CO_2 - Bilanz für Produkte
Product Carbon Footprints
PCF
(EN ISO 14001)

PCF

CO_2 Balance

according to

the Supply Chain

for

GEOCELL Foam Glass Gravel SGS

GEOCELL Schaumglas GmbH **Zeppelinstrasse 15** **D-75438 Knittlingen**	**NL Edewecht** **Industriestrasse 4** **D-26188 Edewecht**

CO_2 - Bilanz für Produkte
Product Carbon Footprints
PCF
(EN ISO 14001)

Explanation of the manufacturer

The CO_2 Balance for Products (Product Carbon Footprints) examines the manufacture of a product at all stages of the supply chain with regard to emissions of greenhouse gases, especially CO_2.

The determination and recording of relevant parameters is carried out with great care.
The results are site and product specific.
Results gained from the CO_2 balance are permanently incorporated into the supply chain of the product in order to optimize the manufacturing process with regard to emissions.
For this reason, the authors reserve the right to make adjustments and changes if these lead to reduction of emission.

GEOCELL Schaumglas GmbH **Zeppelinstrasse 15** **D-75438 Knittlingen**	**NL Edewecht** **Industriestrasse 4** **D-26188 Edewecht**

Knittlingen am 28.05.2020

GEOCELL Schaumglas GmbH
Zeppelinstrasse 15 D-75438 Knittlingen
Tel +49 (7043) 955 595-0
Fax +49 (7043) 955 595-1
kontakt@geocell-schaumglas.eu
www.geocell-schaumglas.eu

CO_2 - Bilanz für Produkte
Product Carbon Footprints
PCF
(EN ISO 14001)

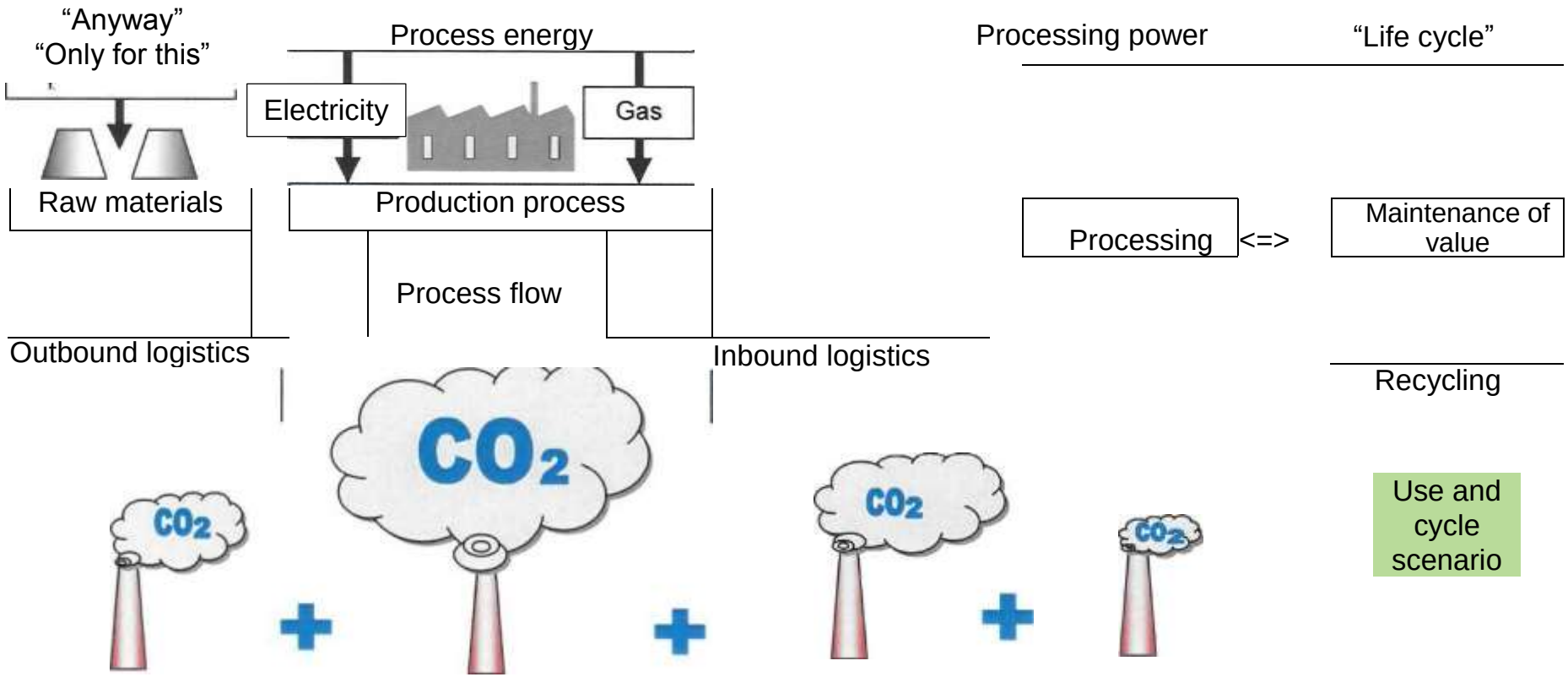
Product Description

GEOCELL foam glass gravel SGS, hereinafter referred to as SGS, is an industrially produced mineral, heat-insulating and load-bearing lightweight bulk material.
The primary raw material is powdered glass from milled alkali silicate glass (soda-lime glass).
By adding secondary additives with continuous supply of thermal energy, the viscous glass mass is foamed voluminously.
The subsequent cooling process leads to the formation of the gravel core.
Characteristic feature of the SGS product is the closed-cell structure of each individual grain, basic requirements for heat, insulating and pressure-stable character.
The properties of material neutrality and resistance to chemical influences that can be assigned to the glass can also be found in the product SGS.

GEOCELL foam glass gravel SGS is a construction product in accordance with the Model Building Regulations (Section 2, Paragraph 10 MBO 2012), which is manufactured in order to remain permanently in structures and to influence them with its properties.
GEOCELL foam glass gravel SGS is a construction product in accordance with the Construction Products Ordinance (BauPVO), as it is manufactured exclusively for this purpose and placed on the market in order to remain permanently in structures and affect them with its properties.

GEOCELL Schaumglas GmbH **Zeppelinstrasse 15** **D-75438 Knittlingen**	**NL Edewecht** **Industriestrasse 4** **D-26188 Edewecht**

The Supply Chain
GEOCELL Foam Glass Gravel SGS



GEOCELL CO_2 - Balance Foam Glass Gravel SGS

CO_2 - Bilanz für Produkte
Product Carbon Footprints
PCF

(EN ISO 14001)

Raw materials

A — Raw materials available independently from the production of GEOCELL foam glass gravel SGS
= "anyway" raw materials

B — Raw materials exclusively produced for the production of GEOCELL SGS foam glass gravel.
= "Only for this" raw materials

Production

Description of raw material	Consumption *	Raw material	Raw material	CO_2 relevant
		A	B	Kg CO_2/m^3_{SGS}
Glass powder [1.2 g/cm³]	**139 30 kg/m³**	X		**not relevant**
Water glass [1.36 g/cm³]	**7.75 kg/m³**	X		**not relevant**
Glycerol [1.26 g/cm³]	**1.02 kg/m³**	X		**not relevant**

* Production volume: 140 m^3/24h

Inbound logistics

Greenhouse gas relevant for the balance - CO_2 emissions **18656.58** kg/100km **year**

Description of raw material	Delivery cycle	Form of delivery	Delivery route	CO_2 relevant (Appendix 1)
			km	**kg/100km year**
Glass powder	**3x per week**	**Truck (Silo)**	**100**	**15655.87**
Water glass	**1x per 14 days**	**Truck (Silo)**	**100**	**2609.31**
Glycerol	**3x per year**	**Truck (IBC)**	**100**	**391.40**

Appendix 1: determination of CO_2 emissions by trucks

Greenhouse gas emissions CO_2 relevant for the balance **0.0 kg CO_2/m^3SGS**

based on annual production 2019 0.54 kg CO_2/m^3_{SGS}

GEOCELL Schaumglas GmbH
Zeppelinstrasse 15
D-75438 Knittlingen

NL Edewecht
Industriestrasse 4
D-26188 Edewecht

Appendix 1: determination of CO_2 emissions by trucks

CO_2 - Bilanz für Produkte
Product Carbon Footprints
PCF
(EN ISO 14001)

Production process 2019

Process energy

Electricity (mix: lignite/wind)

Annual production quantity SGS: 33.042 m^3
Annual production volume RED: 1.600 m^3

Month	Total consumption		Distribution of shares		Effective consumption	
	SGS [kWh]	RED	SGS [kWh]	RED	SGS [kWh]	RED
January	15.834		2.375		15.834	
February	15.939		2.390		15.939	
March	10.468 (1)	4.486 (1)	1.570 (1)	673 (1)	10.468	4.486
April	12.215		1.832		12.215	
May	14.929 (2)	3.732 (2)	2.239 (2)	560 (2)	14.929	3.732
June	16.984		2.547		16.984	
July	2.889		2.468		2.889	
August	18.122		2.718		18.122	
September	19.803		2.970		19.803	
October	16.977		2.546		16.977	
November	19.005		2.850		19.005	
December	12.538		1.881		12.538	
Σ	*175.703*	*8.218*	*28.386*	*1.233*	***175.703***	***8.218***

(1) March: production shares SGS 70% and RED 30% (2) May: production shares SGS 80% and RED 20%

Shares	Effective production	Effective administration	100%
In total	147.317 kWh [SGS] 6.985 kWh [RED]	28.386 kWh [SGS] * 1.233 kWh [RED]*	175.703 kWh [SGS] 8.218 kWh [RED]

For the balance relevant electricity consumption per year production days	[SGS]	5.31 kWh/m^3_{SGS} **
Greenhouse gas emission CO_2 relevant to the balance	[SGS]	2.52 kg CO_2/m^3_{SGS} ***
For the balance relevant electricity consumption per year production days	[RED]	5,13 kWh/m^3_{RED} **
Greenhouse gas emission CO_2 relevant to the balance	[RED]	2.43 kg CO_2/m^3_{RED}***

*** Product share distribution**
**** (Share of production only + product share distribution)/annual production volume**
***** Federal Environment Agency as of 2018: average direct emission 474g CO_2/kWh in Germany (electricity consumption)* (0.474 kg CO_2/m^3_{SGS})**

GEOCELL Schaumglas GmbH
Zeppelinstrasse 15
D-75438 Knittlingen

NL Edewecht
Industriestrasse 4
D-26188 Edewecht

CO_2 - Bilanz für Produkte
Product Carbon Footprints
PCF
(EN ISO 14001)

Production process 2019

Annual production quantity SGS: 33.042 m^3
Annual production volume RED: 1.600 m^3

Process energy

Gas (Natural Gas H)

Month	Total consumption		Distribution of shares		Effective consumption		
	kWh	m^3_{Gas} (1)	kWh	m^3_{Gas} (1)	SGS	[m^3]	RED
January	368.025	32.859	18.401	1.643	32.859		
February	383.372	34.229	19.168	1.711	34.229		
March	343.894	30.705	17.195	1.535	21.493 (2)		9.212 (2)
April	295.148	26.352	14.757	1.318	26.352		
May	478.743	42.745	23.937	2.137	34.196 (3)		8.549 (3)
June	410.568	36.658	20.528	1.833	36.658		
July	49.139	4.387	2.457	219	4.387		
August	440.346	39.317	22.017	1.966	39.317		
September	460.774	41.140	23.039	2.057	41.140		
October	369.061	32.952	18.453	1.648	32.952		
November	435.165	38.854	21.758	1.943	38.854		
December	277.541	24.780	13.877	1.239	24.780		
Σ	*4.311.776*	*384.978*	*215.588*	*19.249*	***367.217***		***17.761***

(1) **Heating value: 11.20 kWh/m^3**
(2) **March: production shares SGS 70% and RED 30%**
(3) **May: production shares SGS 80% and RED 20%**

Shares	Effective production	Effective administration	100%
Σ	367.217 m^3_{Gas} [SGS] 17.761 m^3_{Gas} [RED]	19.249 m^3_{Gas} [SGS] * 888 m^3_{Gas} [RED] *	384.978 m^3_{Gas} [SGS] 18.649 m^3_{Gas} [RED]

For the balance relevant gas consumption per year production days	11.65 m^3_{Gas}/m^3_{SGS} **
Greenhouse gas relevant for the balance - CO_2 emissions	22.95 kg CO_2/m^3_{SGS} ***
For the balance relevant gas consumption per year production days	11,10 m^3_{Gas}/m^3_{RED}
Greenhouse gas relevant for the balance - CO_2 emissions	21,87 kg CO_2/m^3_{RED}

*** Product share distribution**
**** (Share of production only + Product share distribution)/annual production volume**
***** Federal Environment Agency: 1 m^3 of burned natural gas releases ~ 1.97 kg of CO_2**

GEOCELL Schaumglas GmbH
Zeppelinstrasse 15
D-75438 Knittlingen

NL Edewecht
Industriestrasse 4
D-26188 Edewecht

CO_2 - Bilanz für Produkte
Product Carbon Footprints
PCF
(EN ISO 14001)

Production process 2019
Process flow

Annual production quantity SGS:	**33.042 m^3**
Annual production volume RED:	**1.600 m^3**

Phase 1
Viscosity of the glass powder mass + addition by adding thermal energy

Process	CO_2 relevant
physical / chemical	No

Greenhouse gas relevant for the balance - CO_2 emissions **0.0 kg CO_2/m^3_{SGS}**

Phase 2
Foaming of the viscous glass mass by burning glycerine

Process	CO_2 relevant
chemical	Yes

Greenhouse gas relevant for the balance - CO_2 emissions **0.0 kg CO_2/m^3_{SGS}**

Phase 3
Cooling of the foamed glass mass

Process	CO_2 relevant
physical	No

Greenhouse gas relevant for the balance - CO_2 emissions **0.0 kg CO_2/m^3_{SGS}**

GEOCELL Schaumglas GmbH
Zeppelinstrasse 15
D-75438 Knittlingen

NL Edewecht
Industriestrasse 4
D-26188 Edewecht

CO_2 - Bilanz für Produkte
Product Carbon Footprints
PCF
(EN ISO 14001)

Outbound logistics

C — Packaging materials available independently from the production of GEOCELL foam glass gravel SGS
= "Anyway" raw materials

D — Packaging materials exclusively produced for the production of GEOCELL SGS foam glass gravel.
= "Only for this" packaging materials

Forms of packaging

Forms of delivery	Packaging material	Packaging material	CO_2 relevant
	C	D	kg CO_2/m^3_{SGS}
Bulk material	n/a	n/a	not relevant
Packaging material BigBag	X		not relevant

0.0 kg CO_2/m^3_{SGS}

Greenhouse gas relevant for the balance - CO_2 emissions

Delivery	Delivery cycle	Form of delivery	Delivery route	CO_2 relevant
			km	kg CO_2/100km year
Bulk material	**8 x per week**	**Truck (90m³)**	**100**	**50.960** (1)
BigBag	**1x per week**	**Truck**	**100**	**5.047** (2)

Forms of delivery

(1) based on 245 delivery days per year

(2) based on 49 weeks per year

Greenhouse gas relevant for the balance - CO_2 emissions **56.007 kg CO_2/100km year**
based on annual production 2019 **1.70 kg CO_2/m^3_{SGS}** (3)

(3) Determination of CO_2 emission by trucks according to specified formula, Appendix 1

Internal Logistics

Internal Material Handling	average Roadway	CO_2 relevant
	m	kg CO_2/100m
Telescopic handler	**100**	**0.8 kg CO_2/100m**

GEOCELL Schaumglas GmbH
Zeppelinstrasse 15
D-75438 Knittlingen

NL Edewecht
Industriestrasse 4
D-26188 Edewecht

CO_2 - Bilanz für Produkte
Product Carbon Footprints
PCF
(EN ISO 14001)

Processing

For a system-effective processing of GEOCELL foam glass gravel SGS no additional substances are required.
The physical parameters (thermal insulation) and the mechanical parameters (load transfer) are achieved by applying compression energy to the prepared fill.

Application	Processing	CO_2 relevant
Filler, without compaction	Bulk material	No
Load-bearing, compaction	Compaction energy	Yes
Load bearing + thermal insulation, compaction	Compaction energy	Yes

Greenhouse gas relevant for the balance - CO_2 emissions **0.1 kg CO_2/m^3_{SGS} ***

* Acceptance for a flat-rate machine output (compaction machine-1t) of 2.5 h

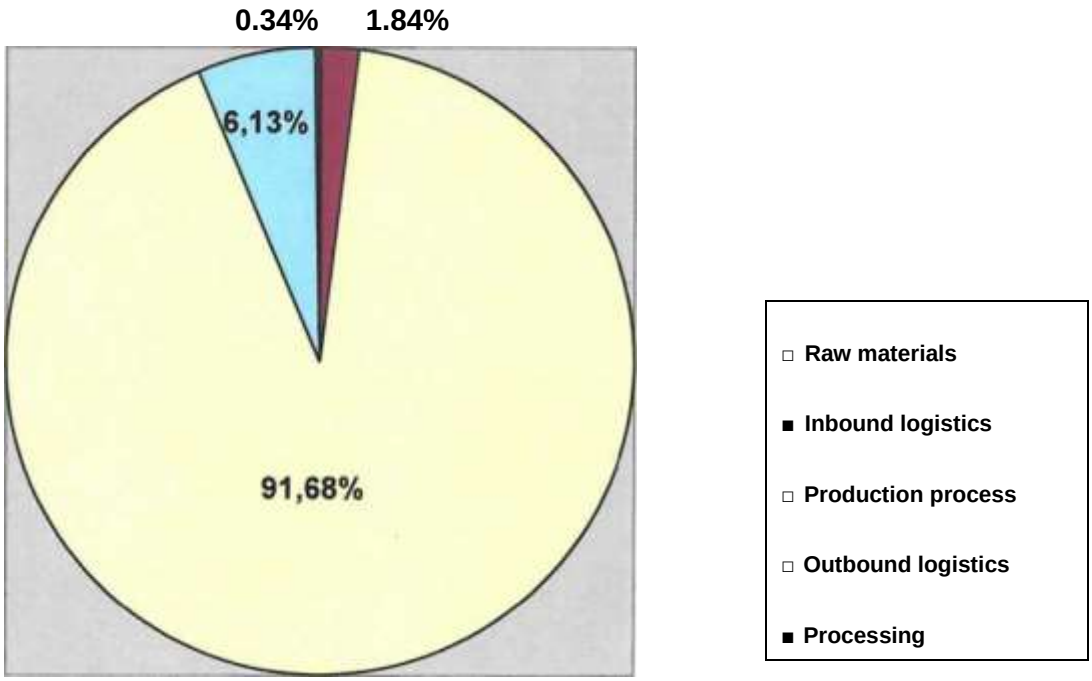
GEOCELL Schaumglas GmbH
Zeppelinstrasse 15
D-75438 Knittlingen

NL Edewecht
Industriestrasse 4
D-26188 Edewecht

CO_2 - Bilanz für Produkte
Product Carbon Footprints
PCF
(EN ISO 14001)

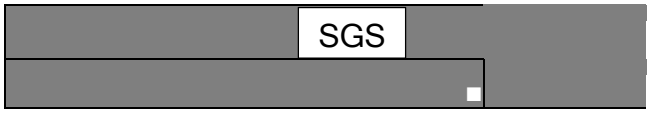
CO2 - Balance in accordance with the supply chain

Percentage composition of CO_2 - consumption per m^3_{SGS}



Raw materials	Inbound logistics	Production Process	Outbound logistics	Processing
0.0 %	1.84%	91.68%	6.13%	0.34 %

CO_2 emission for the production of one m^3
GEOCELL foam glass gravel SGS (NL Edewecht 2019)



29.34 **35.21** **kg CO_2/m^3_{SGS}**

* Minimum value=calculated value, maximum value = calculated value x factor of 1.2

GEOCELL Schaumglas GmbH **Zeppelinstrasse 15** **D-75438 Knittlingen**	**NL Edewecht** **Industriestrasse 4** **D-26188 Edewecht**