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Newsletter

No 3, December 2002

Summing Up the Nordic Biofibre Conference in Gothenburg 2002

On November 5 the Nordic Biofibre Conference was held in Gothenburg with the intention of reviewing the potential for the use of Biofibres in different industrial products. Another aim was to provide an opportunity for new contacts and collaboration. About 50 delegates from Denmark, Finland, Germany, Great Britain, Norway and Sweden attended the conference at Sciencepark Conference Centre, Chalmers University of Technology. Several industrial branches, technological institutes and universities were represented, as well as VINNOVA, the Swedish Agency for Innovation Systems. Among the industries represented were paper, production equipment, raw material producers and developers, other networks organizations, industrial designers, packaging, plastics, the floorings and biotechnological industries.

Claus Schroeder, Bengt Svennerstedt

The chairman assoc. prof Bengt Svennerstedt opening the proceedings, welcomed the audience to the first conference arranged by Biofibre.net.

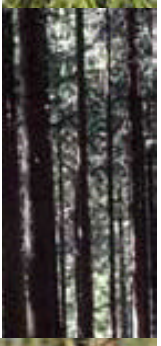
Biofibres from a European Perspective

Dr Melvyn F Askew, IENICA (The Interactive European Network for Industrial Crops and their applications) started the programme with an overview lecturer referring to the IENICA homepage as a source of information about research and development within this field in Europe.

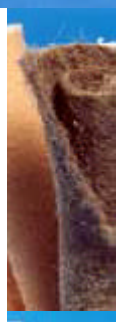
- The introduction of synthetic materials (eg plastics) at the beginning of the 20th century has caused the replacement of the bio-based products we used before, he says.
- As a result of these changes, combined with an enormous increase in energy and chemicals demands, the world is now facing an ecological crisis. This crisis will greatly intensify with the expected growth in demand for industrial products in developing countries.

In the EU lots of fibre plants are cultivated which can be used for different purposes: agave, arundo donax, cereal straws, cotton, flax, hemp, kenaf, miscantus, nettles, reed canary, fibre sorghum, spanish broom, halfa, china grass and wood. The number of commercial species is relatively small and is amazingly consistent throughout the Union. He proposes that we can add value to the crops in the future by processing them to a product that can generate more money. It is also possible to use more parts of the crop for different purposes.
Besides textiles bast fibres like flax and hemp can be used as technical textiles, such as rope, nets, carpets and geotextiles. They can also be used in agrofibre composites, paper and packaging materials, plant pots, building materials like fibre board, insulation materials, fibre-glass substitutes, cement blocks and stucco. They can also be used in car interiors, as door liners, boot liners and parcel shelves. Other parts of the plant e.g. hemp oil, can be used as technical products, such as oil paint, solvents, varnishes, chain-saw lubricants, printing inks, putty coating and fuel, and also as food and hygiene products.

Nordic Industrial Fund
center for innovation and commercial development



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Continuing: Biofibres from a European Perspective

In Europe about 450.000 tpa glass fibre is used for insulation material which could be replaced by biomaterials. One of the disadvantages of glass fibre is the heavy energy use in the production process.
Mr Askew also raised questions about packaging materials in the EU where 6 million tpa is plastic packaging and over 100.000 tpa is polystyrene.

But there are still a lot of questions about the use of plant fibres:

- What are the specifications for fibres?
- What are the environmental benefits of plant fibres?
- Can we enhance textile fibres to compete with cotton?

His conclusion was that opportunities in the market place are good, but specifications and production to specifications are lacking.

Fibres in Printing and Writing Papers

The next overview lecturer was Mr Åke Axelsson, Södra Cell AB. He told us that the world trade in fibres and paper products is expected to grow substantially over the coming 15 years. Today the USA is the biggest consumer of paper and board in the world. China in second place also has major paper production. Nevertheless the import of paper and board is increasing in Japan, China and Korea. There is also fast growth in the consumption of these products. But in other parts of the world there is stagnation or a slow growth in consumption. About 30 % of the world´s consumption of paper and board consists of recycled fibres. But a lot of consumers prefer virgin fibres, causing the consumption of recycled paper to increase slowly. Most people thought that paper consumption would be reduced by the IT-revolution in the world, but it is just the reverse. In spite of that, about half of the world´s consumption of paper is for packaging purposes.

Most non-wood fibres are used in printing and writing paper and are consumed in China and India. The non-wood fibre products can be based on kenaf, jute, hemp, cotton, bamboo, straw and sugar cane bagasse.

Enzymes for Fibre Processing

Dr Claus Felby from Plant Fibre Laboratory, Royal Veterinary and Agricultural University in Denmark lectured before a fruit break. Enzymes can be used where chemical or physical homogeneity is important. Plant fibres are perfect substrates for enzyme processing. Mechanical decortication, a conventionally used method, introduces fibre defects causing reduced strength and a heterogenous surface composition. He pointed out that mechanical decortication is also more energy-demanding than enzymatic. Enzyme applications on fibres can be used for a lot of different purposes: in paper for bleaching, drainage, resin removal, refining and deiking.

There are several specific enzymes that catalyze specific chemical reactions. They can both degrade biological material, but also synthesize polymers. They can change the 3-D molecular structure, and are also environmentally friendly. Enzymes require mild reaction, e.g low temperature and neutral pH. The enzyme effect on drainage in paper manufacture can increase the speed of a paper machine by as much as 5%. In insulation mats enzymes can be used for retting and decortication.

Attenders at the conference

Pre Processing Methods for Fibre Hemp in Pulp and Composite Manufacturing

Mr Antti Pasila, Department of Agricultural Engineering and Household Technology, University of Helsinki, Finland presented a paper about fibre hemp in Finland. The lack of modern suitable harvesting and processing technology has caused difficulties in the hemp production chain. The major problems are the high moisture content of the fibre yield in autumn and the separation of the desired quality fractions from the overall biomass. The cost for indoor drying of fibre raw materials is too high. Therefore a dry harvesting time has to be chosen or harvesting of only the separated parts of the plant. The dry-line method is an integrated harvesting system where fibre plant seeds are harvested in autumn with a combine harvester, and fibre yield in spring using a mower conditioner-baler machinery chain. A simple hammer-milling system was built for processing the dry stalks. This method economically produces short bulky fibre suitable for pulp production. A new approach still under development is frost-line harvesting, where the bast fibre is detached during the harvesting process. Freezing appears fast and in large volumes during the first frost in the autumn.

Dry harvesting in spring causes the main losses in the processing chain. The yield was 15% of the original dry matter yield. This is due to the brittle structure of dry material.

When hemp fibre is used as thermal insulation material only, fibre fraction is used. In pulp and MFT-processes (Moulded Fibre Technology)all hammer milled material (fibre+shives) is used as process raw material.

The Wood Fibre-Plastic Composites Industry in Europe: Technology and Markets

Dr David Plackett, Danish Polymer Centre, Risø National Laboratory, Denmark, was the next speaker. There are few manufacturers in Europe using wood fibre-plastic composites, but a lot of companies are interested in the new possibilities. Most of the products are extruded.

- One problem is that product standards are lacking, we do not even know the product durability in exterior applications, he says.
- How is the consumer´s attitude in different parts of Europe?

In North America there is a rapid growth in fibre-plastic composites. It is used in decking, fencing, industrial flooring, railings, mouldings, noise barriers and roofing. The characteristics of wood-plastic composites are the ability to produce hollow structures. Other advantages are a high stiffness and that the material is recyclable.

The disadvantages are a low bulk density, thermal instability and moisture absorption. Pelletising - compounding by agglomeration or force feeding - can go some way to solving the bulk density problem. Processing at 200 °C or below will reduce thermal instability. Predrying and/or moisture venting from the extruder is one way of approaching moisture absorption.

Looking at the European market for plastic profiles and tubes, the biggest sector - 56%, is windows and 34% for construction purposes.

The advantages of window profiles made of wood-plastic are the low cost, good stiffness and recyclability. The disadvantages is that compatibilisers raise the costs. You also have to learn to handle the new materials. To sum up, there are a lot of technologies that can be used in the future: extruded plant fibre composites, foamed composites, hybrids, biocomposites and nanocomposites.

Dr David Plackett in the middle

Biofibre products for the packaging industry

Dr John Hoffmann, Brødrene Hartmann A/S, Lyngby, Denmark and Mr Lars Sickert, Tetra Pak R&D AB, Lund, Sweden gave us an insight into the use of biofibres in the packaging industry.

Brødrene Hartmann produces packages for eggs, fruit and industrial products using moulded fibres. The fibres are environmentally friendly and inexpensive. The newest production line is dual pack- an environment- friendly food container for ready-made food. The raw material is CTMP fibres due to hygiene requirement, price, know-how and availability. (Clean white virgin pulp is used in the production.) The water resistant barrier is PET because of temperature requirements over 200 °C. The package is processed by moulding. The packages can be used directly in oven and are approved for food contact. Very important is the high standard of production hygiene.
There is more information about the dual-pack on the homepage: www.dualpack.com.

Mr Lars Sickert´s lecture concerned Bio Fibre Products for Liquid Packaging. Tetra Pak produce different packages mainly for liquid food packaging for long-life ambient distribution. The main products are UHT-milk and high quality fruit juices. The packed product requires good protection from oxygen, odours and light.
Tetra Recart is a new package for canned food. It is a paper-based package for product groups previously packed in steel cans. The Tetra Recart project is one of Tetra Pak´s largest development projects ever. It includes new packaging material, new package and also a new form-and-seal machine. The Tetra Recart is made in a retorting process (autoclaving) where a non-sterile product is filled into a non-sterile package. The challenge for the new package is to tolerate the process: 100% relative humidity and 128 °C for up to 2,5 hours, and still have good appearance, high print quality, excellent mechanical properties and extremely good product protection. The shelf life is 24 months, less than for steel cans. But the weight is much less compared to steel cans, which will reduce fuel consumption during transportation. The package has now been launched in five countries.

Renewable Resources based Products for Automotive Interior Applications

Professor Roshan Shishoo and Mr Jörgen Ohlsson IFP research, Gothenburg, Sweden presented a national research project “Green materials for automotive interiors”. The aim of the project was to develop automotive interior prototypes made of 100% renewable materials. The material used was polymers and natural fibres. The prototypes were both made of solid high-density and fibrous low-density parts. Injection moulding was the method used in production of high density parts, compression moulding in the low density parts. In addition to IFP research CTH, SICOMP, STFI and YKI were partners in the research and development project. Saab Automotive, Scania CV, Volvo Car Corporation and Volvo Trucks participated in the project. Suppliers were Borgstena Textile, Collins and Aikman Automotive Interior Systems, Fordonskomponentgruppen and Rieter Automotive. The material was produced by Borregaard Lignotech, Eastman Chemical Company, Sanaco and Södra.

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Continuing: Renewable Resources based Products for Automotive Interior Applications

The Biofibres were either wood, flax or sisal. The following polymers based on renewable resources were used in different products: cellulose esters (CAB, CAP), Aliphatic co-polyester, Poly Lactid Acid (PLA) and Lignopol (a lignin- based material).

Door liners and hat liners can be made from low density material. High density prototypes can be used in cover door handles, coffee mugs and cover lids. One of the problems using the high density material was the smell and mould tendency. There is also a colour change. The conclusion is that the results are promising. But more investigations have to be done. Therefore a new project is in the pipeline.

Professor Roshan Shishoo

Design Development of Bus seats Made of Plant Fibres

Mr Claus Schroeder, Design Nord, Århus, Denmark, told us that the industrial use of plant fibre composites today is closely linked to the car industry, mostly for interior parts. Design/Nord has used plant fibres in two projects: a lightweight seat for city buses and a transportation tray, for example for sorting post. Both projects were sponsored by Danish development programs. Besides Design/Nord, Force Institute, Aalborg, PlastConsult, Randers and Enova, Horsens became partners. This constellation made it possible to cope with most of the barriers that were met during the development process.

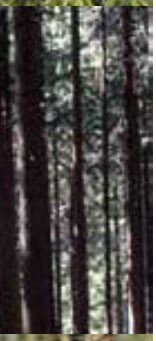
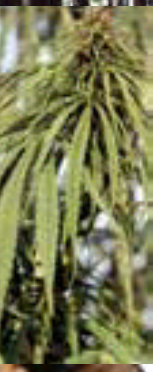
Bus Seats

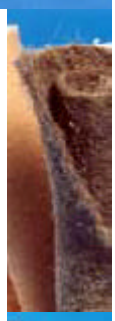
In 1998 a new client requested an innovative design concept for city bus seats. Hemp-PP blends were used because of their accessibility. Because of the tooling costs, a new manufacturing technology was developed during the prototyping phase. Using vacuum consolidation in a closed two sided form tool minimises the costs dramatically. The method has only one metal form part on which the fibre mats are mounted. Then an unpermeable plastic foil is used instead of the second form part. A vacuum between the metal form and the plastic foil puts pressure on the fibre mat that was heated in an oven. To optimise strength the mat thickness could be varied. The advantages of using plant fibre composites instead of conventional material were thermal- and sound insulation, a positive weight/strength ratio and competitive part prices. The 3D form capability of the material allows new mechanical and visual design concepts. In case of an accident no dangerous sharp edges are formed. The barriers to using plant fibres are: high tooling costs, one-sided surface treatment, lack of suppliers for small scale production and the fact that knowhow is limited to the automotive industry.

Sorting trays

The development of this product was sponsored by the Danish Forest and Nature Agency. The advantage of plant fibres for sorting trays compared with ordinary products made of plywood is the 3-D geometries which give less friction and better sound insulation. The lower weight will reduce energy consumption. The price will also be competitive.

There is a desire for materials made of plant fibres without plastic blends in the future.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Bio Fibres for New Materials

The last lecturer was associate professor Mikael Lindström, STFI AB, Stockholm, Sweden, summing up the conference and looking into the future. He pointed out that we need to give new materials their own identity.

- What is a green material? he asked.
- Life cycle analyses have in some cases even shown that the green alternative in the long run has been worse than the petrochemical.
- Are biocomposites and new biofibres, new materials or replacement materials?

The whole chain from fibre producers to end users must collaborate via representatives for matrix suppliers, compounders, producers, process designers and product designers. His view was that very little research and development has been done in order to optimise fibre production with regard to composite reinforcement properties. He pointed out that a new material without industrially relevant processes and application is worthless. He also made a short presentation of a new biofibre project, *New fibres for new materials* at STFI. A micro-mechanistic perspective coupled with fibre knowledge, chemistry, process knowledge and design will be applied within the project.

In conclusion

A common theme during the conference was that plant fibres have a high strength potential and a low weight. Another advantage is the recycleability. Composites based on plant fibres have the potential to replace carbon and glass fibres. The 3D capability of the material is an advantage. There is major potential for plant fibres to be used in a lot of different areas for industrial use in pulp and paper, building materials, furniture and flooring, also in the packaging and car industry.

News

New insulation material with hemp and wool

Isover Flora is a new insulation material from Saint Gobain ISOVER G+H. Insulation mats are made of hemp fibres or a combination of hemp and wool fibres. The new product is approved by ETA (European Technical Approval). Isover Flora is manufactured for use as both thermal and sound insulation.

Choose an ordinary Christmas tree

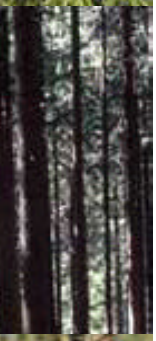
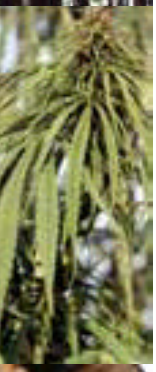
If you compare an ordinary Christmas tree with a plastic one transported from Asia, the ordinary tree grown in your country is much more non-polluting, tells Mats Johansson, environment consultant to Ny Teknik. He has compared different aspects among others discharge of CO2, energy consumption, and distribution of stuff dangerous for the environment.

Strong water resistant formable and flexible paper

Professor Tuula Teeri, Wood Biotechnology, Royal Institute of Technology is head of a research group for paper in the future. She has just made an application to obtain a patent for a new sort of paper. To modify the fibres a chemical enzymatic method has been used. The product is a polymer from wood cells, strong and water resistant. It is also formable and flexible and can be used in still better packaging and hygiene products. It could also make the cellulose components in cars much stronger and durable. Perhaps it could be used in airplanes in the future.

Next Nordic Biofibre Conference

Book November 12, 2003 already now in your calender. Nordic Biofibre Conference will take place at Royal Veterinary and Agricultural University of Denmark, Copenhagen.



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Events

February 4-5, 2003
Ekmandagarna 2003, Rätt fiber på rätt plats"
Stockholm, Sweden
www.spci.se/konf%nationella.htm

March 12-16, 2003
Green Chemistry International Exhibition and Conference
Florence, Leopolda Station, Italy
www.chemicaverde.it

May 12-15, 2003
2nd Forest Engineering Conference
SkogForsk- Forestry Research Institute of Sweden
Växjö, Sweden, Contact: Maria Iwarsson
e-mail: maria.iwarsson@skogforsk.se
www.skogforsk.se/fec

May 19-20, 2003
7th International Conference Woodfiber-Plastic Composites (and other natural fiber)
Monona Terrace Convention Center/Hilton Hotel, Madison, Wisconsin, USA
e-mail:conferences@forestprod.org
www.forestprod.org/

May 19-22, 2003
International Symposium Green Chemistry: Uses and Applications of Renewable Raw Materials
Poitiers Cedex, France
e-mail: gilles.courtois@univ-poitiers.fr
http://labo.univ-poitiers.fr/umr6503/symposium

June 6-7, 2003
Flax workshop
connected with the 50th anniversary of Experimental Farm of the Institute of Natural Fibres in Sielec Stary "Evaluation of Economical and agricultural value of fibre and oil flax cultivars grown in Europe"
Poznan/Sierec Stary Poland
E-mail: sekretar@inf.poznan.pl

June 10-15, 2003
The Seventh International Conference on Frontiers of Polymers and Advanced Materials (ICFPAM)
Bucharest, Romania
Contact: Marian Apostol
E-mail: apoma@theory.nipne.ro

July 20-26 2003
10th International Conference on Composites Engineering, ICCE/10
New Orleans, USA
www.uno.edu/~engr/composite

September 11-12, 2003
4th International Symposium"Materials from Renewable Resources"
Erfurt Exhibition Centre, Erfurt, Germany
www.narotech.de

November 12, 2003
Nordic Biofibre Conference
Royal Veterinary and Agricultural University of Denmark, Copenhagen, Denmark

December 1-4, 2003
Flax and Allied Bast Fibre Plants for Human Welfare
National Research Centre (NRC) Cairo, EgyptOrganized by: NRC and FAO European Cooperative Research Network on Flax and other Bast Plants
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