

**NORWEGIAN EXTERIOR
CLADDING**
Treated with water dilutable acrylic paint

Treindustrien 



Figure 1

NEPD nr: 137E

Approved according to ISO 14025, § 8.1.4

Approved 01-02-2010

Valid until 01-02-2013

Svein Fossdal

Verification

Independent verification of data and other environmental information has been carried out by Anne Rønning (Østfoldforskning), in accordance with ISO 21930, § 9.1

Anne Rønning

The declaration has been prepared by:

Catherine Grini, SINTEF Byggeforsk

Catherine Grini

PCR

NPCR 015 Solid wood products, approved by the NEPD verification committee, has been applied.

About EPD

EPD from other program operators than The Norwegian EPD Foundation may not be comparable.

Manufacturer information

Organisation Treindustrien
Address Forskningsveien 3 B, 0373 Oslo
Contact person Knut Einar Fjulsrud
Organisation no. 980 308 952
ISO 14001/EMAS: _____

Product information

Scope of assessment cradle to grave
Functional unit (FU) 1 m² of planed exterior cladding, installed and maintained with an expected average service life of 50 years. Calculations are based on a thickness of 19mm. All figures in this document refers to 1 functional unit (FU).
Expected service life 50 years
Year of study 2009, with data collection representing 2007
Production area Norway
Expected market area Norway

Product description

Norwegian exterior cladding is a planed timber product that is normally surface-treated. This EPD is based on planed timber used in Norway. The cladding is treated with a water dilutable acrylic paint. Environmental information concerning the paint has been found in the French register of existing EPD. It has been assumed 15 coats of paint during the cladding's lifetime (1 primer coat in production, 2 coats on the building site, 2 coats every 8 years during the use stage). The amount of used planed timber is calculated for vertical boards with dimension 198mm*19mm. The boards have an overlap of 25mm. It has been assumed 5% wastage on the building site and 10% replacement during the use stage. Nails are not included.

Origin of round timber 95% of round timbers used in the production of interior wood panel in Norway are certified in accordance with PEFC's standard.

Environmental indicators

Global warming	5,6 kg CO ₂ -eq.
Energy consumption	166 MJ
Amount of renewable materials	87 %
Indoor classification (according to EN 15251:2007)	not relevant

Product specification

Composition of final product

Table 1

Materials	Unit	Quantity	Part [%]	Data quality
Planed structural timber	m ³	0,0231	87 %	Specific data
Water-based acrylic paint	kg	1,72	13 %	Specific data (Paint Aquaryl Satin from Unikalo)
TOTAL			100 %	

Resource consumption

Material resources

Table 2

Material resources	Raw materials	Production	Building site	Use stage	Demolition	Transport	Total
New, renewable resources							
Timber (without bark) [m ³]	0,0243	0	0,0012	0,0024	0	0	0,0279
Bark [m ³]	0,0027	0	0,0001	0,0003	0	0	0,0031
Water (fresh) [kg]	35,20	0,52	6,54	39,13	0,02	0,06	81,47
Air [kg]	0,23	0,01	0,02	0,01	0,01	0,05	0,33
Other [kg]	3,5E-02	9,3E-04	5,6E-06	4,7E-06	4,7E-06	9,8E-05	0,04
New, non-renewable resources							
Crude oil [kg]	4,88E-01	1,16E-02	8,47E-02	5,08E-01	6,92E-05	2,19E-01	1,31E+00
Natural gas [kg]	4,09E-01	9,44E-03	1,08E-01	6,48E-01	3,42E-04	1,17E-02	1,19E+00
Limestone [kg]	4,15E-02	2,80E-04	6,68E-02	3,95E-01	9,79E-04	4,17E-04	5,05E-01
Hard coal [kg]	1,34E-01	3,04E-03	4,13E-02	2,45E-01	5,59E-04	9,50E-04	4,24E-01
Inert rock [kg]	5,78E-02	1,11E-03	5,05E-02	2,79E-01	4,04E-03	2,57E-02	4,18E-01
Lignite [kg]	1,72E-02	4,30E-05	3,18E-02	1,90E-01	1,53E-04	9,35E-04	2,40E-01
Sodium chloride (rock salt) [kg]	1,34E-02	1,21E-05	2,58E-02	1,55E-01	7,99E-07	2,04E-07	1,94E-01
Iron [kg]	5,72E-03	4,03E-05	8,49E-03	5,08E-02	1,97E-05	8,61E-05	6,52E-02
Other (ore without minerals and elements) [kg]	4,77E-03	2,63E-05	8,04E-03	4,77E-02	9,46E-05	1,19E-04	6,07E-02
Clay [kg]	3,63E-03	1,01E-05	6,66E-03	3,97E-02	3,40E-05	5,47E-05	5,01E-02
Soil [kg]	6,87E-03	2,26E-04	9,02E-04	4,52E-04	8,20E-04	5,50E-05	9,33E-03
Barium sulphate [kg]	4,21E-07	1,66E-05	3,55E-06	1,78E-06	3,55E-06	3,87E-05	6,45E-05
Peat [kg]	1,92E-07	1,79E-05	7,14E-09	2,84E-09	5,67E-09	1,40E-05	3,21E-05
Manganese [kg]	4,51E-05	1,13E-07	8,37E-05	5,00E-04	4,12E-07	7,00E-07	6,30E-04
Chromium [kg]	4,46E-05	2,26E-07	7,52E-05	4,48E-04	5,86E-07	1,69E-08	5,68E-04
Heavy spar [kg]	2,17E-05	1,18E-07	2,31E-06	1,10E-05	4,15E-07	4,95E-04	5,30E-04
Aluminum [kg]	4,12E-05	4,05E-07	5,75E-05	3,39E-04	1,09E-06	8,17E-08	4,39E-04
Dolomite [kg]	3,47E-05	4,28E-07	3,72E-05	2,23E-04	4,31E-09	9,77E-10	2,96E-04
Gypsum [kg]	1,92E-04	6,28E-06	2,48E-05	1,26E-05	2,25E-05	7,60E-06	2,66E-04
Zinc [kg]	1,29E-08	6,10E-07	1,28E-07	6,37E-08	1,27E-07	1,11E-06	2,06E-06
Lead [kg]	1,27E-05	7,00E-08	2,06E-05	1,23E-04	1,16E-07	1,91E-06	1,59E-04
Unspecified [kg]	1,70E-04	3,92E-06	6,14E-05	3,42E-04	4,26E-06	6,67E-05	6,48E-04
Feedstock energy, renewable resources [MJ]							200,87
Feedstock energy, non-renewable resources [MJ]							114,31

Land use and water resources

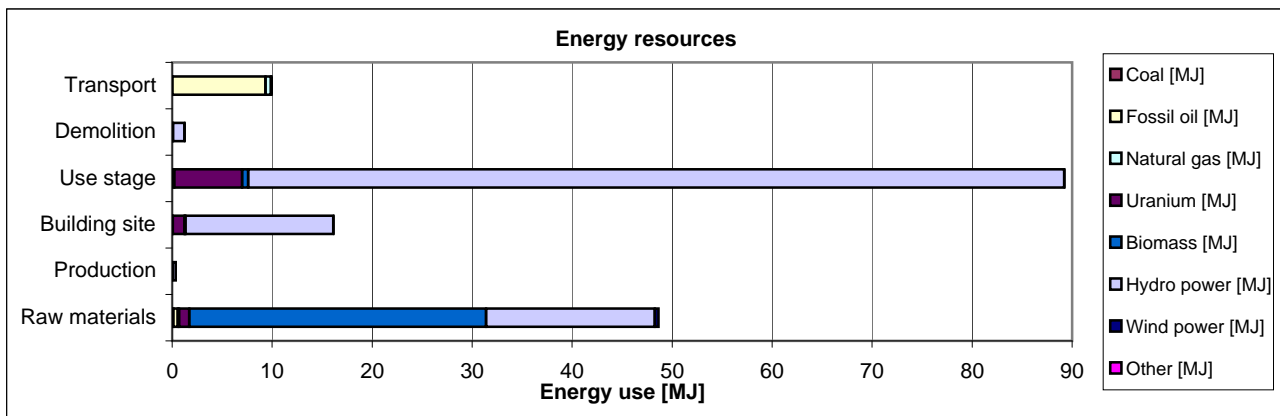
Land use has not been quantified. Water consumption is included in Table 2.

Energy resources

"Production" refers to the painting process only. The production of timber and paint are included in "Raw materials".

Energy carrier distribution for each life cycle fase

Figure 2



Energy consumption specified for the different energy carrier and life cycle stages

Table 3

	Raw materials	Production	Building site	Use stage	Demolition	Transport	Total
Fossil energy							
Coal [MJ]	1,3E-01	4,4E-03	1,8E-02	9,5E-03	1,6E-02	3,5E-02	0,22
Fossil oil [MJ]	4,3E-01	8,1E-04	3,8E-02	2,1E-01	2,9E-03	9,3E+00	10,00
Natural gas [MJ]	1,6E-01	4,4E-03	2,0E-02	2,0E-02	1,6E-02	5,3E-01	0,75
Uranium [MJ]	1,0E+00	1,4E-02	1,2E+00	6,8E+00	5,2E-02	5,0E-02	9,06
Renewable energy							
Biomass [MJ]	3,0E+01	3,2E-02	1,0E-01	6,1E-01	1,3E-05	2,5E-06	30,43
Hydro power [MJ]	1,7E+01	3,3E-01	1,5E+01	8,2E+01	1,2E+00	1,1E-02	114,76
Wind power [MJ]	3,9E-01	1,3E-02	4,8E-02	2,4E-02	4,4E-02	1,1E-03	0,52
Other [MJ]	1,6E-03	4,2E-05	1,0E-04	4,1E-04	3,1E-05	9,5E-04	3,1E-03
Total [MJ]							165,75

The calculation of electricity use is based on Nordel-mix consumed in Norway in 2007.

Emissions and environmental impacts

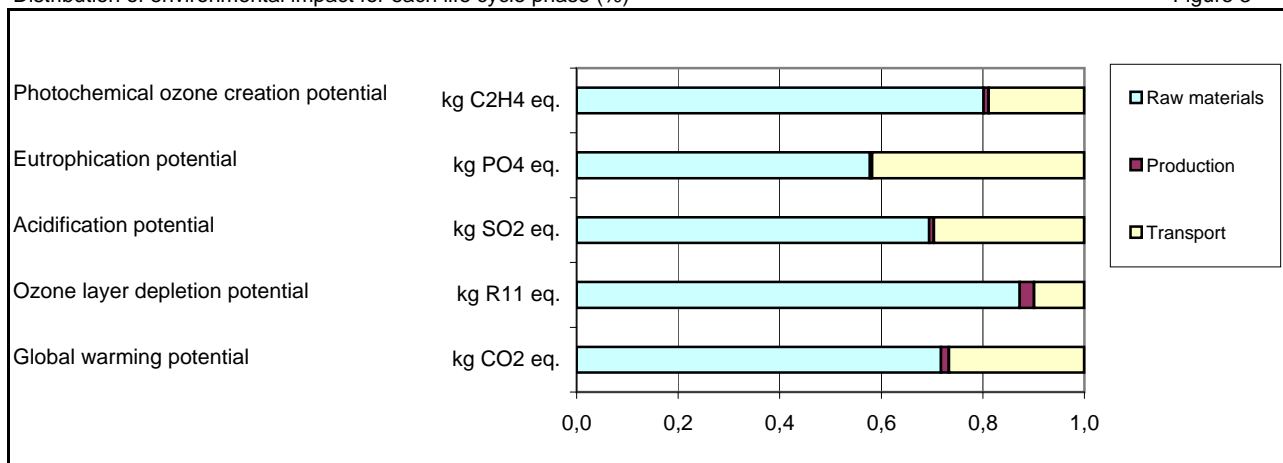
Environmental impacts

Table 4

Indicator	Unit	Raw materials	Production	Building site	Use stage	Demolition	Transport	Total
Global warming potential	kg CO ₂ eq.	1,6E+00	3,4E-02	4,9E-01	2,9E+00	7,1E-03	5,8E-01	5,56
Ozone layer depletion potential	kg R11 eq.	1,2E-08	3,9E-10	1,5E-09	8,0E-10	1,4E-09	1,3E-09	1,7E-08
Acidification potential	kg SO ₂ eq.	1,1E-02	1,5E-04	3,4E-03	2,0E-02	5,8E-06	4,7E-03	0,040
Eutrophication potential	kg PO ₄ eq.	1,1E-03	9,1E-06	5,6E-04	3,3E-03	8,3E-07	8,2E-04	0,006
Photochemical ozone creation poter	kg C ₂ H ₄ eq.	1,5E-03	1,9E-05	8,3E-04	5,0E-03	4,4E-07	3,5E-04	0,008

Distribution of environmental impact for each life cycle phase (%)

Figure 3



Emissions and waste

Table 5

	Raw materials	Production	Building site	Use stage	Demolition	Transport	Total
Emissions to air							
NH ₃ [g]	5,7E-01	3,3E-06	1,1E-02	6,4E-02	1,2E-05	3,8E-03	0,653
CO ₂ [g]	1,2E+03	2,7E+01	4,5E+02	2,7E+03	6,9E+00	5,6E+02	4947,66
CO [g]	1,1E+01	5,3E-02	8,9E-01	5,3E+00	2,1E-03	1,0E+00	18,260
HCl [g]	6,2E-02	1,4E-03	1,5E-02	9,2E-02	2,8E-05	8,8E-04	1,7E-01
Hg [g]	2,6E-05	6,6E-08	4,6E-05	2,8E-04	4,5E-08	6,5E-07	3,5E-04
CH ₄ [g]	1,0E+01	2,6E-01	1,2E+00	7,3E+00	4,9E-03	6,7E-01	19,892
N ₂ O [g]	1,4E-01	1,8E-05	1,0E-04	2,3E-04	6,4E-05	9,7E-03	0,153
NO _x [g]	5,5E+00	6,7E-02	1,7E+00	9,9E+00	5,2E-03	6,2E+00	23,364
NM VOC [g]	3,4E-01	7,2E-03	2,0E-03	9,7E-03	3,2E-04	4,1E-01	0,772
Particles [g]	8,1E-01	1,3E-02	6,3E-01	3,8E+00	5,4E-04	1,1E-01	5,320
Pb [g]	1,2E-04	5,7E-07	2,0E-04	1,2E-03	1,6E-06	1,1E-05	1,5E-03
SO ₂ [g]	6,1E+00	1,0E-01	2,2E+00	1,3E+01	2,1E-03	3,7E-01	21,838
Emissions to water							
BOD [g]	1,3E+00	7,8E-04	2,5E+00	1,5E+01	7,4E-06	8,7E-04	1,8E+01
COD [g]	3,9E+00	7,9E-03	7,2E+00	4,3E+01	4,2E-03	2,7E-02	54,113
N [g]	1,4E-02	2,0E-04	1,4E-02	8,2E-02	9,3E-05	7,9E-04	1,1E-01
P [g]	5,5E-03	1,6E-05	9,8E-03	5,9E-02	7,7E-07	2,5E-04	7,4E-02
Waste							
Waste to landfill [kg]	3,3E-01	3,2E-03	4,5E-01	2,6E+00	5,0E-03	2,5E-02	1,704
Hazardous waste [kg]	1,1E-01	2,0E-03	8,1E-03	1,8E-02	5,0E-03	2,5E-02	0,169

Waste treatment of final product

Landfilling of organic wastes is prohibited from July 1st, 2009.

100% of norwegian exterior wood panel (treated with water dilutable acrylic paint) will be incinerated for energy recovery in an ordinary incineration plant.

Energy recovery from the final product after the end of life belongs to the system utilizing the energy.

Only feed stock energy is included in this analysis.

Use of chemicals

Chemicals

Table 6

Description	Quantity	CAS-nr.	R-phrases	Health ^[4]	Environment ^[4]
Lambda-cyhalotrin [kg]	3,06E-10	91465-08-6	R21, R25, R26, R50/53	class 2	class 2
Imidacloprid [kg]	2,29E-10	13826-41-3	R22	class 4	-
Glyphosate [kg]	4,56E-09	1071-83-6	R41, R51/53	class 4	class 3

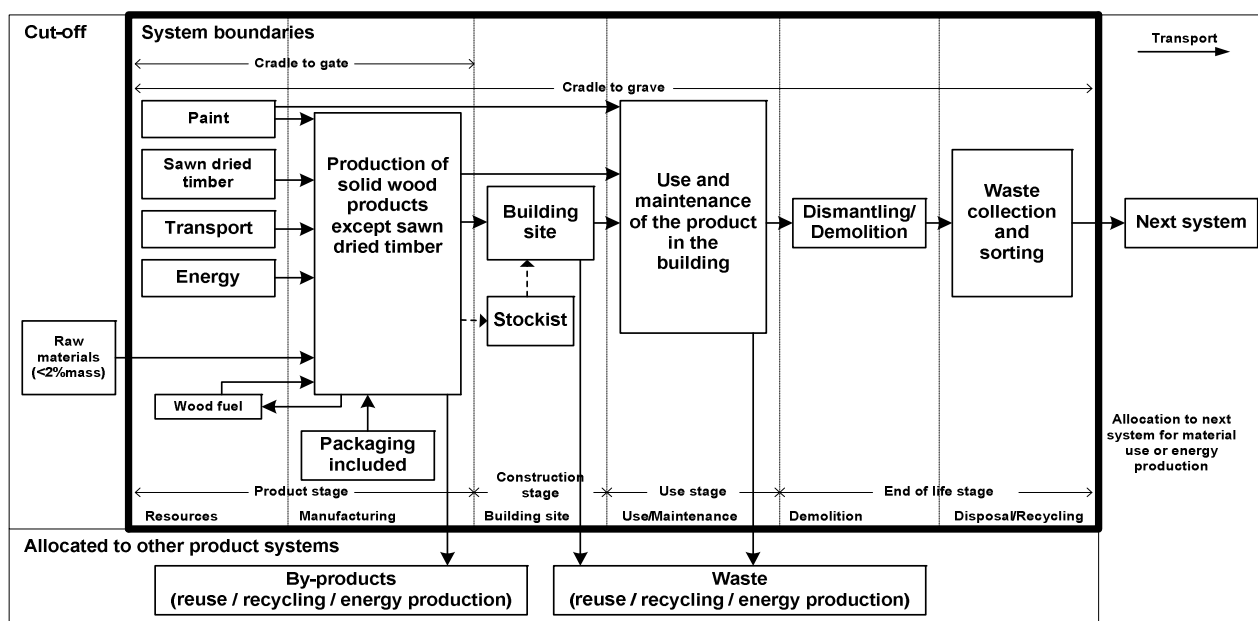
Safety Data Sheet (last revision in February 2009) for the paint Aquaryl Satin produced by Unikalo (<http://www.unikalo.com>) indicates that this paint doesn't contain any dangerous substances with an higher concentration than the thresholds defined in the directive 67/548/EEC.

We recommend to check the content of dangerous substances in the proper Safety Data Sheet for the paint you will use.

Methodology

System boundaries

Figure 4



References

- [1] NS-ISO 14025:2006, Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- [2] ISO 21930:2007, Sustainability in building construction - Environmental declaration of building products
- [3] PCR for preparing an environmental product declaration (EPD) for solid wood products, NPCR 015 2009
- [4] Abrahamsen et al. (2008): "EPDs as a tool for documentation/information on chemicals and toxicity in the value chains of products - a pre-study for EPD Norge".
- [5] Flæte, Per Otto (2009): "Energiforbruk og utslipp fra skogproduksjonskjeden med utgangspunkt i aktivitetsdata fra 2007 - fra frø til industritomt"
- [6] Sintef Byggforsk (2009): "Environmental Product Declaration (EPD) of 9 solid wood products", rapport MIKADO
- [7] EN 15251:2007, Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics