



## Tailor-made fibres for new materials

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# Part of the international arena

“If we’re going to be able to provide support to our customers, then our research activities have to be international just as those of international companies are,” says the President of STFI-Packforsk, Thomas Johannesson.

“Globalisation of world trade has had a huge impact on our areas of interest and we must ensure that we maintain our prominent role. With large and efficient mills using fast growing trees as raw material for pulp production in, for example, South America, and the growing increase in production of paper and board materials in Asia, it is vital that we are able to direct our research in the right directions and to convert the results into practicable solutions for our customers.”

“We profess ourselves to be an adherent of the Open Innovation principal. This is a concept implying that you have to be open to external impressions and ideas that you refine, improve on or transform and then apply to your own operations. These days there is a lot of useful knowledge and know-how to draw on

from all kinds of quarters. And in-house research, of itself, is simply not enough. Even the way of conveying results has to occur on entirely new lines, adapted to customer needs. Because of this, it’s imperative to follow global developments in circles close to our operations.”

“In the past few years, we have shown that we are successful on the international scene. As examples, I can quote large EU Projects such as Ecotarget, Sustainpack and, the most recent one, Eforwood. Many of our Industrial Projects are of a strong international character. We are intensively involved in the new forest based sector technology platform for constructing a strategic research agenda for Sustainable Development. The merger with Norwegian PFI has strengthened our research operations, but not just numerically. In our Cluster Research, several non-European based companies working on the global scene are participating.”

In the laboratories in Drottning Kristinas Road, the rooms are abuzz with many different languages when

visitors gather here to discuss research, development, strategies and collaboration work. ●

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**Om STFI-Packforsk** ska kunna stödja sina kunder med forskning och kompetens måste bolaget liksom industrin arbeta internationellt. Med omfattande massatillverkning från snabbväxande träd i t ex Sydamerika och ökande tillverkning av pappers- och kartongmaterial i Asien är det viktigt att kunna leda forskningen i rätt riktning och omsätta den i för kunderna användbara lösningar:

– Vi bekänner oss till principen för Open Innovation, säger Thomas Johannesson, vd på STFI-Packforsk. Det innebär att man förädlar eller omvandlar intryck och idéer utifrån i sin egen verksamhet. Användbar kunskap finns att hämta på många håll, och enbart intern forskning räcker inte. Vi har under senare år på många sätt visat att vi är framgångsrika internationellt.

## United on forthcoming research

Using a Technological Platform, Europe’s forest based sector will advance innovations and research to strengthen competitiveness in a sustainable society. This new occurrence of gathering together a line of businesses or organisations with a certain technical direction was introduced in connection with the 7th EU Framework Programme.

As Project Manager, CG Beckeman



CG Beckeman (SCA) and Lennart Eriksson (STFI-Packforsk), in close co-operation with the 7th EU Framework Programme and the forest based sector’s forthcoming research.

of SCA Forest Products AB has gathered together the entire European forest based sector, all the way from the paper and pulp industry (through CEPI), sawmills, the production industry (through CE-Bois) and private forest owners (through CEPF) to national organisations.

“The European forest based sector is a global leader on the whole, yet its ability to compete needs to be developed,” says CG Beckeman.

“We have to further develop products using the specific properties of our own, long fibres and we mustn’t omit the development of machinery if, in the future, we are able to compete with countries such as certain ones in South America, with their fast growing short fibres and China, with its rapid expansion.”

What the strategic research agenda will look like for the next 25 years will be presented at the Research Forum in Stockholm in November.

“We have received 145 research proposals from just one of our five value chains, wood products. Each proposal will be evaluated as to how it might have an influence on consumers, society, energy, the environment and

competitiveness.”

CG Beckeman personally believes that, in the future, we will witness new areas using paper as a raw material. He cites one example, Tetra Recart, which was conferred the Wallenberg Award for trailblazing research in the field of packaging.

“Owing to co-operation efforts, new paper and pulp production techniques are going to be developed. Just look at STFI-Packforsk research with the help of its EuroFEX Pilot Paper Machine.” ●

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**Utifrån en** teknologisk plattform, introducerad i samband med EUs 7e ramprogram, ska hela den samlade europeiska skogsnäringen driva innovationer och forskning vidare för att stärka konkurrensen i ett hållbart samhälle.

– Den europeiska skogssektorn är i det stora hela ledande, men det gäller att utveckla konkurrenskraften, säger CG Beckeman, SCA Forest Products AB, som är projektledare.

Hur den strategiska forskningsagendan för de kommande 30 åren ska se ut presenteras på ett forum i november i Stockholm. Varje projektförslag bedöms hur det kan påverka konsumenter, samhälle, energi, miljö och konkurrenskraft.

CG Beckeman tror personligen att vi i framtiden kommer att få se nya områden med papper som råvara.



## Renewable fuels – new components in the product mix

The quest for finding new added-value chemical and energy by-products is developing into a new value chain, where STFI-Packforsk is concentrating a considerable amount of its research efforts. See the article on page 8 of this issue about the WaCheUp project and the article below about the PFI project on newly initiated liquid bio-fuels. To meet the requirements of the Kyoto Agreement, a 2003 directive issued by the EU sets the target for bio-fuels being used for transportation purposes at 5.75% by 2010. Besides the "first generation" bio-fuels in use today, viz. ethanol, fatty acid methyl ester and bio-gas, several "second generation" fuels are being developed. Since this is a subject of enormous topical interest, you can expect to read more about renewable fuels in forthcoming issues of Beyond.

# Liquid bio-fuel – one solution to the energy challenge

The production of bio-fuel from wood can be profitable if the Norwegian Paper and Fibre Research Institute, PFI, a company in the STFI-Packforsk Group, has success with its new research project.

Oil resources will not last forever. Norway, an oil producing country, is convinced that it must invest more in renewable resources. Today, only an insignificant part of the Norwegian market is using bio-based fuel. In Sweden, car owners have already become accustomed to refueling their cars with a blend of petrol and alcohol, and there is a fast-growing market for motor fuels from renewables in many parts of Europe. The Norwegian Ministry of Transport and Communications recently gave a grant of NOK 7 million to a research project, which has the aim of developing new technologies for the production of bio-based fuels from wood. In all, the participants in the project are contributing the sum of NOK 3 million.

A new area of research

PFI research has traditionally concentrated on wood as the raw material for pulp



One aspect that appealed to the Minister of Transport and Communication, Torild Skogsholm, was the interdisciplinary collaboration, where all partners will contribute their know-how and knowledge.

and paper, not on fuels at all. However, the expertise that PFI possesses when it comes to the constituents of wood and its chemical composition is state-of-the-art and the basis for a possible new process. But it would not be possible to start up this project without collaboration from partners having key expertise in the processes that will necessarily be part of the production. PFI has been the catalyst in this interdisciplinary collaboration.

PFI researchers intend to separate the main wood components from each other; cellulose and hemicellulose, lignin and extractives. Bio-diesel will subsequently be produced from the lignin. This will take place by means of a thermal breaking-down of the wood polymers to low molecular compounds. It is also the intention to see if it is possible to separate the fatty acids and the rosin acids in such a way that these can be used for a separate production of bio-diesel. By using more of the components of the wood log, producing ethanol at a competitive price is a realistic goal.


The start-up meeting for the project took place in Trondheim at the end of August. Attending, were also specialists from the University of Bergen, the Royal Institute of Technology in Stockholm, Statoil, Norsk Pellets Vestmarka, Nord-Trøndelagsforskning and STFI-Packforsk. The vision of a new and profitable bio-fuel production also includes the construction of a bio-fuel plant that will require almost one sixth of what is being felled today in Norwegian forests. The good news is that such a plant will be able to use inferior wood. When the net emissions from the new fuel are zero, this should become a technology that is relevant to more than just Scandinavia. We shall see in three and



A sack of wood chips does not make a full tank. However, liquid bio-fuel from wood chips can be an environmentally compatible and profitable alternative in the future. Above, MSc student, Eirik K. Karlsen and PhD student, Jon Reino Karlsen on the job at PFI.

a half years time, when the project comes to its conclusion. ●

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 **PFI** (Papir- og fiberinstituttet), allierat med SFTI-Packforsk, har fått 7 MNOK från norska kommunikationsdepartementet för att utveckla ny teknologi för framställning av biobaserat drivmedel från träråvara.

Forskningen syftar till att separera cellulosa, hemicellulosa, lignin och extraktivämnen. Därefter kommer biodiesel att produceras av lignin. Dessutom kommer man att undersöka om det är möjligt att separera fettsyror på sådant sätt att de kan användas för separat produktion av biodiesel. Genom att utnyttja fler ämnen i vedråvaran bör produktionen bli mer lönsam. Tillsammans med expertis från högskolor och industrin i Skandinavien ska projektet drivas under tre år.

# Tailor-made fibres for new materials

Just in the past year, the world has undergone implausible natural disasters that have brought us to suspect there might be a connection with the improper use of the earth's resources. Concurrently with raw material prices going through the roof, researchers are looking for renewable raw materials that are new. A more ingenious way to do this is to discover new properties and potential in the old familiar renewable raw materials, such as wood fibres.

"It's not just about finding materials to replace existing products, but finding new materials for new products," says Mikael Lindström, responsible for the New Materials and Composites Group at STFI-Packforsk. By this, he means that many of the products that could be produced today from wood-based composite materials are low-cost products and that it would not be profitable for producers to invest in a new process. The aim is to find areas and products that make high demands on the properties of a material with low price-sensitivity. It is therefore important to bring end-use companies into the work, such as furniture and car makers or the engineering and manufacturing industries.

"One possible and interesting area is sporting equipment." Mikael adds, "Here,



Cristian Neagu achieved international success when he was awarded the honour of "Best Student Presentation" at the 8th International Conference on Wood Fibre-Plastic Composites in Madison, Wisconsin in May. A month later, Cristian was awarded the Folke Odqvist Prize by the The Swedish National Committee for Theoretical and Applied Mechanics.

strength and weight properties play a much more important role than price does."

However, costs not only lie with the products and the materials but also in transportation. If it is possible to reduce the weight of the material being used when transporting, there is quite a saving on fuel. To give an example, if you can reduce the material by 1 tonne by choosing lighter materials when building a passenger aircraft, you can then reduce the size of the engines, the dimensions, the volume of the fuel tanks so that, in the end, there is a reduction of 8 tonnes in the total weight load. The cost of materials is rapidly paid back in such a case. Wood fibres are stronger per kilo than fibreglass and, by utilising materials reinforced with cellulose fibres in interior aircraft fittings, there would be a lot of saving on aviation fuel.

## Tailor-made fibres

Another of the advantages of wood fibres is that it is possible to modify them. This is especially important when it comes to finding new areas of use for bio-composites. By modifying the fibres, their properties can be controlled and, by this, tailor-make the fibres to suit different applications. This opens itself for many new possibilities. An example of this is the Bio Auto Project that is looking to find new renewable materials for interior fittings in cars.

In the STFI-Packforsk research cluster, New Fibres for New Materials, a great deal of work goes into building up a platform of materials.

"One of our strengths is that we have succeeded in combining chemistry and physics together in our research," says Mikael. In his opinion, it is also important to have a technical, scientific view of materials development instead of an empirical one. Working together in the cluster are experts in strength, boats and polymers from the Royal Institute of Technology in Stockholm and the



Sporting equipment, with its high demands on strength and weight properties, is a p

Luleå University of Technology. There is also a co-operation with Forest Industry Biotechnology and the WURC (Wood Ultrastructure Research Centre).

Cristian Neagu is a research student at STFI-Packforsk, concentrating on the area of micromechanics for wood fibres. Fifty percent of his time is devoted to the cluster where he works on developing test methods for being able to see the effects of different modifications. His studies range from the smallest nanostructure to properties in the final composite, which involves being able to make quantitative measurements of properties. Cristian says, "It is about understanding what role modification and the materials have for further rapid development."

There is no mistake that there is a great interest in the development work. During the year, Cristian has been awarded two excellent honours.

"This is a hot topic internationally and it fits in well into the thinking about Bio-refinery and renewable plaster," concludes Mikael Lindström. ●

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## Cellulosafibern som råvara är

inte bara förnyelsebar utan också modifierbar och stark i förhållande till vikt. Enligt Mikael Lindström som är ansvarig för gruppen Nya material och kompositier vid STFI-Packforsk skulle man exempelvis kunna spara stora bränslekostnader genom att använda cellulosafiberarmerade material i flygplansinredningar istället för det tyngre glasfiber materialet.

Genom att modifiera cellulosafibern kan man styra dess egenskaper och på så sätt skraddarsy fibrer för olika tillämpningar. Många av produkterna som idag skulle kunna tillverkas av vedbaserat kompositmaterial är lågkostnadsprodukter. Enligt Mikael Lindström gäller det därför att hitta områden och produkter som har höga krav på materialegenskaper men lägre priskänslighet.





potential field for new wood-based composite materials.



Disposable packages need no longer stick to a standard rectangular format. Now they can be adapted to their end use and design requirements.



At the Fair, a wealth of filler materials and shock absorbing partitions were on display. Earlier, corrugated partitions were rapidly produced but it took time to assemble them.

# Fair focus on packaging

What are the prevailing trends in the packaging branch and what significance do new materials, products and processes have for it? STFI-Packforsk visited Interpack, the leading international packaging industry fair.

"This year's fair didn't really offer much exciting news. Nevertheless, there was a lot about refined machine systems, stronger yet thinner materials and improved methods," says Gerald Begéli who has many years of experience in packaging equipment and developments. In his opinion, the field of single portion packages is the one gaining more and more ground. New techniques, technologies and materials are making it possible to profile the packages and make them more user-friendly. By combining the primary packages with various board casings, i.e. sleeves, and shrink-labels with advanced printing, the possibilities are even further increased for producing eye-catching and marketable packages. Digital printing, which is undergoing fast developments, has also made it easier to adapt and individualise the print on packages.

There is another area of interest, viz. methods for opening and reclosing. By complementing existing packaging equipment for flexible materials with an attachment, packages may be made into easy-to-open and recloseable ones. On the whole, an enormous amount of development resources are being put into this opening and recloseability of packages. Experience shows that consumers rate openability and closeability higher than price.

"We've always been prepared to pay for convenience," says Bo Lindskog, manager of the Packaging Materials Group at STFI-Packforsk.

When it comes to transporting systems, there is a noticeable trend towards plastics. Wooden pallets have always been the most common load carrier but, during the past few years, sharper competition has come from pallets made of plastic.

"Today, the selection of plastic pallets, collapsible pallet boxes and plastic crates is enormous and their manufacturers are attempting to break into other fields where wood and corrugated board have been the natural choice up to now. With millions of pallets and crates in circulation, it ought to be a warning signal for the forest sector industry," comment Olof Tillander and Kjell-Åke Henriksson who have recently carried out tests on new lighter-weight pallets and evaluated them for Svenskt Retursystem AB.

## Renewable materials

"It's important to differentiate between materials consisting of renewable raw materials and those that are degradable after usage. Often it is desirable to have both types in one material," says Mikael Gällstedt who is a researcher on Glupack, a project financed by Vinnova. This project, which is a co-operation among STFI-Packforsk, The Royal Institute of Technology in Stockholm and the Swedish Farmers' Supply and Crop Marketing Association, has the aim of developing material based on wheat gluten. It is sufficiently tight for use in food-stuff packaging with demands on an oxygen barrier.

Chitosan is a material that comes from crayfish, crab and prawn shells, for example. In contrast to certain other biologically degradable material, an advantage of chitosan is that there is no risk of fungus growth. It therefore performs well in sticking plasters and similar areas of use.

According to Bo Lindskog and Mikael Gällstedt, biocomposites still account for a small proportion of packaging material. However, nowadays there is a demand from converters, thanks to PLA (Polylactide) made by Cargill. PLA is a film whose source is corn.

"Formerly, no fully developed material has been marketed successfully, which has created a great deal of suspicion, but Cargill is breaking down the barriers," they mean. "This could be seen at Interpack, where renewable and degradable materials had their own section at the fair." ●

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## Att enportionsförpackningar

är ett område som vinner allt större terräng märktes tydligt på förpackningsmässan Interpack. Ny teknik och nya material ger möjlighet att profilera förpackningarna och samtidigt göra dem mer användarvänliga. En stor del av utvecklingsresurserna läggs på öppnings- och återförslutningsbara förpackningar.

Inom området transportsystem märks en tydligt uppåtgående trend för plast där pallar, hopvikbara pallboxar och backar av plast nu slår sig in på andra områden där trä och wellpapp alltid varit självklar.

På mässan fanns en separat avdelning för förymelse- och nedbrytbara förpackningsmaterial. Vid STFI-Packforsk utnyttjas kunskaperna om traditionella plaster till forskningen på nya material av biologiskt material, som exempelvis material baserade på vetegluten eller kitosan.

# Measure what you see!

Development of a white-top mottling measurement system based on visual perception



Korsnäs utilises STFI Mottling both as a tool in the production and in the development of new products. According to Britt Adolfsson, the company uses the method to evaluate all kinds of surfaces.

The important thing when assessing surfaces and quality is that we measure what we see with our own eyes," says Anita Teleman, Research Manager of the Printability group at STFI-Packforsk. "With the aid of our STFI-Mottling Method, we offer our customers a repeatable way of analysing mottling in paper surfaces."

STFI-Mottling is a method used to evaluate reflectance variations in surfaces on board, among other things. When producing multi-layer board, problems with mottling can arise in the white layer. The darker shades of the bottom layers may show through so that the surface is seen as uneven and white-grey mottled.

"In order to be able to evaluate and analyse this phenomenon, we have developed this instrumental white-top mottling method" says Anita Teleman.

"Using a scanner and the software, defects and unevenness in the uppermost

surface are measured. This method has been under development for a long time and its results are in accordance with what we see with our eyes."

"To know with certainty that this method is concordant with how we perceive defects and mottling of different kinds, the method has been developed with the help of perception studies, where people take part in different testing panels."

"The same samples, measured with the STFI-Mottling method, were used in the perception studies," adds Anita. "Samples of varying mottling were evaluated visually by several people and analysed instrumentally with STFI-Mottling."

"People are disturbed most by white-top mottling when its size is between 4 mm and 8 mm. We now know that people can just distinguish a noticeable difference in mottling at around 8%, when it comes to white-top mottling."

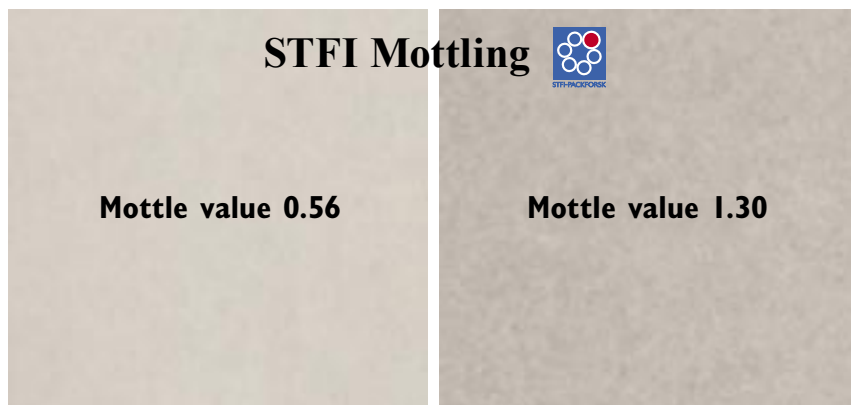
"The image analysis method, STFI-Mottling, is actually more sensitive when compared to human analysis. It also copes with distinguishing smaller differences. The unevenness detected in the image is divided into various size classifications between 1 mm and 8 mm, so that you are given an idea of the kinds of defects. A mottling numeral is obtained for each size classification. The size of the samples may vary from 50 mm x 50 mm to 200 mm x 200 mm."

"Previously, we have only been able to give a visual grading to these defects," says Anita. "This method has been developed in co-operation with the industry and provides a rapid, sensitive and repeatable instrument-analysis option that is significant for being able to optimise the visual appearance of white-top surfaces." ●

## Years of experience with STFI-Mottling

Sweden's Korsnäs AB, a paper and board producer, is a skilled user of STFI-Mottling. It utilises this analytical method in its production and when it develops new board qualities.

"We have been using this method since we procured our first image analysis programme," says Britt Adolfsson, Project Engineer. "In the last few years, we have even participated in further developing this method."



A mottling numeral is obtained for each size classification. A high number means a strong defect.



Korsnäs makes use of this method to measure all kinds of surfaces. This includes everything from unprinted surfaces to formation and various types of printed surfaces. This method is one of those used frequently for evaluating surfaces.

"In fact, we measure anything that can be measured in the form of variations in grey scale and colour," continues Britt Adolfsson. "We very often use it in combination with visual assessments, mainly because I work in a development department."

Britt mentions that one of the advantages of the instrumental method is the fact that it offers repeatability.

"Earlier, you could only grade mottling and defects visually," says Britt. "Nowadays we have the software itself and we make use of it three to four times a week. Developments in this area are occurring continually and we follow them with close interest." ●

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**STFI Mottling är** en bildanalytisk metod som används för att utvärdera och analysera flammighet hos bland annat ytor på flerskiktsparkong. Metoden ger en snabb, känslig och repeterbar instrumentell analysmöjlighet som är betydelsefull för att kunna optimera white-top-ytans visuella utseende. För att med säkerhet veta att metoden är samstämmig med hur vi uppfattar störningar och flammighet av olika slag har metoden utvecklats med hjälp av perceptionsstudier där människor deltar i olika panelförsök.

Korsnäs AB använder metoden till att mäta alla typer av ytor. Det gäller allt från otryckta ytor till formering och olika typer av tryckta ytor.

– Tidigare kunde man bara gradera flammighet och störningar visuellt, säger projektingenjör Britt Adolfsson, Korsnäs.

Vi har idag programvaran själva och använder den tre till fyra gånger i veckan. Det sker utveckling inom detta område hela tiden och vi följer den med stort intresse.

## Seminar for partner customers

Among 50 representatives from STFI-Packforsk partner customers gathered at the research seminar on 4 October. The purpose of this annual event is to present results from the common interest research projects in the Cluster Research Programme. In addition to the presentations, the new Human Product Laboratory for the evaluation of print quality and packaging usability was inaugurated.



## COMING EVENTS

### NOVEMBER

- 1–2 Advanced Training: Paper web forming, structure and properties
- 2–3 Advanced Training: Fibres from forest to paper
- 7–8 Cost Action E41: Analytical tools with applications for wood and pulping chemistry
- 9–10 The European Forest-based Sector Research Forum 2005
- 11 ECOTARGET Review meeting
- 15 Nordic Biofibre Conference, Trondheim
- 21–22 Packaging Diploma Course, session V
- 22–23 Analys- och provningsdagar
- 29 Miljöpack Annual meeting
- 29–30 Advanced Training: The potential of digital printing

### DECEMBER

- 1 Advanced Fibre Management Seminar: Open for companies financing the AFM cluster.
- 6 Seminar in the research cluster "Efficient papermaking by control of detrimental substances". Open for the cluster companies.
- 6–7 Sustainpack Strategic Conference
- 9 Defence of dissertation: "On the evaluation of print mottle" by Carl-Magnus Fahlcrantz

## Continued enthusiastic interest in the STFI-Packforsk Cluster Research Programme

Following intensive discussions during the spring, the STFI-Packforsk partner customers have now stated, "We want to continue to invest in the Cluster Research Programme." This was confirmed when they renewed their three year investments.

"This is gratifying proof that we are a first-rate company, when it comes to R&D in the fields of pulp, paper, printing and packaging. These days, it is the practice of international companies to choose their research providers from all around the world," says Market Co-ordinator, Helena Vollmer.

The Cluster Research Programme (CRP), which currently has an annual turnover of around € 9m, augmented by public and EU funding, is continuing under its present form or even with an expansion in its scope. This, because discussions are presently under way with several new customers who want to participate in the CRP as Partners or as Invitees to particular research clusters. ●

## Have you changed address?

Please let us know by sending an e-mail to [info@stfi.se](mailto:info@stfi.se).

# B



# By-products of value

In the last few years, the Forest Based Industry has succeeded in taking a large piece of the European research cake. Recently, there was the start-up of yet another EU Project co-ordinated by STFI-Packforsk, WaCheUp, which is also a part of the Bio-refinery research cluster.



The start-up meeting for the new research cluster Bio-refinery took place at STFI-Packforsk in May, 2005.

WaCheUp stands for the Upgrading of Waste to Chemicals. It concerns the upgrading of by-products from pulp and cork production to valuable bio-based chemicals. When it comes to chemical pulp production, less than 50% of the raw material remains as fibres in the papermaking pulp. The rest consists of by-products such as bark, lignin and hemicellulose.

“Today, these by-products are incinerated in the pulp mill and most of the heat goes to waste if there isn't a paper mill attached to the pulp mill,” says Birgit Backlund who is responsible for the STFI-Packforsk Bio-refinery cluster.

The idea is to convert the by-products into chemicals that can be used either in a paper mill or to replace petroleum-based raw materials in different chemicals and materials. This makes the project interesting from an environmental aspect. Another point is that the removal of materials from the black liquor relieves the pressure on the soda recovery boiler, which is very often a bottle neck when it comes to an increase in production.

The various parts of the project, i.e. work packages, add to each other. The first thing to do is to ascertain the fractions that it is possible to work on further. For example black liquor is a heterogeneous product containing many substances,

and the object is to separate out those that are of interest.

The next stage is to find technically and financially viable methods and, subsequently, applications that might be interesting to the market. According to Birgit Backlund, it will very likely be harder to find methods than to find products. As an example of an exciting product, she mentions carbon fibre which is one of the strongest materials but is presently being produced from a very expensive petroleum-based raw material. It is here that lignin, which also consists of many carbon chains, could be a much more profitable alternative.

The biorefinery fits into the closed-cycle adapted production concept. Work began during an earlier project, KAM (The Ecocyclic Pulp Mill) and was further developed in FRAM (The Future Resource-Adapted Pulp Mill). Just as in the FRAM Project, WaCheUp will work with theoretical model mills to evaluate chemical and energy balances and the surrounding systems, such as chemicals, effects on the environment etc. Model mills have proved to be a useful tool, not least pedagogically, and are especially good when it comes to systems with the many products of a bio-refinery. ●

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## WORK PACKAGES

- WP 1 Raw materials & primary separation technologies
- WP 2 Development of processing technologies
- WP 3 Development of technologies for valorisation of components
- WP 4 Application development



### EU-projektet WaCheUp.

som också ingår i forskningsklustret Biorefinery, handlar om att uppgradera biprodukter från massa- och korktillverkning till värdefulla biobaserade kemikalier. Kemikalierna ska sen kunna användas i pappersbruket eller ersätta petroleum-baserade råvaror i olika kemikalier och material. Detta gör projektet miljömässigt intressant samtidigt som själva uttaget av material från svartluten skulle avlasta sodapannan som ofta är en flaskhals för produktionsökning.

– Idag används biprodukterna som bränsle och det mesta går till spillo om det inte finns papperstillverkning i anslutning till massabruket, säger Birgit Backlund som är ansvarig för bioraffinaderiklustret vid STFI-Packforsk. Enligt henne finns det många områden där material baserade på dessa produkter skulle vara intressanta.



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