EcoBuild
institute Excellence Centre for eco-efficient and durable wood based materials and products

EcoBuild
NEWSLETTER 2009-3

# EcoBuild – a competence centre for eco-efficient and innovative wood-based materials

## Message from the Manager

Looking back on the first three years (Phase 1) of the centre, we can conclude that we have generated a lot of important results and new ideas. Several biobased material systems, processes and products have already reached industrial applications. The progress has taken place within various projects, but some of the results are generic and will be of use for all participants in the centre. Many of the ideas will be put to the test during Phase 2 of EcoBuild, the coming three-year period 2010-12. The main goal is, as before, to create innovations, in other words to develop ideas into usefulness and value.

The first phase of the centre has involved large corporations, medium sized enterprises, and really small industrial partners. These companies represent the whole value chain from the renewable biomass resources, via components and intermediate products to various end products and end users. This mixture of companies is a key to an effective innovation process. Some industrial partners are also strongly driven by IPR, which means that they regard patenting and licensing issues as a very important part of their everyday business. EcoBuild's stance in these matters is that the industrial partners shall primarily have the rights to commercialize the project results. These rights are of course related to the efforts in the respective projects, according to the general Centre Agreement, and related to any specific project agreements. A basic idea with EcoBuild is that the centre shall act as a hub for innovation processes concerning the development of biobased materials and green chemistry in engineering applications. Around this hub, we find all participants of the centre and their collaborative activities, both generic and more applied.

Phase 2 brings increased expectations, above all when it comes to generating real value and benefits for the industry. At the same time, EcoBuild must continue to develop its excellence and make the centre an internationally competitive and lasting competence platform in the areas of modified wood, new cellulose-based textile fibres, adhesive and coatings systems, and biocomposites. This is most inspiring, and the challenge is taken!

Merry Christmas and a Happy New Year!

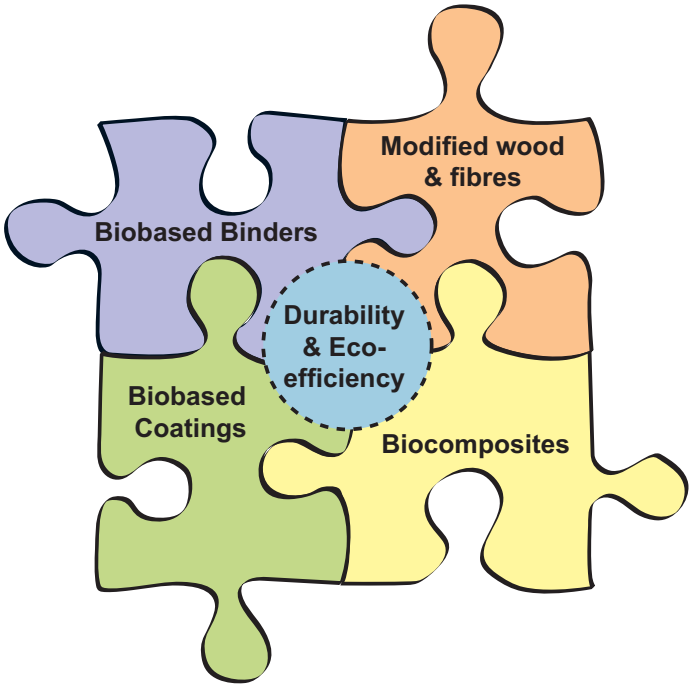
*Magnus Wålinder*

## Centre Management

*Magnus Wålinder*
*Centre Manager*

*Mats Westin*
*Deputy Centre Manager*

## EcoBuild takes the step into Phase 2




*EcoBuild's five Focus areas.*

Three years have soon passed, in which EcoBuild has matured and the evaluation by the main financiers was positive. Naturally there were points of criticism that we now seek to remedy for Phase 2 (the period 2010-2012). As an example, the number of projects is reduced from 23 to 15 at the start of the new year. At the same time we now want to elucidate the more basic research efforts that are more generic in character. They can contribute key knowledge for the benefit of many other projects but should not be hidden within any individual project. For that reason, the centre does not reduce the number of projects to a few gigantic ones. Such an arrangement would also lead to substantial difficulties regarding IPR between participants. We are convinced that we now stand well prepared with a proven organisational structure, which will develop EcoBuild further.

Some denotations have been changed. The five technical areas, each a part of the jig-saw puzzle illustration, are henceforth called Focus areas. Within these areas a number of projects (formerly subprojects) are assembled.

Some of the present partners of the centre have carried out the agreed work in one or more projects and will now leave the centre. Most of the partners continue their engagement, and are joined by several new, very interesting companies, which will make their marks on the work programme during Phase 2. Similarly, some technical development tracks are discontinued, which can be seen as an act of focusing, while the scope of EcoBuild is broadened by the opening of a couple of new tracks. These new companies and projects will be presented more closely in upcoming newsletter issues, after all agreements are signed and ready.

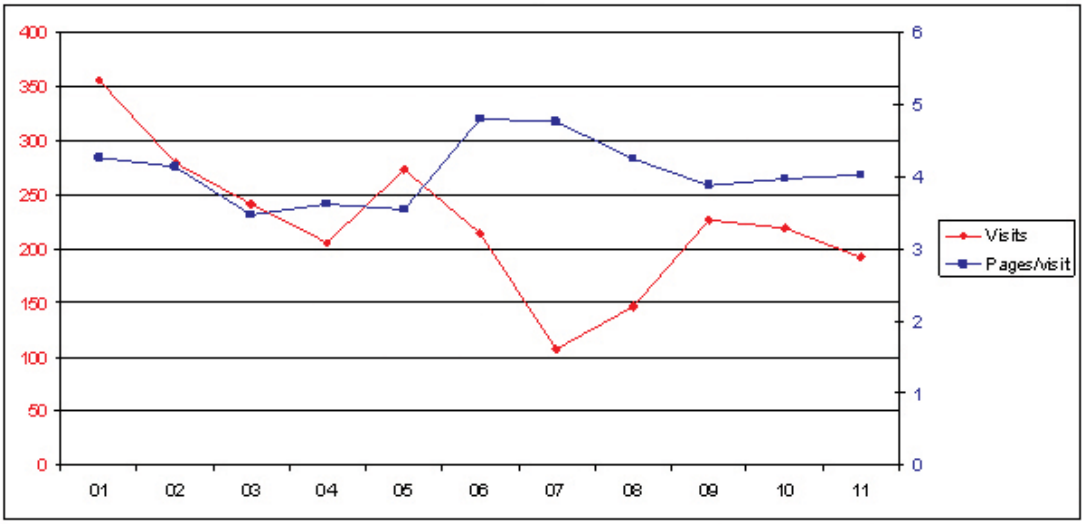
## Home page statistics

One of the most important routes for outgoing information is our home page, where one expects to find all recent and relevant news about EcoBuild. The updates of the home page have been limited to rather small updates during the autumn, but a thorough face-lift will be carried out now as Phase 2 begins. Several partners leave the centre, while others enter in their place. Our array of projects is also subject to change, but we assure you that the overall design will remain and that all users will continue to feel familiar with the home page.

The webmaster has access to an analysis tool, which can give a large number of details about the traffic to the home page. The diagram below shows the number of visits per month during 2009, and it shows clearly that the traffic was largest during the spring. This is presumably partly an effect of the ECWM4 conference. The number of visited pages per visit is fairly constant around 4. Visitors who are well acquainted with the home page will likely go directly to the information they are looking for, which may imply that this number goes down with time. A direct comparison with 2008 is not possible, since the analysis service was interrupted for half of the year.

Another interesting aspect that can be studied is where the traffic comes from. All continents are represented, and Sweden is expectedly the country that answers for the majority of the visits, but the second place has alternated between Norway, Finland, Germany, and the USA.

It is also possible to see how the visitors have approached the web site. The route via a search engine shows a weak tendency to increase, compared to direct traffic and links from other sites. A possible interpretation is that this reflects an increasing number of people generally interested in the area, finding their way through keywords.




## Changes in the staff

Ylva Kärrfelt has left her employment at SP to take up a position at Becker Acroma, a producer of paints and laquers mainly for the wood industry. Thus Ylva also leaves EcoBuild and the leadership position within the focus area Coatings. Her place will be filled when the ongoing recruitment is finished. We wish to thank Ylva for her excellent work during EcoBuild Phase 1.

Katerina Sidorova has joined us from Skellefteå and will work full-time after New Year, partly in a new EU project and partly in some projects led by Stacy Trey.

Emma Östmark will be absent on a maternal leave during all of 2010. Her role in the projects is shouldered by Magnus Eriksson from KTH/Biotechnology. Marielle Henriksson returns from her leave in early January.

Kristoffer Segerholm has been borrowed by Forest Products Lab in Madison, Wisconsin for a period of 3 months until March 2010. He continues work on biocomposites there within one of the EcoBuild projects.

Katerina Sidorova

Magnus Eriksson

## Upcoming conferences 2009

- 9-13 maj 2010 - The 41st Annual Meeting of the International Research Group on Wood Protection (IRG 41), Biarritz, France. http://www.irg-wp.com.
- 17-21 maj 2010 - ECCM 2010 - 4th European conference on Computational Mechanics, Paris, France. http://www.eccm2010.org/ Inkluderar ett mini-symposium "Computational Material Modelling of Wood and Wood Products".
- 20-22 juni 2010 - Forest Products Society, 64th International Convention, Madison, Wisconsin, USA. http://www.forestprod.org/ic-2010callforpapers.html
- 9-23 juli 2010 - 9th World Congress on Computational Mechanics & 4th Pacific Congress on Computational Mechanics, Sydney, Australien. Inkluderar ett mini-symposium "Computational Material Modeling of Wood and Wood Products". http://www.wccm2010.com/
- 20-21 september 2010 - ECWM5 - the 5th European Conference on Wood Modification, Riga, Lettland. http://www.ecwm5.lv/
- 22-24 mars 2011 - 3rd Nordic Wood Biorefinery Conference (NWBC), Stockholm. http://www.innventia.com/nwbc2011

## The fourth EcoBuild Annual Meeting

The Annual Meeting will be held in Stockholm on January 20th. This time, it will be less of a "mini conference" in character and more of a broad workshop within the five focus areas. For many of the newly embarked partners this will be the first opportunity to get to know in earnest the centre, other companies, and researchers who they will now collaborate with.

## Modified wood takes to the sea

*A conventionally built catamaran (other producer) of the type projected by Dellencat*

*Mats Westin shows an example of material combination for application in e.g. a deck.*

Photo: Anders Martinsson, Sockenbilder.

One of the new EcoBuild partners is hereby disclosed: The small, but progressive boat building company Dellencat in Hudiksvall. The vision is to start a serial production of large catamarans, to a large extent built with modified wood. Conventional preservative-treated wood has never become a material for boat building, but this project may mark the beginning of a new era, says Jan-Åke Malmqvist at a press conference arranged at the end of November. We intend to build boats with the least possible environmental impact, and apart from wind power, these boats will be propelled by electric motors and solar cells. The varying appearance of different kinds of modified wood, from the dark furfurylated to the light acetylated, also allows room for new, creative, and decorative design.

Great demands are placed on boat building materials regarding weight and strength, stability and at the same time flexibility, and resistance to degradation by rot, shipworms, and UV light. We can see no reasons today why modified wood should not be able to meet all these demands, and if everything goes as planned, we may already have a prototype launched this summer. The early production will provide opportunities for practical tests with different variants of the materials, including UV resistant clear coatings and biobased alternatives to conventional epoxy resins and glass fibre reinforcements. In parallel, they become exciting demonstration objects that involve results from several EcoBuild projects.

## Decay results from field tests supported by molecular methods

The development of new wood protection systems suffers from the time consuming field trials for biological decay. The need to establish new and accelerated methods to quantify and identify decay fungi in wood has already been discussed in an earlier newsletter. Molecular methods have proven to be a useful tool within wood protection issues but DNA-based methods are rarely used for identification in connection with quantification.

Annica Pilgård et al. now report new findings on the colonisation pattern of decay fungi in wood samples after 6 years in soil exposure. Chemical and molecular analyses have been compared to the traditional field trial rating of the samples. Furfurylated wood (Scots pine) with two different treatment levels were used as test samples, while a copper organic preservative impregnated Scots pine and Scots pine heartwood served as reference material. Decay fungi were quantified with a specific and quantitative real-time PCR method (qPCR, a method that copies specific fungal DNA sequences), using primers that are specific for Basidiomycetes. To further verify this method, ergosterol and chitin assays were performed, together with thermogravimetric (TGA) and light microscopic analyses. The results show that qPCR is more sensitive than the chemical methods, and the results agreed well with the traditional rating and the microscopy analyses. The DNA-based method is very specific, while the traditional rating is a rather crude method, which also could bee seen in the comparison of the results.

## New publications

Publications are an important part of the dissemination of results from EcoBuild. It is of course a particularly important part for those PhD students who hereby collect qualifications in their work towards a thesis. The last issue of the newsletter contained a long list of updates. We continue here with some additional new publications.

- In: Proceedings of the 5th Meeting of the Nordic Baltic Network in Wood Material Science & Engineering (WSE), October 1-2, 2009, Copenhagen, Denmark, Ed. A. Bergstedt, Forest & Landscape, University of Copenhagen (ISBN 978-87-7903-437-2):
  - Pilgård, A. and Alfredsen, G. (2009). A better understanding of the mode of action of furfurylated wood, pp. 13-19.
  - Rowell, R. (2009). Hardening of wood, pp. 5-11.
  - Wålinder, M.E.P., Segerholm, B.K. and Söderström, O. (2009). Water sorption properties and dimensional changes of high wood-content WPC, pp. 153-160.
- Alfredsen, G., Fossdal, C-G. (2009). Postia placenta gene expression of oxidative and carbohydrate metabolism related genes during growth in furfurylated wood. The International Research Group On Wood Protection, 40th Annual Conference, Beijing, China. IRG/WP 09-10701, 1-7.
- Pilgård, A., Alfredsen, G., Børja, I., Björdal, C. (2009). Durability and fungal colonisation patterns in wood samples after six years in soil contact evaluated with qPCR, microscopy, TGA, chitin and ergosterol assays. The International Research Group On Wood Protection, 40th Annual Conference, Beijing, China. IRG/WP 09-20402.
- Östmark, E.; Lawther, M.; Ziethén, R.; Nordqvist, P.; Khabbaz, F.; Malmström, E.; Westin, M. "Bio-resin bonded acetylated OSB" the Fourth European Conference on Wood Modification, Stockholm, April 27-29, 2009 (oral contribution)
- Khosravi, S.; Johansson, M.; Khabbaz, F.; Nordqvist, P. "Protein-based binders for particle boards" Nordic Polymer Days, Copenhagen, Denmark, May 25-27, 2009 (oral contribution)
- Nordqvist, P.; Khabbaz, F.; Malmström, E. "Plant proteins as bio-based binders for the wood industry" Nordic Polymer Days, Copenhagen, Denmark, May 25-27, 2009 (oral contribution)
- Khosravi, S.; Johansson, M.; Khabbaz, F.; Malmström, E.; Nordqvist, P. "Protein-based binders for particle boards" International Conference on Wood Adhesives 2009, Lake Tahoe, USA, September 28-30, 2009 (poster)
- Nordqvist, P.; Khabbaz, F.; Malmström, E. "Comparing soy protein isolate and wheat gluten as biobased binders for the wood industry" International Conference on Wood Adhesives 2009, Lake Tahoe, USA, September 28-30, 2009 (oral contribution)
- Englund, F., Bryne, L.E., Ernstsson, M., Lausmaa, J. and Wålinder, M. (2009). Some aspects on the determination of surface chemical composition and wettability of modified wood. Wood Material Science and Engineering Vol. 4, Nos 1-2, pp. 80-85.
- Wålinder, M., Omidvar, A., Seltman, J. and Segerholm, K. (2009). Micromorphology Studies of Modified Wood Using a Surface Preparation Technique Based on UV-Laser Ablation. Wood Material Science and Engineering Vol. 4, Nos 1-2, pp. 46-51.
- Westin, M., Sterley, M. Rossi, F. and Hervé, J.-J. (2009). Compreg-type of products by furfurylation during hot-pressing. Wood Material Science and Engineering Vol. 4, Nos 1-2, pp. 67-75.

## Key facts about EcoBuild

EcoBuild is a competence centre for cooperation between universities, institutes and industry. The centre is located in the Stockholm campus site of KTH and SP Technical Research Institute of Sweden. The 35 industrial partners cover the whole range from small and medium-sized enterprises to large international corporations, and several of them are based abroad.

The centre is estimated to have a turnover of ca. 100 MSEK during the period 2007-2012. VINNOVA, the Knowledge Foundation and the Swedish Foundation for Strategic Research contributes with 40 MSEK. The industry co-finances with 60 MSEK, half of which is as cash contributions and the rest with their own work.

At the moment ca. 107 persons are connected on to the activities of EcoBuild. Around 80 researchers are directly involved in the projects. 42 of these are senior researchers, out of which 34 have a PhD degree. Ca. 56 pursue their research mainly at institutes or universities and ca. 25 at the partner industries. The cooperation is reinforced by several cases of double affiliation. 5 PhD students work directly as EcoBuild students, and another 3 external students work within connected projects.

## Industrial partners and financiers

AB Bitus, A-Cell Acetyl Cellulosics AB, Akzo Nobel Industrial Coatings AB, Akzo Nobel Nippon Paint AB, Arch Timber Protection, BioVelop A/S, Byggelit AB, Capeco AB, Casco Adhesives AB, DanAcell Danmark A/S, Dr. Wolman GmbH - BASF Group, Guteform AB, IKEA of Sweden AB, Karlson Husindustrier AB, Kebony ASA (tidigare WPT), KIRAM AB, Lammhults Möbel AB, Norrskogs Forskningsstiftelse/NWP, Ofk Plast AB, Osmose Denmark A/S, Perstorp Specialty Chemicals AB, Primo Sverige AB, Rögle Tröskeln AB, Scandinavian FineWood AB, SF Marina Wallhamn AB, Slottsbro AB, SSAB Tunnplåt AB, Sveaskog, Swedish Cable Channel System AB (SCCS), Svenska Lantmännen, Corporate R&D, Södra Skogsägarna, TanumsFönster AB, Vest-Wood Sverige AB (Swedoor), Viance (tidigare CSI), VIDA Packaging AB.

## Centre Board

*Ralph Nussbaum,* Research Manager Coatings IKEA
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*Istvan Furó,* Prof KTH
*Per Brynildsen,* Research Director Kebony

**Main financiers of the Centre**

VINNOVA Knowledge Foundation Swedish Foundation for Strategic Research

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