Proposal for a new COST Action

COST E49

"PROCESSES AND PERFORMANCE OF WOOD-BASED PANELS"

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MEMORANDUM OF UNDERSTANDING
for the implementation of a European Concerted Research Action
designated as

COST E49

"PROCESSES AND PERFORMANCE
OF WOOD-BASED PANELS"

The Signatories to this Memorandum of Understanding, declaring their common intention to participate in the concerted Action referred to above and described in the Technical Annex to the Memorandum, have reached the following understanding:

1. The Action will be carried out in accordance with the provisions of document COST 400/01 "Rules and Procedures for Implementing COST Actions", the contents of which the Signatories are fully aware of.

2. The main objective of this Action is the scientific-based advance of wood-based panels and their production processes towards higher technical, economic and environmental standards.

3. The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at Euro 12 million at 2004 prices.

4. The Memorandum of Understanding will take effect by being signed by at least five Signatories.

5. The Memorandum of Understanding will remain in force for a period of four years, calculated from the date of the first meeting of the Management Committee, unless the duration of the Action is modified according to the provisions of Chapter 6 of the document referred to in Point 1 above.
A. Background

A wide range of wood-based composite materials are made across the World. This COST Action is concerned with a sub-set of wood composites, that is, the wood-based panel (WBP) products. To differentiate WBP from other wood composite materials, this Action defines a panel product as one in which the thickness of the product is considerably smaller than either its width or length. The broad categories of products covered are: particleboards; oriented strand boards (OSB); fibreboards, particularly hardboards and medium density boards (MDF); and the veneer-based products including plywood and laminated veneer lumber (LVL). The structural composite LVL has been included, as it is made as a panel product that is subsequently cut into pieces for use in construction.

The European WBP industry has developed considerably in the last decades and is of significant economic importance. Since 1980 the production of WBP (including plywood) has increased from about 30 to almost 60 million m³ \(^1\), reaching a production value of more than 13 billion € in 2001 \(^2\). It is also a significant employer as, currently, it provides about 85,000 jobs \(^2\). While particleboard still dominates the European market, the introduction of new products, such as MDF and OSB, have contributed greatly to this growth. For example, the European production capacity of MDF in 1990 was 3 mill. m\(^3\) and by 2002 it was 12 mill. m\(^3\), an increase of 400% \(^3\).

Furthermore, it is not just the WBP manufacturing industry that is of economic importance in Europe, it is also the European machine building companies who supply production equipment to the WBP industry. These European engineering companies are world leading for more than 50 years. Consequently, this sector is strongly export orientated. Continuing their technological advantage must be a leading aim for all players involved, including industry, research and government.

Besides the panel producers and the equipment manufacturers, there are other important sectors linked to WBP production. On the wood supply side, forestry, the saw milling and planning industry, and the recycled wood sector are heavily dependent on WBP production. Similarly, suppliers of adhesives and additives have also benefited from the growth in the WBP industry, since up to 20% of WBP structure (that is up to 50% of the production costs) can be attributed to these non-wood raw materials. On the processing side, the diversification of panel products due to their wide application fields and the increased productivity in panel production have stimulated the furniture and building products markets.

Despite the overall significance of the European WBP industry, this sector is currently facing considerable challenges. The most important of which are:

- There is strong competition from other materials, e.g., from inorganic materials and metals in the construction sector and plastics in the packaging sector.
- For WBP, the competition from overseas can be expected to increase, due to:
  - the continuing relative reduction in transport costs,

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\(^1\) Web-based FAO database FAOSTAT, accessed January 2004
\(^2\) EPF Annual Report 2002-03
\(^3\) Wood Based Panels International, 23(4):11-20.
the huge volume of investment in new production capacity for WBP in Asia,
product innovations developed overseas,
currency ratio between Euro and US$,
shifting downstream processes (e.g., furniture production) to low-wage countries.

- For the equipment manufacturers, competition from overseas has developed in recent years, and will almost certainly continue to do so. Some of the machines, so far predominantly produced by European manufacturers, are already offered from East-Asian companies at considerably lower prices. If the product quality has not reached the European standards yet, it is only a question of time before it reaches current European standards.

- Strong competition within the wood based panels industry itself has lead to low profit margins, as well as a world wide concentration of the WBP manufacturing companies in to a few groups and to mega-sites. A considerable number of smaller production sites have been closed in recent years, and the medium size sites will probably be involved in this process soon.

- The demand for systems, as opposed to simply flat panels, is increasing. Such demands generate new challenges regarding the pre-defining and tailoring of the properties of the system components. Vertical integration of production processes becomes important for both the producers of WBP and for research activities.

- Care has to be taken that standards, regulations and legislation, often initiated by strong interest groups representing other materials, do not create an unfair market situation for WBP in Europe. Examples of such tendencies are regulations on VOC (volatile organic compounds) product emissions, or on recycling issues.

These challenges must be met by the following co-ordinated tasks:

1. **Bring the European industry together.** Improve and increase pre-competitive activities (i.e., strategic planning, research, marketing, lobbying).
2. **Bring the European research community together.** Focus and coordinate research capabilities and activities.
3. **Intensify interactions between industry and research community.** Reduce the information and communication lag between both parties. The research community must become more aware of the industry’s needs, and the industry should learn of the expertise, capabilities and facilities of the research institutions.

While the first of these three tasks is heavily dependent on activities from inside the industry itself and its willingness to take steps together, the second and third tasks will mainly (but not exclusively) be addressed by this COST Action.

Although there has been a concentration within the industry to form large company groups and mega-production sites in recent years, the technological progress in WBP production is still dependent on the involvement of the academic research community in both pre-competitive and competitive research. The main research fields in the WBP sector are:

- **Adhesives, additives, wood/non-wood raw materials:** Effects on product performance; market and supply situation; including recycled wood and fibres from annual plants.
- **Process technology:** All stages of the process from break-down of wood to finishing of the panel; optimisation of established processes (e.g. additive blending, hot-pressing, etc.); development of new equipment (e.g. dry-gluing for MDF, mat pre-heating); environmental issues (e.g. process emissions in air, water, noise).
- **Sensor technology, Non destructive testing (NDT):** (On-line) process control; NDT quality control, forecast, optimisation.
- **Product development:** New panel products; better building systems; new material classes; low product emissions, new finishing techniques.
- **Fundamentals:** Physical phenomena on the macroscopic, microscopic and sub-microscopic level (e.g. heat and mass transfer in several sub-processes, material deformation and rheology, adhesion, adhesive and additive distribution).
**Modelling and computer simulation:** From individual phenomena to global models; subprocesses or process chains; statistical modelling; mathematical-physical modelling.

**Economics and Marketing:** Impacts of exchange-rate fluctuations; changes in production capacity around the World; climate change levy; CE marking; eco-labelling.

**Ecological and social impacts:** Disposal and recycling options; minimisation of negative environmental effects; factories and their local communities.

This list demonstrates the diversity and breadth within the field of WBP research itself. There is no doubt that today, research scientists must be specialists in their field in order to achieve the critical depth required. Nevertheless, it is also important for the individual to keep an overview of the whole sector and the factors affecting it. Equally, the industry must find guidance through the variety of competences available.

Such concern requires a direct, transparent and uncomplicated information exchange among the different fields of research, between industry and research, and across national boarders. Whilst a few of the listed research topics are, or have been, part of other COST Actions the vast majority have not. A single COST Action that unifies the key players in the European WBP industry and European research area is, therefore, urgently needed.

The Action will build on some previous Actions, and will use synergies with existing Actions. In this respect, the following Actions will be of relevance:

- **E8** Mechanical performance of wood and wood products
- **E13** Wood adhesion and glued products
- **E29** Innovative Timber & Composite Elements/Components for Buildings
- **E31** Management of Recovered Wood
- **E34** Bonding of Timber
- **E44** Wood Processing Strategy

This COST Action will also work with existing European networks, initiatives and organisations (e.g., InnovaWood, ERA-Wood, European Panel Federation (EPF)). The large number of stakeholders highlights the necessity for promoting and coordinating WBP related research at a European level.
B. Objectives and Benefits
The main objective of this COST Action is the scientific-based advance of wood-based panels and their production processes towards higher technical, economic and environmental standards. Such improvement is essential if the sector is to meet future demands and competition from other materials and markets.

Overall objectives and benefits
The COST Action is an ambitious initiative which will provide a common platform for the key players in the European WBP community to:

- Coordinate and conduct WBP research activities
- Identify and address strategic scientific and technological problems, in a cohesive and integrated manner
- Improve the understanding of industry needs by the academic research community
- Broaden the knowledge basis to promote the development of innovative technologies in WBP production at the European level
- Collate and analyse information on WBP related research activities and facilitate an effective and rapid European-wide sharing of research results
- Inform the industry about available research capabilities, expertise and facilities and how to access these
- Stimulate the development of interdisciplinary approaches in WBP research
- Provide information on national research programmes and possibilities in Europe
- Strengthen the WBP sector to prepare for joint research projects at an European level
- Increase financial involvement of industry in research with the academic community
- Identify trade barriers to WBP caused by different national codes, standards, regulations and laws
- Reduce the differences in interpretations of European standards
- Develop strategies to increase the use of WBP, taking into account the inherent capabilities of the materials
- Disseminate knowledge and information about WBP to the wider scientific and public community
- Prepare an outlook of the future trends and developments in the WBP sector from European and intercontinental point of view

Scientific and technological objectives
This COST Action will facilitate activity in the following fields:

- Enhance existing WBP and stimulate product innovations through a knowledge-based R&D approach
- Optimise the ecological and technological properties of WBP
- Improve automation and control technologies for all stages of the production processes
- Minimise environmental impact of production processes
- Adaptation/Modification of the production processes caused by external influences, e.g. raw material supply situation
- Provide information on suitability of WBP for new and existing building systems
- Improve techniques for modelling and simulation of WBP production and performance
- Enhance the understanding of the relationships between process, structure and product performance on a micro and macro scale
- Integrate fundamental research with applied science on WBP process technologies and products

All activities will be conducted against the background of current and future international markets (e.g., Europe, China, North America). Results of these activities will help the industry to reduce its costs and therefore improve its competitiveness.
C. Scientific programme

This COST Action will initially consist of three Working Groups (WG). While the first and third WG concentrate on technology and information transfer, the second WG will cover fundamental research on WBP production and product performance. This combination reflects the importance placed by those who will be involved in this Action on linking fundamental and applied research. This combination is considered a prerequisite to the development of a viable medium to long term view of research and development activities.

While there is a considerable amount of research and development work on WBP production and performance going on in different European wood research institutes, this work is not coordinated. The titles of articles published in journals and presented at conferences suggest that there is extensive replication of effort at the moment; part of the problem is the lack of information exchange between the old and new EU member states, caused by traditional barriers and language restraints. The aim of each of the WGs is to bring the European researchers and practitioners together to improve information transfer, reduce replications/duplications, and set up collaborative projects.

**WG 1: Process optimisation and process innovation**

All companies are interested and are actively involved in process optimisation; it is part of their survival strategies. Understandably, each company guards its knowledge in order to maintain a competitive edge. This WG recognises this and will not attempt to gather commercially sensitive information. Instead, this WG will focus its efforts on the collation and co-ordination of research on generic issues that face many panel product manufacturers.

For example, the use of recycled wood is increasing across the particleboard manufacturing sector. This is positively perceived in general, but it does come with some problems, in particular, its cleanliness. All companies who use recycled wood specify that preservative-treated wood should be excluded from the supply. It is difficult, however, for the recycled material suppliers to be sure that they do not inadvertently include treated wood and for the particleboard manufacturers to check that their suppliers are not sending treated wood. Research on the detection and measurement of contaminants in recycled wood and finished products would be of benefit to the European WBP industry as a whole.

Other generic issues include:
- Pre-competitive research on new production methods
- Real-time monitoring of the manufacturing processes
- Process automation
- The reduction of gaseous, aqueous, light and sound emissions from factories
- Improving binder efficiency
- Enhancing recycled wood cleaning systems
- Minimising energy usage and environmental impact

Initial discussions between the manufacturing and research communities are likely to generate other generic topics.

**WG 2: Fundamentals and modelling**

A fundamental understanding of those physical and chemical mechanisms relevant in the manufacturing process, and of the relationship between raw materials, process and properties of the final product is a prerequisite for the design of flexible, intelligent and cost-effective production systems, as well as for the development of innovative products. For example, to truly comprehend the relationship between process and product performance, the influence of the process on the
The micro-structure of the panel must first be understood, and then how the structure affects the performance of the panel. When looking at competing material types, technological advances of which have been heavily driven by fundamental research efforts, it becomes evident that the long-term development of the WBP sector will be difficult without such knowledge.

There has been a rapid rise of development and usage of computer modelling and simulation techniques in almost all engineering disciplines during the last two decades. However, the full potential of today's models has not yet been exploited, and not all available models meet the needs of the industry. One of the objectives of this WG is, therefore, to collate information on modelling and simulation, to inform the industry about existing simulation models and their potential, and to gather knowledge about the requirements defined by the industry.

The scientific programme for this Working Group may encompass:

- Heat and mass transfer during drying, pre-heating and hot pressing
- Mat formation from a geometrical and statistical point of view
- Mechanics and rheology of fibres and particles on a meso-, micro-, and sub-microscopic scale
- Raw material-process-property relations, including adhesive cure and bond strength development
- Sorption processes of raw materials and products
- Simulation of production processes
- Modelling of the performance of WBP

**WG 3: Performance in use and new products**

This WG will be concerned with the performance and end-uses of WBP. Across Europe, universities, research institutes and industry conduct research and development on existing and new products. Often, however, information dissemination is limited to the national level. It would be beneficial to the WBP sector if this information could be more effectively disseminated at the European level. Areas of particular interest include understanding and optimisation of the performance of WBP; differences between laboratories/countries in interpreting/implementing test methods; behaviour and end uses of new products; and analysing market information for the development of new products/applications. Considering the above, collaborative activities at the European level are needed. The overall objective of this WG is to improve the efficiency of use and competitiveness of WBP. In particular, the WG aims to take into account the following specific issues:

- Weather, fire and bio resistance of WBP
- Dimensional stability of WBP
- Creep and fatigue behaviour of structural composites
- New products for structural applications
- Structural integrity of WBP assemblies and their connections
- New surface coating techniques with environmentally friendly materials and processes
- Formaldehyde and VOC emissions from WBP
- Combinations of wood with non-wood materials
- End of life strategies for WBP
- Differences between laboratories/countries in interpreting/implementing European test methods
- Verifying the appropriateness of existing design values
- Comparison of European test methods and standards with methods of important overseas markets
- Socio-economic factors that influence WBP markets
D. Organisation and Timetable

The COST Action will be led by a Management Committee (MC). Responsibility for detailed planning, execution and documentation of the individual activities will be delegated by the MC to a Steering Group (SG), consisting of the Chair of the COST Action, the Working Group Coordinators, and when necessary others through appointment by the MC. Where possible, the MC or SG meetings will be organised in connection with Working Group meetings, workshops and conferences to minimise the costs involved in the coordination of the COST Action.

The milestones and instruments of the COST Action are summarised in Table 1. A four year timescale is envisaged for this Action. An initial planning and steering seminar of the MC will elaborate the details on the structure, instruments, activities and responsibilities of the COST Action, and will start the planning of the opening workshop to be organised within four months. The opening workshop shall summarise the state-of-the-art in research and development activities, including the current national, European and overseas international research programmes.

The main activities of the COST Action are to be carried out at the WG level. The WGs will act as links between the COST Action and existing research programs, and will be the fora for intensive interactions between the industry and the research community. WG meetings for sub-groups or for the entire WG will be organised as and when required within individual activities. Exchange visits of scientists, especially young scientists, within the short-term scientific mission scheme will be encouraged by the MC to foster collaboration between institutions, laboratories and industries of COST countries.

The three WGs are closely linked to each other. To provide the key information from within the WGs to the plenum of the COST Action, and to stimulate the interactions between the WGs, two or three plenum workshops will be organised. These workshops may include a one day session for each of the WGs, which will run in parallel, followed by a one day session in the plenum.

In addition, this Action will make use of the “Training Course” instrument for the training of both industrialists and academics that are interested in WBP technology and research. The WBP sector is a technological one and so it changes rapidly in terms of the equipment used to manufacture panel products, the raw materials, especially the adhesives and additives, and legislation relevant to the manufacture and use of WBP. At the same time, this instrument can help disseminate information coming from this Action.

A midterm conference and a final conference will present the results of the COST Action to a broader audience. These conferences may be organised in connection with established international conferences.
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<th>Year</th>
<th>Regular Activities</th>
<th>Public Activities</th>
<th>Evaluation</th>
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<td>1</td>
<td>Initial planning and steering seminar (MC)</td>
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<td>Opening workshop (plenum):</td>
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| 2    | **WG meetings:**
      | Main link between COST Action and existing research programs.                     |                   |                                              |
|      | Specific to individual activities.                                                |                   |                                              |
|      | Participation of sub-group or entire WG.                                          |                   |                                              |
|      | Midterm conference *)                                                             |                   | Internal and external evaluation;
|      | (Possibly revision of WGs and individual activities)                              |                   | (Possibly revision of WGs and individual activities) |
| 3    | **Short-term scientific missions**                                                 |                   |                                              |
| 4    | Training course                                                                    |                   |                                              |
|      | **Plenum workshops:**
      | Presentation, discussion and synchronization of WG activities.                    | Final conference *)| Internal and external evaluation |
      | Day 1: WG sessions. Day 2: Plenum session.                                         |                   |                                              |
      | (Total of 2 or 3 workshops)                                                       |                   |                                              |

*) Preferably in connection with established international conferences
F. Economic dimension

The following COST countries have actively participated in the preparation of the Action or otherwise indicated their interest:

- Austria
- Belgium
- FYR of Macedonia
- France
- Germany
- Italy
- Poland
- Serbia and Montenegro
- Slovenia
- Switzerland
- United Kingdom

On the basis of national estimates provided by the representatives of these countries, the economic dimension of the activities to be carried out in these countries has been estimated, in 2004 prices, at roughly Euro 12 million.

This estimate is valid under the assumption that all countries mentioned above but no other countries will participate in the Action. Any departure from this will change the total cost accordingly.

G. Dissemination plan

Oral and poster reports during the workshops and conferences will present results and progress of particular COST Action projects. Proceedings with papers or extended abstracts will be prepared for participants. Regular information bulletins over the internet will be set up and serve the COST Action participants with fast information. While the midterm and final conference will be open to a wider audience, the plenum workshop will be a forum for presenting to the active participants of the Action, as well as to invited representatives of the extended research community, industry, service providers, and R&D policy makers. The plenum workshops shall integrate the activities carried out on the WG level.

Results of research carried out by the Working Groups under this COST Action will be submitted to international scientific journals and reviews. All publications arising from research carried out under this COST Action will credit COST support, and the Management Committee will encourage and promote all co-authored papers.

Joint meetings of WGs in this COST Action with relevant Working Groups from other COST Actions will be organised in such a way as best to promote interdisciplinary communication. An internet site of the COST Action will include relevant information for the Action's participants, and will provide a platform to present the results of the activities to the public.

The Action’s MC will maintain close contact with the COST Technical Committee (TC) on Forests and Forestry Products (TC FFP) through attendance of the Rapporteur at meetings of the Sector Group on Wood Technology. A written annual report will be submitted to the TC, as required by the "Rules and Procedures for Implementing COST Actions".
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ADDITIONAL INFORMATION
NOT PART OF THE MOU
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Additional Information