



BIOSWITCH

RENEWABLE SOLUTIONS IN PACKAGING, BIOMATERIALS, WOODEN CONSTRUCTIONS AND PAPER

THE GOOD PRACTICE CASE STUDY OF STORA ENSO

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Abstract

Stora Enso is a renewable materials company that offers variety of wood- and biomass-based solutions for different sectors from food and beverages to textiles and building. Stora Enso operates in over 30 countries with strong ties to Finland and Sweden. Stora Enso owns and manages millions of hectares of lands and is dedicated to sustainable sourcing e.g. through forest certification schemes. Recently, Stora Enso launched its first single-use food bowls made of renewable molded wood fiber as an alternative to fossil-based plastics. It was important for Stora Enso to be able to meet the typical challenge that fossil-based plastics imposes on biobased solutions – unique and high-performance properties. Stora Enso produced a safe and high-performing plastic-free and PFAS-free solution. Stora Enso estimates the CO₂ footprint of their fiber-based solutions to be even 75% lower compared to alternative packaging materials, such as plastic or bagasse.



This project has received funding from the Bio-Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.



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biomass technology group



Food & Bio Cluster
Denmark



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Company background

Stora Enso is a renewable materials company that develops and produces variety of solutions that are based on wood and biomass. The main solutions of Stora Enso are for the food and beverages, retail, building, manufacturing, publishing, pharmaceuticals, cosmetics, confectionary, hygiene and textiles. Their vision is that there is a potential to make anything that's made from fossil-based materials from a tree, and that they drive for a sustainable future with bioeconomy. Stora Enso is listed in Helsinki (Finland) and Stockholm (Sweden) stocks and employ some 26 000 people in more than 30 countries. Stora Enso owns or manages over 2,35 million hectares of lands and 98 % of those forests were covered by the forest certification schemes.



Takeaway food companies to switch from plastic containers to bio-based

Stora Enso launched its first single-use food bowls made of renewable molded wood fiber. The goal is to help takeaway food companies safely switch from fossil-based plastics to bio-based materials.

Eco-friendly customers and tightening legislation drive takeaway food companies to consider alternatives to plastic food containers. EU is banning single-use plastic products starting from the most typical marine litter, such as straws and cutlery, in 2021. Member states will also have to find ways to reduce the use of plastic food containers and drinks cups. Various countries all over the world are planning to impose taxes on single-use plastics.



“The vast majority of takeaway packaging are still made of plastics, but some food companies already say they want to give up all plastics, and others want to reduce the use of plastics. Either way, sustainable packaging will be essential for their future businesses,” says Annica Rasch, Sales and Marketing Director of Formed Fiber products at Stora Enso.

Stora Enso is a major provider of renewable fiber-based packaging materials, wooden constructions, paper and pulp. It has some 26 000 employees in over 30 countries and its sales in 2018 were EUR 10.5 billion. Stora Enso undoubtedly has a wide range of solutions to offer to the takeaway packaging market. Rasch, however, points out that displacing all plastics in the takeaway sector requires, besides new capacity, also new types of fiber products. She readily admits that the unique properties of plastics are hard to compete with but the company is up for the challenge.

Challenge #1: Barrier properties

Wood fiber makes a sturdy food bowl, tray or cup, but it tends to absorb water and grease coming from the food. The conventional solution is to spread a thin barrier coating on the paperboard and use it to seal the seams after forming the dish.

Typical barrier coatings are fossil-based plastics, such as PE (polyethylene) or PET (polyethylene terephthalate), both of which function very well as barriers and can be separated from fiber in modern recycling processes, but they will not break down in the natural environment. This applies to the non-fossil alternative, plant-based PE, as well. Another plant-based barrier plastic, PLA (polylactic acid), decomposes in specific composting conditions, but not in the natural environment.

Both fossil and bio-based plastic barriers are increasingly applied as water-based dispersions, which break down in cardboard recycling processes and thus facilitate the recovery of fiber.



Another way to provide fiber packages with barrier properties, is to mix waxy particles into the pulp. Per- and polyfluoroalkyl substances, PFAS, are widely used in this way. They are, however, highly persistent in the environment and in the human body, and some of them have been found harmful to health. Restrictions on PFAS have recently been introduced in various countries, and Denmark was the first to ban them in paper and board.

“When we started to develop our new product line, we wanted to go plastic-free and PFAS-free, and in year 2019 we started collaboration with HS Manufacturing Group to adopt their patented barrier technology, Protean™, for formed fiber applications,” Rasch says.

Challenge #2: Design and production

Besides barrier solutions, Stora Enso wanted to create new shapes and styles and increase efficiency of the packaging production, thus accepting another challenge for fiber-based packaging set by plastics. It is obvious that injection molding of plastics cannot be beaten by folding paperboard, whereas molding of pulp offers a whole different approach.

The method of molding, or forming, pulp is probably best known from egg cartons, many of which can be quite rough on the surface. Modern molding methods, however, allow smooth surfaces and attractive shapes.

Stora Enso is using a molding method called thermoforming to produce high-quality box inserts for the electronics packaging market. This is the method they also acquired for takeaway food packaging.



“Thermoforming method is readily available on the market and it suits the takeaway sector. Other methods are coming on board later. We want to experiment with various production methods and components to create new properties and increase production efficiency,” Rasch says.

In year 2019 Stora Enso announced its EUR 5 million investment to build a new production line and related infrastructure to manufacture formed fiber products at Hylte Mill in Sweden.

Formed fiber bowls were launched

Stora Enso launched its first formed fiber bowls under the brand name PureFiber™ in September 2020. They were not the first to introduce formed fiber products to the takeaway packaging market, but Rasch believes they were the first, or among the first, to do it without plastics and PFAS.

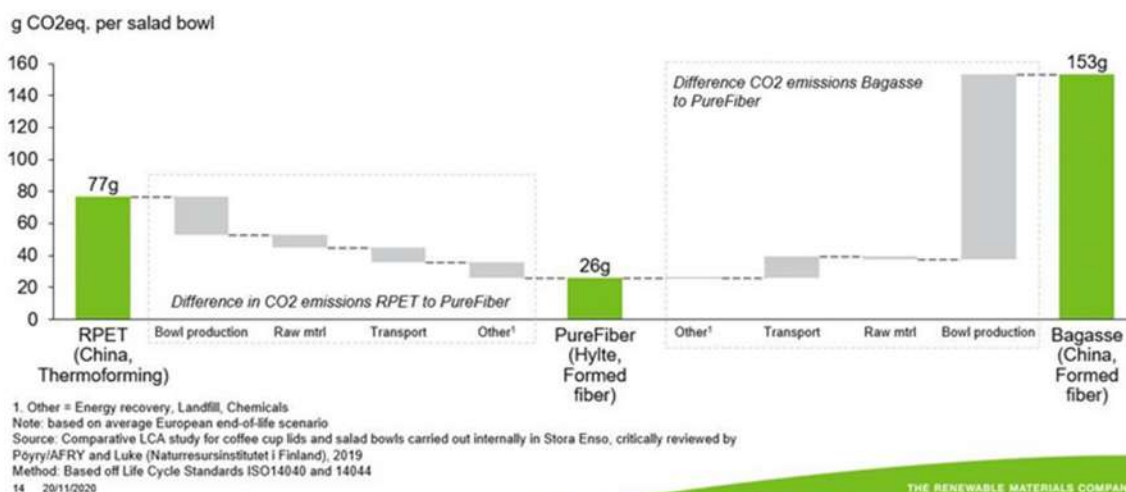
“We combined formed fiber with Protean™ technology, which is plant-based and offers excellent water, grease and oil resistance.”

According to Rasch, PureFiber™ products have already proven recyclable and biodegradable. This means that clean products can be recycled with cardboard. As to biodegradability, the key questions are, how long it will take for the material to decompose and will it require an industrial composting facility.

“We have compostability trials going on, and first results are coming out in the first quarter of next year.”

Stora Enso estimates the CO₂ footprint of PureFiber™ products to be 75% lower compared to alternative packaging materials, such as plastic or bagasse.

LCA shows 60-80% lower climate impact of PureFiber™ vs. bagasse and RPET



The whole supply chain was needed

Rasch considers the development of new barrier and fiber technologies an essential task when offering alternatives to plastic containers and trays which have been on the market for a long time. To succeed in it, the whole supply chain is needed, she says.

“We need to understand both our customers and consumers. We need to find out how products should be packed, distributed and communicated. We also need to collaborate with the suppliers of barrier and fiber forming technology.”

Besides listening to customers and consumers, Stora Enso took a step closer to consumers in the supply chain. While barrier-coated paperboard goes to packaging producers, formed fiber products go to packaging distributors or even directly to large brand owners using packages.

“We are also working on another business model, in which we provide packaging producers with pulp, barrier, recipe and technology. In this way they could benefit from our knowledge of fiber and diverse technologies, and still produce their own packages.”

More capacity and innovation in the future

Stora Enso is investing in more formed fiber capacity in Sweden and China. What type of fiber products will eventually capture the market, is not a pressing question to Rasch.



"I believe there is room for everyone in the market. The main competition is between fiber and plastics."

There is also room for innovation in the formed fiber products.

"We now have our first bowls, but we want to develop our materials and production methods further, together with the supply chain. This is ongoing work."

It is already clear that the PureFiber™ selection can be easily complemented by cups and trays, but Rasch is also looking past the takeaway sector, to the fruit and vegetable sector which typically uses plastics in packaging. Another attractive target could be foods with long shelf-life.

"Longer shelf-life would require oxygen barriers which are more challenging than moisture and grease barriers. Formed fiber products are presently used only with plastic coatings. This is a challenge we want to address."

The only challenge that may seem unattainable for fiber products is to beat the low price of plastics. Rasch points out that raw material prices are actually in favor of fiber, but plastic products still benefit from the efficiency of thermoforming processes that have been refined over decades.

"It's just a matter of time before formed fiber products have the same cost of production as plastics. Until then, we make sure that our prices are competitive with other sustainable products."

Tingstad – distributor to lead the change

“We see a trend that an increasing amount of our customers not only value packaging functionality, but also aspects such as circularity and sustainability. We strive to make sustainability accessible to our customers. For instance, we have released a digital feature letting customers, as we call it, “sustainify” their shopping cart on our e-commerce site. In other words, a tool transforming the content of the customer’s order into more sustainable products. We strongly believe that PureFiber™ will play an important role in the transition from plastic to non-plastic food packaging. We are excited about bringing a truly sustainable solution to the market together with Stora Enso.”

- Emma Diedrich from Tingstad



Tingstad is a family-owned company and the market-leading distributor of disposables and food service products to the HORECA sector in the Nordic countries. The company has been around for 60 years and has a turnover of EUR 250 million. Tingstad launched the first PureFiber™ food bowls in October 2020.