

Wood welding – an award-winning discovery

Like metal, wood "melts" and can be welded, a discovery recently rewarded by the Schweighofer prize.

The 2005 Schweighofer prize for innovation in wood science has been awarded to a joint Swiss-French team led by Tony Pizzi (France) and Balz Gfeller (Switzerland) for their work on wood welding.

Wood welding is a mechanical friction process allowing the assembly of timber without any adhesives.

No toxic adhesives needed

The research team involved has developed a wood bonding process that eliminates the use of adhesives. Almost 100 000 tones of furniture adhesives of petrochemical origin are used annually in France alone. Acrylic and vinyl adhesives sometimes contain small residues of their original monomers, which are toxic and polluting. Furthermore, the use of these adhesives is expensive and requires hours of hardening to obtain a finished bonded joint. In contrast, glueless wood welding is very quick.

"Weldlam" instead of "gluelam" wood

The process consists of applying mechanical friction, under pressure, alternately to the two wood surfaces to be welded. The equipment required for this process is already available as it is used to weld thermoplastic joints, in the automobile industry for instance. At the very high temperatures generated by mechanical friction (higher than 180°C) the characteristics of the lignin and hemicellulose between the cell walls of the wood change, and they start to flow, hence the initial phase of "melting". The wood fibres thereby released become entangled and set in the molten material as it cools, forming a high density composite. This composite constitutes the bondline, or better the weldline, of the timber joint.

The researchers involved have also elucidated some of the main chemical reactions occurring during the

welding. The mechanical resistance of the joints formed by welding in 2–4 seconds is comparable to that obtained 24 hours after gluing.

This process can be applied to weld two flat pieces of timber, originating from the same or different tree species, and can be used in the manufacture of furniture and wood joinery. The only limitation is that the joint is not exterior-grade, but only suitable for interior joints. One can then refer to "weldlam" where one now speaks of "gluelam".

The result of a mistake

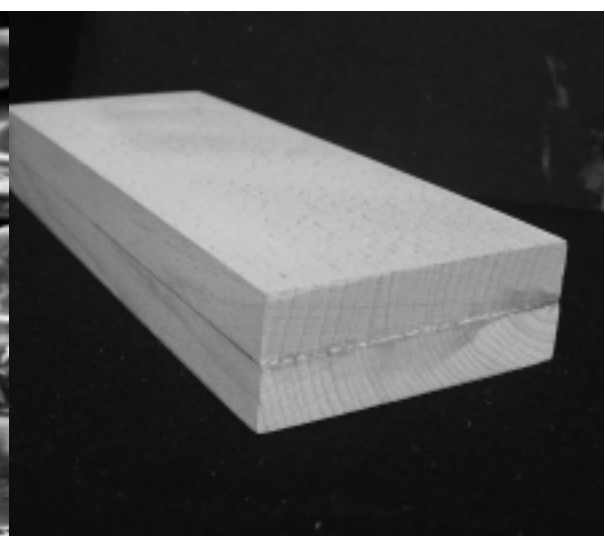
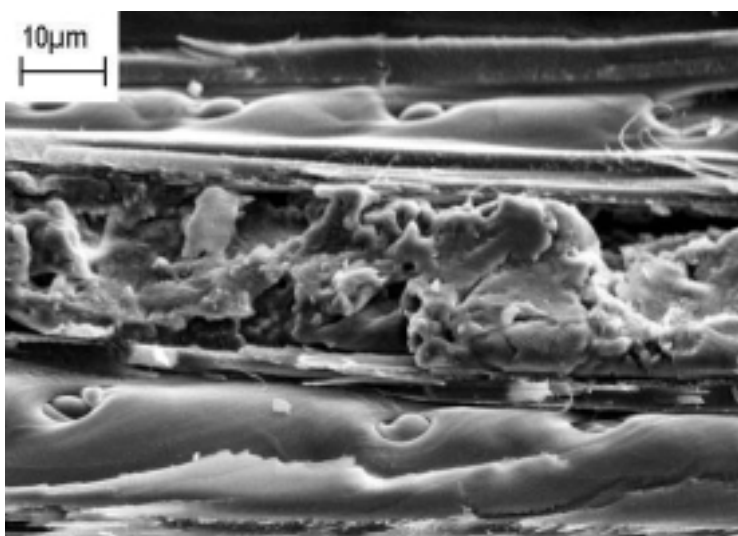
It is perhaps a paradox, that one of the researchers involved, Tony Pizzi, is an adhesives specialist. Prior to the discovery, the Swiss School used the linear friction equipment to glue wood by inserting and melting a piece of plastic between the two surfaces. One of the technicians forgot, on one

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Left: Intact and welded wood fibres.

Right: Wooden pieces welded with linear friction. Both photos: Pierre Gelhaye from INRA LerfoB



occasion, to insert the plastic between the wood surfaces. Nonetheless, the wood welded, and welded well. The French team then analysed in depth the welded joints by a number of analytical techniques and successfully determined what had happened at the molecular and wood anatomical levels. This knowledge was used to further improve the results.

Text: Jean-Michel Leban, INRA

Contact: INRA LERMAB-ENSTIB: Tony Pizzi, Antonio.pizzi@enstib.uhp-nancy.fr

Photo below: The research team at the Awards ceremony in Vienna in June 2005.

From left to right : Mr Schweighofer, Dr L. Delmotte, Dr F. Pichelin, Dipl. Ing. M. Lehmann, Dr A. Pizzi, Dipl. Ing. H.F. Kanazawa, Dr S. Wieland, Dr J.-M. Leban, Dr M. Properzi, Prof. B. Gfeller and Mr Bo Borgström, one of the main judges and President of the European Confederation of Wood-working Industries who presented the prize. One recipient of the prize, Dr M. Zanetti, was absent.

Photo: Franz Pfügl

THE SCHWEIGHOFER PRIZE

was established in 2003 by an Austrian sawmilling family wishing to foster innovation and the transfer of novel technologies in the wood industry. Every two years 300 thousand Euros are awarded, divided between a main prize for work that has already been extensively commercialized, and four prizes for other innovations, each worth 50 000 Euros.



European forest research raises its profile

A new high-level organisation serving European forest research will be established on 4 September, when the European Forest Institute (EFI) changes its legal status from that of a Finnish association to an international organisation serving the forestry-related needs of policy-making and decision-making bodies in Europe.

In the beginning of July Spain and Romania ratified the Convention on the European Forest Institute. Six other countries (Norway, Denmark, Croatia, Finland, Sweden and Germany) had already ratified the Convention. Two months after the eighth instrument of ratification has been deposited, the Convention will enter into force.

The current structure of the EFI association will remain very much the

same with the addition of a new organisational body, the Council. The Council, which will include representatives of the ratifying countries, will convene every three years.

The first Council meeting will be held in Finland on 5 September. The new international status of the EFI, endorsed by the European governments, will mark a new era in pan-European research cooperation by bringing international forest research closer to the national agendas. With the new status it will be easier to pool resources for topics important to forests and forestry.

Contact: Risto Päivinen, risto.paivinen@efi.fi

Source: www.efi.fi

EFI was established by 12 European organisations in 1993. Now the Institute has nearly 140 Associate Members organisations from 39 countries.

EFI Associate Member include universities, research institutes, industrial bodies and non-governmental organisations.

EFI conducts research in four Research Programmes (Forest Ecology and Management, Forest Products Markets and Socio-Economics, Policy Analysis, and Forest Resources and Information).

The annual budget amounts to 3 million euro and 15 nationalities were represented in its international staff last year.

SNS initiates a new journal for wood scientists

The first issue of a new wood material science and engineering journal will be published in 2006, as a result of initiatives from the SNS-affiliated Wood Science and Engineering network. It will be the first journal in the field issued from the Nordic countries.

The network, together with the SNS secretary, identified a need for the new journal. Some of the motives for publishing the new journal are:

- Research in wood technology has expanded in the Nordic countries through programs such as Wood Wisdom. This implies that more papers will be published.
- Much of the research in the wood science field is published in conference proceedings. With another journal competing for these manuscripts, more articles can be published in peer-reviewed and internationally available journals.
- The publishing time of many of the competing journals is rather long; 11–19 months for Journal of Wood Science, Wood Science and Technology, Wood and Fiber Science and *Holzforschung*, for instance. The long publishing time is one reason why many wood science students in

the Nordic countries prefer to write monograph dissertations. A new journal should strive to reduce the publishing time.

- The Scandinavian forest-related journals *Silva Fennica* and *Scandinavian Journal of Forest Research* are not preferred journals for wood science articles. Thus, the risk of overlaps with these journals is small.

“Sister” to ScandJForR

The new journal will be published by Taylor & Francis, under an agreement with SNS. It will thus be a sister publication to *Scandinavian Journal of Forest Research*, and there will be close cooperation between them. The name has not yet been decided, but the working title is “Wood Material Science and Engineering”. Articles on pulp and paper products will only be included if they are related to wood’s material properties.

SNS also calls for contributory



The Metla building in Joensuu is an example of the increasing interest in wood technology. 2000 m³ of wood was used in its construction, in many innovative ways.

Photo: Mats Hamnerz

articles for the first issues. An editor is also being sought. Anyone interested should contact the SNS secretary at og@forskningsradet.no.

Shortcuts

Forest research in the North

News and Views has published a series of articles over the years 2002–2005 describing forest research in the Nordic countries, the Baltic States and Russia.

The articles have now been compiled into a single document, freely available for downloading at the SNS webpage,

www.nordicforestresearch.org



Honorary doctorate for Joseph Buongiorno

A member of the editorial board of *Scandinavian Journal of Forest Research*, Professor Joseph Buongiorno, has been appointed honorary doctor at the forestry faculty of SLU (Swedish University of Agricultural Sciences).

The doctorate is being awarded in recognition of Professor Buongiorno’s economic and mathematical models based on economic theory. The tools that Joseph Buongiorno have

developed help analysts around the world to better understand changes in trade patterns, environmental and energy politics, demography and technology.

Professor Buongiorno works at the Department of Forest Ecology and Management, University of Wisconsin-Madison, USA.

He will receive his doctorate in October in Sweden.

NOVA – a university spanning national boundaries

Many recent Nordic doctors in forestry, agriculture or veterinary science have taken at least one course under the auspices of NOVA – the Nordic Forestry, Veterinary and Agricultural University Network.

NOVA and SNS have started to cooperate in the provision of research training.

NOVA's primary objective is to promote collaboration in higher education between the Nordic universities within the fields it covers. The main focus is on MSc- and PhD-level education.

"The PhD-courses are a success story of NOVA", says Paul Jensén, rector of NOVA. Each year, 300–400 students take the 10–15 PhD courses it is involved in.

Besides organizing educational programs, NOVA seeks to increase the mobility of students across the national borders. The numbers of Nordic students who have studied abroad have doubled in the last three years. NOVA is also expanding its activities in the Baltic States and Russia, and many students from these countries now participate in the courses.

Co-operation with SNS

Discussions on ways that SNS and NOVA can cooperate are currently underway. The main focus of the SNS

is on research, while NOVA focuses on education. Thus, research training could be a field where joint interests of the organisations meet.

"Research training has so far had low priority for SNS, but development within this area is highly desirable", says Johs Kolltveit, head of the SNS board. "SNS and NOVA could share the costs of supporting research training activities and dispersing information on them. For example, SNS could provide support for meetings of SNS-affiliated networks and encourage them to organise PhD courses in parallel to the meetings. NOVA could help organise the courses".

"We will also discuss applications from external donors, such as Marie Curie funds from the EU for arranging research training courses and conferences", says Paul Jensén.



NOVA is primarily funded by its seven member universities/faculties:

- KVL (Royal Veterinary and Agricultural University, Denmark)
- SLU (Swedish University of Agricultural Sciences)
- UMB (Norwegian University of Life Sciences)
- NVH (Norwegian School of Veterinary Science)
- Helsinki University – Faculty of Veterinary Medicine
- Helsinki University – Faculty of Agriculture and Forestry
- Agricultural University of Iceland

NOVA's secretariat is based in Alnarp, Sweden, and has three employees.

Webpage:
www.nova-university.org

Paul Jensén, the rector of NOVA, has seen a strong increase in the activities of NOVA during the last few years.

Contact News & Views

Write to the scientific editor:
Mats Hannerz,
Skogforsk
SE-753 52 Uppsala
Sweden.
mats.hannerz@skogforsk.se

More info about SNS:

www.nordicforestresearch.org

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- short
- relevant to the Journal
- interesting for the readers.

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News & Views is edited by
Mats Hannerz
mats.hannerz@skogforsk.se,
and produced by
Carl Henrik Palmér. chp@areca.se