PAROC®
Better built environment

ENVIRONMENTAL PRODUCT DECLARATION

Self-declaration according to EN 15804

OWNER OF DECLARATION:
Paroc Group Oy, Energiakuja 3,
P.O. Box 240, FI-00181 Helsinki, Finland

MANUFACTURER:
The rock mineral wool production is modelled based on site specific data for seven Paroc plants over Europe.

DECLARED UNIT:
1 m^3 stone wool, product group with density <70 kg/m^3, average 35 kg/m^3. Lambda, average 0,035 W/mK

ISSUED:
28.01.2014, Expires: 28.01.2019
Independent verification of data and other environmental information has been carried out by Martin Erlandsson, IVL Swedish Environmental Research Institute.

SIGNATURE:

PE INTERNATIONAL
SUSTAINABILITY PERFORMANCE

PRODUCT DESCCRIPTION:

PRODUCT GROUP WITH DENSITY <70 KG/M³, AVERAGE 35 KG/M³

Stone wool is made from volcanic rock, typically basalt or dolomite, and an increasing proportion of recycled material. Stone wool is a wide spread building material which is mainly used for thermal insulation. It is available with different densities and thermal conductivities and is applicable in different areas of the building and industrial processes.

AREA OF APPLICATION:
The variety of the performance properties of stone wool thermal insulation make them suitable for the use in large numbers of applications for roofs, walls, floors and panels, such as:

- Inverted insulation for terrace roofs
- Floor insulation including insulation of highly loaded industrial floors
- Insulation of thermal bridges for exterior walls
- Interior insulation of walls and ceilings
- Insulation of pitched roofs – above and below rafters
- Prefabricated elements e.g. building sandwich panels, facade elements
- Technical insulation (of pipes, ducts etc.)

LCA CALCULATION RULES

DECLARED UNIT:
1 m³ stone wool, 35 kg/m³
Products with specific top layers are not considered within the scope of the study.

SYSTEM BOUNDARIES:
The system boundary of the EPD follows the modular design defined by EN 15804.

The production stage (module A1-A3) covers the following steps:

- Raw materials production (e.g. diabase, dolomite)
- Binder components production (e.g. resin)
- Transports of raw materials and pre-products to manufacturing plant
- Product manufacturing (power, thermal energy, auxiliaries, emissions)
- Production of packaging materials
- Waste management, water treatment, end-of-life of residues

With the exception of Modules A1 to A3 (describing the manufacturing of stone wool) all other modules are calculated on the basis of assumptions or scenarios.

The following scenarios were considered in this study:

- module A4 (transport to the building site, 300 km,
- module A5 (packaging waste processing, waste generated in the installation is assumed to be 0 %.
- module C2 (transport to the EoL, 50 km and
- module C4 (landfill).

PRIMARY DATA:
The rock mineral wool production is modeled based on site specific data for seven PAROC plants over Europe. Therefore data were collected based on the financial year 2011. The quantities of raw materials, energies, auxiliary materials and supplies used have been ascertained as cumulative annual values. Suppliers were not involved in the data collection process, except for the resin used. For the resin the supplier provided an LCA study, thus the inventory data used could be integrated into the LCA model. For the remaining pre-products generic data were used. The LCA of the single plants was created for the country specific reference area.

BACKGROUND DATA:
For life cycle modeling the GaBi 6 Software System for Life Cycle Assessment, developed by PE INTERNATIONAL AG, is used. All relevant background datasets are taken from the GaBi 6 software database. The technological background of the collected data reflects the physical reality of the declared average stone wool produced by PAROC.

INFO ON ELECTRICITY MIX:
Within the different plants the country specific power grid mix (reference year 2009) is applied.

ALLOCATION:
Besides stone wool iron is produced during the melting process of raw materials and sold. As the contribution of the co-product iron to the overall revenue represents less than 2% it is considered as low (EN 15804). Allocation shall be based on physical properties (e.g. mass, volume) when the difference in revenue from the co-products is low. Iron as by-product is allocated by mass. This approach is in line with EN 15804. A comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product specific characteristics of performance, are taken into account.

RESULTS ACCORDING TO EN 15804

RESULTS OF THE LCA - RESOURCE USE: 1 M³ STONE WOOL PRODUCT, 35 KG/M³									
		Raw material supply	Transport	Manu-facturing	Transport to the construc-tion site	Installation	Transport to EoL	Disposal	Benefits and Loads Beyond the System Boundary
Parameter	Unit	A1	A2	A3	A4	A5	C2	C4	D
PERE	[MJ]	33,79			n/a	n/a	n/a	n/a	n/a
PERM *	[MJ]	0,00			n/a	n/a	n/a	n/a	n/a
PERT	[MJ]	33,79			0,63	0,01	0,07	0,53	–0,90
PENRE	[MJ]	472,81			n/a	n/a	n/a	n/a	n/a
PENRM *	[MJ]	0,00			n/a	n/a	n/a	n/a	n/a
PENRT	[MJ]	472,81			16,19	0,25	1,78	7,27	–13,22
SM	[kg]	0,35			0,00	0,00	0,00	0,00	0,00
RSF	[MJ]	0,05			0,00	0,00	0,00	0,00	0,00
NRSF	[MJ]	0,41			0,00	0,00	0,00	0,00	0,00
FW	[litre]	119,48			0,00	0,00	0,00	0,01	0,00
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

* The heating value for stone wool is "0". Packaging material is not included here. PERM and PENRM are calculated as product-related indicators.
But within the modules A1-A3 the production of packaging materials is included: Polyethylene foil: 0,42 kg /m³.

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 M³ STONE WOOL PRODUCT, 35 KG/M³									
		Raw material supply	Transport	Manu-facturing	Transport to the construc-tion site	Installation	Transport to EoL	Disposal	Benefits and Loads Beyond the System Boundary
Parameter	Unit	A1	A2	A3	A4	A5	C2	C4	D
HWD	[kg]	4,44E–03			0,00E+00	0,00E+00	0,00E+00	4,94E–03	0,00E+00
NHWD	[kg]	6,98E+00			2,10E–03	0,00E+00	2,30E–04	3,41E+01	–3,32E–03
RWD	[kg]	2,18E–02			2,25E–05	1,45E–05	2,47E–06	1,30E–04	–7,95E–04
CRU	[kg]	n/a			n/a	n/a	n/a	n/a	n/a
MFR	[kg]	n/a			n/a	n/a	n/a	n/a	n/a
MER	[kg]	n/a			n/a	n/a	n/a	n/a	n/a
EE [power]	[MJ]	n/a			0	2,20	0	0	n/a
EE [thermal energy]	[MJ]	n/a			0	7,22	0	0	n/a
Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy per energy carrier								

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 M³ STONE WOOL PRODUCT, 35 KG/M³									
		Raw material supply	Transport	Manu-facturing	Transport to the construc-tion site	Installation	Transport to EoL	Disposal	Benefits and Loads Beyond the System Boundary
Parameter	Unit	A1	A2	A3	A4	A5	C2	C4	D
GWP	[kg CO_2–Eqv.]	47,40			1,17	1,34	0,13	6,28	–0,78
ODP	[kg CFC11–Eqv.]	2,68E–08			2,04E–11	1,15E–09	2,24E–12	3,72E–10	–2,77E–10
AP	[kg SO_2–Eqv.]	2,01E–01			3,63E–03	1,14E–04	3,72E–04	3,27E–03	–1,80E–03
EP	[kg PO_4^{3-}–Eqv.]	1,90E–02			7,83E–04	2,03E–05	7,90E–05	1,57E–03	–1,25E–04
POCP	[kg Ethen Eqv.]	1,95E–02			–1,07E–03	1,16E–05	–1,04E–04	1,33E–03	–1,53E–04
ADPE	[kg Sb Eqv.]	4,00E–06			4,36E–08	6,19E–09	4,78E–09	1,79E–07	–5,95E–08
ADPF	[MJ]	468,96			16,19	0,24	1,78	7,27	–13,20
Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources								

INTERPRETATION OF RESULTS

The **GWP** is dominated by CO_2 emissions during the production process at plant. Main initiator of the GWP is the combustion of all energy carriers used at plant, especially coke. Considering the product stage (module A1–A3) about 73% of its GWP is due to the direct combustion of coke and other energy carriers directly at plant. Another share of about 18% in the stone wool production is due to upstream processes in the electricity supply chain.

The **AP** is dominated by the production due to the emissions related to the melting process and curing process. The main impacts refer to emissions to air: 19 % result from Ammonia, almost 60 % from sulfur dioxide and 18 % from nitrogen oxides.

The Eutrophication potential is mainly made up from ammonia emissions (40 %) and NOx emissions (45 %), predominant resulting from the production process at plant. The **EP** is significantly influenced by the emissions from the cupola furnace and curing oven but as well by upstream processes in the electricity supply chain in the plants apart from the north of Europe.

The **POCP** is particularly dominated by the carbon monoxide emissions during the production process. The electricity supply chain contributes with about 15 % to the POCP of the product stage (module A1–A3).

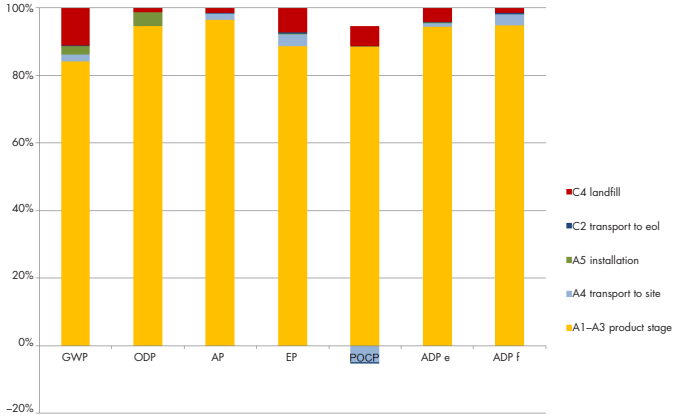
The **ADP fossil** follows the interpretation of the PENRT. A relevant **secondary material** as input in the production of stone wool is electric arc furnace slag (EAF slag).

The **fresh water use** is dominated by upstream processes in connection with energy generation with about 75%. In comparison, the direct water use at plant is of minor importance. The calculated fresh water use follows the definition of the "blue water consumption". This quantity doesn't consider the turbined water.

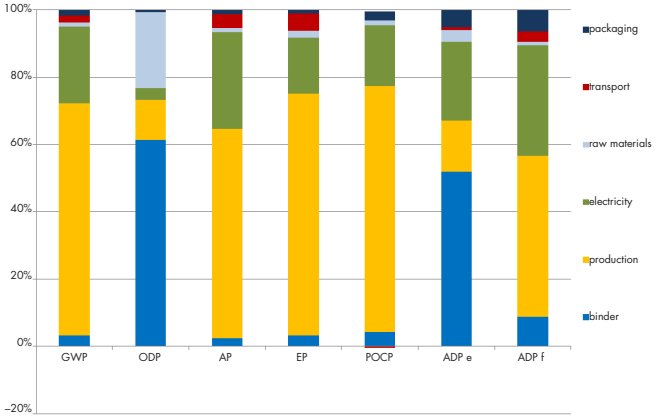
The non-renewable primary energy demand **PENRT** is dominated by the consumption of energy (especially coke) during the production at plant. Considering the product stage about 55% of its PENRT is due to the direct use of coke and other energy carriers directly at plant which are summarized in the subsystem "production". Another share of about 22% is due to upstream processes in the electricity supply chain. The Polish plant contributes with about 30% to the overall PAROC Mix. More than 80% of the Polish power grid mix is generated from lignite and hard coal.

The renewable primary energy demand **PERT** is dominated by the electricity supply chain because of the applied power grid mixes in the Swedish and Finish plants. In these plants electricity generated from 100% hydropower is accounted for.

IMPACT CATEGORIES FOR THE STONE WOOL'S LIFE CYCLE MODULE



BREAKDOWN OF MODULE A1-A3



REFERENCES:

DIN EN 15804 EN 15804:2012–04: Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products.

GABI 6 2012 GaBi 6: Software and database for life cycle engineering. LBP, University of Stuttgart and PE INTERNATIONAL AG, Leinfelden-Echterdingen, 2012.

ADDITIONAL INFORMATION

HEALTH AND SAFETY

You can use and handle PAROC stone wool products safely without health hazards. To ensure product safety Paroc Group produce only high bio-soluble stone wool fibre.

- The European Certification Board for Mineral Wool products (EUCEB) trademark on our products confirms that PAROC stone wool fibre fulfils the requirements of the biosolubility.
- RAL quality mark certifies that our stone wool products do not contain carcinogens, mutagens or substances toxic to reproduction, according to the German technical regulation for dangerous substances TRGS 905 and according to REACH Candidate List.

PAROC stone wool products fulfil the most stringent requirement (M1) in the Finnish voluntary system for building material emissions developed by the Finnish Society of Indoor Air Quality and Climate in Finland. Our stone wool products are recognized as low emitting products, for which they have been tested since 1995. PAROC low emitting products are recognized by the M1 label.

QUALITY AND ENVIRONMENT

Paroc is certified according to EN ISO 9001:2008 Quality management and the EN ISO 14001:2004 Environmental management systems. Certificates have been granted to the operations which produce PAROC insulation in all four Paroc production countries. The certificates encompass stone extracting in Paroc owned quarries, manufacturing and sales.

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