



# Environmental Product Declaration

in accordance with ISO 14025



Adhesive compounds and fillers  
(organic)

Sto Aktiengesellschaft



Declaration number

EPD-STO-2011311-E

Institut Bauen und Umwelt e.V. (Institute Construction and Environment)

[www.bau-umwelt.com](http://www.bau-umwelt.com)



Institut Bauen  
und Umwelt e.V.



Abbreviated version  
**Environmental  
Product Declaration**

<p><b>Institut Bauen und Umwelt e.V.</b> <a href="http://www.bau-umwelt.com">www.bau-umwelt.com</a></p>  <p>Institut Bauen und Umwelt e.V.</p>	<p>Programme holder</p>	
<p>Sto Aktiengesellschaft Ehrenbachstrasse 1 D-79780 Stühlingen</p> 	<p>Declaration holder</p>	
<p>EPD-STO-2010311-E</p>	<p>Declaration number</p>	
<p><b>Adhesive compounds and fillers: StoPrefa Coll, StoLevel Classic, StoArmat Classic, StoArmat Classic Plus, StoPrefa Armat, Sto-Reinforcement Fibre Plaster</b></p> <p>This declaration is an environmental product declaration in accordance with ISO 14025 and describes the environmental performance of the building products named here. It is intended to promote the development of environmentally friendly and healthful construction. All relevant environmental data are disclosed in this validated declaration. The declaration is based on the PCR document "Coatings with organic binders", base year 2010-04.</p>	<p>Declared building products</p>	
<p>This validated declaration entitles us to carry the mark of Institut Bauen und Umwelt e.V. It is applicable only for the named products for three years from the date of issue. The declaration holder is liable for the underlying statements and documentation.</p>	<p>Validity</p>	
<p>The <b>declaration</b> is complete and contains in detailed form:</p> <ul style="list-style-type: none"> <li>- product definition and structural specifications</li> <li>- specifications on basic materials and their origin</li> <li>- descriptions of how the products are manufactured</li> <li>- notes on product application</li> <li>- statements on the condition of use, extraordinary effects and stage after use</li> <li>- results of the life cycle assessment</li> <li>- documentation and tests</li> </ul>	<p>Contents of the declaration</p>	
<p>26 February 2011</p>	<p>Date of issue</p>	
 <p>Prof. Dr.-Ing. Horst J. Bossenmayer (President of the IBU)</p>	<p>Signatures</p>	
<p>This declaration and the underlying norms have been examined in accordance with ISO 14025 by the independent Expert Committee.</p>		<p>Audit of the declaration</p>
 <p>Prof. Dr.-Ing. Hans-Wolf Reinhardt (chair of the Expert Committee)</p>	 <p>Dr. Eva Schmincke (Examiner appointed by the Expert Committee)</p>	<p>Signatures</p>

Abbreviated version  
*Environmental  
Product Declaration*



Adhesive compounds and fillers are factory-manufactured, paste-form mixtures made of one or more water-based binder dispersions, mineral calibration grains, water and additives. As a rule, they are preserved against bacteria, yeast or fungal attack. Hardening is through film formation of the polymer dispersions and drying into adhesive, filler and reinforcing coats.

Product description

Used as adhesive compounds and fillers in external wall insulation systems (EWIS) and as levelling and renovation fillers on mineral and organic substrates, including wood and metal surfaces.

Field of application

The Life Cycle Assessment (LCA) was performed in accordance with /DIN EN ISO 14040/ and /DIN EN ISO 14044/, the requirements of the IBU guideline on Type III declarations and the product-group-specific norms for "Coatings with organic binders". The LCA covers raw materials and energy production, raw materials transportation, actual manufacture, use and disposal. The long version (see chapter 8) also contains information on transportation, stage of use and disposal of the adhesive compounds and fillers.

Framework of the  
life cycle assessment

Raw material provision, production up to the factory gates	Unit per kg					
Evaluation dimension	Sto-RFP	StoLevel Classic	StoPrefa Coll	StoArmat Classic	StoPrefa Armat	Sto-Armat Classic Plus
Primary energy requirement, non-renewable [MJ]	8,61E+00	8,75E+00	1,25E+01	1,05E+01	7,91E+00	7,40E+00
Primary energy requirement, renewable [MJ]	1,14E-01	1,14E-01	2,91E-02	2,08E-01	1,14E-01	1,14E-01
Abiotic depletion potential (ADP) [kg Sb equiv.]	3,41E-03	3,47E-03	5,27E-03	4,00E-03	3,10E-03	2,87E-03
Global warming potential (GWP 100) [kg carbon]	3,33E-01	3,25E-01	3,12E-01	4,62E-01	3,06E-01	3,01E-01
Ozone depletion potential (ODP) [kg R11 equiv.]	1,17E-07	1,23E-07	2,21E-07	1,16E-07	1,18E-07	1,13E-07
Acidification potential (AP) [kg SO <sub>2</sub> equiv.]	1,45E-03	1,39E-03	1,33E-03	1,77E-03	1,28E-03	1,26E-03
Eutrophication potential (EP) [kg PO <sub>4</sub> equiv.]	1,48E-03	1,47E-03	3,12E-03	1,45E-03	1,31E-03	1,21E-03
Photochemical ozone creation potential (POCP)	2,49E-04	2,42E-04	4,57E-04	2,38E-04	2,15E-04	2,00E-04

Scope of the  
life cycle assessment

Raw material provision, production, utilisation and disposal	Unit per kg					
Evaluation dimension	Sto-RFP	StoLevel Classic	StoPrefa Coll	StoArmat Classic	StoPrefa Armat	Sto-Armat Classic Plus
Primary energy requirement, non-renewable [MJ]	8,99E+00	9,13E+00	1,28E+01	1,08E+01	8,29E+00	7,78E+00
Primary energy requirement, renewable [MJ]	1,14E-01	1,14E-01	2,91E-02	2,08E-01	1,14E-01	1,14E-01
Abiotic depletion potential (ADP) [kg Sb equiv.]	3,59E-03	3,65E-03	5,45E-03	4,18E-03	3,28E-03	3,05E-03
Global warming potential (GWP 100) [kg carbon]	3,61E-01	3,53E-01	3,40E-01	4,90E-01	3,34E-01	3,29E-01
Ozone depletion potential (ODP) [kg R11 equiv.]	1,17E-07	1,23E-07	2,21E-07	1,16E-07	1,18E-07	1,13E-07
Acidification potential (AP) [kg SO <sub>2</sub> equiv.]	1,76E-03	1,70E-03	1,64E-03	2,08E-03	1,59E-03	1,57E-03
Eutrophication potential (EP) [kg PO <sub>4</sub> equiv.]	1,52E-03	1,51E-03	3,16E-03	1,49E-03	1,35E-03	1,25E-03
Photochemical ozone creation potential (POCP)	2,82E-04	2,75E-04	4,90E-04	2,71E-04	2,48E-04	2,33E-04

\* For a building life cycle assessment, the material requirement per surface is decisive; see also table in 8.2.2.

In addition, the following documentation and tests are depicted for the environmental declaration:

**Radioactivity:** Determination of the radionuclides in accordance with gamma spectroscopic analysis by the Fraunhofer-Institut für Bauphysik, Stuttgart-Holzkirchen, Prof. Dr. Klaus Sedlbauer

**VOC emissions:** For products with interior wall application in accordance with Committee for Health-related Evaluation of Building Products – test.

**Washing out of components:** Adhesive compounds and fillers are not subject to weather; the test does not apply.

Documents  
and tests



Product group: Coatings with organic binders  
 Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
 Declaration number: EPD-STO-2011311-E

Issued on  
 26-02-2011

**Area of application** This environmental declaration refers to adhesive compounds and fillers with organic binders from the Sto factory in Weizen

**1 Product definition**

**Product definition** Adhesive compounds and fillers with organic binders are factory-manufactured, paste-form mixtures made of one or more water-based polymer dispersions, mineral calibration grains, water and additives. Hardening is through film formation of the polymer dispersions and drying into adhesive, filler and reinforcing coats.

**Application** Used as adhesive compounds and fillers in external wall insulation systems (EWIS) and as levelling and renovation fillers on mineral and organic substrates, including exterior wood and metal surfaces.  
 Direct contact with groundwater is not intended.

**Placing on the market / rules for use** DIN EN 15824

**Quality assurance** Internal and external supervision in accordance with the above standards. Quality management system in accordance with DIN EN ISO 9001. Environmental management system in accordance with EMAS or DIN EN ISO 14001, Certification number: 003651 QM, 003651 UM

**Properties as supplied** Adhesive compounds and fillers with dispersion binders are produced in the factory as paste-form products and filled into plastic containers, drums, big bags, or wet silos and delivered to the construction site.  
 After drying and hardening, the result is layers with high flexibility, impact resistance and the lowest possible susceptibility to cracking.

**Building technology data**

Criterion	Standard							Unit
		Sto-RFP	StoLevell Classic	StoPrefa Coll	StoArmat Classic	StoPrefa Armat	StoArmat Classic Plus	
Density	DIN 53217	1.4 - 1.45	1.4 - 1.45	1,3	1.5 - 1.6	1.7 - 1.8	1.45 - 1.55	g/cm³
Water vapour diffusion mass flow density V	EN ISO 7783-2	43 - 54	43 - 54	9 - 10	35 - 52	30 - 34	43 - 54	g/m²*d
Thermal conductivity	DIN 4108	0,7	0,7	0,7	0,7	0,7	0,7	W/m*k
Water permeability rate W	EN 1062-3	0,01	0,01	< 0.05	0,03	< 0.05	< 0.02	kg/m² * √h
pH value	DIN ISO 10390	8 - 10.5	8 - 10.5	8 - 10.5	8 - 10.5	8 - 10.5	8 - 10.5	pH
Solids content	DIN 18556 DIN 53189	80 - 87	75 - 82	68 - 75	78 - 85	80 - 86	75 - 83	%

Degree of whiteness and lightness are not relevant for adhesive compounds and fillers.



Product group: Coatings with organic binders  
 Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
 Declaration number: EPD-STO-2011311-D

Issued on  
 26-02-2011

**Sound protection** Sound-protection requirements are not placed on adhesive compounds and fillers.

**Biocidal characteristics** Adhesive compounds and fillers with organic binders are normally preserved for the duration of storage against bacteria, yeast or fungus.

**2 Base materials**

**Base materials primary products**

Basic materials [mass %]	Adhesive compounds and fillers
Polymer dispersion 50%	12 - 30
Stone dust	52 - 66
Pigments	0 - 0.2
Filler material	0 - 20
Water	8 - 14

**Materials / additives**

Thickening agent	< 0.5 mass %
Water retention agent	< 0.5 mass %
Anti-foaming agent	< 0.3 mass %
Dispersing agent	< 0.4 mass %
Film forming agent (VOC)	< 2.0 mass %
Container conservation	< 2.0 mass %

**Explanation of materials**

**Polymer dispersions:** Water-based dispersions based on copolymers (acrylate, styrolacrylate, terpolymers, etc.)

**Rock flour:** Powder made of natural materials, such as quartz ( SiO<sub>2</sub>) or calcite (CaCO<sub>3</sub>). They can contain minor and trace minerals.

**Pigments:** Mineral pigments, mostly titanium dioxide

**Bulking agents:** Synthetic bulking agents, such as precipitated CaCO<sub>3</sub>, BaSO<sub>4</sub>, Al(OH)<sub>3</sub>, etc.

**Thickening agents:** Cellulose or starch ethers, polyacrylate and polyurethane products, bentonite derivatives.

**Water retention agents:** Special cellulose ethers to achieve longer working times.



## Environmental product declaration in accordance with ISO 14025

Adhesive compounds and fillers: StoPrefa Coll, StoLevel Classic, StoArmat Classic, StoArmat Classic Plus, StoPrefa Armat, Sto-Reinforcement Fibre Plaster

Page 6

---

Product group:	Coatings with organic binders	Issued on
Declaration holder:	Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany	26-02-2011
Declaration number:	EPD-STO-2011311-D	

---

	<p><b>Anti-foaming agents:</b> Surface-active substances for avoiding foam formation during manufacture and application</p> <p><b>Dispersing agents:</b> Surface-active substances for fast distribution of calibration grains and pigments.</p> <p><b>Film-forming agents:</b> Organic solvents for reducing the film-formation temperature in case of low outside temperature.</p> <p><b>Packaging preservative:</b> Preservative for stabilising the products during the storage phase (mostly on isothiazolinone basis).</p>
<b>Raw materials extraction and origin</b>	<p>Sand and limestone powders are extracted from natural deposits in near-surface layers by means of grinding and selection processes. The extracted mineral raw materials come from within a radius of maximum 300 kilometres from the plant.</p> <p>Water-based polymer dispersions are produced through polymerisation of suitable monomers, mostly with 50% solids content at chemical companies and delivered in silo wagons. The transport distances are max. 400 kilometres.</p> <p>Additives are manufactured by chemical companies and delivered in sacks, drums or silos. Transport distances can be up to 600 kilometres.</p>
<b>Availability of raw materials</b>	<p>Many organic components are dependent on fossil raw materials (oil, natural gas, coal), which are considered to be scarce. Some of the organic products, such as cellulose derivatives, fatty acids, alcohols, etc., are gained from renewable raw materials.</p> <p>Inorganic components consist of mineral raw materials which are not scarce.</p>

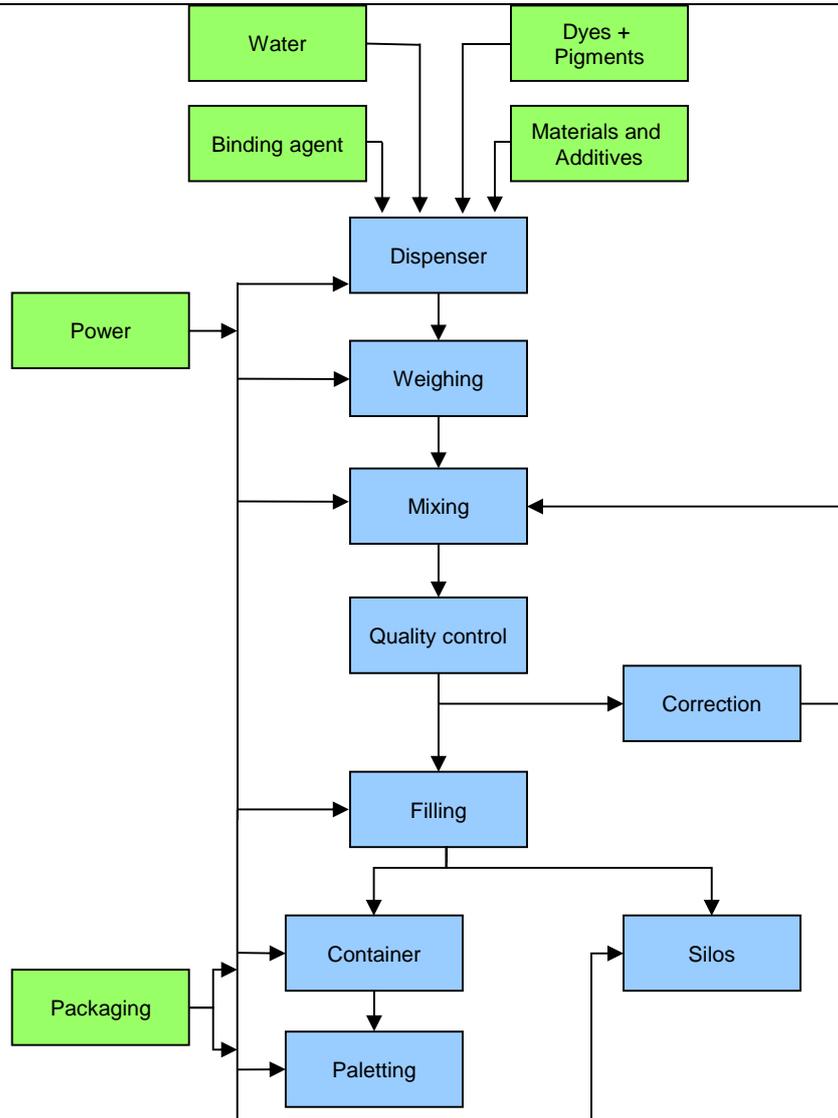
### 3 Product manufacture

<b>Product manufacture</b>	The formulations used are optimised according to market requirements within the percentage spectrum specified under section 2, Base Materials. Other materials are not included.
----------------------------	--



Product group: Coatings with organic binders  
Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
Declaration number: EPD-STO-2011311-D

Issued on  
26-02-2011



Paste-form adhesive compounds and fillers are manufactured in mixing plants in the following work steps:

1. Filling of the inventory or weighing containers
2. Conveyance of the ingredients into the mixer
3. Dispersing and mixing
4. Quality control, adjustment of the consistency, if necessary
5. Filling of the products into storage and transport packaging
6. Loading and delivery

The raw materials are stored in the production factory in silos, big bags, or sacks. According to the respective formulation, they are gravimetrically dosed and intensely mixed. After filling and packaging, they are temporarily stored or delivered directly. At the construction site, the products' consistency can be adjusted with water to meet the application and weather conditions.

### Health protection manufacturing

In the chemical industry, safety glasses and gloves and possibly protective helmets are required in the plant. Modern mixing plants have automatic dosing of raw materials, so employees have practically no contact with raw materials. For solvents and preservatives, the manufacturer's safety instructions are followed.



Product group: Coatings with organic binders  
Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
Declaration number: EPD-STO-2011311-D

Issued on  
26-02-2011

**Environmental protection manufacturing**

**Water**

If the product remains the same, cleaning water is used as mixing water for the subsequent lot. Otherwise, all production wastewater is cleaned in our own wastewater treatment plant and then sent on to the municipal wastewater treatment plant. Dry waste (dust) is worked in.

**Fluids**

Storage and production are protected through safety measures (double-walled silos or collecting vats) against undesired leakage of fluid components.

**Noise**

Noise level measurements have shown that all values determined inside and outside the production sites are well below the required specifications.

**Waste**

Types of waste include foils, paper bags, wood, paper, waste oil, metal scrap and residual commercial waste. These waste types are separated, stored and recycled.

**4 Product application**

**Application recommendations**

Organically bound adhesive compounds and fillers can be applied manually or by machine.

After the products are applied to the intended surfaces, they are levelled and textured with an appropriate tool.

Specific information on application and other actions with these products are described in detail in the technical data sheet.

**Occupational safety environmental protection**

The regulations of the workers' compensation insurers and the respective safety data sheets of the products apply.

Direct contact with the eyes and skin must be avoided through personal protective measures.

During application and drying of the adhesive compounds and fillers, film forming agents (solvents) are released into the atmosphere. No other negative influences on the environment are currently known.

Adhesive compounds and fillers must not reach the sewer system, surface water or groundwater. That also applies to the cleaning water for tools and machines. The wastewater is collected and disposed of through suitable cleaning systems.

**Residual material**

Due to the value of these products, the residual material is kept and used at the next construction site.

**Packaging**

Packaging, such as foils, plastic buckets and paper, is collected separately and given to the waste management contractor for recycling.

The reusable wood pallets are given back to the manufacturer, who repays the deposit, and returned to the production process.

**5 Usage conditions**

**Ingredients**

As depicted under point 3 Product Manufacture, mostly natural rock flour and water-based polymer dispersions are used in the production of adhesive compounds and fillers with organic binders. Organic components are gained more and more frequently from renewable raw materials. The additives for improvement of application and storage characteristics are added only in small amounts.



Product group:	Coatings with organic binders	Issued on
Declaration holder:	Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany	26-02-2011
Declaration number:	EPD-STO-2011311-D	

**Effects on environment and health** After drying, the unique matrix of rock flour and water-based polymer dispersion results in firm, long-lasting, elastic and crack-resistant layers, which adhere firmly to practically all substrates. They are impact-resistant, tough and crack-bridging.

Hazards for water, air and soil are not expected if the products are used as intended.

**Useful lives** Organically bound products are largely weather- and crack-resistant and, with appropriate care, can last as long as the buildings.

## 6 Extraordinary influences

**Fire** The products correspond to Class B1 in accordance with DIN 4102-1. But in practice, they are always tested in a system or with the corresponding building element in accordance with DIN EN 13501-1 and fulfil fire classification B-s1, d0.

**Water** If subject to the action of water for a long time, the products can soften temporarily. After drying, the original firmness is restored. No relevant water-soluble substances are washed out.

## 7 Reuse phase

**Reuse and further use** Adhesive compounds and fillers are normally not exposed directly to the weather. They are integrated in the building system or unit. After the end of the usage phase but before the end of the building element's useful life, they can be used further.

**Reuse and further use** Adhesive compounds and fillers are not reused or further used.

**Disposal** Due to their organic component, adhesive compounds and fillers have an inherent energy content (feedstock energy), which can be regained in incinerators. Hardened adhesive compounds and fillers can be disposed of safely in landfills. But adhesive compounds and fillers are seldom separated, due to the thin layers, but disposed of together with the substrate.  
The waste code is 170107 or 170904.

## 8 Life cycle assessment

### 8.1 Information on system definition and modelling of the lifecycle

**Declared unit** The declaration refers to 1 kilogramme of adhesive compound or filler in a ready-for-use, paste-form condition (with mixing water). The impact data for practical application and ecological considerations are specified per square metre (kg/m<sup>2</sup>).

**System limits** The lifecycle analysis of the examined products covers production, including raw materials extraction and energy provision, up to the finished, packed product at the factory gate, transport to the construction site, as well as disposal or recycling of the packaging, which is included in the LCA of production. No balance-relevant processes run in the use stage of the adhesive compounds and fillers.

**Assumptions and estimates** For examination of the use and disposal stage, a total of 400 km was used for transport paths from the ramp to the construction site and for disposal of the construction waste. This was determined by a rough estimate.  
The distribution of electricity consumption per batch was converted to kg of product. Water consumption was calculated per kg of product; cleaning water was estimated.



---

Product group:	Coatings with organic binders	Issued on
Declaration holder:	Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany	26-02-2011
Declaration number:	EPD-STO-2011311-D	

---

<b>Cut-off criterion</b>	Processes whose total contribution to the final result, according to mass and in all impact categories looked at, is less than 1% can be ignored. The total of ignored processes does not exceed 5% of the impact categories looked at. Investment goods for the manufacturing processes (machines, buildings, etc.) were not considered.
<b>Transport</b>	All transportation of the raw materials and additives used as well as distribution transportation has been considered in the balance, taking distance and capacity utilisation into account.
<b>Period under review</b>	The data for manufacture of the examined products refer to the year 2009. The life cycle assessments were prepared for Germany as reference area. The result is that, besides production processes under these marginal conditions, the precursors relevant for Germany, such as electricity and energy provision, were used.
<b>Background data</b>	The data for the background processes come from the GaBi 4 database, specific, averaged data records of the German Paint Industry Association and from the corresponding EPD data records of Plastics Europe for the copolymers.
<b>Data quality</b>	The age of the data used is under 5 years. The data records used for the plastic dispersions were mostly updated based on the PCR document for plastics from Plastics Europe. Value was placed on completeness of the environmentally relevant lifecycle inventory analysis, both on the input side and on the output side.
<b>Allocation</b>	Allocation refers to assignment of the input and output flows of a LCA module to the examined product system and other product systems /ISO 14040/. Relevant allocations (i.e. the assignment of environmental burdens of a process to several products) did not have to be made for the examined products in this life cycle assessment.
<b>Thermal recovery of waste and packaging</b>	Plastic packaging, packaging of the adhesive compounds and fillers are partially thermally recovered. The energy gained thereby is credited to the manufacturing lifecycle segment with a standard process for electricity or thermal energy from natural gas with reference to Germany.
<b>Notes on the use stage</b>	No observations on the use stage of adhesive compounds and fillers were performed.
<b>Information on the disposal stage</b>	Adhesive compounds and fillers are thin-layer coatings that adhere firmly to the substrate. They are disposed of in landfills together with the demolished substrate.

## 8.2 Depiction of the balances and evaluation

### 8.2.1 Depiction of the balances and evaluation per 1 kg of adhesive compound and filler

The following chapters show the lifecycle inventory analysis of the adhesive compounds and fillers with regard to primary energy needs, water needs and waste.

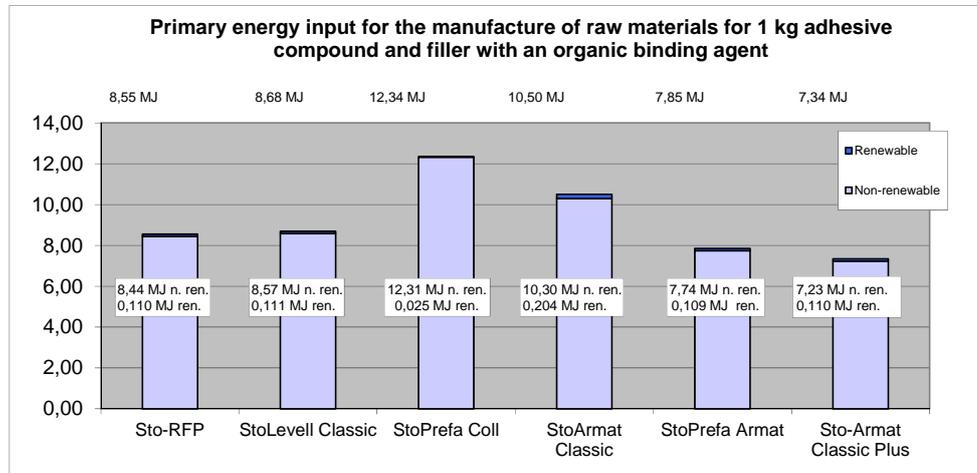
This environmental product declaration refers to adhesive compounds and fillers with organic binders.

**Primary energy** Illustration 1 shows the primary energy use (renewable and non-renewable) separately for the production of raw materials of 1 kg of adhesive compounds and fillers, Sto-Reinforcement Fibre Plaster, StoLevel Classic, StoPrefa Coll, StoArmat Classic, Sto-Prefa Armat and Sto-Armat Classic Plus.



Product group: Coatings with organic binders  
Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
Declaration number: EPD-STO-2011311-D

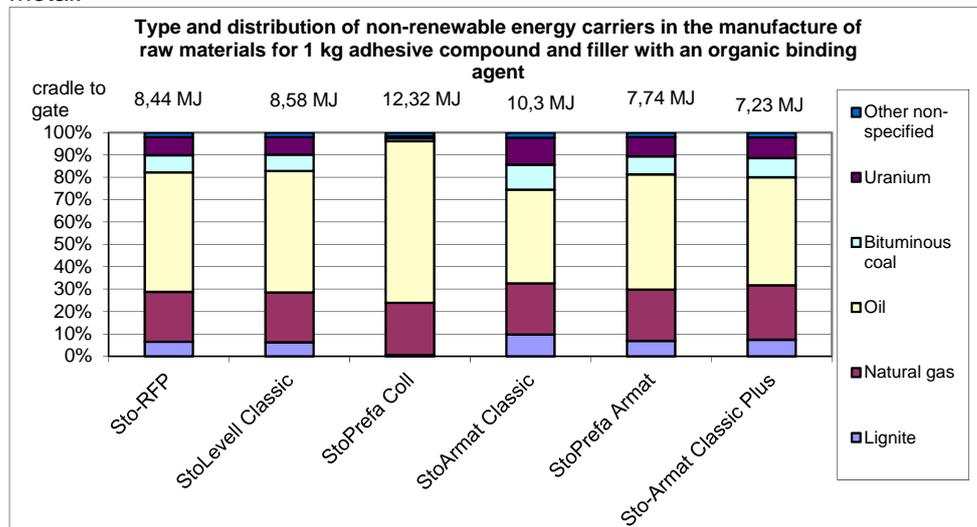
Issued on  
26-02-2011



**Illustration 1 shows the primary energy use (renewable and non-renewable) separately for the production of raw materials of 1 kg of Sto-Reinforcement Fibre Plaster, StoLevel Classic, StoPrefa Coll, StoArmat Classic, StoPrefa Armat and Sto-Armat Classic Plus.**

At approx. 98%, provision of raw materials requires the largest share of primary energy.

Further evaluation of the non-renewable energy sources used for production of 1 kg of adhesive compound and filler shows hardly any differences due to the relatedness of the formulation. The only exception is StoPrefa Coll, which, as a binder-rich adhesive, is used specially on smooth substrates, such as wood or metal.



**Illustration 2: Type and distribution of non-renewable energy sources for production of the raw materials for 1 kg of adhesive compound and filler.**



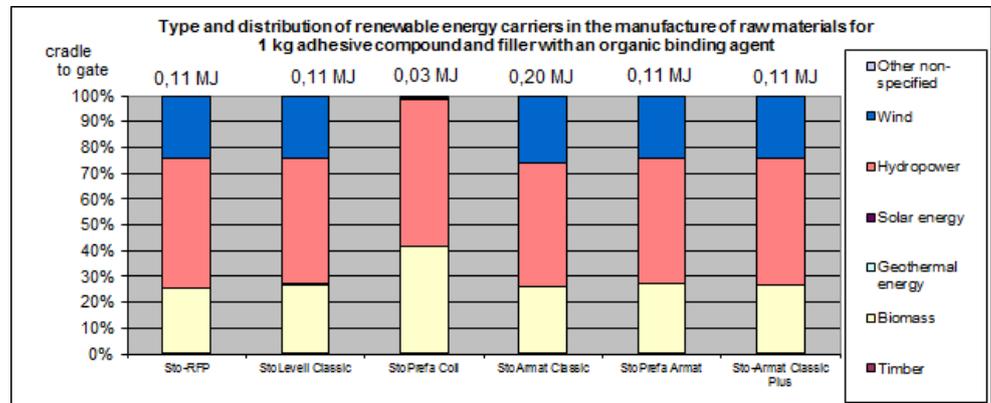
Product group: Coatings with organic binders  
 Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
 Declaration number: EPD-STO-2011311-D

Issued on  
 26-02-2011

Table 1 shows the type and distribution of renewable energy sources.

renewable energy carriers in %	Sto-RFP	StoLevel Classic	StoPrefa Coll	StoArmat Classic	StoPrefa Armat	Sto-Armat Classic Plus
Timber	0,25	0,25	0,22	0,26	0,25	0,25
Biomass	25,23	26,70	41,47	25,75	26,82	26,69
Geothermal energy	9,04E-04	8,91E-04	3,34E-03	7,65E-04	8,58E-04	8,29E-04
Solar energy	5,77E-03	5,72E-03	8,41E-05	6,23E-03	5,76E-03	5,75E-03
Hydropower	50,29	49,08	56,72	48,05	48,80	48,61
Wind	24,01	23,82	0,86	25,89	23,99	24,33
Other non-specified	0,21	0,15	0,73	0,05	0,13	0,12

Illustration 3 shows the type and distribution of renewable energy sources.



**Illustration 3: Type and distribution of non-renewable energy sources for production of the raw materials for 1 kg of adhesive compound and filler.**

Table 1 shows that the distribution of renewable energy sources is dominated especially by hydroelectric power, biomass and wind energy. Other energy sources are well below 1% and cannot be depicted in illustration 3.

**Production and packaging**

For production, only electricity from hydroelectric power is used, of which 5% of requirements are covered by our own water turbines.

The relevant energy values and environmental impacts are depicted in the following table.

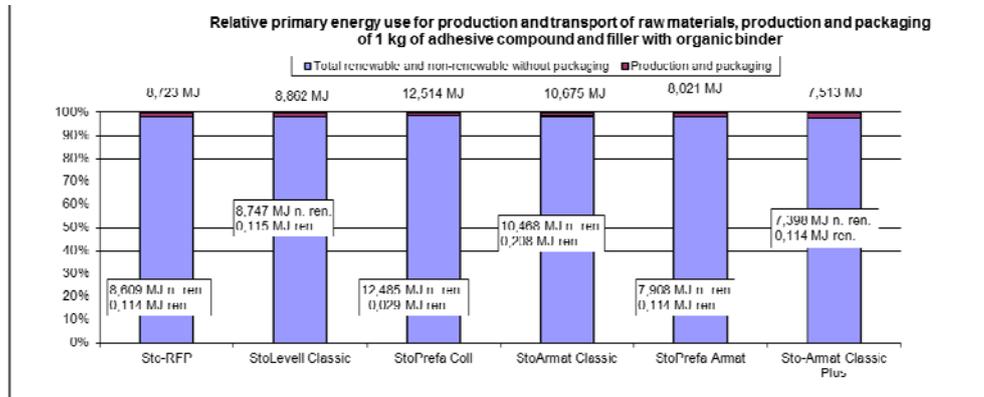
<b>Primary energy non-regenerative</b>	MJ	1,67E-01
<b>Primary energy regenerative</b>	MJ	3,59E-03
<b>Abiotic Res. requirement (CML)</b>	kg Sb equiv.	0,00E+00
<b>Global warming potential</b>	kg carbon dioxide	6,91E-03
<b>Ozone depletion potential</b>	kg CFC11 equiv.	3,11E-08
<b>Acidification potential</b>	kg SO2 equiv.	2,73E-05
<b>Eutrophication potential (CML)</b>	kg PO4 equiv.	0,00E+00
<b>Photochemical ozone creation potential</b>	kg ethene equiv.	7,72E-07

**Table 2: Primary energy use and environmental impacts for production and packaging of 1 kg of adhesive compound and filler with organic binders**



Product group: Coatings with organic binders  
 Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
 Declaration number: EPD-STO-2011311-D

Issued on  
 26-02-2011



**Illustration 4: Relative primary energy use for production and transport of raw materials, production and packaging of 1 kg of adhesive compound and filler with organic binder**

**Water use**

Water is a formulation component of the paste-form products. The portion by weight is approx. 20%, depending on the product.

Cleaning water is cleaned in our own wastewater treatment plant and then sent on to the municipal wastewater treatment plant.

**Waste**

The evaluation of waste generated in production of 1 kg of adhesive compound and filler is separated into three sections – excavation / mining waste, non-hazardous waste (municipal waste) and hazardous waste, including radioactive waste.

**Table 3: Waste in the production and transport of raw materials, production and packaging of 1 kg of adhesive compound and filler**

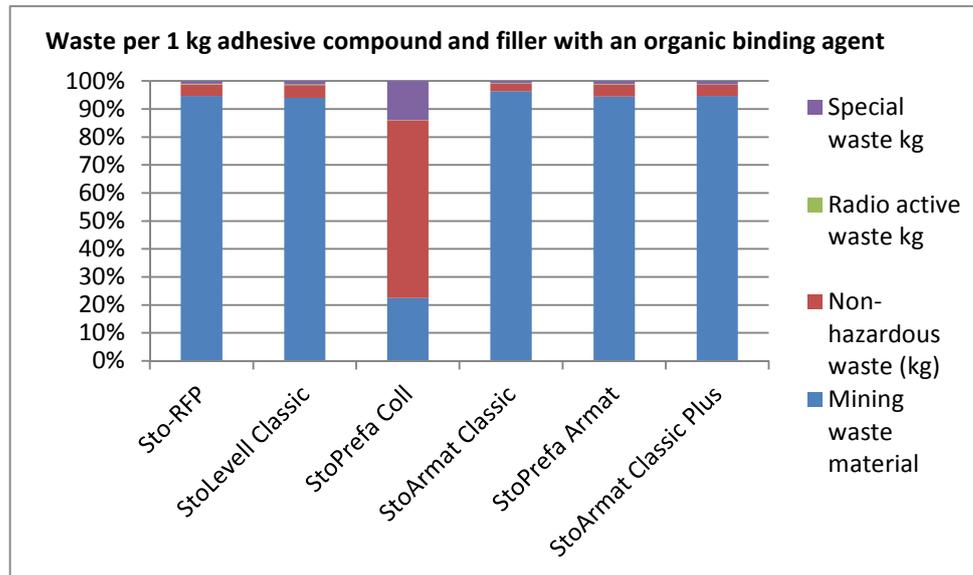
Waste	Sto-RFP	StoLevel Classic	StoPrefa Coll	StoArmat Classic	StoPrefa Armat	StoArmat Classic Plus
Mining waste material	1,54E-01	1,35E-01	4,97E-03	2,30E-01	1,31E-01	1,30E-01
Non-hazardous waste (kg)	6,74E-03	6,61E-03	1,40E-02	6,40E-03	5,89E-03	5,43E-03
Hazardous waste (kg)	1,92E-03	2,07E-03	3,11E-03	2,23E-03	1,81E-03	1,87E-03
Radio active waste kg	2,31E-04	2,26E-04	4,35E-05	4,18E-04	2,23E-04	2,25E-04
Special waste kg	1,69E-03	1,84E-03	3,06E-03	1,82E-03	1,59E-03	1,64E-03

The graphic depiction of the waste in the production and transport of raw materials, production and packaging of 1 kg of adhesive compound and filler:



Product group: Coatings with organic binders  
 Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
 Declaration number: EPD-STO-2011311-D

Issued on  
 26-02-2011



**Illustration 5: Waste per 1 kg of adhesive compound and filler.**

For **excavation and mining waste**, excavation represents the greatest amount. Excavation applies especially in the precursor chain for obtaining rock flour and electricity (coal production).

Waste of the category **non-hazardous waste** comprises municipal waste, commercial waste similar to household waste, organic waste, internal chemicals, and the like. All disposal processes are modelled "to the end", up to final disposal in the landfill. For that reason, the amount of non-hazardous waste is usually low. The situation is different for radioactive waste, for which no scenario for final storage has yet been established. Therefore, they appear in the category of Hazardous Waste.

**Hazardous waste** is mainly waste from the precursor chains, including generation of electricity. Besides radioactive waste for nuclear power generation, this includes slag from filter systems and sewage sludge from wastewater treatment.

**Estimate of impact**

The potential environmental factors from the manufacture of adhesive compounds and fillers are presented in the following.

Evaluation dimension	Unit per kg						
	Sto-RFP	StoLevell Classic	StoPrefa Coll	StoArmat Classic	StoPrefa Armat	Sto-Armat Classic Plus	Production packaging
Primary energy requirement, non-renewable [MJ]	8,44	8,58	12,3	10,3	7,74	7,23	1,67E-01
Primary energy requirement, renewable [MJ]	0,11	0,11	0,0255	0,204	0,11	0,11	3,59E-03
Abiotic depletion potential (ADP) [kg Sb equiv.]	3,41E-03	3,47E-03	5,27E-03	4,00E-03	3,10E-03	2,87E-03	0,00E+00
Global warming potential (GWP 100) [kg carbon]	0,326	0,318	0,305	0,455	0,299	0,294	6,91E-03
Ozone depletion potential (ODP) [kg R11 equiv.]	8,61E-08	9,22E-08	1,90E-07	8,49E-08	8,66E-08	8,19E-08	3,11E-08
Acidification potential (AP) [kg SO2 equiv.]	1,42E-03	1,36E-03	1,30E-03	1,74E-03	1,25E-03	1,23E-03	2,73E-05
Eutrophication potential (EP) [kg PO4 equiv.]	1,48E-03	1,47E-03	3,12E-03	1,45E-03	1,31E-03	1,21E-03	0,00E+00
Photochemical ozone creation potential (POCP)	2,48E-04	2,41E-04	4,56E-04	2,37E-04	2,14E-04	1,99E-04	7,72E-07

**Table 4: Environmental impact of the manufacture and transport of raw materials, production and packaging of 1 kg of adhesive compound and filler with organic binder.**



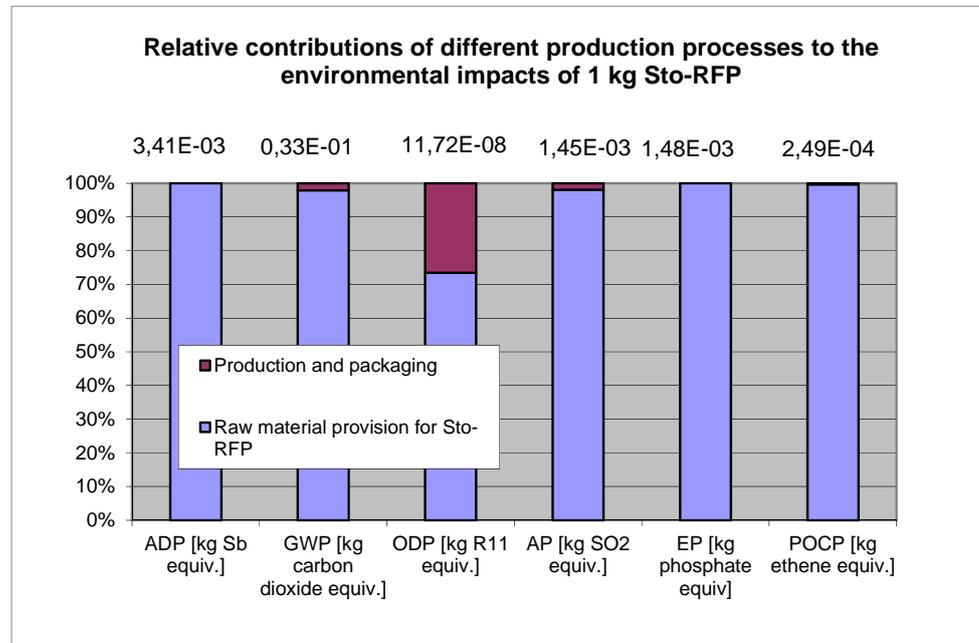
Product group: Coatings with organic binders  
Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
Declaration number: EPD-STO-2011311-D

Issued on  
26-02-2011

The following illustrations 6a to 6f show the contributions of raw materials procurement and production including packaging of 1 kg of the various adhesive compounds and fillers on the impact categories of abiotic depletion potential (ADP), global warming potential (GWP), ozone depletion potential (ODP), acidification potential (AP), eutrophication potential (EP) and photochemical ozone creation potential (POCP).

The relative contributions of the production processes and packaging on the environmental impact per 1 kg of adhesive compound and filler are shown in the illustrations 6a to 6f

Raw material procurement causes the largest share of environmental impact in all impact categories. This result correlates with the primary energy requirements. The contribution of production and packaging is relatively low.

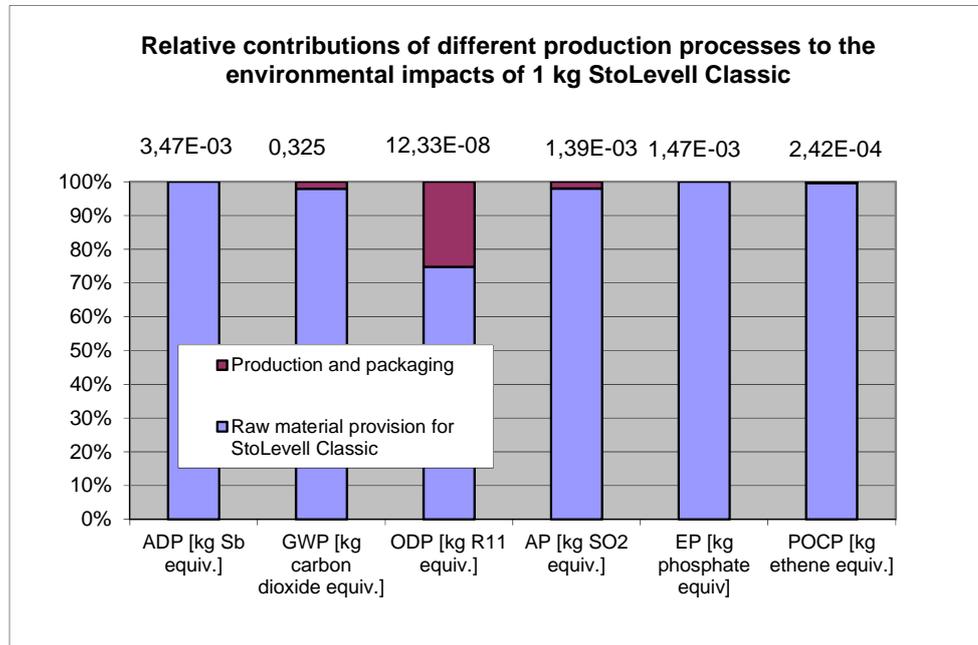


**Illustration 6a: Relative contributions of various production processes to the environmental impact of 1 kg of Sto-Reinforcement Fibre Plaster**

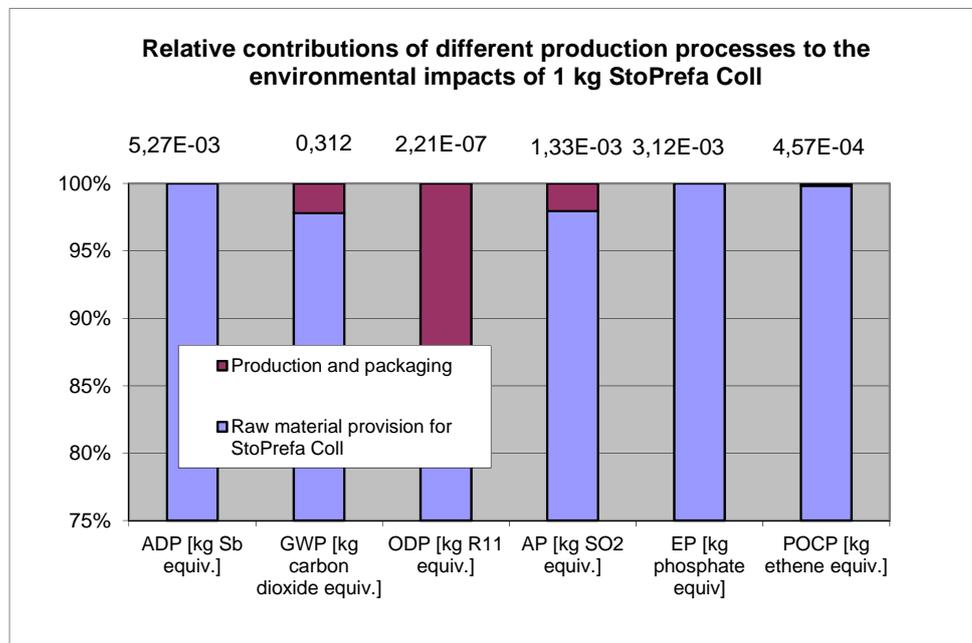


Product group: Coatings with organic binders  
Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
Declaration number: EPD-STO-2011311-D

Issued on  
26-02-2011



**Illustration 6b: Relative contributions of various production processes to the environmental impact of 1 kg of StoLevel Classic**

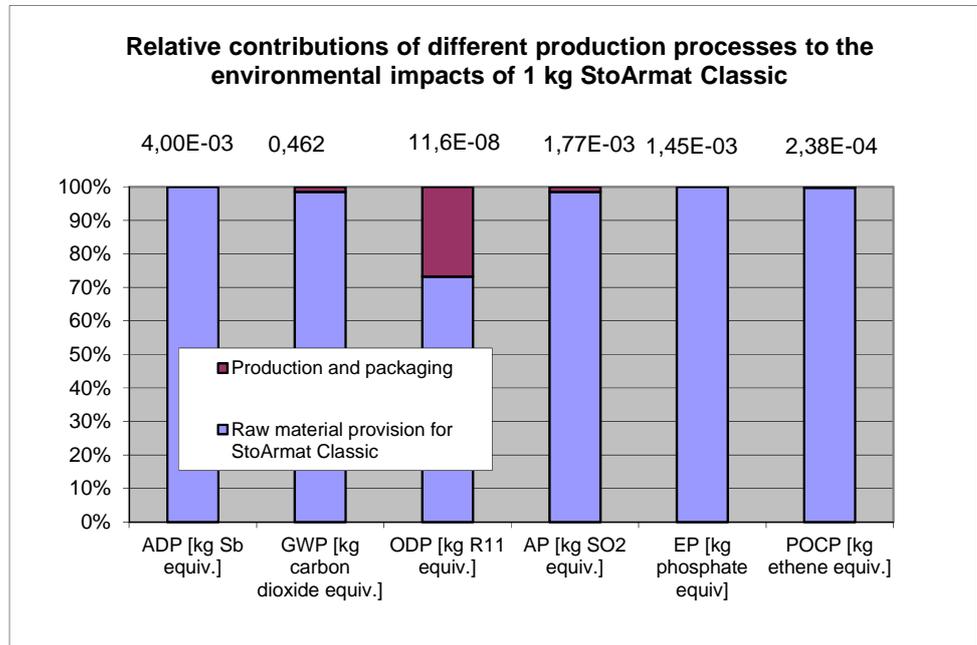


**Illustration 6c: Relative contributions of various production processes to the environmental impact of 1 kg of StoPrefa Coll**

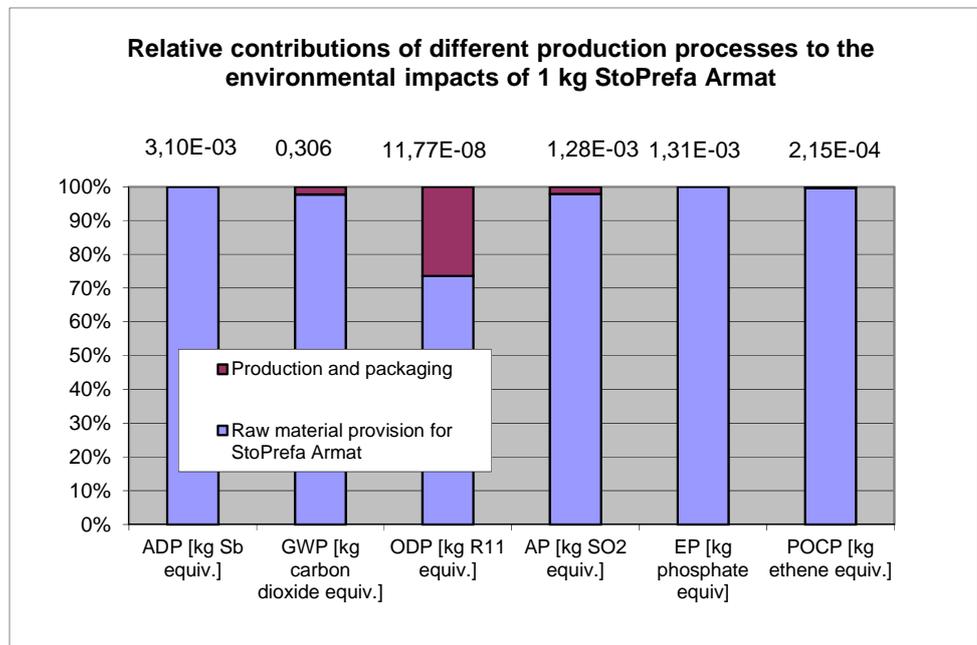


Product group: Coatings with organic binders  
Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
Declaration number: EPD-STO-2011311-D

Issued on  
26-02-2011



**Illustration 6d: Relative contributions of various production processes to the environmental impact of 1 kg of StoArmat Classic**

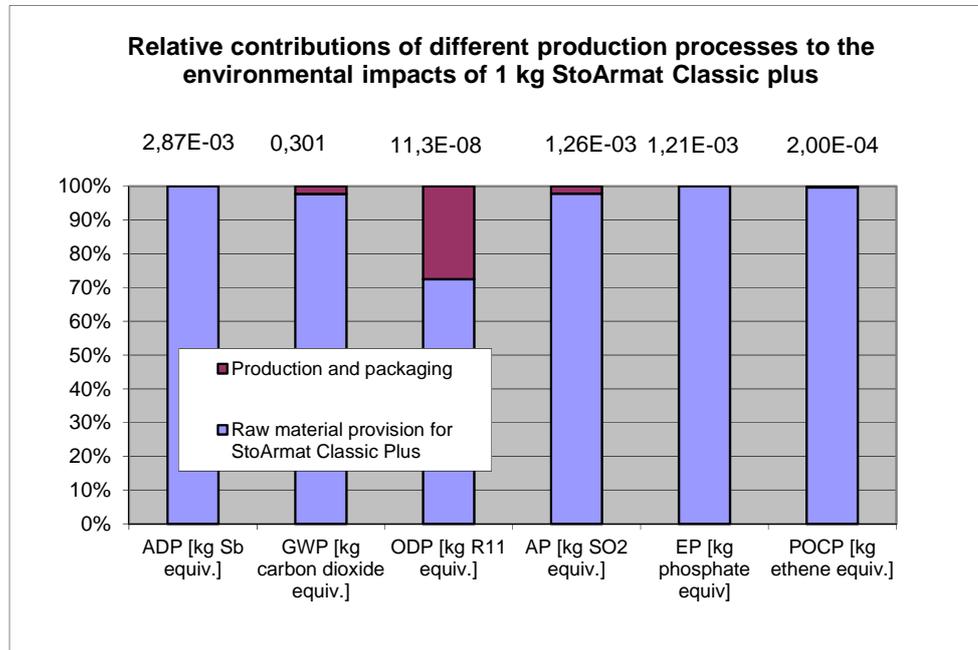


**Illustration 6e: Relative contributions of various production processes to the environmental impact of 1 kg of StoPrefa Armat**



Product group: Coatings with organic binders  
 Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
 Declaration number: EPD-STO-2011311-D

Issued on  
 26-02-2011



**Illustration 6f: Relative contributions of various production processes to the environmental impact of 1 kg of StoArmat Classic Plus**

**Transport during the building, use and disposal stages**

**Estimate of impact**

For examination of the building, use and disposal stages, a total of 400 km per 1 kg was used for transportation from the ramp to the construction site and for disposal of the construction waste.

Table 5 shows the environmental impact of transportation during use and disposal.

		Transport 1 kg 400 km
<b>Primary energy non-regenerative</b>	MJ	3,80E-01
<b>Primary energy regenerative</b>	MJ	0,00E+00
<b>Abiotic Res. requirement (CML)</b>	kg Sb equiv.	1,75E-04
<b>Global warming potential</b>	kg carbon dioxide equiv.	2,81E-02
<b>Ozone depletion potential</b>	kg CFC11 equiv.	1,10E-11
<b>Acidification potential</b>	kg SO2 equiv.	3,17E-04
<b>Eutrophication potential (CML)</b>	kg PO4 equiv.	3,94E-05
<b>Photochemical ozone creation potential</b>	kg ethene equiv.	3,32E-05

**Table 5: Environmental impact of transport of the building, use and disposal stages of 1 kg of adhesive compound and filler with organic binder.**



Product group: Coatings with organic binders  
Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
Declaration number: EPD-STO-2011311-D

Issued on  
26-02-2011

<b>Non-renewable energy Resources</b>	<b>MJ</b>	<b>%</b>
Lignite	0,00	0,54
Natural gas	0,01	3,46
Oil	0,35	92,76
Bituminous coal	0,01	2,60
Uranium	0,00	0,62
Other non-specified	0,00	0,02
Total	0,37	100,00

**Table 6 shows the type and distribution of non-renewable energy sources during transport to the construction site and for disposal.**

<b>Renewable energy Resources</b>	<b>MJ</b>	<b>%</b>
Timber	0,00	0,00
Biomass	0,00	7,67
Geothermal energy	0,00	0,00
Solar energy	0,00	0,00
Hydropower	0,00	88,49
Wind		
Other non-specified	0,00	3,84
Total	0,00	100,00

**Table 7 shows the type and distribution of renewable energy sources during transport to the construction site and for disposal.**

#### **Use stage**

Adhesive compounds and fillers are not exposed to the weather. The elasticity ensures high flexibility and the absence of cracks. The useful life can equal the life of the building element. Use of adhesive compounds and fillers does not contribute to the lifecycle inventory analysis.

#### **Disposal stage**

Disposal takes place with the building element / system, normally as building rubble.

#### **8.2.2 Depiction of the balances and evaluation per m<sup>2</sup> of adhesive compound and filler**

To simplify use of the data, the lifecycle inventory analysis values and environmental impacts of the adhesive compounds and fillers are also used for the average consumption of product per m<sup>2</sup>, which is documented in the technical data sheet. Possible variations in consumption can be caused by an uneven substrate.



Product group: Coatings with organic binders  
 Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
 Declaration number: EPD-STO-2011311-D

Issued on  
 26-02-2011

The impact balance in impact/m<sup>2</sup> is depicted in tables 8 and 9, taking into account the respective consumption values that are documented in the corresponding technical data sheets.

Evaluation dimension	Unit per m <sup>2</sup>					
	Sto-RFP 2,5	StoLevel Classic 2,5	StoPrefa Coll 0,8	StoArmat Classic 2,4	StoPrefa Armat 2,5	StoArmat Classic Plus 3,5
Consumption in kg/m <sup>2</sup>	2,5	2,5	0,8	2,4	2,5	3,5
Primary energy requirement, non-renewable [MJ]	2,15E+01	2,19E+01	9,97E+00	2,51E+01	1,98E+01	2,59E+01
Primary energy requirement, renewable [MJ]	2,84E-01	2,84E-01	2,33E-02	4,98E-01	2,84E-01	3,98E-01
Abiotic depletion potential (ADP) [kg Sb equiv.]	8,53E-03	8,68E-03	4,22E-03	9,60E-03	7,75E-03	1,00E-02
Global warming potential (GWP 100) [kg carbon]	8,32E-01	8,12E-01	2,50E-01	1,11E+00	7,65E-01	1,05E+00
Ozone depletion potential (ODP) [kg R11 equiv.]	2,93E-07	3,08E-07	1,77E-07	2,78E-07	2,94E-07	3,96E-07
Acidification potential (AP) [kg SO <sub>2</sub> equiv.]	3,62E-03	3,47E-03	1,06E-03	4,24E-03	3,19E-03	4,40E-03
Eutrophication potential (EP) [kg PO <sub>4</sub> equiv.]	3,70E-03	3,68E-03	2,50E-03	3,48E-03	3,28E-03	4,24E-03
Photochemical ozone creation potential (POCP)	6,22E-04	6,04E-04	3,65E-04	5,71E-04	5,37E-04	6,99E-04

**Table 8: Estimated impact of the adhesive compounds and fillers with organic binder with production and packaging per m<sup>2</sup>**

Evaluation dimension	Unit per m <sup>2</sup>					
	Sto-RFP 2,5	StoLevel Classic 2,5	StoPrefa Coll 0,8	StoArmat Classic 2,4	StoPrefa Armat 2,5	StoArmat Classic Plus 3,5
Consumption in kg/m <sup>2</sup>	2,5	2,5	0,8	2,4	2,5	3,5
Primary energy requirement, non-renewable [MJ]	2,25E+01	2,28E+01	1,03E+01	2,60E+01	2,07E+01	2,72E+01
Primary energy requirement, renewable [MJ]	2,84E-01	2,84E-01	2,33E-02	4,98E-01	2,84E-01	3,98E-01
Abiotic depletion potential (ADP) [kg Sb equiv.]	8,96E-03	9,11E-03	4,36E-03	1,00E-02	8,19E-03	1,07E-02
Global warming potential (GWP 100) [kg carbon]	9,03E-01	8,83E-01	2,72E-01	1,18E+00	8,35E-01	1,15E+00
Ozone depletion potential (ODP) [kg R11 equiv.]	2,93E-07	3,08E-07	1,77E-07	2,78E-07	2,94E-07	3,96E-07
Acidification potential (AP) [kg SO <sub>2</sub> equiv.]	4,41E-03	4,26E-03	1,32E-03	5,00E-03	3,99E-03	5,51E-03
Eutrophication potential (EP) [kg PO <sub>4</sub> equiv.]	3,80E-03	3,77E-03	2,53E-03	3,57E-03	3,37E-03	4,37E-03
Photochemical ozone creation potential (POCP)	7,05E-04	6,87E-04	3,92E-04	6,50E-04	6,20E-04	8,15E-04

**Tabelle 9 Estimated impact per m<sup>2</sup> for manufacture of the raw materials, production and packaging as well as use and disposal**

## 9 Verification

### 9.1 VOC

Adhesive compounds and fillers are exterior products. The VOC emissions into the atmosphere per product result from the sum of the added solvent portions in the formulation and the applied amount of the product. A test of exterior products by the Committee for Health-related Evaluation of Building Products is not intended.

### 9.2 Leaching behaviour

A standardised method for so-called "leaching" is currently being developed in TC 139, WG 10. The above-named products are adhesive compounds and fillers, which are not exposed to the rain/weather.



Product group: Coatings with organic binders  
Declaration holder: Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany  
Declaration number: EPD-STO-2011311-D

Issued on  
26-02-2011

## 10 PCR document and checking

This declaration is based on the PCR document "Coatings with organic binders", 2010-04.

Review of the PCR document by the Expert Committee. Chairman of the Expert Committee: Prof. Dr.-Ing. Hans-Wolf Reinhardt (Stuttgart University, IWB)
Independent audit of the declaration in accordance with ISO 14025: <input type="checkbox"/> internal <input checked="" type="checkbox"/> external
Validation of the declaration: Dr. Eva Schmincke

## 11 Literature

- /IBU 2006/ Institut Bauen und Umwelt e.V (Ed.): Leitfaden für die Formulierung der Anforderungen an die Produktkategorien der Umweltdeklarationen (Typ III) für Bauprodukte, Stand 01-2006 (Guideline for formulation of requirements for the product categories of the environmental declarations (Type III) for building products, as at January 2006)
- /CML 2002/ Guinée, J. B. (Ed.) : Handbook on Life Cycle Assessment – Operational Guide to the ISO Standards, Boston Kluwer Academic Publishers, 2002
- /EGS/ Directive 91/155/EEC ("Safety Data Sheet Directive"), amended by Directives 93/112/EC and 2001/58/EC
- /EN 13501-1/ Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests, 2000
- /Eyerer and Reinhardt/ Eyerer P., Reinhardt, H.-W. (ed.): Ökologische Bilanzierung von Baustoffen und Gebäuden – Wege zu einer ganzheitlichen Bilanzierung, Birkhäuser Verlag, Basel 2000 (Ecological balancing of building materials and buildings - paths to holistic balancing)
- /GaBi 2007/ GaBi 4: Software und Datenbank zur Ganzheitlichen Bilanzierung, Universität Stuttgart und PE INTERNATIONAL GmbH, Leinfelden-Echterdingen 2007. (Software and database for holistic balancing)
- /GefStoffV/ Verordnung zum Schutz vor gefährlichen Stoffen (Gefahrstoffverordnung GefStoffV) vom 23. Dezember 2004, BGBl S. 3855 (German ordinance for protection from hazardous materials (Hazardous materials ordinance GefStoffV) of 23 December 2004)
- /ISO 14025/ DIN EN ISO 14025: Environmental Labels and declarations – Type III environmental declarations – Principles and procedures, version 2005
- /ISO 14040/ DIN EN ISO 14040: Environmental management – Life cycle assessment – Principles and frameworks, version 2005
- /ISO 14044/ DIN EN ISO 14044: Environmental management – Life cycle assessment – Requirements and guidelines, version 2005
- /Schiesl et al./ Schiesl, Hoberg, Rankers: Umweltverträglichkeit von Baustoffen für Außenfassaden, Forschungsbericht F415, ibac Aachen, 1995 (Environmental compatibility of materials for exterior facades, research report F415)



## Environmental product declaration in accordance with ISO 14025

Adhesive compounds and fillers: StoPrefa Coll, StoLevel Classic, StoArmat Classic, StoArmat Classic Plus, StoPrefa Armat, Sto-Reinforcement Fibre Plaster

Page 22

---

Product group:	Coatings with organic binders	Issued on
Declaration holder:	Sto AG, Ehrenbachstrasse 1, D-79780 Stühlingen, Germany	26-02-2011
Declaration number:	EPD-STO-2011311-D	

---

/TAS/	TA Siedlungsabfall: Technische Anleitung zur Verwertung, Behandlung und sonstigen Entsorgung von Siedlungsabfällen (3. Allgemeine Verwaltungsvorschrift zum Abfallgesetz) vom 14. Mai 1993 (BAnz. Nr. 99a vom 29.05.1993) (Technical directive for recycling, treatment and other disposal of residential waste, from 14 May 1993)
/DIN 4102-1	Fire behaviour of building materials and elements - Part 1: Classification of building materials - Requirements and testing.
/DIN EN 13823	Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item.
DIN EN 15824	Specifications for external renders and internal plasters based on organic binders



Institut Bauen  
und Umwelt e.V.

**Publisher:**

Institut Bauen und Umwelt e.V. (IBU) (Institute Construction and Environment)

Rheinufer 108

D-53639 Königswinter, Germany

Tel.: +49 (0)2223 296679-0

Fax: +49 (0)2223 296679-1

E-mail: [info@bau-umwelt.com](mailto:info@bau-umwelt.com)

Internet: [www.bau-umwelt.com](http://www.bau-umwelt.com)

**Photographic credits:**

Sto Aktiengesellschaft

Ehrenbachstrasse 1

D-79780 Stühlingen