Environmental Product Declaration

in accordance with ISO 14025

Kronoply OSB/Kronopol OSB

Kronoply GmbH
Kronopol Sp. z o.o.
Kronofrance SAS

Institut Bauen und Umwelt e.V.

Declaration number
EPD-KRO-2009111-E

Institut Bauen und Umwelt e.V.
www.bau-umwelt.com

Summary
Environmental Product Declaration

Programme holder

Institut Bauen und Umwelt e.V.

(Institute Construction and Environment e.V.)

www.bau-umwelt.com

Institut Bauen und Umwelt e.V.

Declaration holder

Kronoply GmbH	Kronopol Sp. z o.o.	Kronofrance SAS
Wittstocker Chaussee 1	ul Serbska 56	Route de Cerdon
D-16909 Heiligengrabe	PL-68 200 Zary	F-45 600 Sully sur Loire

Declaration number

EPD-KRO-2009111-E

Declared construction products

Kronoply/Kronopol OSB/2, OSB/3, F**** and OSB/4 wooden panels

This Declaration is an Environmental Product Declaration in accordance with ISO 14025 and describes the environmental features of the construction products outlined here. It intends to promote the development of construction which is compatible with both the environment and health. This validated Declaration discloses all of the relevant environmental data.
The declaration is based on the “Wooden materials” PCR document, version 2009-01.

Validity

This Declaration entitles the holder to bear the official stamp of the Institut Bauen und Umwelt. It applies exclusively for the products referred to for a period of one year from the issue date. The declaration holder is liable for the details and documentation upon which the evaluation is based.

Content of the Declaration

The **Declaration** is complete and comprises in detail:
- Product definition and physical construction data
- Details on base materials and material origin
- Description of the product manufacturing process
- Information on product processing
- Data on the utilisation status, extraordinary effects and re-use phase
- Results of the life cycle assessment
- Documentation and tests

Issue date

20 October 2011

Signatures

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Testing the Declaration

This Declaration and the regulations upon which it is based have been tested by the independent Committee of Experts (SVA) in accordance with ISO 14025.

Signatures

Prof. Dr.-Ing. Hans-Wolf Reinhardt (Chairman of the SVA)	Dr. Frank Werner (tester appointed by the SVA)

Summary

Environmental Product Declaration

Product description

OSB panels (Oriented Strand Board – Kronoply/Kronopol OSB) are adhesive-bound, three-ply wooden panels (pressed panels) made from oriented scattered, longitudinal wood chips (pinewood veneer 120 - 160 mm in length), so-called strands (micro-veneers), in accordance with EN13986 and EN 300 "OSB". "Strands" of a defined thickness and shape primarily comprising roundwoods are glued at several layers. The central layer is oriented at a 90° angle to the top layers. The OSB panels are glued with an MUPF resin in the top layers and a polyurethane resin in the central layer or even with polyurethane resin only. The boards are manufactured at thicknesses of 6-40 mm (depending on the panel type) and panel gross density is approx. 600 kg/m^3.

Area of application

Kronoply/Kronopol OSB/3 Kronoply/Kronopol F***** and Kronoply/Kronopol OSB/4 correspond with wood material class 100 and utilisation class 1 and 2 and may therefore be applied in humid areas and non-weathered outdoor areas. OSB panels can be used in all supporting and stiffening components (ceilings, walls, roofs, floors, chipboard panels) in which the general construction inspection approval or the performance features to DIN EN 13986 are a prerequisite for application. Kronoply/Kronopol OSB/3 panels can also be used in other areas such as in the packaging industry or for shelves, furniture, doors etc. Kronoply/Kronopol OSB/2 panels correspond with wood material class 20 and utilisation class 1. Kronoply/Kronopol OSB/2 panels may therefore be used for supporting purposes in dry and interior areas.

Scope of the LCA

The **Life Cycle Assesment (LCA)** has been performed in accordance with DIN ISO 14040 ff in line with the requirements of the IBU Guidelines. Apart from the company-specific questionnaire, the "GaBi 2006" was also applied as a data basis. The life cycle assessment is performed for the products' manufacturing phase taking consideration of all upstream chains such as raw materials extraction and transport ("cradle to gate"). The negative greenhouse potential can be seen as reducing the same in the manufacturing process by binding CO_2 in the OSB panels. During the end-of-life phase, incineration of the OSB panels is modelled in a biomass power plant with energy utilisation (electricity and thermal energy). The "Power mix EU 25" and "Thermal energy from natural gas EU 25" substitution processes are credited for energy utilisation. A comparison with other products is only permissible in the context of comparable applications in the building.

Results of the LCA

Evaluation factor	Unit per m³ OSB	Total	Production	End of life
Non-regenerative primary energy	[MJ]	-6,543	5,370	-11,914
Regenerative primary energy	[MJ]	12,094	12,307	-213.0
Greenhouse warming potential (GWP 100 years)	[kg CO_2 equiv.]	-415.7	-777.4	361.7
Ozone Depletion Potential (ODP)	[kg R11 equiv.]	-8.28E-06	2.53E-05	-3.36E-05
Acidification potential (AP)	[kg SO_2 equiv.]	3.36E-01	9.40E-01	-6.05E-01
Eutrophication potential (EP)	[kg PO_4 equiv.]	1.14E-01	1.31E-01	-1.70E-02
Summer smog (POCP)	[kg ethene equiv.]	4.98E-02	1.28E-01	-7.83E-02

Created by: Kronoply GmbH

in co-operation with PE INTERNATIONAL, Leinfelden-Echterdingen

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Documentation and tests

In addition, the following **documentation and tests** are depicted in the Environmental Declaration:

- Formaldehyde - Measuring agency: HFB Engineering GmbH, Leipzig
- MDI (diphenylmethane 4,4' diisocyanate) - Measuring agency: eco-Umweltinstitut GmbH
- Eluate analysis - Measuring agency: Elektro-Physik Aachen GmbH
- Fire gas toxicity - Measuring agency: Elektro-Physik Aachen GmbH
- PCP / Lindan - Measuring agency: MPA Eberswalde

Area of applicability This document applies to the Kronoply/Kronopol OSB/2, Kronoply/Kronopol OSB/3, Kronoply/Kronopol F**** und Kronoply/Kronopol OSB/4 boards manufactured in the following plants: Kronoply in D-16909 Heiligengrabe (Germany), Kronopol in Pl-68-200 Zary (Poland) and Kronofrance in F 45600 Sully sur Loire (France).

0 Product definition

Product definition Kronoply/Kronopol OSB (Oriented Strand Boards) are adhesive-bound, three-ply wooden panels made from oriented scattered strands (micro-veneers) as per DIN EN 300 “Panels made from long, slim, aligned chips (OSB)”. The central layer is oriented at a 90° angle to the top layers.

Kronoply OSB/3 (as per DIN EN 13986) panels are glued with an MUPF resin in the top layers and an MDI resin (diphenylmethane-diisocyanate) in the central layers; the latter are converted into PUR (polyurethane) and polycarbamide in production. Alternatively, full gluing with an MDI resin is also possible.

Kronoply F**** (to Z-9.1-618) and Kronoply OSB/4 (to Z-9.1-503) are glued fully with an MDI resin (diphenylmethane-diisocyanate) which is converted into PUR (polyurethane) and polycarbamide during production.

Application Kronoply/Kronopol OSB/2, Kronoply/Kronopol OSB/3, Kronoply/Kronopol F**** and Kronoply/Kronopol OSB/4 are CE-certified to DIN EN 13986 – Wooden materials for use in construction. Furthermore, Kronoply/Kronopol F**** and Kronoply/Kronopol OSB/4 have a construction inspection approval from the DIBt. These can be used in all supporting and stiffening components (ceilings, wall elements, roof boarding, flooring) in which the general construction inspection approval or the performance features to DIN EN 13986 are a prerequisite for application. Kronoply/Kronopol OSB panels can also be used in other areas such as in the packaging industry or for shelves, furniture, doors etc.

Kronoply/Kronopol OSB/2:

CE marking to EN 1986/ EN 300: 1034 – CPD – 1291/6/06 or 0380 – CPD – 0163

Certificat de Qualité, Panneaux de process CTB-OSB 2

Kronoply/Kronopol OSB/3:

CE marking to EN 13986/ EN 300: 1034 – CPD – 1291/1/09, 1034 – CPD – 1276/1/07 or 0380 – CPD – 0164

PSI 115 (USA, Canada);

JSP 1 (Japan)

Certificat de Qualité, Panneaux de process CTB-OSB 3

Kronoply/Kronopol F****:

CE marking to EN 13986/ EN 300: 1034 – CPD – 1291/5/05 or 1034 – CPD – 1276/1/06

General construction inspection approval: DIBt Z.9.1-618 (Germany)

Kronoply/Kronopol OSB/4

CE marking to EN 13986/ EN 300: 1034 – CPD – 1291/1/08, 1034 – CPD – 1276/2/07 or 0380 – CPD – 0165

General construction inspection approval: DIBt Z.9.1-503 (Germany)

Certificat de Qualité, Panneaux de process CTB-OSB 2

Quality assurance ISO 9001-2008: Germanischer Lloyd QS-1408 HH;

FSC Wood; GFA-COC-001008;

PEFC Wood; PEFC/04-35-0010

IBO Declaration D 03.03-46/00 (Austrian Institute for Construction Biology);

Internal monitoring by the manufacturer as well as external monitoring by HFB Leipzig, WKI Braunschweig, PSI USA/Canada, JAS Japan

Delivery status, features

Kronoply/Kronopol OSB/2

Table 1: Supply range (panels per pack) Subject to change.

Thickness [mm]	**9**	**11**	**12**	**15**	**18**	**22**	**25**
2440 x 1220 mm	100	84	78		52		

Table 2: Kronoply/Kronopol OSB/2 – Characteristic values to EN 13986		Chip direction of top coat					
		parallel			right-angled		
		Nominal thickness of panels [mm]					
	d	6 – 10	>10 – 18	>18 – 25	6 – 10	>10 – 18	>18 – 25
Strength values [N/mm²]							
Panel loads							
Bending	$f_{m,k}$	18.0	16.4	14.8	9.0	8.2	7.4
Pressure	$f_{c,90,k}$	10.0			10.0		
Thrust	$f_{v,k}$	1.0			1.0		
Wall plate loads							
Bending	$f_{m,k}$	9.9	9.4	9.0	7.2	7.0	6.8
Traction	$f_{t,k}$	9.9	9.4	9.0	7.2	7.0	6.8
Pressure	$f_{c,k}$	15.9	15.4	14.8	12.9	12.7	12.4
Thrust	$f_{v,k}$	6.8			6.8		
Strength values [N/mm²]							
Panel loads							
Elasticity module, bending	E_{mean} [a]	4930			1980		
Thrust module	G_{mean} [a]	50			50		
Wall plate loads							
Elasticity module	E_{mean} [a]	3800			3000		
Thrust module	G_{mean} [a]	1080			1080		
[a] The following calculation values apply for the characteristic rigidity values E_{05} and G_{05}: $E_{05} = 0.85 \times E_{mean}$ and $G_{05} = 0.85 \times E_{mean}$							
General and physical values							
Gross density to EN 323	m	580 kg/m³					
Limit deviations for board thickness		± 0.8 mm (unground) ± 0.3 mm (ground)					
Thermal conductivity figure to DIN 68 763	λ	0.13 W/mK					
Emission class		E1					
Usage class to ENV 1995-1-1		1					
Fire performance class to EN 13501-1		D – s2,D0					
CE number		1034 – CPD – 1291 / 6 / 06 (D) 0380 – CPD – 0163 (F)					

Product group: Wood materials
Declaration holder: Kronoply OSB
Declaration number: EPD-KRO-2009111-E

Created 20.10.2009

Kronoply/Kronopol OSB/3

Table 3: Supply range (panels per pack) Subject to change.

Thickness [mm]	8	9	12	15	18	22	25
2500 x 1250 mm	120	100	78	60	52	42	
2500 x 675 mm 4-sided tongue + groove			78	60	52	42	38
Ground on both sides							
2500 x 675 mm 4-sided tongue + groove			78	60	52	42	38

Table 4: Kronoply/Kronopol OSB/3 – Characteristic values to EN 13986

		Chip direction of top coat					
		parallel			right-angled		
		Nominal thickness of panels [mm]					
	d	6 – 10	>10 – 18	>18 – 25	6 – 10	>10 – 18	>18 – 25
Strength values [N/mm²]							
Panel loads							
Bending	$f_{m,k}$	18.0	16.4	14.8	9.0	8.2	7.4
Pressure	$f_{c,90,k}$	10.0			10.0		
Thrust	$f_{v,k}$	1.0			1.0		
Wall plate loads							
Bending	$f_{m,k}$	9.9	9.4	9.0	7.2	7.0	6.8
Traction	$f_{t,k}$	9.9	9.4	9.0	7.2	7.0	6.8
Pressure	$f_{c,k}$	15.9	15.4	14.8	12.9	12.7	12.4
Thrust	$f_{v,k}$	6.8			6.8		
Strength values [N/mm²]							
Panel loads							
Elasticity module, bending	E_{mean} [a]	4930			1980		
Thrust module	G_{mean} [a]	50			50		
Wall plate loads							
Elasticity module	E_{mean} [a]	3800			3000		
Thrust module	G_{mean} [a]	1080			1080		
[a] The following calculation values apply for the characteristic rigidity values E_{05} and G_{05}: $E_{05} = 0.85 \times E_{mean}$ and $G_{05} = 0.85 \times E_{mean}$							
General and physical values							
Gross density to EN 323	m	600 kg/m³					
Limit deviations for board thickness		± 0.8 mm (unground) ± 0.4 mm (ground)					
Tensile strength to EN 319	perm. σ_{Zy}	0.18	0.15	0.13	0.18	0.15	0.13
Thermal conductivity to EN 13986	λ	0.13 W/mK					
Vapour diffusion resistance figure	μ	200 / 300					
Thickness swelling to EN 317		≤ 15%					

Emission class	E1 – 100% formaldehyde-free binding agents
Usage class to EN V 1995-1-1	1 + 2
Fire performance class to EN 13501-1	D - s2,D0
CE certificate no.	1034 – CPD – 1291/1/09 (D) 1034 – CPD – 1276/1/07 (Pl) 0380 – CPD – 0164 (F)

Kronoply/Kronopol F*****

Table 5: Supply range (panels per pack) Subject to change.

Thickness [mm]	12	15	18	22	25	30
2500 x 1250 mm	78	60	52	42	38	32
2650 x 1250 mm	78	60				
2800 x 1250 mm	78	60	52			
3000 x 1250 mm	78	60				
5000 x 2500 mm		16	12	10		
6250 x 675 mm 2-sided tongue + groove				22	18	
2500 x 675 mm 4-sided tongue + groove		60	52	42	38	32
2500 x 1250 mm 4-sided tongue + groove	78	60	52	42	38	

Product group	Wood materials	Created
Declaration holder:	Kronoply OSB	20.10.2009
Declaration number:	EPD-KRO-2009111-E	

Table 6: Kronoply/Kronopol F**** - Characteristic values to Z-9.1-618

		Chip direction of top coat					
		parallel			right-angled		
		Nominal thickness of panels [mm]					
	d	8 - 18	> 18 - 25	> 25 - 30	8 - 18	> 18 - 25	> 25 - 30
Strength values [N/mm²]							
Panel loads							
Bending	$f_{m,k}$	28.0	23.0	23.0	14.0	12.5	12.5
Thrust	$f_{v,k}$	1.5			1.5		
Wall plate loads							
Bending	$f_{m,k}$	19.5	17.0		13.5	12.5	
Traction	$f_{t,k}$	12.0	10.5		8.0	7.5	
Pressure	$f_{c,k}$	14.0	12.5		11.0	10.5	
Thrust	$f_{v,k}$	8.0	7.0		8.0	7.0	
Strength values [N/mm²]							
Panel loads							
Elasticity module, bending	$E_{m,mean}$	6500			3000		
Thrust module	G_{mean}	100			100		
Wall plate loads							
Elasticity module, bending	$E_{m,mean}$	3500			2500		
Elasticity module, traction	$E_{t,mean}$	3500			2500		
Elasticity module, pressure	$E_{c,mean}$	3500			2500		
Thrust module	G_{mean}	1000			1000		
The following calculation values apply for the characteristic rigidity values E_{05} and G_{05}: $E_{05} = 0.9 \times E_{mean}$ and $G_{05} = 0.9 \times E_{mean}$							
General and physical values							
Gross density to EN 323	m	620 kg/m³					
Limit deviations for board thickness		± 0.4 mm					
Bearing stress strength	perm. σ_l	5.0			4.0		
Cross pass to EN 1087-1	σ_{Zy}	0.14	0.12	0.10	0.14	0.12	0.10
Thermal conductivity figure to DIN EN 13986	λ	0.13 W/mK					
Vapour diffusion resistance figure	μ	200/300					
Thickness swelling to EN 317		≤ 9%					
Emission class		E1 – 100% formaldehyde-free binding agents < 0.03 ppm					
Usage class to ENV 1995-1-1		1 + 2					
Fire performance class to EN 13501-1		D - s2,D0					
General construction inspection approval		Z-9.1-618					

Kronoply/Kronopol OSB/4

No standard formats. Only special production for industrial use.

Table 7: Kronoply/ Kronopol OSB/4 - Characteristic values to Z-9.1-503

		Chip direction of top coat					
		parallel			right-angled		
		Nominal thickness of panels [mm]					
		8 - < 18	18 - ≤ 30	> 30 - 40	8 - < 18	18 - ≤ 30	> 30 - 40
Strength values [N/mm²]							
Panel loads							
Bending	$f_{m,k}$	28.5	27.5	27.5	20.0	19.0	19.0
Thrust	$f_{v,k}$	2.0	1.5	1.5	2.0	1.5	1.5
Wall plate loads							
Bending	$f_{m,k}$	11.4	10.9*	No data*	8.2	8.0*	No data*
Traction	$f_{t,k}$	13.5	11.5	11.5	12	11.0	11.0
Pressure	$f_{c,k}$	14.5			14.5		
Thrust	$f_{v,k}$	9.5	7.0	6.5	9.5	7.0	6.5
Strength values [N/mm²]							
Panel loads							
Elasticity module, bending	$E_{m,mean}$	7500			3500		
Thrust module	G_{mean}	60	70	110	60	90	120
Wall plate loads							
Elasticity module, traction	$E_{t,mean}$	3500			3000		
Elasticity module, pressure	$E_{c,mean}$	3500			2500		
Thrust module	G_{mean}	1100			1100		
The following calculation values apply for the characteristic rigidity values E_{05} and G_{05}: $E_{05} = 0.9 \times E_{mean}$ and $G_{05} = 0.9 \times E_{mean}$ * These loads are not regulated for nominal thicknesses > 25 mm.							
General and physical values							
Gross density to EN 323	m	620 kg/m³					
Limit deviations for board thickness	mm	± 0.5	± 0.8		± 0.5	± 0.8	
Cross pass to EN 1087-1	σ_{Zy}	0.19	0.13	0.10	0.19	0.13	0.10
Thermal conductivity figure to DIN EN 13986	λ	0.13 W/mK					
Vapour diffusion resistance figure	μ	200 / 300					
Length variation on increase/decrease of relative humidity	−{}−%/%	0.005					
Thickness swelling to EN 317		≤ 9%	≤ 8%	≤ 6%	≤ 9%	≤ 8%	≤ 6%
Emission class		E1 – 100% formaldehyde-free binding agents < 0.03 ppm					
Usage class to ENV 1995-1-1		1 + 2					
Fire performance class to EN 13501-1		D - s2,D0					
General construction inspection approval		Z-9.1-503					

1 Raw materials

Raw materials, primary products

Base materials in % mass:

Wood share, min. 80%, of which:

- pine with FSC Certificate, min. 40 %

Secondary materials / Additives

Adhesive, of which:

- MUPF resin 0-11%
- PUR resin (MDI basis) 4-6%

Water in the form of wood moisture 5-8%

Urea < 1%

Material definitions

- **Wood mass**

  Only fresh debarked wood from pine forests harvested via thinning measures of largely PEFC- or FSC-certified, ecologically-supervised forests (FSC = Forest Stewardship Council, an international, non-profit association committed to sustained forest management).

- **Adhesive** (binding agents for wood chips):

  - MUPF resin: The mixed resin comprises melamine, urea and phenol. The adhesive (aminoplast) sets fully during the pressing process (polycondensation).

  - PUR resin: MDI (diphenylmethane-diisocyanate), a polyurea primary product which is transformed into PUR (polyurethane) and polyurea during the OSB manufacturing process, is used. These belong to the group of polyurethane resins.

- **Urea:**

  Urea is added to the wood material in order to modify and optimise the panel properties. This is present chemically in the OSB.

- **Wax emulsion:**

  A paraffin wax emulsion is added to the recipe for the purpose of hydrophobicity (improving moisture resistance).

Harvesting raw materials and origin of materials

Only wood from domestic forest stocks is used. Wood with a PEFC or FSC Certificate is preferred. All of the wood originates from within a radius of max. 300 km and this regional aspect represents an essential contribution towards sustained, ecological forest management. The average transport distance is 136 km. Adhesive and urea come from a distance of up to 800 km.

Regional and general availability of raw materials

The wood originates exclusively from sustained managed forests and is sufficiently available as a sustained raw material. The binding agents and urea are synthesised from natural gas, a fossil raw material of limited availability.

2 Product manufacture

Product manufacture

Manufacturing process breakdown:

1) Debarking the wood
2) Cutting the roundwood to strands (small veneer-like strips)
3) Drying the wet strands from 100% wood moisture to 3% wood moisture
4) Straining the strands into top layer, middle layer and fine layer
5) Gluing the top layer and middle layer strands with resin
6) Aligning the top layer strands in the production direction; the middle layer strands are oriented at an angle of 90° to the top layer

7) Pressing the strand cake in a continuous press
8) Trimming the OSB along the long edges and cutting to length
9) Stacking the OSB and packing with cardboard packaging and steel bands

All leftover strands and OSB (trimmings) during the manufacturing process are redirected into the production process.

Health protection Manufacture

Measures for avoiding health risks/problems during the manufacturing process:

Owing to the manufacturing conditions, no particular statutory or regulatory measures are required. The MAK values (Germany) are significantly fallen short of at each point of the system.

Environmental protection in manufacturing

Measures for reducing environmental pollution triggered by the manufacturing process:

- **Air:** Waste air generated during production is cleaned in accordance with statutory specifications. Emissions are significantly below the requisite limit values.
- **Water/Ground:** No contamination of water or ground. No waste water generated by production. Production is free of waste water.
- **Noise:** Sound protection analyses have established that all values communicated inside and outside the production facility are far below the requisite (German) standards. Noise-emitting system components such as the debarking drum have been encapsulated accordingly.

3 Product processing

Processing recommend-ations

The Kronoply/Kronopol OSB can be sawn, milled, planed and drilled using standard woodworking machinery or tools. Correct structural installation must be ensured. When selecting additional products, please ensure that they do not have a negative influence on the designated environmental compatibility properties of the building product referred to. Detailed processing information is available directly from Kronopol Zary (Poland), Kronoply Heiligengrabe (Germany) und Kronofrance Sully (France) or at http://www.kronoply.de.

Industrial safety Environmental protection

Industrial safety and health protection measures: When processing/fitting Kronoply/Kronopol OSB, the standard safety measures as for processing solid wood must be taken (protective gloves, dust masks when grinding and sawing).

Environmental protection measures: Processing or fitting Kronoply/Kronopol OSB does not trigger any environmental pollution. No special measures need to be taken to protect the environment.

Residual materials

Residual materials and packaging: Residual material on building sites (cuttings, packaging) must be collected sorted by waste contingent. The specifications outlined by local disposal authorities and the information provided in section 6 “Re-use phase” must be taken into consideration when disposing of residual materials.

Packaging

Kronoply/Kronopol OSB packaging:

Paper/Cardboard transport packaging and band irons can be sorted and directed to the recycling circuit.

4 Condition of use

Contents

Contents in condition of use:

The contents comply with those of Kronoply/Kronopol OSB base material composition (see 1. “Base materials“). In the curing process, the adhesive (MUPF) is 3D-cured in an irreversible polycondensation reaction in the top layers while applying heat. MDI binding agent in the panel middle layer fully and irreversibly reacts with the wood moisture to become a 3D-cured polyurethane (PUR) and polyurea. The binding agents are chemically and stably bound to the wood. The low volume of released formaldehyde from the top layer resin is not harmful to health. The phenol values communicated are also harmless (see evidence in 7.5 Phenols) and can be attributed to their natural presence in wood. The PUR gluing (middle layer) is free of formaldehyde. Gluing with MUPF and PUR leads to Kronoply/Kronopol OSB displaying great stability as regards deviations in humidity. The special Contifinish surface has the advantage that short-term admission with water is not absorbed immediately by the OSB but rather pearls off. The top layer resin is colourless with the result that the wood character of Kronoply/Kronopol OSB is retained thanks to the size and alignment of the strands.

Relationships between environment and health

Health aspects:

No damage to health can be anticipated if Kronoply/Kronopol OSB is used as designated. With the exception of low, harmless volumes of formaldehyde, no emissions of pollutants can be ascertained (see evidence in section 8, especially 8.1 Formaldehyde).

Environmental aspects: No risks for water, air and ground if Kronoply/Kronopol OSB is used as designated (see evidence in section 8).

Reliability of condition of use

Details on application experience, recommended measures for avoiding structural damage: When using Kronoply/Kronopol OSB in supporting or stiffening elements, the regulations of DIN 68800-2, “Wood protection – Preventive structural measures” apply. Furthermore, the specifications outlined in DIN 1052:2008-12 or to DIN V EN 1995-1-1 with National Application Document (NAD) also still apply for constructive applications.

5 Extraordinary effects

Fire

Fire performance:

- Building material class B2 “normally flammable” to DIN 4102-1
- D-s2, d0 - to EN 13986 Euro-class D, Smoke class s2, Drip class d0

Development of smoke gas / Smoke density: In accordance with the smoke development and smoke density associated with solid wood.

Fire gas toxicity: Owing to the conversion process during combustion, hydrogen cyanide is released from the PUR resins contained in the panels under certain fire conditions. Owing to the toxicity of gaseous hydrogen cyanide arising, leftovers of the products referred to may only be burned in accordingly permissible and sealed systems and under no circumstances in any type of naked flame.

Changing the system condition (burning dripping/falling material): Burning dripping material is not possible as Kronoply/Kronopol OSB does not liquefy when heated.

Water

Effects of water: No heavy metals could be established in the quantitative analysis of inorganic trace substances in the material.

Mechanical destruction

Breakage: Kronoply/Kronopol OSB breakage features display relatively brittle performance, whereby no smooth breaks are established along the panel edges.

6 End of life phase

Re-use

Provided they are untreated and not fully glued, Kronoply/Kronopol OSB panels can be easily sorted and re-used for the same application when converting or completing the usage phase of a building.

Further use

Provided the panels have not been damaged or contaminated with foreign products, Kronoply/Kronopol OSB can be used again in line with their original designated purpose.

Recycling Kronoply/Kronopol OSB can be directed to the chipboard manufacturing process if sorted accordingly.

Further use **Energetic utilisation** (in approved systems): Owing to the high heat value of 17 MJ/kg, energetic utilisation for generating process energy and electricity (CHP plants) from OSB leftovers and OSB panels arising from breakage measures on the building site is recommendable.

Disposal **Disposal/Landfilling:** Kronoply/Kronopol OSB leftovers on the building site as well as those incurred by breakage measures may not be landfilled where material recycling is not possible but rather require energetic recycling (see above) or combustion in an MVA owing to their purely organic components (wood, MUPF, PUR) and their high heat values. Waste key: 170201/030103 in line with the European Waste Catalogue.

Packaging: Paper/Cardboard transport packaging and band irons can be sorted and directed to the recycling circuit. In individual cases, external disposal can be arranged with the manufacturer.

7 Life cycle assessment

7.1 Manufacturing Kronoply OSB panels

Declared unit The declared unit refers to the manufacture and disposal of one cubic metre of OSB composite wood board in the product mix (Kronoply/Kronopol OSB/2, Kronoply/Kronopol OSB/3, Kronoply/Kronopol F**** and Kronoply/Kronopol OSB/4). The average gross density of the panel is 623.33 kg/m³ (moisture: approx. 5%).

For the end-of-life scenario, the declared unit is burned thermally in a bio-mass power plant for generating energy taking consideration of the substitution of electricity and heat.

System limits The selected system limits comprise the production of OSB panels including extraction of the raw material to the packaged product at the factory gate (cradle to gate).

The GaBi 4 (2006) data base was used for generating energy and transport. The review framework comprises the following details:

- Forest processes for the provision and transport of wood
- Production of all raw materials, primary products and consumables including the associated relevant transport
- Transporting and packaging the raw materials and primary products
- OSB panel production process (energy, waste, thermal utilisation of production waste, emissions) and provision of energy from the resource
- Packaging including thermal utilisation thereof

The products tested are produced 33% in the Heiligengrabe plant, 38% in the Zary plant and 29% in the Sully sur Loire plant.

The utilisation phase for OSB panels was not examined in this declaration. As the end-of-life scenario, a biomass power plant with energy recovery (credits in accordance with the substitution approach) was assumed (“gate to grave”). The analysis framework starts at the gate to the utilisation plant. In terms of output, it is assumed that the ash incurred is directed to a landfill.

Cut-off criteria On the input side, at least all material flows integrated in the system and greater than 1% of its entire mass or contributing more than 1% to the primary energy consumption are taken into consideration. On the output side, at least all material flows are recorded which leave the system and whose environmental effects are greater than 1% of all effects in a category taken into consideration. All input used as well as all processspecific waste and process emissions have been analysed. Accordingly, the material flows with a mass share of less than 1% are also recorded. The cut-off criteria are therefore complied with as per the IBU guiding principles.

Transport

The relevant transports of raw materials and consumables used are always taken into consideration.

Assumptions and estimates

On the basis of data recorded by Kronoply at the production sites, it can be assumed that the product mix presented is representative for the panels tested.

All leftovers incurred during production and final manufacturing (trimmings, cuttings and milling leftovers) are directed to thermal utilisation in a separate power plant. External thermally-utilised leftovers are also taken into consideration. The credits from energy decoupling of the combustion plants are incorporated in the analysis.

The end-of-life scenario was assumed as a bio-mass power plant and modelled in accordance with the average panel composition.

The results of the lifecycle inventory and effect analysis are indicated as a product mix, whereby there are few differences between the individual OSB panels.

Period under review

The data used refers to the actual production processes of fiscal 2006 of plants reviewed where Kronoply/Kronopol OSB wood composite panels are manufactured. The volumes of raw materials, energy, consumables and fuels used have been communicated as average annual values. The life cycle assessment was drawn up for the reference area of Germany, Poland and France in line with the respective shares of annual production.

Background data

“GaBi 4” – the software system for comprehensive analysis (/GaBi 2006/) – was used for modelling the lifecycle for the manufacture and disposal of OSB panels. All of the background data records of relevance for manufacturing and disposal were taken from the GaBi 4 software data base. The upstream processes for the forest were analysed as per “Schweinle 2001” and “Hasch 2002” in the Rüter and Albrecht update (2007).

Waste wood is taken into consideration from the waste wood dealer’s gate, whereby a CO_2 content of 1.851 kg CO_2 per kg of wood dry weight and a primary energy content of 18.482 MJ per kg wood dry weight is taken into consideration. No upstream pollutants are taken into consideration; chopping the waste wood and transporting it from the waste wood dealer to the production site (30% wood moisture) are included in the analysis.

Data quality

The data for the products tested was initially recorded directly in the three production facilities. The most important input and output data was supplied by the respective sites with the result that good data representativity can be assumed.

The majority of data for upstream chains originates from industrial sources and was collected under consistent time- and method-based constraints. The process data and background data used are consistent. Importance was attached to a high degree of completeness when collating material and energy flows of environmental relevance. Data was recorded by means of questionnaires.

Allocation

Allocation relates to the assignment of input and output flows for a life cycle assessment module to the product system tested (ISO 14040).

No allocations are necessary for the system of manufacturing OSB panels under review as residual material is recycled energetically.

Allocation to the individual production lines is necessary for the share of energy supplied by the internal power plant at the Heiligengrabe production site. Allocation was performed in accordance with energy usage for the individual products. Power plant emissions were allocated to electricity and thermal energy on the basis of the market price.

The attribution of energy credits for electricity and thermal energy produced in the end-of-life (EoL) process in the biomass power plant is based on the heat value of the input. The credit for thermal energy is calculated in the EoL on the basis of "EU-25 Thermal energy from natural gas"; the credit for electricity is calculated from the respective German, Polish or French power mix or in the EoL from the EU – 25 power mix. The emissions dependent on input (e.g. CO_2, HCl, SO_2 or heavy metals) were calculated in line with the content composition of the ranges used. Emissions dependent on technology (e.g. CO) are added in terms of waste gas volume.

In the production of allocatable external thermal utilisation processes (e.g. packaging), the relevant power mix at the production location or the "Thermal energy from natural gas DE and EU 25" is used.

Information on the usage phase

Kronoply/Kronopol OSB/2, Kronoply/Kronopol OSB/3, Kronoply/Kronopol F**** and Kronoply/Kronopol OSB/4 are wooden materials for use in construction. Kronoply/Kronopol OSB/4 can also be used in all supporting and stiffening components (ceilings, wall elements, roof boarding, flooring) in which the general construction inspection approval or the performance features to DIN EN 13986 are a prerequisite for application. Kronoply/Kronopol OSB panels can also be used in other areas such as in the packaging industry or for shelves, furniture, doors etc.

7.2 Thermal utilisation of OSB panels

Selecting the disposal process

Thermal utilisation in a biomass power plant was assumed for the OSB mix for this Environmental Product Declaration and modelled in line with the average OSB panel composition. The plant features SCNR flue-gas denitrification, dry sorption for desulphurisation and a fabric filter for particle cleaning. The fuel utilisation factor is 93%.

Credits

The substitution approach is applied for generating energy. Electricity and heat as products generated are attributed the appropriate credits which would be incurred by saving fossil fuels and their emissions in the case of conventional energy generation (see above).

7.3 Depicting the analyses and evaluations

Life cycle inventory analysis

The following section depicts the life cycle inventory analysis as regards primary energy consumption, CO_2 analysis and waste volumes.

Primary energy

Table 7 depicts primary energy consumption (regenerative and non-regenerative, lower heat value H_u) broken down into total, production and end of life of one cubic metre of OSB panel product mix.

The consumption of non-regenerative energies for the manufacture of insulation panels (cradle to gate) is almost 5,370 MJ per m^3, whereby production accounts for approx. 34%, the provision of raw materials makes up for 63% while transport and packaging account for 2.6%.

12,307 MJ of regenerative energies (99% solar energy stored in the biomass and 1% wind and water power) are also used for manufacturing one cubic metre of OSB panel.

Table 8: Primary energy consumption for the manufacture of 1 cubic metre of OSB panel

OSB panel product mix				
Analysis factor	Unit per m³	Total	Production	End of life
Non-regenerative primary energy	[MJ]	-6,543	5,370	-11,914
Regenerative primary energy	[MJ]	12,094	12,307	-213

Closer inspection of the composition of primary energy consumption indicates that the energy stored in the OSB panel product primarily in the renewable raw materials within the throes of the photosynthesis process stays until its End of Life. 1 m^3 of finished OSB panel has a lower heat value of approx. 10,597 MJ.

Closer analysis of the non-regenerative energy requirements for the manufacture of one cubic metre of OSB panel reveals that natural gas is used as an essential primary energy carrier which accounts for approx. 51% of the primary energy used. Around 6% of energy requirements are covered by pit coal and 4% by brown coal while another 12% is covered by uranium. The 12% share of uranium in primary energy consumption is attributable to the purchase of external power from the public grid as per the respective power mix at the production locations which also incorporates nuclear energy. Crude oil accounts for 27& while the remaining 51% is covered by natural gas.

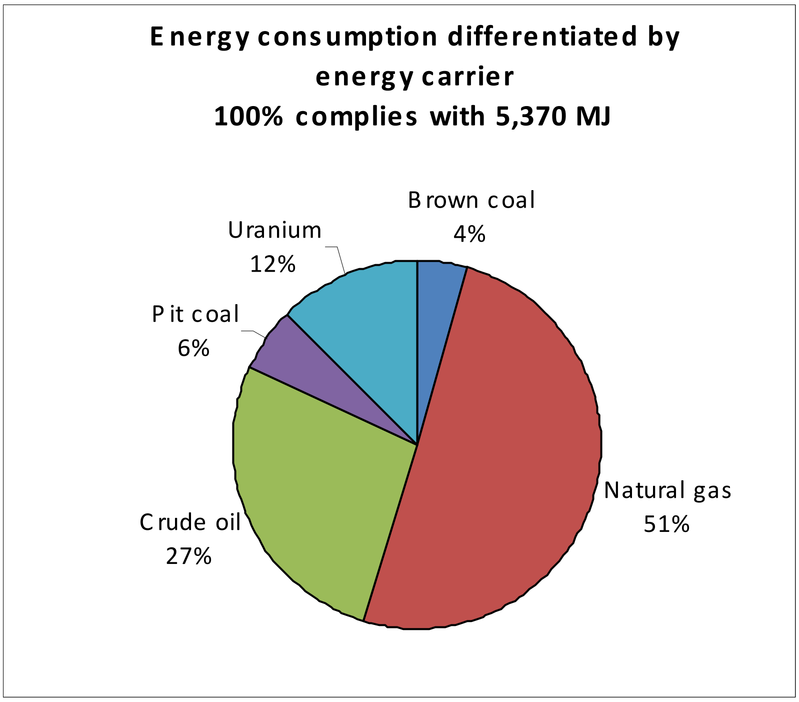

Fig. 1: Distribution of non-regenerative energy consumption by energy carrier in the manufacture of 1 m^3 of OSB panel product mix

The distribution of non-regenerative energy carriers across the individual processes is depicted in Fig. 2. Thermal utilisation of packaging and other waste is modelled as average waste incineration for the respective substance fraction with conversion into thermal energy and electricity production, and for wood waste in a biomass power plant. This gives rise to electricity credits by substituting electricity in the public network in line with the respective power mix and a credit for thermal energy as per average production of thermal energy from natural gas per m^3 of finished OSB panel produced.

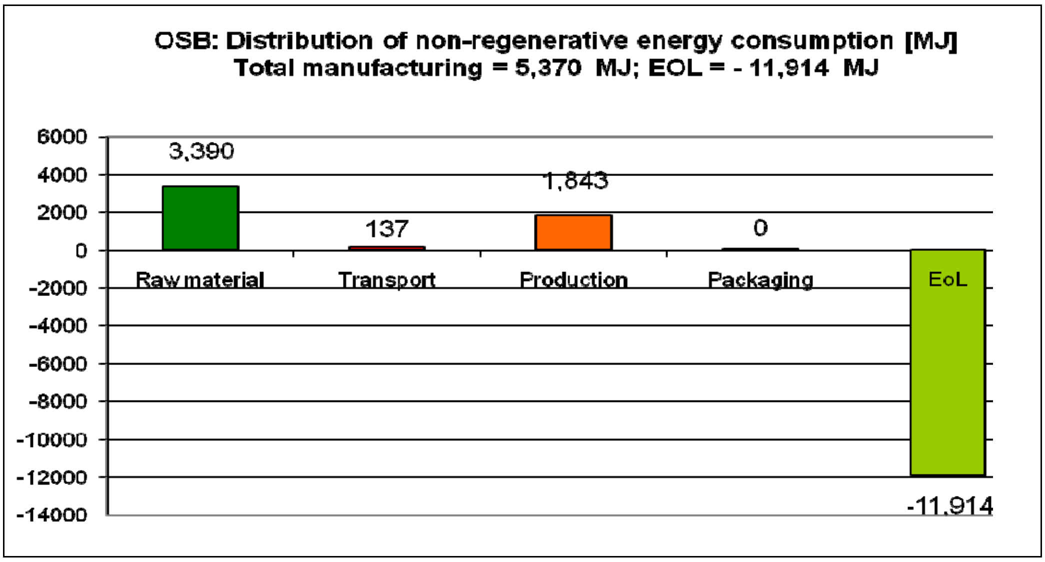

Fig. 2: Distribution of non-regenerative energy consumption in the manufacture of 1 m³ of OSB panel

Taking consideration of manufacturing and End of Life, Fig. 3 (combustion of the average OSB panel in a biomass power plant) indicates that the energy credit for electricity and thermal energy (credit for EU 25 Power mix and EU-25 Thermal energy from natural gas) corresponds to 11,914 MJ of non-regenerative energy carriers per m³ of OSB panel. Accordingly, the use of non-regenerative primary energy when offsetting manufacturing and incineration is reduced from 5,370 MJ/m³ to a negative value of -6,543 MJ/m³. This means that more non-regenerative energy is replaced by the use of regenerative energy stored in the OSB panel than was actually required for manufacture.

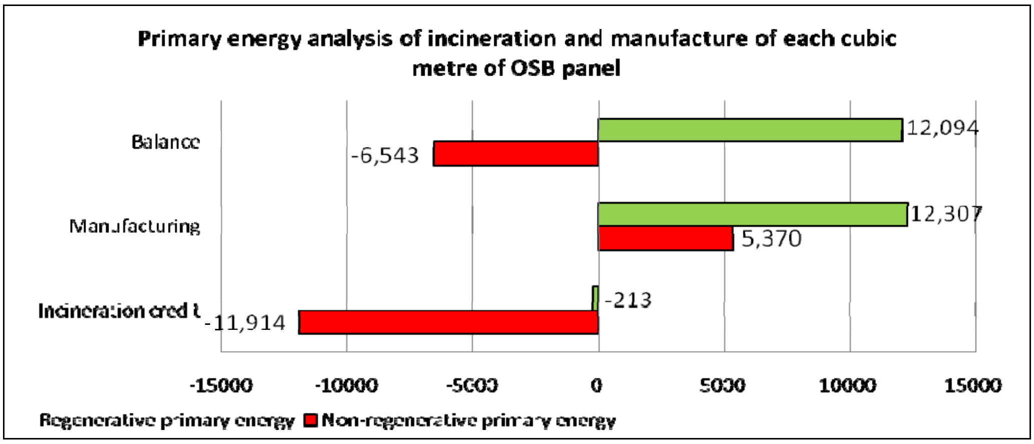

Fig. 3: Primary energy analysis of regenerative and non-regenerative energy carriers for the manufacture and incineration of 1 cubic metre of OSB panel

CO_2 analysis

The CO_2 analysis in Fig. 4 indicates that the manufacture of each cubic metre of OSB panel generates 368 kg in CO_2 emissions, of which 140 kg of CO_2 originate from direct thermal utilisation of wood in the production phase and a further 228 kg are accounted for by CO_2 fossil emissions. On the other hand, a total of 1,178 kg of CO_2 are stored from the air via photosynthesis in the wood following the manufacture of each cubic metre of OSB panel over the course of tree growth, of which 1,038 kg of CO_2 remains bound per cubic metre. The CO_2 stored in the wood in the OSB panel is not released until the end of the life cycle, e.g. thermal utilisation of the panel. If CO_2 absorption (input) is offset against CO_2 emissions (output) in manufacturing, the result is a balance of 810 kg of stored CO_2 per cubic metre of OSB panel for the manufacturing phase by means of binding in the product and substitution of non-regenerative energy carriers. This storage effect is useful over the utilisation phase. During end-of-life incineration in the biomass power plant model, the carbon stored in the panel is emitted back into the atmosphere primarily in the form of CO_2. At the same time however, substitution of fossil fuels occurs and therefore of CO_2 from incinerating these fossil energy carriers to the effect of -663 kg CO_2. This energetic substitution effect therefore results in an overall balance of -406 kg CO_2 over the entire life cycle.

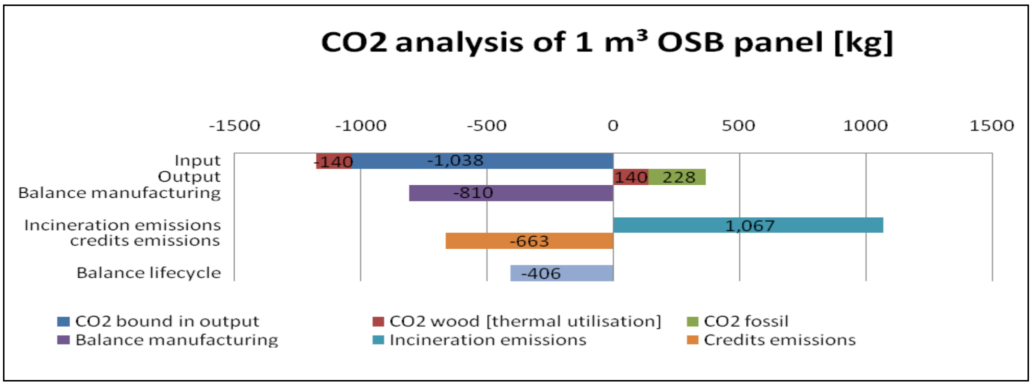

Fig. 4: CO_2 analysis of the manufacture of 1 cubic metre OSB panel product mix

Waste

An analysis of waste volumes for the manufacture of 1 cubic metre OSB panel is depicted separately for the three segments: mining waste / excavation waste (including ore treatment residue), municipal solid waste (including domestic waste and commercial waste) and special waste including radioactive waste (Table 8).

Table 9: Waste volume in the manufacture and incineration of 1 m³ OSB panel **Analysis factor**	**Manufacture [kg / m³]**	**EoL [kg / m³]**	**Total** **[kg / m³]**
Landfilling / Excavated waste	306.18	-536.58	-230.40
Municipal solid waste	0.056	0.000	0.056
Special waste	0.891	-0.454	0.437
Of which radioactive waste	0.236	-0.454	-0.218

Mining waste forms by far the most significant quantitative share, followed by special waste and municipal solid waste.

As far as **excavated waste** is concerned, mining waste accounts for the most significant quantitative factor in manufacturing with over 99% (303 kg), followed by ore treatment residue deposits, treatment residue, building rubble, excavated earth, ash etc. with a total share of less than 1%. Mining waste is incurred in particular in the extraction of mineral raw materials and coal in the provision of raw materials and energy carriers. Incineration of the insulating panel at the end of the lifecycle substitutes excavated waste in the provision of energy to an extent of 537 kg per m^3 of OSB panel.

The most essential influential factors within the **municipal solid waste** segment are represented by commercial waste similar to domestic waste, unspecific waste and liquid waste. All other fractions play a subordinate role. Incineration at End of Life causes a minor increase in the overall waste volume incurred.

Special waste is essentially waste from upstream stages. The “sludge” contingent accounts for the largest share of special waste with 0.65 kg per m³ of OSB panel produced. Each cubic metre of OSB panel produced also incurs 0.24 kg of radioactive waste, whereby 98.5% of that is accounted for by ore processing residue which is part of the power mix pre-chain. By means of energy recovery at End of Life however, more radioactive waste is substituted than required in production which in turn gives rise to a negative overall value.

Estimated impact

Table 9 below depicts the contributions by manufacturing and incineration of 1 m^3 OSB panel to the Greenhouse Warming Potential (GWP 100), Ozone Depletion Potential (ODP), Acid Potential (AP), Eutrophication Potential (EP) and Photochemical Ozone Creation Potential (summer smog potential POCP) effect categories. The regenerative primary energy (PE reg.) and non-regenerative primary energy (PE ne) are also outlined.

Table 10: Absolute contributions by manufacturing and End of Life per cubic metre of finished OSB panel to the effect categories under review

	PE ne	**PE reg.**	**GWP 100**	**ODP**	**AP**	**EP**	**POCP**
Unit	MJ	MJ	kg CO_2 equiv.	kg R11equiv.	kg SO_2 equiv.	kg PO_4 equiv.	kg ethene equiv.
Raw materials	3,389.9	12,277.7	-1,019.2	1.34E-05	3.27E-01	7.66E-02	6.38E-02
Production	1,843.3	28.7	232.1	1.20E-05	5.55E-01	4.47E-02	5.96E-02
Transport	136.8	0.162	9.74	1.70E-08	5.78E-02	9.99E-03	4.60E-03
Packaging	0.371	0.226	-0.008	1.13E-09	7.06E-05	1.33E-05	5.13E-06
Total manufacturing	**5,370.5**	**12,306.8**	**-777.4**	**2.53E-05**	**9.40E-01**	**1.31E-01**	**1.28E-01**
End of Life	-11,913.9	-213.0	361.7	-3.36E-05	-6.05E-01	-1.70E-02	-7.83E-02
Total	**-6,543.4**	**12,093.8**	**-415.7**	**-8.28E-06**	**3.36E-01**	**1.14E-01**	**4.98E-02**

If the **system limit manufacturing including End of Life** (incineration of the panel in a biomass power plant) is taken into consideration, the significance of the type of utilisation and/or disposal over the entire lifecycle becomes apparent from an environmental aspect. The additional emissions incurred as a result and/or any associated substitution effects in the energy supply system are depicted graphically in Fig. 5.

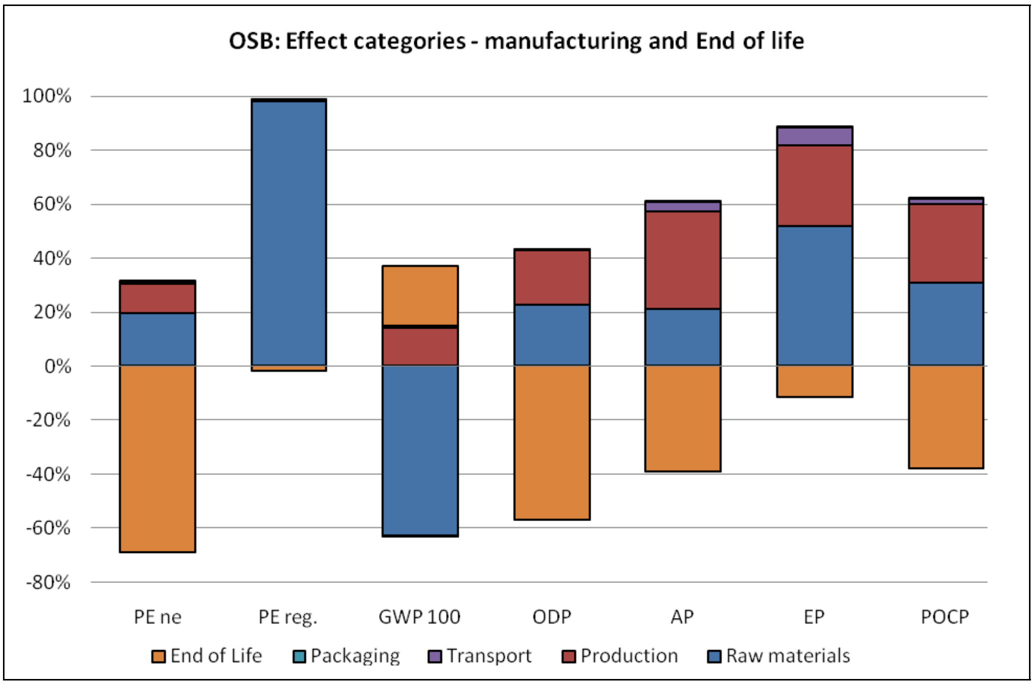

Fig. 5: Process shares in the effect categories – system limit plant gate and thermal utilisation at the end of life

The End of Life depicted arises by offsetting the emissions produced in the incineration process against the emissions avoided for generating electricity and steam. This involves the difference between the emissions of thermal utilisation of the OSB panels and the emissions avoided as a result in average energy generation (credits). These substitution effects at End of Life reduce all of the effect categories with the exception of the Greenhouse Warming Potential.

The **Greenhouse Warming Potential** is dominated by carbon dioxide in manufacturing. For each m^3 of OSB mix, 1,038 kg of CO_2 is integrated in the raw materials contained in the product. Another 140 kg of CO_2 equivalent are integrated in the wood used for energy and emitted again in the power plant during the production process. This CO_2 integration in the tree growth phase is offset by other greenhouse CO_2 emissions in the provision of raw materials, production, transport and packaging. Just over 95% of the emissions are carbon dioxide, almost 1% is accounted for by nitrous oxide and almost 4% are VOC emissions (especially methane). Over the product lifecycle therefore, a balance of approx. minus 777 kg CO_2 equivalent arises owing to the carbon stored in the product. The emission values at End of Life arise from the incineration minus the credit (substitution effects in the power mix as well as in average steam production) for energy utilisation from 1 m^3 average OSB panel (approx. 623 kg) from a 362 kg CO_2 equivalent. Within the system under review (manufacturing and End of Life) therefore, there is a Greenhouse Warming Potential of -415.7 kg CO_2 equivalent per m^3 OSB panel. The energetic substitution effects are therefore higher than the fossil emissions required for production.

The provision of raw materials (approx. 53%) and production (47%) essentially contribute towards the **Ozone Depletion Potential**. For each m^3 of OSB, a total Ozone Depletion Potential of 2.53E-05 kg R11 equiv. is incurred in production. The substitution of energy at End of Life causes an Ozone Depletion Potential value of approx. -8.28E-06 kg R11 equiv. in the overall system.

The provision of raw materials (35%) and production (60%) in particular contribute towards the **Acidification Potential**. For each m^3 of OSB, 0.94 kg of SO_2 equivalent are emitted during the production phase. The incineration emissions minus the emission credits owing to energy utilisation of the OSB panel at the end of life amount to -0.605 kg SO_2 equivalent. Accordingly, an acidification potential of approx. 0.336 kg SO_2 equivalent arises in the overall system under review.

The provision of raw materials (58%) and production (34%) are the most significant contributing factors in terms of the **Eutrophication Potential** in production. Transport accounts for 7.6%. In manufacturing, the Eutrophication potential accounts for 0.131 kg phosphate equivalent. The EoL reduces the Eutrophication potential taking consideration of the substitution effects to a phosphate equivalent of 0.114 kg.

The provision of raw materials contributes approx. 50% and production contributes 47% to the **Photochemical Ozone Creation Potential (near-ground ozone formation)**. Overall, the POCP within the plant gate system limit accounts for an ethane equivalent of 0.128 kg. The EoL reduces the POCP by means of energy substitution to 0.0498 kg of ethane equivalent.

8 Requisite evidence

8.1 Formaldehyde

Measuring agency: HFB Engineering GmbH, Prüfstelle für Baustoffe und Bauelemente, Leipzig, Germany

Test reports, date: 8-10.7.2008 and 15-17.7.2008

Result: The formaldehyde content was examined using the Perforator Method in accordance with DIN EN 120. The results are clearly below the limit value of 8.0 mg HCHO/100g atro panel (at 6.5% material moisture) in accordance with DIBt Guideline 100 in line with the Chemical Restriction Regulation, Annex to § 1, section. 3 in combination with the publication by the BGA in the Public Health Gazette in October 1991 on “Test procedures for wood materials”. The average results for the OSB panel (9-25 mm) are 0.16-0.39 mg HCHO/100g in accordance with DIN EN 120 (average values of double determination).

8.2 MDI

Measuring agency: eco UMWELTINSTITUT GmbH, Sachsenring 69, 50677 Cologne, Germany

Test report, date: 29.08.2001, project no. 365-1B/2001

Result: The diisocyanate monomers (test chamber) emission test after 3 days as per DIN V ENV 13419-1 and DIN V ENV 717 in line with the professional evaluation of the test report indicated that the presence of diisocyanate monomers could not be verified (4 substances, determination limits 3 µg/m³ and 5 µg/m³).

8.3 Eluate analysis

Measuring agency: Elektro-Physik Aachen GmbH

Test report: 7004/2009 dated 27.5.2009

Result: Glued OSB FO were tested. The parameters were determined in accordance with the “Waste Wood Act 08/2002”. Pb, Cd, Cr, Cu and Hg metals were lower than the limit value. At 0.55 mg/kg_{TS}, As was below the limit value of 2. The requirements of the Waste Wood Act are complied with for all of the parameters.

Measuring agency: Elektro-Physik Aachen GmbH

Test report: 7006/2009 dated 01.07.09

Result: OSB mixed glues were tested. The parameters were determined in accordance with the “Waste Wood Act 08/2002”. As, Pb, Cd, Cr, Cu and Hg metals were lower than the limit value. The requirements of the Waste Wood Act are complied with for all of the parameters.

8.4 Toxicity of fire gases

Measuring agency: Elektro-Physik Aachen GmbH

Test report: 14/2009 dated 14.05.09

Result: Glued OSB FO were tested. The results in accordance with DIN 53 436 indicate that no chlorine compounds (HCL – limit of detection 1 ppm) or sulphur compounds (SO_2 – limit of detection 1 ppm) could be verified. The gaseous emissions released under the selected test conditions largely comply with the emissions released by wood under the same conditions.

8.5 VOC

Volatile organic compounds (VOC) can be indicated as an option where validity is shorter (1 year).

8.6 PCP / Lindan

Measuring agency: MPA Eberswalde, Materialprüfungsanstalt Brandenburg GmbH, Germany

Test report: 31/07/7847/13, 25.9.-11.10.2007 and 31/08/1011/09, 19.6.-1.7.2008 (as per CEN/TR 14823 and Annex IV Waste Wood Act, wood moisture: based on EN 322)

Result: After extraction of the substances contained, the solutions were derivatised, reprocessed and subjected to a gas chromatography analysis. The PCP and Lindan values are below the limit of detection of 0.1 mg/kg.

9 PCR document and examination

This declaration is based on the “Wooden materials” PCR document, version dated January 2009.

Review of the PCR document by the Expert Committee. Chairman of the Expert Committee: Prof. Dr.-Ing. Hans-Wolf Reinhardt (University of Stuttgart, IWB)
Independent examination of the declaration in accordance with ISO 14025: ☐ internal ☒ external
Validation of the declaration: Dr. Frank Werner

10 Literature

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STANDARDS AND LEGISLATION

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DIN 1052 DIN 1052:2008-12, Design of timber structures - General rules and rules for buildings

DIN 4102-1 DIN 4102-1:1998-05, Fire behaviour of building materials and building components - Part 1: Building materials; concepts, requirements and tests

DIN 53436 DIN 53436, Producing thermal decomposition products from materials in an air stream and their toxicological testing

DIN 68800-2 DIN 68800-2:1996-05, Protection of timber - Part 2: Preventive constructional measures in buildings

DIN CEN/TR 14823 Permanence of wood and wood products - Quantitative determination of pentachlorphenol in wood – Gas chromatographic process; German version CEN/TR 14823:2003

DIN EN 1052-1	DIN EN 1052-1: 1998-12, Methods of test for masonry - Part 1: Determination of compressive strength; German version EN 1052-1:1998
DIN EN 1052-2	DIN EN 1052-2:1999-10, Methods of test for masonry - Part 2: Determination of flexural strength; German version EN 1052-2:1999
DIN EN 1052-3	DIN EN 1052-3: 2007-06, Methods of test for masonry - Part 3: Determination of initial shear strength; German version EN 1052-3:2002 + A1:2007
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DIN EN 71-3	DIN EN 71-3, Safety of toys - Part 3: Migration of certain elements
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DIN EN ISO 14041	DIN EN ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14044:2006); German and English version EN ISO 14044:2006
DIN EN ISO 9001	ISO 9001:2008-12: Quality management systems - Requirements (ISO 9001:2008); Trilingual version EN ISO 9001:2008
DIN EN 1995-1-1	DIN EN 1995-1-1:2008-09, Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings; German version EN 1995-1-1:2004+A1:2008
DIN EN ISO 14044	DIN EN ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14044:2006); German and English version EN ISO 14044:2006
DIN ISO 14025	ISO 14025: 2007-10, Environmental labels and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006); Text in German and English
DIN EN 300	DIN EN 300:2006-09,Oriented Strand Boards (OSB) - Definitions, classification and specifications; German version EN 300:2006
DIN EN 317	DIN EN 317:1993-08, Particleboards and fibreboards; determination of swelling in thickness after immersion in water; German version EN 317:1993
EN 319	DIN EN 319:1993-08: Particleboards and fibreboards; determination of tensile strength perpendicular to the plane of the board; German version EN 319:1993
EN 322	DIN EN 322:1993-08, Wood-based panels; determination of moisture content; German version EN 322:1993
EN 323	DIN EN 323:1993-08, Wood-based panels; determination of density

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In the case of doubt, the original EPD “EPD-KRO-2009111-D” is applicable.

This is to certify that the above text is a true translation of the German original submitted to me: Theley, Federal Republic of Germany, 21 December 2009

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