



Antti Rohumaa



Kinga Judith David



Antro Sällä

Pentti Herajärvi

Renamed the International, rather than European, Panel Products Symposium in 2007, this well-established conference, organised by the BioComposites Centre in Wales, left the UK for Finland this year. Mike Botting reports

Viable solutions

Helsinki University of Technology's (TKK) Department of Forest Products Technology is well-known in the international wood products industry for its expertise in wood generally, but particularly in veneer-based panel products such as plywood and laminated veneer lumber (LVL).

Located in Espoo on the outskirts of Helsinki and adjacent to the Dipoli conference centre, TKK made the perfect host for IPPS' first meeting outside the UK and its 12th since it was founded by the BioComposites Centre (BC), Bangor University in 1997.

This year's conference took place against a backdrop of economic woe and uncertainty about what the future holds.

However, as conference chairman Rob Elias of the BioComposites Centre pointed out: "We are continuing to see a demand for panel products with excellent environmental credentials combined with higher performance...to deliver these novel functional materials we need to see panel mills working with machinery producers, resin and additive companies, academia and experts from new fields to develop viable solutions".

The IPPS conference is designed to foster exactly that kind of synergy and this year presented seven sessions entitled:

Setting the scene; Formaldehyde; Plywood; Resin strength and quality control; Resin technology; Monitoring and testing; and Raw materials and new products.

Antro Sällä of the Finnish Forest Industries Federation gave the keynote address *Opportunities and challenges for the panel industry in Finland*.

He said his federation has 120 member companies in pulp and paper, panels, solid and engineered wood and prefabricated housing.

Turning to statistics about his home



Rob Elias

country, Mr Sällä said Finland covers 338,000km², of which 10% is water in the form of 187,888 lakes. Sixty nine percent of the land is forested. The country is home to 5.2 million people, many of whom work in the 40 paper and board mills, 38 pulp mills, 170 sawmills and 20 plywood, particleboard and fibreboard mills. One in five Finns belongs to a family that owns some forest.

The panel industry represented 12% of the Finnish woodworking industry in 2006. It produced 1.4 million m³ of plywood (softwood and birch), 0.4m m³ of particleboard and 0.1m m³ of fibreboard.

"Finland has more than doubled its plywood capacity since the early 90s because of the growth in softwood plywood capacity, while in the last 60 years forest products industry production as a whole has quadrupled – sustainably," said the speaker.

The first speaker in session 1 was Miia Tähtinen of Pöyry Forest Industry Consulting Oy, Finland, on *The future of boreal coniferous fibre – need versus availability*.

She said that boreal forests comprise

the world's largest terrestrial biome, covering around one billion hectares of land in Canada, Alaska, most of the Russian Federation, Sweden, Finland, Norway, Iceland and the northern part of Mongolia. Annual growth increment is about two billion m³.

About 21% of all forest resources, and half of coniferous resources, grow in Russia. Warming of the climate is adversely affecting logging in Russia, said Ms Tähtinen, and while there are over 200 million m³ of unutilised fibre resources in the annual allowable cut, they are mainly far from existing infrastructure and consist largely of less-utilised species such as larch.

In Canada, the mountain pine beetle infestation is also exacerbated by climate change and it is predicted that by the end of 2008, 50% of mature lodgepole pine forests will be dead and 80% by 2013. This beetle is also an increasing problem in Sweden, reported the speaker.

"The 'as-usual' path for the consumption side has been disrupted severely by growth in China and other fast-growing economies, putting pressure on all raw materials," said Ms Tähtinen.

"Population pressure and previous 'mining' of renewable resources such as wood has added to the pressure.

"Active research into alternative methods to balance the supply/demand picture of boreal coniferous fibre is necessary."

Sarah González-García, University of Santiago de Compostela, Spain, spoke about a *Life cycle impact assessment of particleboard, MDF and HDF*.

"Production of chemicals used in the mills (specifically UF and PF resins), and high electricity consumption, significantly influenced the environmental impacts," concluded the speaker. "MDF seems to be the most environmentally-friendly

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Audience



panel, since it showed a lower contribution to all damage categories (human health, ecosystem quality and resources) than the other panels."

Rob Elias of the BioComposites Centre took *Market demand and innovation in wood based panels* as his theme.

He said that, while in terms of the gross operating rate of all industries in Europe, wood and wood products were third or fourth in the league tables, in terms of manufacturing of value-added products in the EU-25 countries, wood and wood products are way down the list and that this needs to be addressed.

"We need to add more value, learn more about market needs, recognise the speed of change, expand our knowledge base and work more closely with customers and the supply chain," said Dr Elias. "We also need to recycle more and reduce waste and energy consumption and public bodies are beginning to write this into their specifications."

Speaking of Modern Methods of Construction (MMC), in which panels play an important part, Dr Elias said the drivers were energy efficiency, lower U-values, waste reduction and transport reduction (less trips to the building site).

In this regard, one area of work for BC currently is in recycling MDF back into MDF, with a pilot plant due in December/January 2008/9.

Ending his presentation with his "to do list", Dr Elias said: "We need to increase the knowledge base (expand the network),

apply MMC principles not just to new but existing housing stock, apply for R&D funding under FP7 (EU Framework 7) and be more collaborative".

Kicking off session 2, Dr Mark Irlé, Ecole Supérieure du Bois (ESB), Nantes, France, spoke on *Free formaldehyde – where can I find it?*

He reported that a consortium of panel manufacturers, Synervia (a technology transfer organisation) and the ESB have created a project called 'Eco-Panneaux' which aims to help manufacturers of particleboard and plywood to produce panels that emit less formaldehyde during manufacture and in use.

This project involves making many panels with new adhesives and testing them for formaldehyde emission according to EN 717-2, providing an opportunity to observe the evolution of formaldehyde emission over time.

It was clear that there is a strong influence of specimen moisture content on formaldehyde emission as measured by the EN standard, said the speaker.

"In our view it is the diffusion of free formaldehyde, and hydrolysis of other formaldehyde-containing compounds, that is of greater relevance to the formaldehyde observed in typical tests applied to recently manufactured panels than the hydrolysis of the resin," concluded Dr Irlé.

"We should be careful in talking about formaldehyde coming from wood itself because we are not sure that this is true



Dipoli Conference centre

we would be handing a gift to the steel and concrete industry if we do."

Björn Engström of Casco Adhesives, Sweden, explained his work on *Real time determination of formaldehyde emission using NIR spectroscopy*.

He said that the method was looking promising in full-scale trials, but he did not know when it would be ready for commercialisation.

The final presentation in the session was given by Ms Kinga Judith David of Transilvania University, Romania, who reported on the successful conclusion of a *Study of formaldehyde emission stable state for particleboards by the flask method*.

Session 3, on plywood, was opened by Jouni Rainio of Hexion Specialty Chemicals, Finland. He offered *New approaches to different plywood gluing methods*.

He looked at roller and curtain coating, spraying, liquid extrusion and foam extrusion techniques and reported that tailor made resins are needed for each and that close cooperation between plywood mill and resin supplier is a must.

Factors influencing the properties of veneer based products was presented by Anti Rohumaa of TKK. Mr Rohumaa's work was on log soaking. He found that soaking affects veneer lightness in terms of colour; veneer wettability in which the contact angle was found to be negatively correlated to soaking temperature; and lap-shear bond strength with PF resin, which showed a positive correlation.

Henrik Heräjärvi looked at the quality of Finnish and Russian birch in plywood production. He concluded that quality differences between Russian veneers are significant in comparison with the Finnish cultivated birch stands while the log diameters from the latter are smaller.



Audience pays close attention to the speaker in the purpose-built Dipoli conference centre

IPPS CONFERENCE REPORT



Martin Ohlmeyer



Roger Rowell



Peter Meinschmidt

thus producing less face quality veneers.

"What is going to happen to the 15-20 million m³ of birch timber harvested annually in northwest Russia as their domestic use covers one third of that volume, at most?" asked Mr Herijärvi, referring to the imminent Russian export tax.

He also wondered what would happen to the Finnish mills, since 50% of their raw material has been imported from Russia in recent years.

The second day of this two-and-a-half day symposium began with session 4, opened by Steve Young of Timberfest New Zealand, who described successful trials of his company's Bond-o-Matic internal bond testing machine. He said this offers reliable, repeatable measurements, removing human variability in test results, and expects to release this device to the market in May 2009.

Milan Sernek of the University of Ljubljana, Slovenia, talked about *Monitoring bond strength development during phenol formaldehyde adhesive cure*. He said his team successfully used dielectric analysis with a detector embedded in the PF glue line of plywood.

Opening session 5, on resins, David Harmon, North American technical manager for Hexion Specialty Chemicals Inc, looked at *Advances in ultra-low emitting UF resin for particleboard, MDF and hard wood plywood*. The new resins will use existing resin plants and application systems, maintain mill productivity and minimise the cost impact.

"A variety of new resin technology choices are available to meet the needs of composite wood products customers and to also comply with the increasingly lower formaldehyde emission demands of the regulators," concluded Mr Harmon.

J David Mullen of Hercules Inc, US, offered a formaldehyde-free adhesive system for interior wood products.

In a joint venture with Heartland Resource Technologies, Hercules has developed water-based soy adhesives utilising soy flour and a proprietary cross-linking resin. Called Soyad, these resins were validated in July 2008 in hardwood plywood, particleboard, MDF and engineered wood flooring, said the speaker.

Session 6 on 'Monitoring and testing' was opened by Robert Massen of Baumer Inspection, Germany.

He reported on *Monitoring the quality and match to reference of [decorative] panels with a new camera-based true*

colour vision technology.

The colour-match and quality consistency of decor-surfaced panels is a vital element as the human eye can spot even minor differences (and apparently the female eye is statistically five times superior to the male in this regard – don't choose the cabinet furniture, guys!). However, human inspection is notoriously variable, both in one person over time and between different people/shifts.

Mr Massen said that colour perception is in fact a combination of colour and structure. He claimed that Baumer has developed a camera-based system with a continuously self-calibrating camera and ColourBrain® technology that simulates the human vision system.

Using the B-stage test to guide the production of impregnated low pressure laminate paper was introduced by Dmitri Sumigin in place of the absent David Rigg of Australia. The B-stage test measures the solubility of resin in warm water and is a reliable measure of the degree of polymerisation in the MF resin and can be used to predict impregnated paper behaviour.

Rounding off session 6, Hauke Kleinschmidt of Electronic Wood Systems (EWS) of Hameln, Germany, described the company's various equipment for on-line quality control measurements for panels, including a new calibration method for weight-per-unit-area and thickness measuring gauges as well as a new method for non-contact weight control.

Martin Ohlmeyer of vTI Institute of Wood Technology, Hamburg, Germany, looked at *Evaluation of parameters influencing VOC emissions from OSB* and concluded that it is possible to produce panels from various hardwoods, and coniferous wood species, with significantly lower emission levels than Scots Pine.

Steffan Jerrelid of Limab, Sweden, described his company's non-contact measuring system for the dimensions of panels using optical triangulation by laser sensors. This was the last presentation of day two of the symposium.

An excellent gala dinner with fun quiz followed, as always at EPPS/IPPS.

Peter Meinschmidt of the Fraunhofer Institute (WKI), Germany, had the job of waking up the delegates for the third morning of papers in session 7, *Raw materials and new products*.

Dr Meinschmidt's work was in two parts: using agricultural fibre to make lightweight particleboards; and testing

particleboards in which the pore space had been filled with Expancel microspheres or expandable polystyrene.

In part 1, successful lightweight panels were made, though with some reservations. In part 2, panels made using Expancel were found to need further work, while those utilising polystyrene showed no clear correlation between mechanical properties and amount of polystyrene.

How to produce high-performance straw MDF was explained by Sören Halvarsson of mid-Sweden University. Among the factors he highlighted as affecting final board quality were density and resin loading, removal of small fibre fragments and dust from the feedstock, clean, dry and mould-free feedstock and pre-treatment of size-reduced straw to increase the moisture content and for temperature and pH regulation.

Guido Hiltner of German size-reduction machinery maker Maier explained the *Multi-lateral applications of the knife ring flaker*. Maier's MRZ flaker is claimed to reduce energy consumption by nearly a third and to produce better flakes, requiring less glue.

Roger Rowell, professor emeritus of the University of Wisconsin, US, and chief wood scientist with Titan Wood in Holland, talked about *Production of dimensionally stable and decay resistant wood composites based on acetylation*.

"Acetylation allows us to compete with materials such as ceramics and steel in a materials world as a uniform, consistent and reproducible composite," he said.

The final speaker was Peter Vinden from the University of Melbourne, Australia, who spoke about *Microwave manufacturing of solid wood composites*.

Confirming its status as an international conference, IPPS not only attracted delegates from all over the world, including Brazil, Venezuela, Chile, Peru, Iran, Korea, the US and many European countries east and west, but also had an international line-up of speakers on a wide range of interesting topics.

Not only that, but the conference is further emphasising its international credentials by going 'on the move'. This year Finland, next year Nantes, France and subsequent years' events will be in other, as yet unannounced, venues. □

The full text of the papers presented at IPPS12 can be purchased from the BC, Bangor University, Gwynedd, LL57 2UW, www.bc.bangor.ac.uk