



Paper Chase

Paper bottle developers are making progress, and headlines, as they work to advance the technology

By Robert Grace

Paper or plastics? That’s a trending question—not for retail checkout bags, mind you, but for bottles. Yes, bottles. Paper bottles are not new, but they’re garnering a lot of attention these days. And, for the moment, most are both paper and plastics, but more on that later.

In mid-January Jabil Inc., the \$27 billion, 260,000-plus-employee contract manufacturer and supply chain behemoth, made headlines by acquiring Ecologic Brands Inc., one of the longest-standing paper bottle innovators. Ecologic was founded in 2008 in California by CEO Julie Corbett and has supplied commercial paper bottles to eco-minded cleaning products company Seventh Generation for 11 years. It also counts Unilever and L’Oréal as major customers. The firm, which has delivered almost 10 million paper bottles in 10 countries since 2010, is currently the only commercial producer of such products.

Separately, this spring Coca-Cola in Europe is planning to do its first, modest pilot test, in Hungary, of a paper bottle, for its vegan snacking drink called AdeZ. Popular online retailer Kifli.hu there will provide 2,000 prototype paper bottles to consumers and then gauge their reaction. Paboco (Paper Bottle Co.) of Slangerup, Denmark, which is partly owned by Austrian plastics packaging giant Alpla, developed and makes the bottle for Coke.

Additionally, brands such as spirits makers Absolut Vodka and Johnnie Walker are using paper-based bottles.



Julie Corbett of Ecologic

The St. Petersburg, Fla.-based Jabil announced in March that it is investing \$25 million in Ecologic’s Manteca, Calif., location and to build out a paper bottle plant at Jabil’s plant in Tortosa, Spain. Jabil says it is making the investment “in response to significant consumer packaged goods (CPG) market demand.” The expansion, it adds, “will create the first paper-based scaled technology in the market, as Jabil delivers Ecologic’s

innovative pulp molding capabilities to new geographies and enables production of hundreds of millions of new paper packages.”

Paper Bottle Back Story

The U.K.-based GreenBottle, which began in 2006 with a laminated paper bottle, initially for milk and then for wine, is widely seen as the first paper bottle maker. However, the firm went bankrupt in 2014 due to infringement issues on Ecologic’s patents, according to Corbett. Ecologic later acquired Greenbottle’s assets and patents, but did not adopt any of its technology, she says.

Paboco, meanwhile, traces its roots to 2010 with the launch of Danish innovation and startup expert EcoXpac A/S. The venture gained further traction five years later when Danish brewing giant Carlsberg Group joined forces with EcoXpac to develop what they called the “the Green Fibre Bottle,” a paper bottle prototype based on recycled fibers. EcoXpac had competence in pulp molding and tool manufacturing but needed support in other areas such as fiber and barrier

technology, paper making and the like.

In parallel, Swedish paper packaging material developer BillerudKorsnäs AB was exploring the possibilities of another paper bottle product. The three companies ended up agreeing to work together in 2015, with BillerudKorsnäs becoming a shareholder in EcoXpac. Eventually, plastics bottle maker Alpla-Werke Alwin Lehner GmbH & Co. KG joined the effort and together in 2019 they rebranded EcoXpac and formed a joint-venture company called Paboco. Today Alpla and BillerudKorsnäs are equal shareholders in Paboco, with the founding family still owning a minority stake, said Gittan Schiöld, Paboco's chief commercial officer, in a March 29 telephone interview from her home in Stockholm.



Danish brewer Carlsberg, working with Paboco, launched two prototype paper-based beer bottles in late 2019. Courtesy of Carlsberg

Carlsberg has been working since 2015 to develop a functional paper beer bottle. In late 2019 it introduced its first two prototypes, made from sustainably sourced wood fiber. Both are fully recyclable and have an inner polymer barrier to allow the bottles to contain beer. One version has a thin, recycled PET film barrier, and the other a 100 percent bio-based polyethylene furanoate (PEF) film barrier.

From Plants to Plastics

Dutch renewable chemistry startup Avantium, which counts food and beverage giants Danone and Coca-Cola among its shareholders, developed the PEF resin, which it sees as a potential plant-based alternative to PET. Avantium's so-called YXY technology catalytically converts plant-based fructose syrup from corn and wheat sugars into PEF. The firm said last summer it was building a 5,000-ton-per-year pilot plant in Delfzijl, Netherlands, and expects it to begin operating in 2023.

One key advantage of PEF, according to Avantium CEO Tom Van Aken, is that, unlike PET, the orientation of its molecules isn't completely linear, meaning it creates a better barrier against air and other substances. Van Aken has said that PEF's oxygen barrier is 10 times better than PET, its CO₂ barrier is six times better and its water barrier is twice as good. This makes it enticing for beer, fruit juice and carbonated beverages. But the resin is far from being available in commercial quantities.

Avantium spent years working to improve its purification

process, to enable it to remove the greenish tinge in PEF bottles, so they now are completely clear. The YXY technology is said to significantly extend the recycling life of the material, while common microbes can make it degrade within years (compared with hundreds of years), should it end up in a landfill. There also is no bond between the plastics barrier and the paper, meaning the two components can be easily separated, but that still presents challenges for recyclers, who typically handle either paper or plastics, but not both.

No Shortage of Critics

This has spurred skepticism and criticism from some environmental officials, who question why one would want to replace highly recyclable, all-PET bottles with a dual-material alternative that potentially complicates the recycling process. That's a fair question, to which Paboco and Ecologic have responses.

Given its intention to challenge a super-efficient, conventional packaging system with an alternative approach, Paboco decided early on to pursue an open innovation process that involved collaboration across the entire value chain, explains Schiöld.

"First of all, we're scaling an entirely new technology, which is a massive task. We want to do that while not [taking steps] to harm the current recycling chain. We want the bottle, of course, to be recycled as paper and be repulpable as paper." While the initial developments necessitate the use of a polymer barrier liner, the project is still very much in the early stages.

"It's interesting," she adds, "because we communicate the journey, but once we show something, it's what people see as the truth. So, yes, we get some criticism ... It's frustrating because you're not even allowed to try somehow. We have to stand our ground and believe in what we do." Taking a different, more closed approach would likely extend the development journey by perhaps five to 10 years, she suggests.

Schiöld describes Paboco's current process as "basically like injection molding but with pulp. The bottle that we have launched uses injection stretch blow molding technology to blow the barrier inside. The paper shell builds up the mechanical strength. The barrier [is not structural and] only serves as a liquid barrier. With this approach, we also can use existing closure systems. This initially helps, so the investment levels will also be stepwise," she says.



Gittan Schiöld of Paboco

"Once we move away from the barrier we have today, the whole paper bottle neck and everything will be in paper," more like a stiff cardboard neck. "We will move away from the liner we have today, and the target is to have as little barrier as possible." But these developments take time.

The Jabil Effect

Jabil spokesman Eddie Austin, meanwhile, calls Ecologic's

Risky Business

A South Korean brand learns the hard truth about greenwashing claims

Greenwashing. It's defined as the process of conveying a false impression or providing misleading information about how environmentally sound a company's products are. And it can be a marketer's nightmare.



Innisfree had to apologize after a social-media storm triggered by its claim that a paper wrap around a plastics bottle constituted a paper bottle. Courtesy of Innisfree

A recent incident in Asia underscores the risks inherent in trying to market "green" products too aggressively. Leading South Korean cosmetics brand Innisfree, part of the Amorepacific Group, publicly apologized in April after an angry customer took to social media to challenge the eco-friendly packaging credentials of one of the brand's hydrating serums.

The package for Green Tea Seed Serum boldly proclaims: "Hello, I'm Paper Bottle" and is positioned as part of a portfolio of the firm's more environmentally friendly products. Amorepacific has trumpeted a policy of using "Less Plastic," by which the group said it wants to

reduce its estimated 700 tons of plastics packaging by 2022, while also increasing its recyclability. All admirable goals.

But one customer cut open the 160-ml bottle and noticed that the package was actually a thin, inner plastics bottle wrapped in paper—a key fact omitted in Innisfree's marketing materials. The customer posted photos on Facebook and the backlash began.

The company apologized for any "confusion" caused, while noting that the product's plastics bottle uses nearly 52 percent less polymer than previous packaging. The BBC news service quoted an Innisfree representative as saying, "This product is called 'paper bottle' to make it easier to explain the role of paper label wrapping outside of the bottle. However, we understand that the entire container can be seen as paper material because of the product name. We are deeply sorry for the confusion caused and will try to deliver more accurate information to you."

Parent company Amorepacific goes on to state on its website that the new packaging also uses 10 percent recycled plastics in its cap and shoulder, and that both the paper bottle and lighter plastics container can be sorted out and recycled after use.

The key takeaway: While it can take years for a brand to build trust with consumers, an incident such as this can undo much of that good virtually overnight, while also potentially giving a black eye to others in the same sector that are trying to do the right thing. Brands and paper bottle makers must be careful to be honest and transparent, especially during this phase when most such containers are paper/plastics hybrids.



Ecologic has delivered 10 million paper bottles since 2010. Courtesy of Ecologic

molded pulp technology "transformative" and says it was "really the only commercially scalable platform in this space that we wanted to pursue."

Jabil's purchase of Ecologic, which also is California's 10th-largest paper recycler, is lending instant credibility to the entire paper bottle sector. Its recently announced investment will allow Ecologic to bring in new pulping equipment that's going to help deal with more contaminated feedstocks.

"Being a packaging solutions company is fine and dandy," says Corbett. "But we want to be a waste solutions company, as well. In the end, the CPGs all have massive [environmental] mandates." A key challenge is in how to help CPGs deal with all this when the industry is highly tethered to a massive plastics infrastructure that is not easy to change. Jabil, which is known for its nimbleness despite its massive size, is not as tethered, she notes.

In a March 18 telephone interview, Corbett said that in the two months since the acquisition was announced, "I literally have been in eight to 10 meetings a day, with every CPG on the planet, nonstop." She suggests that the major consumer packaged goods companies are not about to commit to a new technology without the ability to scale up production if demand calls for it.

"When I started Ecologic," she recounts, "I reached out to so many packaging companies—so many I lost count. For years I heard the same old thing: 'Plastics works and is cheap, sustainability is likely a passing trend like so many other concepts.' A real sense of denial. Jabil was the first company that shared the vision and understood that sustainability was not a trend but an essential part of the solution.

"It's a gift to the sustainable packaging world to



Paboco has developed prototype paper bottles, all with polymer liners. Closeup of the finely textured surface of a Paboco bottle. (inset) Courtesy of Paboco

have a big guy like Jabil jump in," she remarks, "and I think that's what CPGs have been waiting for."

Even Paboco's Schiöld sees the broader advantages of such a move. "I think it's great," she says of Jabil's involvement, "because it creates focus for the whole industry, and it gives us more focus to do things better and faster. We definitely see them as colleagues."

"The market is huge, and we're going to need different solutions. It's not like we think that plastics doesn't make sense. We also need to allow the consumer to make different choices. There are a lot of learnings to be shared, as well."

Ecologic's Evolving Technology

Corbett says that her firm continues to advance its design and approach. "We're launching this super-thin PET liner inside of our bottle instead of a pouch. So, we're doing extrusion blow molding, but we're also going to do injection stretch blow molding." The firm currently has a Bekum H-155 continuous extrusion blow molding machine and is looking at purchasing either a single-stage or two-stage injection stretch blow molding unit.

Ecologic's first bottle for Seventh Generation a decade ago or so included a mono-material pouch. It featured an injection molded fitment with a nylon-free monomaterial film. The company included a "How to Recycle" emblem on the package. But material recovery facilities (MRFs) cannot easily determine if a film structure is laminated or not, she notes, and with no infrastructure to properly sort such items, "the recyclability story around the pouch is a problem."

The shift to a thin liner from a pouch "is a massive step change," notes Corbett. "The thing about sustainability is all about what the MRFs can deal with. You can innovate all you like, but if the recycling stream can't deal with the product, then you can't claim recyclability."



That early bottle also joined the two molded fiber shell halves with glue. But Ecologic now has taken glue out of the product entirely, and instead developed technology that allows the two halves to interlock securely. The bottles' shell components also can nest, which eliminates the need to ship air, and then the customer can integrate with Ecologic at its own site and use an automated process to assemble and fill the finished bottles.

New EcoJars use about 85 percent less PET than competitive plastics jars and are fully recyclable. Courtesy of Ecologic



When it comes to the paper bottle critics, Corbett insists that there is much more to the product’s sustainability story than meets the eye. She cites a peer-reviewed life cycle assessment (LCA) done to compare a seventh-generation paper bottle with a typical high-density polyethylene rigid bottle. She says the paper bottle produced 37 percent fewer CO2 emissions, generated 59 percent less solid waste and consumed 48 percent less energy to manufacture. That, she asserts, represents the broader impact of Ecologic’s Box to Bottle closed-loop business and manufacturing model.

Ecologic also is preparing to launch a pair of jars. Its paper based EcoJar will use about 85 percent less PET than current (often multilayer) plastics jars and be fully recyclable. They will initially be offered in 130-ml and 100-ml sizes.

“We’re also developing liner-less products, with no plastics,” says Corbett, echoing Schiöld’s stated objective for Paboco.

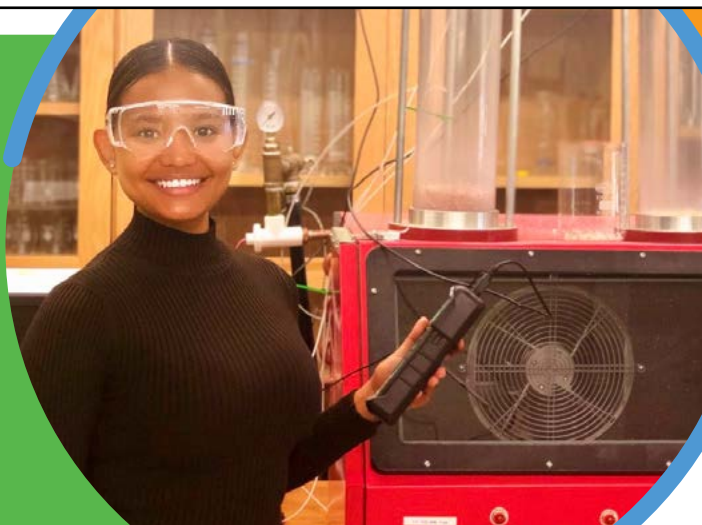
“You can’t be scared to fail, and to fail fast,” Corbett states, “because failures are your biggest strength in the end. That’s how we’ve improved and evolved the business model.”

It’s clear that intensive work continues in development of paper bottles and that much remains to be done, especially to ensure that such containers don’t impede overall recycling progress. Major players such as Ecologic and Paboco understand that their current products will evolve and address many concerns voiced about such technology today. In the meantime, they may wish to quote the saying that goes, “Don’t let perfect be the enemy of good.”

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- Antonia Chin, 2020 SPE Foundation Scholar

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