DuraSense

A case study

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Innovation:	**Biocomposite**
Intervention:	**DuraSense**
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Methodology:	Four interviews, three site visits, one trade fair, desktop research. More interviews were planned but were later cancelled by interviewees.
Case Study Overview	
Sector(s):	Paper/plastic
Value Chain Stage(s):	Resource and production
Type of Intervention:	Technical
Date & Duration:	Innovation project for biocomposites initiated in 2014, first products made from DuraSense launched 2018.
Location:	Sweden
Initiating Actors:	Stora Enso
Actor Constellation:	Stora Enso Local SMEs with expertise in plastic converting
Short Description of Intervention:	Biocomposites are composite materials usually consisting of a biobased fibre mixed with a plastic. Biocomposites are used in a range of applications, such as automotive panels and upholstery, noise insulating panels, and indoor furniture. Recent estimates for Europe are that more than 30 compounders are active in the area of biocomposites and together produced more than 100 000 tonnes in 2018. In an effort to diversify into new products, Stora Enso focused on biocomposite as an opportunity with large potential and developed DuraSense, which is a biocomposite made of cellulose fibres, wood particles, and a plastic which may be a bioplastic, recycled plastic, or fossil based plastic. DuraSense was mainly developed in-house by a small team, after engaging with different external stakeholders to understand market requirements and potential. To test the material and its properties in different downstream applications the team started collaborating with local SMEs with expertise in plastic converting.
Research Theme Summaries	
1. Innovation History & Dynamics:	In 2014, following the closing down of two paper machines (in 2012 and 2013) in Hyltebruk in south-western Sweden and the laying off of almost 300 employees, a new analysis of diversification opportunities concluded to focus on biocomposites. In 2017 the decision was made to invest in a commercial scale compounding unit for the production process in Hyltebruk, a 12 MEUR investment which allows for the production of 15 000 tonnes per annum of DuraSense. This unit is currently the largest biocomposite compounding unit in Europe, although it is a small unit compared to manufacturing units for plastics. In mid-2018 the first set of consumer products were launched, a range of kitchen utensils by Orthex. Also disposable cutlery has been launched and other products are being developed.
2. Governance Arrangements & Agents of Change:	Decreasing markets for traditional products (newsprint in the case of Hyltebruk) forced Stora Enso to look for new opportunities, which coincided with increasing interest in green materials such as biocomposites in several markets. Current policies and regulations are dismissed as direct drivers for the development. The development was done in collaboration with local firms, although not through any formal partnerships or joint ventures. The initiative has led to Stora Enso making two major investments in a production facility and a competence centre for biocomposites. According to public information these investments total 19 MEUR, of which 12 million were for the production facility. No information has been disclosed on how the investments were financed. The initiative also led to the filing of several patents in the area of biocomposites and their manufacturing, codifying the knowledge produced in the innovation project. The initative also led to the founding of a new subsidiary within Stora Enso focusing on biocomposites.
3. Transformative Capacities:	Investing in new knowledge through the recruiting of new research engineers was crucial to building up capacity to work with the new area. The restructuring of work in the team, from a structure focused on continuous production to one focused on rapid decision making was important for moving the project forward. When realising that some

	competences needed for taking the project to a marketable product were missing, collaborations were formed, which added necessary capacity. The visibility of the biobased content, by including coarse wood fibres in the biocomposite, attracts attention and makes the renewable properties legible. The value of this is accentuated in the products which do not use pigmented plastics but retain the wood-based colour. Recycling is recognised as a key concern, but most interviewees recognise that plastic recycling schemes and policies are almost completely focused on plastic packaging, which is most likely not what DuraSense will be used for, thus distancing the innovation a bit from the recycling discourse.
4. Assessment & Evaluation:	The main assessment of the decarbonisation potential relies on the substituted volume of plastics by wood fibres in the biocomposite, which is up to 50% but depends on the application requirements. The carbon footprint depends on the polymer used in the biocomposite but it is reported to be up to 80% lower than conventional plastic when using a biobased polymer, which currently is biobased poly-ethylene.
5. Uptake & Consequences:	The biocomposite business is now a separate business organisation within Stora Enso, not only due to its low carbon properties but also due to the fact that it is a type of product that lies outside of the regular business activities of the firm which mainly deals with sawn wood, pulp, board, and paper. The low carbon properties of all these products are promoted in the communication of the firm – in this way the narrative around DuraSense thus closely follows the business-as-usual narrative. DuraSense has reached commercial production in a facility with a production capacity of around 15 000 tonnes per annum, which is the largest capacity for biocomposites in Europe. It is thus in itself a scaling of biocomposite production, although the actual production is yet unknown, but assumed to be far from the full capacity.
Conclusion & Outlook	
Key Learnings:	The DuraSense case showcases several trends identified and discussed within Reinvent: the move towards biobased raw material resources to substitute for fossil ones; industries diversifying and crossing traditional boundaries; the value of collaboration along the value chain for successful innovation in new areas. The case shows how a window of opportunity was created for the initiative in a situation when the main actor was under severe pressure, forcing them to look for new opportunities, combined with a growing interest for alternatives to traditional plastics in some markets. The increasingly intensified discourse around plastics and their negative environmental effects supported the initiative throughout the development process. The case shows how two sectors are approaching each other, however not through partnerships between global firms but rather through very local processes building on trust and proximity rather than a quest for a global market from the start through a jont venture or similar scheme. If and when the market for biocomposites in general and DuraSense in particular matures, the type of partnerships needed to grow may of course be completely different, which is also acknowledged by the main actor.
Open Questions & Further Research Requirements:	The opportunity to integrate biocomposites into a circular system for production and use of plastics is largely unexplored but raises questions when it comes to standardisation and recycling. As it thus far seemingly is a material used in niche market applications, the role of strategic partnerships for decarbonisation remains interesting to explore in this context.

For Europe to achieve its long-term climate objectives, carbon-intensive industries have to reduce their emissions.

REINVENT focuses on plastics, steel, paper and meat & dairy – industrial sectors that are key to our daily lives, but where low-carbon transitions are still relatively unexplored.

To gain a broader understanding of the possibilities of transition, entire value chains of the industries are studied. This includes non-technical factors such as supply chains, financing, trade, and social and economic impacts. Together with forward-looking industry leaders and policy-makers, we explore potentials and capabilities for making transitions in these resource-intensive industries.

PARTICIPANTS & FUNDING

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