The forest industry and innovation

Innovation

Finnish Forest Industries
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**THE FINNISH FOREST INDUSTRY** is known the world over for its development of innovative processes and products as well as solutions tackling the challenges of sustainable development. The goal of this industry remains unchanged: to strengthen its expertise as a forerunner as well as develop innovations for future business that utilise wood in a wide variety of ways.

Climate change and finite natural resources increase the need for development of resource-efficient processes and clean technology. Product end-users require lower impact and longer lasting products and services, which meet future needs and reduce environmental loads.

**FINNISH FOREST SECTOR MAKING FINLAND A LEADING BIOECONOMY**

The Finnish forest industry is leading the way for a new bioeconomy by developing customer-oriented product, service and technology innovations. The future of Finland’s forest sector is being built with new approaches using state-of-the-art technologies, interdisciplinary solutions and products that diversify conventional forest industries.

Key factors for achieving success are the ability to anticipate changes in consumer needs and to quickly apply adaptations to them. Finland’s unique forest cluster, a centre of expertise, lays an exceptionally sound foundation for this.

**WOOD IS FINLAND’S STRATEGIC RESOURCE**

Today and in the future wood is Finland’s strategic resource. Sustainable use of wood creates well-being and decreases the environmental load. Wood is also Finland’s most important renewable resource refined on an industrial scale. Industries based on the sustainable use of wood are a substantial source of revenue for both the national and regional economies.

“Wood is a precious renewable and recyclable material that can be used in a wide variety of applications. In the global economy it is a major source of national value added, whose utilisation promotes the solution of environmental and energy problems alike.”
SOLUTIONS TO CLIMATE CHANGE

Climate change can be slowed by sustainably increasing the use of wood and shifting the focus of consumption onto renewable materials. The forests have a unique ability of binding carbon dioxide in the atmosphere and storing it. The carbon dioxide is not only stored in live trees, but also wood and paper products. At the end of their lifecycle wood and fibre products, which can be reused and recycled, are suitable for use as a renewable energy source together with biomass that cannot be refined.

The benefits of wood and fibre as a renewable and recyclable material will be apparent in the low-carbon bioeconomy of the future. Materials and natural resources are carefully used, thus generating as much added value as possible.

The most significant environmental impacts of consumption come from housing, the food cycle and transportation. In Europe construction consumes more raw materials than any other industrial sector. Construction and demolition generate approximately 40–50% of all waste.

NEW PRODUCTS IN EXISTING AND NEW AREAS

In the forest industry, bioeconomy growth areas include construction and interior decoration, packaging and tissues, and bio-based energy. New bioeconomy products are found in biofuels and biochemicals as well as by combining wood and fibre with other materials. Smart paper and packaging products and building materials are developed using information technology. Products manufactured using nanotechnology are given entirely new properties. New applications, such as for the foodstuffs and pharmaceutical industries, are created alongside existing products.
PROFITABLE AND COMPETITIVE BUSINESS

Improving operational efficiency and streamlining organisational structures improve the cost competitiveness of Finnish production. Competitiveness is also improved by process innovations and services that reduce production costs and increase the value added of products. At the same time, new knowledge, technology and expertise and new operating models for creating more competitive and customer-oriented products and services are developed.

THE FOREST INDUSTRY DEVELOPS EXISTING AND NEW PRODUCTS

Existing forest industry products will still form the core of business for quite some time, as paper, packaging and wood products are constantly being developed by new generations. Even though the demand for some paper types is showing slow growth on mature markets, new applications bring with them new markets.

Bringing the manufacture of new products to Finland, however, requires that the existing production, by means of which the development of new products will be financed, is competitive.
OPTIMAL ENVIRONMENT FOR BUILDING SUCCESS

The Finnish forest sector boasts cutting-edge mills, highly skilled personnel and an otherwise wide range of expertise. Finland also has an ample supply of raw materials that fulfil the sustainability criteria. The only area where the sector has to catch up at the international level is in cost competitiveness.

The forest sector, which uses more domestic production inputs than any other industrial sector, operates in a network economy. The costs of the network as a whole are decisive to the competitiveness of the Finnish forest sector.
Highly skilled people, companies and investments go where the conditions are ideal for their performance. Finland can maintain its position as a leading innovation and production environment for the forest industry. However, this requires a systematic effort to continuously develop the innovation environment.

Expertise and education meeting the needs of companies

The forest sector innovation and expertise environment is competitive when companies have the opportunity to operate flexibly and the operating environment is conducive to continuous renewal. In such cases the available expertise and education meet company needs proactively in a way that there are always capable actors available for the development of businesses and new products and services.

Companies restructuring and creating the new seek partnerships with internationally prestigious institutions. This is why institutions of higher education must aggressively define their areas of expertise and target their resources accordingly. Co-operation has to be close.

Finland possesses the means to preserve its status as a leading production and innovation environment for the forest industry.
Expertise at the customer end of the value chain must be taught and the continuity of key professorships in the forest industry and its client industries must be ensured.

RESEARCH PROGRAMMES AND RISK FINANCING
FOR GROWTH AND NEW BUSINESS DEVELOPMENT

In a competitive environment there are major research and development programmes continuously underway. Companies are offered growth as well as programmes and risk financing for developing new businesses. In order to ensure continuous innovation the focus of research is shifted to the end of the value chain, close to the customer.

The operational prerequisites of world-class research in Finland must be maintained. Furthermore, ensuring the research requirements of the wood product cluster requires special attention, so that small and medium-sized enterprises (SMEs) can participate in the development and restructuring of the sector.

Public investment in the construction of pilot facilities and demonstration environments must be increased to such an extent that new business opportunities can be capitalised upon quickly, thus increasing competitive edge. The risk financing of companies in the sector must be increased substantially. In Finland the commercialisation of research and creation of new entrepreneurship and business must be accelerated by means of research funding, investment subsidies and taxes.

BIOECONOMY IN LEGISLATION

Legislation, standardisation, various regulations and public procurement, among others, must be subsidised to further diversify the use of wood and its fibre.

Regulations on products made of wood which are unjustifiably more restrictive than on other products should be eliminated. Leadership in moving the bioeconomy forward also demands initiative in the EU and other international organisations in recognising the position and environmental benefits of products manufactured using wood.
Moving forward as the world’s leading forest cluster

Finland’s forest cluster has played a crucial role in the development of technologies which are currently being utilised within the cluster throughout the world. These solutions were developed in the latter half of the 20th century, when Finlandambitiously brought its own forest assets to the global market in the form of, for example, paper and sawn timber. Finland also established the foundation for today’s strong forest cluster, particularly for mechanical engineering, chemicals and forestry.

Now, on the threshold of developing next-generation solutions, the Finnish forest cluster and its client sectors have the opportunity to play an equally central role. In a globalising economy new business opportunities are appearing not only in Europe, but also on large, growing markets and in areas of affordable raw materials.

Growth in conventional global forest cluster products is being seen primarily outside the EU. Advances in technology make it possible for the networking of expertise regardless of location.

INCREASING CO-OPERATION WITH CUSTOMER CLUSTERS

The forest cluster of the future will expand its boundaries, particularly to include customer clusters and information technology, chemicals and energy clusters.
THE GOAL OF FOREST INDUSTRY innovation is to bring new customer-oriented products, which are based on wood and fibre as well as Finnish know-how, to market. It is also to foster new and enhance existing companies and businesses. The goal is also to showcase the possibilities of wood and fibre and their role in the society of tomorrow as well as implement new types of operating approaches.

INVESTMENTS IN RESEARCH, INNOVATION AND BUSINESS DEVELOPMENT

The Finnish forest cluster invests annually EUR 450 million in research and development. Approximately two-thirds of the research and development investments are made within Finland.

FINNISH FOREST COMPANIES’ INVESTMENTS ON RESEARCH AND DEVELOPMENT

A large percentage of the forest sector’s machine and equipment investments involve production process development. Companies also engage in activities that specialise in the establishment of new businesses. These investments do not appear in research and development investment calculations.

In recent years the investment rate for the forest sector has been approximately 5% per annum. Out of all industrial sectors, the forest sector has invested the most in Finland every year.

SOURCE: Finnish Forest Industries, Confederation of Finnish Industries EF, Statistics Finland, corporate annual reports
New wood and fibre products

TRANSFORMING THE WOOD PRODUCTS INDUSTRY
FROM A MATERIAL SUPPLIER TO A SOLUTIONS PROVIDER

The wood products industry is becoming more closely linked to wood products end-user value chains, thus transforming it from a material supplier to a solutions provider. New types of business concepts are developed for the wood products industry and the prerequisites for product component suppliers are enhanced. New modification and surface forming technologies, composite products and structures, and integrating smart features in products and services updates wood products products.

Wood products industry material flows are also being used in potential bioenergy and bio-based chemical applications.

Growing demand is concentrated not only on existing products, but also more advanced products and services. New fibre and composite solutions are already making their entrance. The increased use of wood requires more extensive cooperation between the construction and wood products sectors.

The value of wood products and solutions used in construction will double by the year 2030. By the year 2020, 20% of the wood products industry turnover will come from bioenergy or related businesses.

Wood products industry research strategy

Birch plywood-fibreglass-carbon fibre composites can be used to make windmill blades. The structure offers an unparalleled strength-to-weight ratio and is also the most cost-effective alternative for the customer.

Plywood panels are also used for various modes of transport, such as flooring for trains and road vehicles and in gas tankers. The advantages of these panels are their light weight and durability.

At the World Expo 2010 Shanghai, the Finnish pavilion will be clad in modern shingles made of a wood-plastic composite.
NEXT-GENERATION BIOREFINERIES

New biorefinery products include biofuels and biochemicals as well as various biocomposites, bioplastics and biomaterials. The market, particularly where biofuels are concerned, is growing rapidly. This growth is primarily due to the EU targets on the renewable energy sources.

The next generation of biorefinery products includes second-generation synthetic biodiesel, bioethanol, bio-heating oil and bioenergy (green electricity and heating). Wood components and chemical compounds can also be used to make foodstuffs, pharmaceuticals and cosmetics as well as structural components for entirely new materials.

It would be wise to integrate biorefineries in pulp and paper mills, as a pulp mill is already, in this sense, a biorefinery. The forest sector possesses the necessary technology, know-how and production infrastructure for building the next generation of biorefineries.

Wood is also an ideal material for public buildings, apartment blocks and offices.
VERSATILE PACKAGING AND TISSUES

Fibre-based packaging, household and hygiene products, wood packaging, and labels and wrappings are some of the products currently manufactured by the fibre-based packaging industry. In these products environmental requirements enhance the position of renewable fibre. In addition to protecting a product, packaging is also an effective instrument for logistics and branding. Increased use of information or other technologies and new solutions can make fibre packaging smart and functional, thus serving the consumer even more effectively.

An indicator label on food packaging can, for example, show the continuity of the cold chain. RFID (Radio Frequency Identification) can, for example, certify that the mobile phone packaging is genuine. RFID can also be used to track and improve the flow of goods and information. Smart pharmaceutical packaging reminds the user to take their meds and helps in monitoring the pharmaceutical effects. Printed electronics offers even more new possibilities for both packaging and printed media.

High-quality household and hygiene products make everyday life easier and improve hygiene. When wood fibre is customised, for example, to be more effectively used in tissues or when chemicals or nanotechnology are added to fibre, entirely new kinds of tissue products are created.

Bio- and nanotechnology and combinations of various materials make it possible to develop new properties and functionality for wood and fibre products. For example, enzymes can be used to make wood fibre conduct electricity or be water repellent. Nanotechnology is used to modify wood fibre materials and endow them with entirely new properties. It is also possible to increase the durability of paper and board, regulate the moisture behaviour of fibres and alter their optimal properties.
RESEARCH AND DEVELOPMENT FOR THE GOOD OF THE ENVIRONMENT

Forest sector research and development are also guided by environmental considerations. New energy and resource-efficient technologies and solutions reduce the quantity of raw materials and energy required for products, whilst still retaining the best basic properties: products made of wood, its fibre or components are renewable, recyclable and biodegradable.

FROM NETWORKING COMES THE NEW

In a global economy expertise is networked and independent of location. Ideally, those who are capable of responding quickly to customer and consumer needs as well as utilising new technologies, operating approaches and business opportunities will succeed. Finland’s position on global expertise and value networks requires active participation and international influence.

The innovative combination of different scientific disciplines and areas of expertise, customer-oriented approaches and modern wood architecture will build up future competence. Joint forest sector research is precompetitive. In consortium and value chain-based projects new products and services are developed using the results of precompetitive research.
GAINING STEAM FOR COMMERCIALISATION

The commercialisation of research must be accelerated. Otherwise it will not be possible to take advantage of business opportunities or achieve a permanent competitive edge. Public investments that promote the construction of pilot facilities and environments must be increased. New types of environments for both the testing of new technologies and engaging in a dialogue with customers and consumers are needed during the research and development phase.

The risk financing of companies in the sector must be increased substantially. The commercialisation of research and creation of new entrepreneurship and business must be accelerated by means of favorable research funding, investment subsidies and taxation. Investments and industries go where the conditions are ideal for their development.

Rapid commercialisation and the customer-orientation of innovations require a new kind of co-operation, including for research and development. Expertise must be exchanged and investments made across sectors. More effective use of research which has until now remained outside the traditional forest cluster must also be put to use.

STRATEGIC CENTRES FOR SCIENCE, TECHNOLOGY AND INNOVATION

Strategic Centres for Science, Technology and Innovation (SHOK) offer a new way of working in close co-operation for top-level research units and companies using research results. The Centres facilitate the allocation of new and existing financing and human resources to areas vital to the Finnish business sector.

The Centres are choices for ensuring future competitiveness. Strategic Centres for Science, Technology and Innovation supporting the forest sector operating environment are Forestcluster Ltd, Cleen Ltd (Strategic Centre for Science, Technology and Innovation of the Finnish energy and environment cluster), machine and equipment manufacturer Fimex Oy and RYM-SHOK Oy Built Environment Innovations.
FORESTCLUSTER LTD STRENGTHENING FOREST CLUSTER RESEARCH

Innovations boosting company Forestcluster Ltd assembles and strengthens forest cluster research resources. Its purpose is to initiate research and innovation programmes and channel research funding to focus areas. Under the direction of Forestcluster Ltd, the Strategic Centre for the forest sector intends on becoming the strongest innovation environment at the international level. The forest cluster goal is to double the value of sector products and services by the year 2030.

In the Forestcluster Ltd research programme for smart and resource-efficient production technologies, existing processes are developed into more flexible production methods, which can be realised with considerably smaller investments. In the biorefinery research programme, which utilises wood in a variety of ways, functional and efficient biorefinery technology is developed and new approaches and value chains for the post-processing of wood are created. The third research programme focuses on future customer solutions.

Further information: www.forestcluster.fi

FINNISH WOOD RESEARCH LTD INITIATES JOINT RESEARCH FOR THE WOOD PRODUCTS INDUSTRY

Finnish Wood Research Ltd co-ordinates and consolidates joint wood products cluster research and development. The goal is to combine top expertise and foster skills, to use research resources sensibly and to improve the availability of information. In addition to domestic research co-operation, it is also important to participate in European and international research co-operation. The challenges encountered in international co-operation include the standardisation of norms and standards as well as market expansion.

EUROPEAN FOREST-BASED SECTOR TECHNOLOGY PLATFORM

The Forest-Based Sector Technology Platform brings together key actors within the sector in Europe. Its objective is to enhance joint research in the European forest sector. This co-operation gives industry the opportunity to direct and co-ordinate research resources in a way that supports company business goals. The European Union wants to be a leader in the building of a bio-based society and utilisation of innovations. The forest cluster plays a major role in this development.

Further information: www.forestplatform.org
The forest industry comprehends the production of pulp, paper and board and materials manufactured from these as well as the manufacture of sawn timber, plywood, boards and furniture. Wood-based construction and the carpentry industry are directly linked to the forest sector. Small and medium-sized enterprises (SMEs) account for approximately 15% of the total forest sector turnover. In the wood products industry SMEs enjoy a much larger percentage – approximately one-third of the total turnover – but in the pulp and paper industry, due to its capital-intensive nature, they only account for approximately 3%.

The Finnish forest cluster comprehends the forest, chemical and technology sectors, communications and packaging companies, the construction and energy industry, transport sector companies, forest owners and the planning and advisory services related to these industries as well as universities, institutions of higher education and research institutes. The value of forest sector turnover in Finland is approximately EUR 40 billion.

In Finland the forest sector, which is based on the sustainable use of a renewable raw material, is of significant regional importance in terms of raw material use, renewable energy and employment. The forest sector offers Finland technological leadership and competitive edge based on expertise as well as an industrial core for new growth companies and business sector services.

One out of every ten Finns earns a living in the forest sector or one of its attendant industries. The forest industry is instrumental to the future of over 50 Finnish towns and cities. In many regions the forest sector is the primary source of income and foundation of a vital community.

The forest sector directly and indirectly employs nearly 200,000 Finns. It offers a source of income and vitality even in the more sparsely populated regions of Finland. The Finnish forest cluster generates one-third of the nation’s net export revenues.
**FOREST INDUSTRY** is based on a renewable resource that binds carbon-dioxide from the atmosphere. Products can be recycled and reused as renewable energy at the end of their lifecycle like other forest biomass that is unsuitable for processing. Forest industry products are pulp, paper, board products, paper goods and packaging. The forest industry also includes wood construction and prefabricated wooden house construction, the sawmill and panel industry, the carpentry industry and biomass and biofuel refining.