

COST E49 “PROCESSES & PERFORMANCE OF WOOD- BASED PANELS”

Measurement and Control of VOC Emissions

“*COST Action E49*” is a European network of scientists from both the public and the private sector, active in the area of “Processes and Performance of Wood Based Panels”. Its principal aim is to help the European wood-based panels sector to meet future demands and competition from other materials and markets through the scientific-based advance of wood-based panels and their production processes towards higher technical, economic and environmental standards.

Action E49 organised its second conference in cooperation with the Wilhelm-Klauditz-Institut (WKI) of the Fraunhofer Gesellschaft, in Braunschweig, Germany, from 28 to 29th November 2007. The conference focused on technologies and strategies that will minimise VOC emissions from wood-based panel products during their manufacture and use. The conference attracted over 90 delegates from 29 countries.

Wood-based panel products contribute to the comfort and well-being of everyone through their applications in furniture and in house construction; and their contribution to indoor air quality is becoming increasingly important. Today, a healthy indoor environment is a matter of public

interest highlighted by the recent publication of a number of regulations and guidelines. Furthermore, there is an increasing demand for standard test methods to evaluate the use of indoor products in Europe. In 2000, the German Committee for Health-related Evaluation of Building Products (AgBB) initiated this discussion by developing criteria for the evaluation of interior building products on the basis of a previous COST action.

From June 2007 panel manufacturers need to consider the new European regulation for ‘Registration, Evaluation and Authorization of Chemicals’ (REACH), that aims to improve the protection of human health and the environment, from the risks that can be posed by chemicals.

Within this framework, the main topics of the COST E49 conference were:

- Measurement and risk assessment of VOC emissions;
- Natural and synthetic emissions of VOCs from wood-based panels;
- Technologies for the reduction of VOCs.

MDF YEARBOOK is pleased to publish the following summaries of presentations by speakers and thanks the organisers for their cooperation.



Conference hall

Measurement and risk assessment of VOC emissions from wood-based panels

Modern, thermally efficient buildings with low air-exchange rates should only be built with products that do not downgrade indoor air quality. "Wood and wood-based materials are potential sources of very-volatile, volatile and semi-volatile organic compounds (VVOC, VOCs and SVOCs) because of the natural smell of wood and additives used to make the products like glue systems and finishes". Therefore, modern product development and innovations should consider both the health effects and the technical performance of products. It is anticipated that materials and products for indoor use will be evaluated for their chemical emissions and sensory effects in the near future.

Dr. Mark Irle, Chairman of COST Action E49, opened the conference by highlighting the objectives of the Action and the challenges faced by the wood-based panel industry and its research community. He stressed the Action's working ethos to intensify the interactions between the industry and academia by raising awareness in both parties and by reducing the information and communication lag between them. Key initiatives include the coordination of research activities as well as the identification of technology gaps and industry research needs. These are achieved by organization of meetings, workshops, conferences, scientific missions and training schools, by the preparation of state-of-the-art reports and also by launching website databases gathering and sharing information on research projects and industry needs.

Kristina Saarela, VTT, Finland, the first keynote speaker, addressed the Measurement and risk assessment of VOC emissions by presenting the existing standards for VOC emission testing, the emission labelling systems established to control indoor air quality, the calculation of risk indexes as well as examples of indoor air concentrations in buildings with wood panels and wood structural elements. Dr. Saarela noted that the calculated risk index for indoor VOCs had decreased between 1997-2004, and that the sensory evaluation of building materials is essential when predicting its impact on indoor air quality as the inhabitants perceive it.

Dr. Vera Steckel, BFH, Germany, spoke about the evaluation of rapid testing methods suitable for the assessment of VOC-emissions from wood products. Three different materials had been tested: solid timber, OSB, and fibreboard. For rapid testing, a slightly modified gas analysis instrument (originally designed and used for formaldehyde testing according to DIN EN 717-2) as well as a commercially available thermo-extractor had been applied. The chamber method (DIN EN ISO 16000-9) had been used as a reference method.

Prof. Edmone Roffaël, University Goettingen, Germany, discussed the release of volatile organic acids from wood and wood-based panels as assessed by using the flask-technique originally developed for measuring the formaldehyde release from panels. He mentioned that the interaction between the resin and wood in particle- and fibreboards has a decisive influence on the release of volatile acids from the boards, and that PF-bonded boards emit higher amounts of acetic acid compared to



Dr. Mark Irle

PMDI- and UF-bonded boards.

Prof. Dieter Haaks, Aero-Laser GmbH, Germany, presented the determination of formaldehyde emission from wood-based and plastic materials using the fast and sensitive Formaldehyde-Monitor AL4021 in combination with desorption- and extraction-techniques.

Prof. George Mantanis, TEI Larissa, Greece, showed results from evaluating the indoor concentrations of formaldehyde in new apartments. In most cases, concentrations far exceeded the level of 1ppm, however, systematic ventilation proved helpful in reducing the formaldehyde indoor levels. In that respect, residents were also advised not to smoke inside the new apartments helping to diminish the formaldehyde concentrations sooner.

Dr. Richard Gminski, Institute of Indoor and Environmental Toxicology, Germany, presented the development of a new in-vitro chamber measurement method for evaluating the toxicological properties of volatile organic compounds (VOC) as single components or as emissions from building products in simulation of in vivo inhalation exposure. This method can reveal the potential risk to human health of indoor air pollutants such as VOC emitted from building products.

Natural and synthetic emissions of VOCs from wood-based panels

Prof. Salthammer, WKI, discussed the indoor air guideline values, product labelling and the issue of indoor chemistry and particles.

Dr. Martin Fischer, the Institut für Holztechnologie Dresden, Germany, presented the results from determining the VOC emissions in two case studies: samples of MDF prepared from pine-wood and multi-layer parquet elements tested for conformance according to the AgBB scheme. He concluded that attempting to reduce one type of VOC may increase the evolution of another type and research efforts should be continued to find solutions for VOC emission reduction, a problem inherently coupled with the use of home-grown bulk woods for the production of boards, e.g. pine. The continuous monitoring of the VOCs from wood and wood based products is a

necessity for safeguarding a healthy living environment.

Dr. Jorge Martins and colleagues from the Polytechnic Institute of Viseu, Portugal, studied the effects from using recycled wood on the formaldehyde release of particleboard (PB). The influence of different wood mixtures (pine, eucalypt, sawdust and recycled wood) and operating conditions (platen temperature and press cycle time) on PB mechanical properties and formaldehyde content (determined by the perforator method) had been analysed. The results revealed that the mechanical performance decreases when increasing the percentage of recycled wood. Also, the extractable formaldehyde increases when increasing the percentage of recycled wood, but the quality of recycled wood may play an important role.

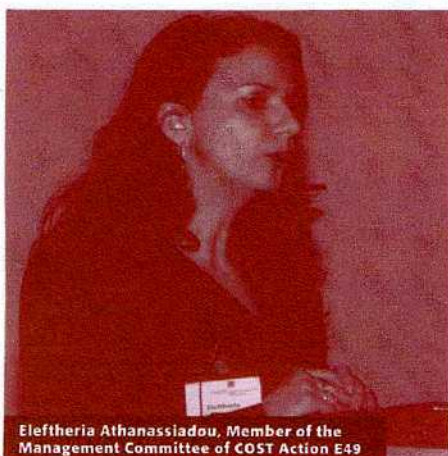
Prof. George Ntalos, TEI Larissa, Greece, discussed the use of agricultural residues such as cotton stalks and vine prunings as raw materials for board making, which provided reduced formaldehyde content according to EN 120 (perforator method) when tested in experimental one-layer particleboards.

Dr. Chuck Yu, BRE, UK, presented the evaluation of emissions from wood panels prepared from recovered construction timber treated with new types of wood preservatives. The testing had shown negligible emissions to the air of the active substances. The VOC emissions evaluated according to the German AgBB scheme were shown to represent a low risk to building occupants. The emission of formaldehyde from the boards was equivalent to or below the European E1 limit.

Technologies for the reduction of VOCs

Dr. Martin Ohlmeyer, BFH, made an introduction on the VOC definitions, on the evaluation of formaldehyde and VOC and on the parameters influencing these emissions.

Mrs. Eleftheria Athanassiadou, CHIMAR HELLAS SA, Greece, reviewed the re-evaluation of formaldehyde by the IARC and the reactions it created, the current regulatory and industry status, the report prepared by IARC and the recent Formaldehyde science conference organised by FormaCare. She presented the worldwide occupational exposure limits for formaldehyde, the classification according to leading standards for wood panels as well as the solutions proposed by CHIMAR to



Eleftheria Athanassiadou, Member of the Management Committee of COST Action E49



Dr Martin Fischer

produce panels with reduced formaldehyde emission even at the level of natural wood. She concluded that it is possible to meet the new demands for very low formaldehyde emission from composite panels with the use of properly formulated aminoplastic resins systems, without any deterioration in panel performance or significant modification of plant operating conditions, or need to employ other types of binders.

Dr. Martin Feng of FPIInnovations – Forintek Division, Canada, discussed the production of pilot scale OSB panels using three types of commercial adhesive systems as a wood binder (PF, PF/MDI and MDI). He demonstrated that spraying aqueous urea solution to dry wood strands at various loading rates can effectively reduce the emissions of formaldehyde, acrolein and some other volatile organic compounds from OSB pressing without adversely affecting the board properties and regardless of the adhesive type used.

Prof. Julia Mihailova, University of Forestry-Sofia, Bulgaria, presented the results from investigating ways to reduce the formaldehyde emission of UF-bonded PB. The approaches presented include: introducing various additives, clarifying the influence of interactive production parameters such as the quantity of added carbamide, the pressing temperature and the moisture content of wood particle mat, and using low-toxicity UF.

Dr. Rob Elias of the BioComposites Centre in the UK, discussed the development of a new bio-resin based on rapeseed oil. He mentioned that manufacture is carried out in a clean, low effluent procedure, yielding formaldehyde free products with a high solids content. The processing steps are achievable at industrial scale and the bio-resin system is well placed to compete with phenol-formaldehyde and isocyanate resin formulations in wood-based panel applications.

The conference closed with the presentation of **Prof. Marius Barbu** of Transilvania University Brasov, Romania, providing an update on the powder coating technique as an alternative solution to obtain low VOC finished wood-based panels. For more information, visit: www.costE49.org