's actions are forcing industrialized nations to reconsider overseas disposal. Americans and Europeans recycle a small percentage of their own plastic waste, the majority ending up in landfills and oceans.

Supply Chain Links May Become Obsolete

A retort pouch is a laminate of flexible plastic and metal foils which offers an alternative to traditional canning. First used in the U.S. military, today popularity is growing rapidly around the world to package a variety of food and drink. The pouches are convenient and have a long shelf life, however the multi-layer construction prevents them from being recyclable.³¹ It is the current package Patagonia Provisions uses for salmon while the company searches for a recyclable option. Provisions is interested in finding a cannery to work with on designing a can with a new shape fitting the branding of its salmon filet. However, a lot of U.S. canneries have closed as the pouches replace cans. Ironically, the old-school steel can with tin or enamel coating, which was a pioneer in food packaging more than 200 years ago, is still easily recycled today.³²

Innovation Opportunity and Challenges

Innovators have roadblocks to overcome on the journey to sustainable food packaging solutions through the entire life-cycle. Since single-use packaging is a low-margin business, it is a challenge and an opportunity. The challenge is that any kind of change to the system needs to be cost competitive quickly. The opportunity is that if you have an innovation that is cost competitive and provides differentiation, there's a real hunger for adoption on the manufacturing end and some interesting opportunities for growing packaging businesses. Startups, capitalizing on consumer anxiety about climate change and plastic pollution, are re-thinking alternatives to everyday packaging and trying to compete with industry giants with household names such as Saran wrap.³³

²⁹ <https://www.plasticchina.org/>

³⁰ http://www.chinadaily.com.cn/china/2017-07/21/content_30194081.htm

³¹ <https://www.transparencymarketresearch.com/retort-pouches-market.html>

³² <https://www.bbc.com/news/magazine-21689069>

³³ <https://www.fastcompany.com/90290048/inside-the-3-billion-race-to-kill-plastic>

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