

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

Message from the Manager

EcoBuild is approaching its end! But only the end of Phase 2, of course! We now try hard to get organized to be able to move with all sails set into "Phase 3", from 2013 and beyond. One strength that we must utilize and further develop is the relationships between universities, institutes and industry, our extensive networks for research and innovation in several topical areas. Wood modification, wood composites, biobased polymers and binders, and cellulose-based textile fibres are all examples of such areas where intensive work is pursued in EcoBuild and among researchers around the world. We see the dawn of a revolution in society's material use. The motivation is simply that humankind is faced with a decisive challenge, not to use more resources today than we can replace tomorrow. We can not continue to deplete the resources of the earth and pollute the environment as we have done.

A solution in part to these challenges is evident, but not easy to reach – we must better utilize the resources of the renewable forests, both nationally and internationally. An important question is how we strike a balance between a strongly increased use of the forest biomass as fuel and its use for material production. If the current development in the bioenergy field in Europe continues, the volume of timber felled may be larger than growth within 10-15 years, and that is not a sustainable development. All the EcoBuild areas are connected to this challenge, i.e. that the share of manmade materials produced from renewable sources must grow. Wood as an engineering material has in fact lost market shares over the last few decades. A strong industrial development of material science and engineering in a cooperation between chemical, material, and forest industries is therefore needed to turn the tide.

An important piece of news is the changes in the EcoBuild management taking effect 1 January 2012, described further below.

The motto of EcoBuild is: Building a sustainable future with biobased materials.

Magnus Wålinder



Change of helmsman

As described in the article below, Magnus Wålinder now steps back from his place at the helm, for obvious reasons. New centre manager is Emma Östmark, who already has experience as project leader and been involved in most of the projects in the Focus Areas 1 Biobased Binders and 2 Biobased Coatings. This castling manoeuvre will not be directly noticeable in the daily work, partly because Magnus continues to some extent in the centre management.

Magnus Wålinder appointed professor in building materials at KTH

Magnus Wålinder has been appointed professor in building materials at KTH, Dep. of Building Science. Magnus has maintained a split position at both KTH and SP Träteknik for the past several years.

– I began this responsible job full time from the 1 June this year. We have agreed that I will be "on loan" at SP for 20% of my time to support the centre management. Assistant manager Mats Westin continues his specific role as technical coordinator during next year, which also is the last year of the six-year programme grant from Vinnova and the Knowledge Foundation. With Emma Östmark as the new Centre Manager we have a well-functioning and experienced troika. In my new position I will act somewhat as a "guest professor" at SP and EcoBuild, and I expect to support both the continuity in the centre and its future material research.

– We see very good opportunities for a continued base financing of EcoBuild also after 2012, through several large national financing bodies but also through the EU framework programmes. Winds of change blow throughout the world, and I am convinced that new biobased material concepts will remain a very important and topical field. An important factor for the centre continuity is, as before, an efficient participation by industry.

– My split position has until recently emphasized SP. Now the situation is reversed, but we will definitely continue with the successful cooperation between SP Träteknik and KTH, particularly with regards to biocomposites, "green chemistry", and material science.

– As a professor, I have now a stronger responsibility for the Masters education at the Built Environment programme of KTH, but another task is to formulate new R&D programmes for building materials of the future. It is important to remember that I need to be "material neutral", in principle, and that the research will be governed to a large extent by the available research grants. The programmes I am currently sketching are well in line with the expected future of EcoBuild, and they are mainly dealing with efficient ways to upgrade and utilize those forest byproducts that today are used as bioenergy sources. The idea is to develop new types of eco-efficient biobased building material systems. One area includes wood-plastic composites (WPC), totally built on renewable raw material feedstock and with applications e.g. in building envelopes.

Centre Management



Magnus Wålinder
 Centre Manager



Mats Westin
 Deputy Centre Manager

EcoBuild annual meeting 31 January

The 2012 annual meeting of EcoBuild will be held in Stockholm on Tuesday 31 January. As usual, the emphasis will be on a seminar which presents the overall status of the Centre activities as well as highlights from some projects. More details about times, the venue, and the seminar contents is just about to be sent out.

Other staff changes



Dennis Jones started with SP Trätekt 10 October. Most recently, he held a position at BRE (Building Research Establishment) based at their office in Wales. Dennis has a very broad experience of work on various aspects of durability, wood preservation and protection, as well as on composites, building systems and environmental performance of building products. In other words, his competence covers a large part of the EcoBuild field of work. He is warmly welcomed! [FOTO]

Support for a continuation of CelluNova

CelluNova, the largest individual project in EcoBuild, progresses at good speed and new results appear every week. Several test runs have already produced new textile fibres and intensive work is now laid down to further improve their technical properties. A short but intense project is now added on, thanks to a separate grant from Vinnova in their call "Challenge driven innovation". An integrated factory for fibre production will be designed in some detail, and this means that the research directly takes steps closer to industrial application.

The "digestion" of wood-rotting fungi can be monitored

Wood protection is a field in great change. New wood protection systems are constantly being developed but their protection mechanisms remain poorly understood. Molecular methods can be used to study protection mechanisms utilized by decay fungi when exposed to different wood protection systems. Studies on the expression of fungal genes will give us a better understanding of the fungal degradation of wood and we can optimize our wood protection systems further. However, no single technique will give us the answer to all questions but we can gather small pieces of the puzzle using different approaches. The aim of the present study within EcoBuild project P15 was to investigate the effects of acetylation levels on the growth of the brown rot fungus *Postia placenta*. Our preliminary results show that no decay was detected in any of the acetylated samples by this method, over the range of acetylation levels tested, after 4 weeks of testing.

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"The sun chair" – new field test method

In the EcoBuild project 13 metal-free wood preservatives are tested for use in above-ground situations. One field test includes a newly introduced set-up, the "decking-cladding rig" or the "sun chair". It consists of 4 horizontal boards, simulating the exposure of decking boards, and 4 vertical boards that simulate a façade cladding. The construction is easy to assemble and relatively easy to evaluate. Tests have been running for more than two years and differences between the tested preservatives can already be discerned.



The test method has also been employed in evaluations of resistance towards moulds for a number of new WPC that have been developed in EcoBuild by SP and KTH in cooperation with OFK Plast AB and Viance LLC. The materials of OFK Plast have earlier showed very good resistance to degrading fungi. A small addition of a newly developed metal-free preservative to the existing material has given very promising results for the ability to prevent mould growth. This result brings new possibilities for the use of WPC materials in applications that have stringent requirements on mould resistance.

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Please be seated

In project P7, we have worked on the development of WPC materials for furniture, which requires a better understanding of how the materials should be processed to give an attractive appearance. WPC (woodfibre plastic composites) most often contain wood fibres and a thermoplastic matrix. The production includes a compounding step, where the plastic material is melted and blended with wood fibres and additives. The compound comes out in granulate form which is used in a subsequent injection molding or extrusion process.

The large market for WPC, especially in the US, is extruded boards and profiles that can substitute other building materials as panels or impregnated boards in e.g. decking. Current materials are mainly suitable for extrusion, which bears significant differences from injection molding. In the latter process the WPC material must have a low viscosity to be able to fill the molding tool. These products also often require higher impact resistance, and the demands on the appearance are generally higher, e.g. possibilities to include dyes for colour variations.

We have tailored several WPCs for different furniture applications. The advances made are primarily increased impact resistance



through improved interactions between wood fibres (type, size, shape), plastic matrices and additives.

In order to make WPC products sellable they must look good, quite simply. Injection molding affects the appearance of WPC and ordinary plastic in different ways. A deep understanding of what happens to the materials through the whole process is necessary for having full control. The project work has taught us to choose raw materials and process parameters that enable us to steer the fibre distribution and other aspects of appearance.

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A lecture that gave insights into possibilities with WPC

Dr. Anand Sanadi of the University of Copenhagen visited EcoBuild in Stockholm the 14th of December and gave a much appreciated lecture on his extensive work in WPC development, mainly at Univ. of Wisconsin. The audience of SP employees, students at KTH, but also some interested representatives from industry heard about materials not commonly encountered. Two main features of the lecture were: the broad selection of plant fibres tested in combinations with thermoplastics and a series of board materials produced with an unusually high content of fibres. Dr Sanadi brought along demonstration samples of WPC boards with fibre contents from 70% to an impressive 90%. Their mechanical properties are similar to those of wet-formed boards, but by using a process for regular plastics instead of infusion into fibre mats a rapid and efficient production is attained.



Focus area 3: Biobased composites

Our series of short presentations of workers in EcoBuild continues with Focus Area 3. The purpose of this portrait gallery is to give an overview and facilitate contacts, internally and for external readers of the newsletter.

The following persons also belong here, and they were presented in the issue 2011-1: Stig Bardage, Heather Anne Fogarty, Karl Christian Kristensen, Stig Lande, Pia Larsson Brelid.

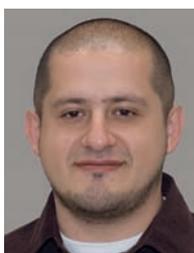
Projects P7 WPCs for furniture
P8 Biocomposites for outdoor use
P9 Thermoset biocomposites

Area coordinator:
Magnus Wälinder, KTH/SP Trätekt
Composites, Adhesion,
Surface characterization



Jonas Aspling
Swerea IVF

Plastic processing, Product design, Injection moulding, Extrusion, Compounding, Mechanical testing, Thermal analysis, Failure analysis



Carlos Barreto
Norner AS

Wood modification, Polymer management



Lars Evensen
Norner AS

Business Development Manager, Managing Director, Norner Mimir India Pvt Ltd



Bengt Hagström
Ph.D., Swerea IVF

Plastic processing, Injection moulding, Extrusion, Compounding, Rheology, Polymer physics, Fibre technology
Polymerfysik, Fiberteknologi



Olof Frisk
OFK Plast

Wood composites, Extrusion



Marielle Henriksson
Ph.D. SP Trätekt/KTH

Polymeric materials, Cellulose nanocomposites, Adhesion, Glueing



Daniel Holmberg
SP Trätekt

Test methodology, Mechanical properties, Durability



Kenneth Lövdahl
IKEA of Sweden

Plastic products, Manufacturing processes



Annica Pilgård
Ph.D. SP Trätekt

Molecular biology, Ecotoxicology, Durability



Gustav Sandin
SP Trätekt

Life cycle assessments, Sustainability assessments, Environmental issues



Stig Scholander
IKEA of Sweden

Technical development, Board materials, Composites



Kristoffer Segerholm
SP Trätekt

Composites, Durability, Fungi, Moulds, Coatings, Wood structure, Wood properties



Stacy Trey

Ph.D. SP Trätekt/Wallenberg Wood Science Centre
Biocomposites, Wood modification, Polymer chemistry



Rune Ziethén
SP Trätekt

Board materials, Glueing, Mechanical properties, Durability



Harry Øysad
Norner AS

Polymer science, Polymer additives, Project management

Upcoming conferences

Upcoming conferences

- 23-26 January 2012: 3rd Annual Next Generation Bio-Based Chemicals, San Diego, CA, USA. www.infocastinc.com/index.php/conference/biobased12
- 28 February-1 March 2012: Advanced Biofuels in a Biorefinery Approach, Copenhagen, Denmark. www.bio4bio.dk/Biorefinery-Conference2012
- 5-7 April 2012: Joint International Symposium on Wood Composites and Veneer Processing and Products, Seattle, Washington, USA. www.woodsymposium.wsu.edu
- 6-8 May 2012: 12th International Conference on Biocomposites, Niagara Falls, Ontario, Canada. www.biocomposites-toronto.com
- 3-5 June 2012: Forest Products Society's 66th International Convention, Washington DC, USA. Convention theme: Forest Products: Solutions for a Global Green Economy. www.forest-prod.org/ic/index.php
- 19-20 June 2012: Biobased materials - WPC, Natural Fibre and other innovative Composites Congress, Stuttgart, Tyskland. www.hanser-tagungen.de/web/index.asp?task=001&vid=20110331164235
- 8-13 July 2012: 2012 IUFRO All Division 5 Conference, Lissabon, Portugal. www.iufro2012.org
- 16-19 July 2012: World Conference on Timber Engineering, Auckland, New Zealand. www.conference.co.nz/wcte2012
- 27-30 August 2012: 12th European Workshop on Lignocellulose and Pulp, Espoo, Finland. www.helsinki.fi/ewlp2012/index.html
- 16-18 September 2012: The 6th European Conference on Wood Modification, Ljubljana, Slovenia. www.ecwm6.si
- 23-25 October 2012: 4th Nordic Wood Biorefinery Conference, Helsinki, Finland. www.vtt.fi/sites/nwbc2012/index.jsp?lang=en

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 27 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. 140 MSEK during the period 2007-2012, spin-off effects included. VINNOVA, the Knowledge Foundation and the Swedish Foundation for Strategic Research contributes with 40 MSEK. The industry co-finances with 65 MSEK, half of which is as cash contributions and the rest as their own work efforts.

At the moment ca. 120 persons are connected to the activities of EcoBuild. Around 80 researchers are directly involved in the projects. 71 of these are senior researchers, out of which 46 have a PhD degree. Ca. 40 pursue their research mainly at institutes or universities and ca. 40 at the partner industries. The cooperation is reinforced by several cases of double affiliation. 8 PhD students work directly as EcoBuild students, and another 2 external students work within connected projects.

Industrial partners

Akzo Nobel Industrial Coatings AB, Akzo Nobel Industrial Finishes AB, Arch Timber Protection, BioVelop A/S, Byggelit AB, Capeco AB, Casco Adhesives AB, Dellencat, Dr. Wolman GmbH - BASF Group, Eastman Chemical Company, Heatwood AB, Hennes & Mauritz AB, IKEA of Sweden AB, Jeld-Wen Sverige AB, Kebony ASA, KIRAM AB, Norner Innovation AS, Ofk Plast / Polyplank AB, Osmose Denmark A/S, Perstorp AB, SSAB Tunnpått AB, Svenska Lantmännen, Svenskt Konstsilke AB, Södra Skogsägarna, TanumsFönster AB, Vestre AB, Viance.

Centre Board

Ralph Nussbaum, Research Manager Coatings IKEA
Lars Stigsson, CEO KIRAM
Eva Hörwing, CEO Byggelit Holding
Ulf Odda, General Manager Casco Board Systems (Akzo Nobel)
Hans Thulin, (ordf.) CEO TanumsFönster
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