Markets, Applications, and Processes for Wood Polymer Composites (WPC) in Europe

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• Wood K plus
• Market survey 2009
  – actors
  – market growth / outlook
  – raw materials
  – market & technology development – applications
  – production figures
  – trends
• Characterization of the commercial product decking
• Aspects for end user
• Conclusions
  – outdoor applications
  – market
Wood K plus

- R&D Institute
- Founded 2001 by the Austrian Government
- 80 scientific employees
- 50 projects
- Budget: 7.0 million p.a.
- 4 business units and one cross sectional field

Solid Wood and Wood Composites
Wood Polymer Composites
Surface technology and logistics
Wood and Pulp Chemistry
Market Analysis & Innovation research
Wood K plus carried out a survey among the WPC actors in the European market in June 2009.

The results of this survey contributed to a multi-client study „Market Information on Wood-Plastic Composite Decking and Siding in Europe, 2009”.

Please find some results of the study in following!
121 European WPC companies and 59 research institutes in 13 countries were approached by an email survey. An answer rate of 18% (19 companies and 14 R&D institutes) was achieved.

How is your company involved in the WPC business? (n=33)

- Manufacturer; 11
- R&D; 14
- Compounding; 4
- Machine manufacturer; 1
- Supplier of Additives; 2
- Sales; 1
Production figures and numbers of actors:
Germany – 30 % / Benelux – 12 % / Austria – 10 % / France – 6 %.
Scandinavia – 12 % of European actors – more tradition for decking and siding
than in central Europe especially for solid wood.
Development of WPC production 2000 - 2009

Market growth stage:
Growth rate **North America** 22 %

Market intro stage:
Growth rate **Europe** 51 %

Sources: nova, 2009; Milacron, 2009; Hackwell Group, 2006; own compilation
Outlook WPC Decking in Europe

Which market volume do you think will WPC decking reach in 2015 in Europe? (n=34)

- <30,000: 6%
- 30,000-60,000: 12%
- 61,000-100,000: 21%
- 101,000-150,000: 29%
- >150,000: 18%
- n.a.: 15%

produced tons per year
Polymers used in 2007 / 2009

Which polymers do you use for your production?

(multiple answers were possible)

PP-r
PP-v
PE-r
PE-v
PVC-r
PVC-v
other-r
other-v

2009 / n = 25
2007 / n = 22

v = virgin
r = recycled

Natural fibres used in 2007 / 2009

Which fibres do you use for your production?

(multiple answers were possible)

10

Market & Technology Development - I

European Applications of WPC in 2003

European Applications of WPC presented in Homepages 2008

based on a survey of Hackwell Group in 2003, n companies = 25, Production 30,000 t

based on nova institute and own compilation, n companies = 61, n applications = 168, Production 70,000 – 100,000 t in 2007
There is replacement potential of wood but also of aluminum and plastics in garden furniture.
Market & Technology Development - WPC in exterior siding

Kovalex from Kosche, 2008

Twinson-face, Deceuninck, 2008

Tech-wood, 2008
Niche Applications

Tecnaro used by Gucci, ECO PUMP, 2010

Kareline Composite used e.g. by Kupilka, Flaxwood and Fenron

Fasal composite used e.g. by Rödel and Babel

Hiendl NFC®

Babel Pico, 2010

GRENADILL-COMPOSITE Fa. Rödel, 2010
European WPC Production Figures

- The European **WPC-decking** market currently amounts to about **68,000 t**, which amounts to **57 %** of the total market.

- The European **WPC-siding** market currently amounts to about **13,600 t (11 %)** and is at its **initial stage**.

- The production of **other WPC applications** amounts to about **38,400 t (32 %)**.

- **Total European Production** increased from **3,000 t** up to **120,000 t** (without automotive), which means an annual **growth rate of 51 %**.
European Trends on Products & Technologies

- **Trend into decking** as a main product, all big producers produce decking although **new applications are permanent coming up**

- **Exterior siding** is also produced by all big producers

- Trend to **injection molded** products, e.g. furniture and furniture parts

- Trend to **consumer goods** and **music instruments**

- Mainly **virgin materials are used**, but trend to use of **recycled material ongoing**

- Trend to **development of own technology**, because of **expensive licenses**
Why would one invest so much research effort in a relatively simple product?

- Despite the interesting and promising properties of WPC-materials, *decking* (besides railing and fencing) is still the only application in which they have gained some market penetration.

Therefore, if one wants to know how real-world WPCs (produced outside the lab) perform, one needs to look into deckings.
• Numbers of brands and producers are permanently changing
• Autumn 2008: ~ *35 brands* from ~ *25 producers*

• WPC is a complex composite material
• Know-how is necessary for achieving good properties
→ *a broad variance in quality has to be expected*

• Motivation for attempting a comprehensive characterization:
  – *Basis for further research*
  – *Help to avoid dissatisfying consumers with undelivered promises*

• Not all European products could be obtained – some are very difficult to get
• Consultation generally insufficient
Prices of WPC in 2009

WPC are quite expensive

Customers will expect better properties!

Prices do not include substructure
Some of the deckings show very high bending at only 500 N → narrow-stepped support necessary

As expected, bending is inv. proportional to $F_{max}$
Xenon weathering

- Xenon testing (1500 h) as artificial weathering
- Pictures taken before, and after 500 and 1000 h
- Total colour change less suitable to describe ageing than Lightness
  → some deckings get lighter, some darker
Advantages of WPC ...

... for the customers ("end user") – no ranking

do not split
  do not warp
  low maintenance
  high dimensional stability
  good weather resistance
  good UV-resistance
  free design and colors
  simple to clean
  ...........
  made from wood

Open discussions are running in many diverse forums in the internet → find topics for marketing and R&D and how to target the customers!!!

(key words i.e.: “wpc” “splitterfrei”)
Consumer Perceptions of WPC Fencing, 2004

++ durable
++ innovative
++ comfortable
+- natural

+- “warm”
- expensive
+- elegant/exclusive

Consumer Perceptions on WPC Decking, 2004

Several statements at forums, 2010

covers at end of profiles - circular cut-outs problematic
break through / hollow profiles
touch and feeling of “plastic”

warming of the surface
do not splinter
consultation

price ...........

Importance of WPC decking attributes in % (Conjoint Analysis)
Conclusions – applications / outdoor

- Complex composite material → **Broad range of performances**
- High prices → need to deliver some **outstanding properties**
  - Point out the advantages !!!

- Wood is still superior for most mechanical properties
- **High weight**, especially of full profiles, **might be a disadvantage** for consumers
- **Low HDT-A** of some products **might be problematic** in the summer
- WPC show very **low water absorption** → should alleviate microbial decay
- Judged by OIT/Xenon results, **some deckings might not last long enough** → however, correlation with outdoor weathering trials necessary!
Conclusions - market

• At the moment, marketing is taking place at a low level, although European public is very cautious toward new materials.

  ↩️ **Large WPC producers could change this through joint marketing activities!**

  ↩️ **WPC is far too unknown among the decision makers as well as the end consumers.**

• The wood-working as well as the polymer industry lack adequate knowledge about the use of WPC (wood or plastic side) and vice versa.

  ↩️ **Suitable Information is needed!**

• The prices of WPC licenses are high, and the alternative is to develop own recipes. Investments in product development should increase. Cooperating with different disciplines and companies is an appropriate tool for successful product development.

  ↩️ **Cooperate or loose!!!**