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The demonstration economy

Innventia Days 2015 highlighted a very relevant perspective for the future society: the need to demonstrate all new ideas and technologies in order to bridge the gap to implementation.

In May 2016, Innventia will release its third Global Outlook Report: A Cellulose-Based Society. As a first step towards the release, a preview of the trends and scenarios being worked on was presented during Innventia Days on 30 September - 1 October.

One of these trends involves the need to demonstrate new ideas and technologies in order to bridge the gap to implementation. At Innventia, we call this trend "The demonstration economy".

In addition to the next Global Outlook, the Innventia Days programme included some topics related to demon-

stration, such as R&D infrastructure, value chain collaborations and concept demonstrators.

"Forest-based materials as enablers of the unexpected!" was the starting point of Innventia's 2015 master thesis school which linked research-oriented projects with innovation-oriented projects. The common approach was material-driven and the context was 'material identity'. The initiative involved eight students, seven demonstrators, six projects, five in the supervisory team, four companies, three tactility tests, two champagne bottles and one invention. ●

Save the date!

Innventia will release its third
Global Outlook Report:
A Cellulose-Based Society
May 24, 2016

The second day was dedicated to a workshop discussing how the trends will affect the industry and our lives towards 2030.



 **Innventia Days 2015** handlade till stor del om en av trenderna som identifierats inom projektet A Cellulose-Based Society, en trend kallad The demonstration economy. Behovet att demonstrera nya ideer och teknologier för att dessa ska nå implementering. Infratrstruktur för FoU, samarbeten över värdekedjan var några av programpunkterna. I anslutning till seminarieprogrammet fick deltagarna bl.a. se en utställning av demonstratorer från sex exjobbprojekt med materialidentitet som gemensamt tema. Vad samhällets trender innebär för morgondagens industri diskuterades under andra dagens workshop kopplad till A Cellulose-Based Society.



Master thesis school exhibition, pharmaceutical packaging, the FEX papermaking facility and the carbon fibre laboratory were visited.



Do your packaging solutions support your business?

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The demonstration economy

Subsidiaries:



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PFI AS
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GreenLight makes lignin carbon fibre possible

The nine organisations co-operating in the GreenLight project gathered to “kick off” their work in Stockholm on 22-23 September. The aim of the project is green and cost-efficient carbon fibre composites for light-weight cars.

Biobased cost-efficient carbon fibres would enable an increased replacement of steel with carbon fibre composites in cars. This would in turn decrease the weight and fuel/electricity consumption of the car fleet.

The vision of the GreenLight project is to utilise lignin, a wood component

that is a large by-product from pulp mills, as raw material for such green and cost-efficient carbon fibres. Lignin-based carbon fibres have so far only been produced in small laboratory scale. The great challenges for the GreenLight team are to achieve good enough carbon fibre strength and to upscale the involved processes to pilot scale. GreenLight’s Project Manager Per Tomani, Innventia is optimistic:

“A reflection from the two days kick-off meeting is that we are a very positive and capable team with a lot of energy.”

The GreenLight team covers the whole value chain from lignin production, represented by Innventia and the pulp producer Södra to the final

use of carbon fibre materials in cars, represented by CRF, car maker Fiat’s research unit. The team also includes experts on spinning (FIBRE and Fourné Machinenbau), forming of textile webs (Swerea SICOMP and the textile institute STFI) and the combination of the textiles with plastics into composite materials (Blatraden, NetComposites, and Swerea SICOMP).

The GreenLight research project was initiated by Södra and Innventia and is taking place within Bio-Based Industries, a partnership between European industrial companies and the EU. The four-year project has a budget of EUR 2.6 million and is coordinated by Innventia.●

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Biobaserade kostnadseffektiva kolfibrer skulle göra det möjligt att ersätta stål med kolfiberkomposit i bilar. Detta skulle i sin tur minska vikten och bränsle/ elförbrukning av bilparken. Visionen för Greenlight-projektet är att utnyttja lignin som råvara för sådana gröna kolfibrer. Lignin-baserade kolfibrer har hittills endast tillverkas i laboratorieskala. De stora utmaningarna är att nå tillräcklig styrka hos kolfibern och att skala upp processerna till pilotskala. Projektet, som hade kick-off den 22-23 september, täcker hela värdekedjan från lignin produktion, representerad av Innventia och massatillverkaren Södra till den slutliga användningen av kolfibermaterial i bilar, representerad av biltillverkaren Fiat’s forskningsenhet CRF.



Turning lignin into bio-based aviation fuel

Innventia is coordinating the Lignojet research collaboration, which aims to establish lignin as a raw material in bio-based aviation fuel. The Swedish-Brazilian project is co-funded by VINNOVA, and brings together players throughout the entire value chain.

The global market for renewable products is expected to exceed USD 200 billion as early as 2015. Brazil will be one of the most important producers in this global market, with significant raw material assets and large-scale production of bio-based fuels. The recently launched Lignojet project will demonstrate how these fuels can be produced from forest raw materials that do not compete with food production through integrated production in the pulp mill.

Lignojet will look at concept development and the upscaling of new separation processes in the pulp mill, and at the further processing of lignin for a specific application: bio-based aviation fuel. The aviation industry has committed to reducing its environmental impact, and has set ambitious targets for achieving carbon-neutral growth from 2020 and reducing CO2 emissions between 2005 and 2050 by 50 percent. Future aviation fuel must be based on renewable raw materials, but in order for these to be able to compete with fossil fuels they must be produced cost-effectively.

“We can do this by integrating production in facilities for other biomass



Europe’s first permanent tank facility for bio-jet fuel has been installed at Karlstad Airport.

processes,” explains Marie Anheden, who is leading the project. “In the pulp mill, for example, there are already processes and equipment for dealing with large biomass flows in a cost-effective and environmentally-friendly manner.”

One requirement for a large-scale introduction of bio-based aviation fuel is that there must be a functioning market and a value chain. The project includes the Brazilian pulp producer Fibria and Sweden’s Karlstad Airport, where Europe’s first permanent tank facility for bio-jet fuel has been installed. Värmland is also home to LignoBoost Demo, Innventia’s demonstration facility where large-scale pilot testing will be carried out. Valmet and SP Process Development are also partners in the project.

“One of the project’s aims is to establish a roadmap for introducing lignin-based aviation fuel in Brazil and Värmland,” adds Marie. “These parties will be central to achieving this.”

The world’s first permanent tank facility for bio-jet fuel was opened a year ago at Karlstad Airport. Since then, further advances have been made towards more climate-smart aviation, thanks largely to the Fly Green Fund, in which Karlstad Airport’s CEO Peter Landmark has been a driving force.

“When the tank facility was unveiled, the industry took a great leap forwards,” says Peter. “After that, there was a dramatic increase in interest and awareness.”

What politicians, authorities and the outside world thought lay 20-30 years in the future is already a reality.

“It’s certainly true that bio-jet fuel made from various raw materials is already used, but here it’s a matter of also developing applications within products based on forest raw materials as quickly as possible,” concludes Peter. “In this way we will gain a new local fuel industry, and with our current knowledge we should be able to fly using certified biofuel from forest raw materials within 5-8 years.”

The project will run until December 2016.●

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Current awareness from the Innventia Group

Lignojet är ett svensk-brasilianskt forskningspartnerskap kring etablering av lignin som råvara i biobaserat flygbränsle. Framtida flygbränslen måste baseras på förnybara råvaror men för att dessa ska kunna konkurrera med fossila bränslen måste de produceras kostnadseffektivt. I massabruket finns redan processer och utrustning att hantera stora flöden av biomassa på ett kostnadseffektivt och miljövänligt sätt. Lignojet, som koordineras av Innventia, kommer att titta på konceptutveckling och uppskalning av nya separationsprocesser i massabruket och vidare bearbetning av ligninet. I projektet ingår bl.a. Karlstad Airport där Europas första permanenta tankanläggning för bio-jetbränslen finns installerad.



Do your packaging solutions support your business?

Packaging Audit combines the right skills and measurement tools based on customer needs for cost savings, user experience or legal requirements. The aim is to help companies to optimise their packaging and processes throughout the packaging value chain.

For many companies, it may be difficult to identify exactly what elements of the packaging value chain need to be improved for a problem to be solved. What does the introduction of new laws and regulations mean for my packaging line? Could a new design or a new approach improve efficiency? Or do I simply make changes to the product in order to facilitate smarter packaging choices? To help companies find answers to such questions and focus on the right issues, Innventia has introduced something called Packaging Audit.

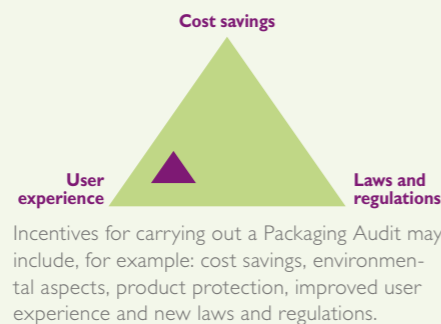
Packaging Audit is an analysis of the different parts of a company's packaging value chain, where Innventia works together with the customer to find the best packaging solution that works throughout the value chain, reduces waste in the chain's different parts, minimises environmental impact and is also well received by users.

The new service was launched during Scanpack 2015 where Karin Edström was managing Innventia's participation.

"We help companies identify which elements of the packaging value chain need to be improved in order to solve a

problem and generate new profits," Karin explains. "Packaging Audit combines the right skills and measurement tools based on customer needs for cost reduction, user experience or legal requirements, for example." ●

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 **Packaging Audit** är en genomlysning av olika delar i ett företags förpackningsvärdekedja där vi tillsammans med kunden hittar den bästa förpackningslösningen som fungerar i hela värdekedjan, reducerar spill i kedjans olika delar, minskar miljöpåverkan och tas emot väl av användarna. Innventia erbjuder tjänsten med olika inriktningar och kombinerar rätt kompetenser och mätverktyg utifrån kundens behov. Incitament för att genomföra en Packaging Audit kan exempelvis vara kostnadsbesparingar, miljöaspekter, förbättrad användarupplevelse, nya lagar och regler och/eller nyutveckling av produkter och förpackningar.

A sense of craftsmanship, freshness and quality

Innventia has designed new packaging concepts for Saltå Kvarn for its freshly-baked bread, with the aim being to position the bread as a premium product. The packaging reflects the company's profile in terms of craftsmanship, freshness and quality and helps consumers to reduce food waste. This commission made use of Innventia's new service Packaging Audit.

Many Swedish consumers are aware of the fact that Saltå Kvarn's products are organic and consider them to be of a high quality. The company's prepacked products are easily recognisable on the shelf. However, the bread, which is baked using artisan techniques and stoneware flour from Saltå Kvarn's own mill, is packaged in-store in a standard window bread bag that does not reflect the quality of the bread inside. The challenge issued to Innventia by Saltå Kvarn was therefore to design packaging solutions that are not only more environmentally compatible, but also capable of positioning the bread as a premium product and helping it to stand out from other brands.

Consumer studies and conceptualisation

The process began with a situation assessment of the bread's journey from bakery to consumer. A study was then carried out, involving a consumer survey in stores and tools such as mood boards, to identify the bakery feel that should be expressed by the packaging. This study resulted in a target vision for the packaging proposals, with a key consideration during development being shelf life. Karin Edström, the project manager at Innventia, explains:

"The bakery feel was important in order to convey naturalness and craftsmanship. It was equally important, however, to consider various ways in which the shelf life of the bread could be maintained once the consumer got it home, to reduce food waste. These included, for example, looking at the design of the packaging and the information about storage and use."

With these criteria in mind, three new packaging concepts were developed in collaboration with designer Alexandra

Denton. Two of the concepts are based on commercial materials, paper and cloth, used in a new way, with the design contributing to improved function and a heightened sense of quality. The third proposal is based on a brand new textile-like paper material produced using a paper-making machine. As this material can be manufactured with rigid and soft sections, there is scope for brand new adaptive packaging solutions.

The commission for Saltå Kvarn made use of Innventia's new service Packaging Audit, which was launched in conjunction with Scanpack on 20-23 October in Gothenburg. Two of the concepts, the packaging made from paper and from a textile-like paper material, were on display at Innventia's stand. ●



Paper bag with matt surface and a barrier applied to the inside for a longer shelf life. The Saltå Kvarn logo perforated on both sides for the right amount of ventilation. The concertina design means the bag can be used for several types of bread.

 **Innventia har för Saltå Kvarn** tagit fram nya förpackningskoncept för dagsfärska bröd i syfte att positionera brödet som en premiumprodukt. Uppdraget utfördes enligt Innventias nya tjänst Packaging Audit och inleddes med en nulägesanalys av brödets väg från bageri till konsument. Efter en studie med bl.a. konsumentundersökning i butik och verktyg som "moodboards" för att identifiera den eftersökta bagerikänslan, utvecklades tre koncept i samarbete med designer. Förpackningarna speglar företagets profil när det gäller hantverk, hållbarhet och kvalitet samtidigt som de hjälper konsumenten att minska matsvinn.



'Cloth packaging' from the paper-making machine. The soft and rigid surfaces suggest a high-quality product, but also help to keep the bread fresh for longer. Patterns that combine rigid and soft surfaces enable air permeability to be tailored, and text can be integrated directly into the material.

Review of packaging chain transforms Ecophon's approach

Innventia's Packaging Audit for Ecophon signalled the beginning of a more systematic approach to packaging.

The Hyllinge-based company Ecophon manufactures sound-absorbing ceiling and wall systems, among other products. The company is the market leader in its field and delivers to customers around the world, with short lead times. The majority of products are rectangular panels of various sizes, although nowadays more and more of the company's products are specially-designed solutions, such as rounded sound absorbers for ceilings. These special designs are harder to package and the result has not always been as good as the company would have liked. Ecophon therefore wanted packaging development to be incorporated early on in development work and so opted to review its packaging chain.

The company contacted Innventia for a situation assessment. One objective was to identify points in the chain where improvements could be made that would reduce costs as well as the risk of damage.

"We interviewed key individuals throughout the chain to get their opinions on obstacles and opportunities present in production and carried out observation studies of the entire production process," explains Innventia's Olof Tillander.

One of the issues identified was that the large number of new products meant that there were a number of different sizes of packaging, which then didn't fit the pallets. This also caused problems when loading the pallets onto lorries.

Items were also being reloaded several times, which increases the risk of damage. Innventia also conducted a number of tests to determine how products and packaged products are affected by temperature, moisture and mechanical stresses. Impact resistance and edgewise crush tests identified the products' weak points.

The result of the review was summarised in a number of recommendations. The investigation complete, everyone involved attended a workshop at Ecophon with the aim of producing a plan for implementing the recommendations.

"For us, this signalled the beginning of a more systematic approach to packaging. We have started to treat packaging as an element of the end product. When we develop a new product, the packaging must be included in the development process right from the start," says Ecophon's quality manager Per Bäcklin. ●

 **Hyllinge-företaget Ecophon** tillverkar ljudabsorbenter bland annat för tak och väggar. Fler och fler av produkterna är designade speciellt för att förpackas. Företaget ville därför ha med förpackningsutvecklingen i ett tidigt skede i utvecklingsarbetet och bestämde sig för att göra en översyn av förpackningskedjan. Ett mål var att se var i kedjan det gick att göra förbättringar som kunde såväl spara kostnader som minska skadorna. Efter nulägesanalys och tester sammanställdes resultatet av översynen i ett antal rekommendationer. För Ecophon blev Innventias Packaging Audit startskottet att jobba mer systematiskt med förpackningar.

For me, it all started with usability. We are now expanding the concept to include functionality and performance throughout the entire value chain. Our vision is packaging that works at every stage of the chain. My mission is to highlight customers' needs and to suggest a way of creating this packaging.

By Sandra Pousette



Sandra Pousette
Project Manager, Packaging development and product testing
Ask me about: Packaging Audit and usability issues
Hidden talent: Artistic activities involving waterbased colours

Packaging a service

During my early years working in the packaging industry, I fought for packaging to be easier to use, including when opening and resealing. Here at Innventia, we had the idea of carrying out testing with different target groups in order to give manufacturers feedback, and so we created a usability lab. Although many were sceptical, we believed in the concept. Today, even the sceptics are in favour of packaging that is easy to open and reseal. Standards have been drawn up or are being developed to offer testing methods and guidelines for developing packaging that is easier for consumers to use.

Packaging is a common but complex phenomenon that needs to fulfil a whole host of requirements. As well as looking good on the shelf and attracting buyers, it should also protect both its contents and its surroundings. In addition, it should work well during converting and filling, facilitate handling and transportation, be easy to open and sometimes reseal and ideally be made from renewable materials. To put it simply, it should work throughout the entire value chain.

When we test packaging, we have the opportunity to link identified problems to factors such as the properties of the material, the choice of material and transportation protection. Various different departments within a company

should be involved in order to be able to rectify these identified problems, but we have seen examples where poor internal communication has prevented changes that have been made from being adapted for the entire value chain. Somewhere along the way, the idea came about at Innventia to look at the bigger picture, a packaged product's journey through the value chain – after all, every product is packaged at some stage...

Over the years, we have gained an insight into how different companies tackle the packaging issue and the opportunities for working with them to find solutions from an overall perspective. For example, Ericsson takes an inclusive view of its packaging, meaning that it is included in the product development process. This means that they can save resources, prevent transport damage and avoid complaints and costs relating to repairing or replacing products.

When we at Innventia decided to package our own services, we took our experiences from various customer commissions as our starting point. For example, we have noted the need for improved internal communication, greater understanding of material properties and the product's own ability to minimise the amount of packaging. We have also seen that one of our most important roles is

to ensure that all the parties involved sit around the table to discuss the packaging together. In other words, a systematic way of analysing different stages of a company's packaging value chain. That's why we created Packaging Audit.

For me, it all started with usability. We are now expanding the concept to include functionality and performance throughout the entire value chain. Our vision is packaging that works at every stage of the chain. My mission is to highlight customers' needs and to suggest a way of creating this packaging. ●

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 **Förpackningen är en vanlig** men komplex tingest som ska uppfylla en uppsjö med krav. När vi testar en förpackning har vi möjlighet att koppla funna problem till egenskaper hos materialet, valet av material, transportskydd för att bara nämna några. För att kunna genomföra förändringar som är anpassade för hela värdekedjan bör flera avdelningar i ett företag vara inkopplade. Vi har genom åren fått inblick i olika företags sätt att hantera förpackningsfrågan och möjlighet att tillsammans med dem hitta lösningar utifrån ett helhetsperspektiv. Utifrån våra erfarenheter av att genomlysa olika delar av ett företags förpackningsvärdekedja på ett systematiskt sätt skapade vi tjänsten Packaging Audit.

Expanded accreditation for product safety and lignin analyses

Innventia now offers accredited analysis of primary aromatic amines in food contact materials, and of lignin content in pulp.



Some substances in the group of primary aromatic amines (PAAs) are carcinogenic. PAAs are utilized in the production of azo pigments that may be used for printing of food contact materials (FCM).

These substances are regulated in many countries, for example in the EU regulation (EU) 10/2011 for plastic

materials. Innventia now offers accredited analysis of these substances.

"It means, among other things, that results are internationally comparable, and ensures that analyses meet the performance requirements specified in various regulations", explains Kai-Yee Thim, who is working with product safety of FCM.

The scope of the accreditation is now also being extended with a chemical pulp analysis which will have great impact on the introduction of lignin products. Innventia has a long tradition of chemical pulp analyses, and one of the most common analyses involves determining the lignin content.

"To the best of my knowledge, we're the first in the world to offer an accredited lignin analysis. It means that we are now delighted to be able to offer our customers even more useful and reliable analyses," says Fredrik Aldaeus, quality manager for Innventia's chemical analyses. ●

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See www.innventia.com for all tests and analyses available at Innventia.

New bio-based lightweight material is unveiled

The lightweight, fuel-efficient car of the future can be made using materials from Swedish forests. The research institutes Innventia and Swerea SICOMP have worked together in unique cooperation to develop the first carbon-fibre composite 'demonstrator' from softwood lignin.



The investments of recent years in test beds and R&D infrastructures to realise the vision of new lightweight forest materials are now starting to pay dividends. The research institutes Innventia and Swerea SICOMP are both part of RISE, Research Institutes of Sweden, and are the first in the world to unveil a composite demonstrator based on 100 percent softwood lignin.

The demonstrator – a sandwich structure in which balsa wood is laminated with carbon fibre – is the first proof that it is possible to manufacture lignin-based carbon fibre, even if this is still only on a laboratory scale. The production of another demonstrator is already under way to demonstrate a future application within the automotive industry. Lighter cars would mean lower fuel consumption, and would also make electric cars more viable. Sweden can truly become a leading country when it comes to the bioeconomy and fossil-free vehicle fleets.

"Our first demonstrator is helping us to understand what we need to focus on in our R&D work, so it's particularly pleasing that we have now taken a big

COMING EVENTS

NOVEMBER

- 17 VINNOVA annual conference, Stockholm
- 17-19 CEPI European Paper Week, Brussels
- 18-19 SPCI autumn meeting, Stockholm
- 23-25 3rd Iberoamerican Congress on Biorefineries (CIAB), Concepcion

DECEMBER

- 8-10 CompositesWorld's Carbon Fiber 2015, Knoxville
- 16-17 Sixth WPC & NFC Conference, Cologne

For further information on coming events, see www.innventia.com

Innventia videos

Get to know Innventia and the people at Innventia by watching videos on our website. For example, take a look at our latest film about Packaging Audit on www.innventia.com/packagingaudit