New life to PVC

Laborplast since 1958

LCA study

of Recycled PVC Cores and Compounds

Reference standards: ISO 14040 | ISO 14044
Date of issue: 16/03/2023

LABORPLAST

From 1958 to the present

The history of Laborplast
is constantly **evolving**
towards new and ambitious goals

1958

In a small factory in Sacconago, in the municipality of Busto Arsizio (Varese) Eugenio, Pierino, Paolo and Giovanni Pariani founded **Fratelli Pariani** and started manufacturing PVC products for the construction sector, particularly pipes and fittings destined for local construction sites.

1973

Fratelli Pariani opened its new plant in Bienate di Magnago, with a floor area of approximately 2,500 m^2. **Labor Plast snc** was founded. This artisan company intended to develop and equip to meet growing market needs.

1980

Laborplast started using grinded materials from industrial waste as a replacement for virgin rigid PVC compounds.

1990

The management, consisting of four second-generation cousins, looked at the industrial packaging sector and purchased a new single-screw line to produce recycled PVC reel cores.

1997

Laborplast snc became Laborplast srl.
It invested in more advanced production machinery: the single-screw extrusion lines were replaced with high-performance twin-screw lines.

2005

The first compounding plant was purchased, with a production capacity of approximately 1,300 kg/h.

2010

Construction of a new plant in Busto Arsizio on a 10,000 m^2 area.

2012

Laborplast obtained its first ISO 9001 Quality system certification.

The company had 4 extrusion lines for recycled PVC reel cores and a recycled PVC compound production plant with a production capacity of about 2,000 kg/h with an annual processed quantity of 9,000 tonnes of raw material.

2013

The family's third generation joined the company in September. The new Busto Arsizio site, with more than 10,000 m2 of floor area, became the business heart. Core production capacity doubled, and compound production tripled.
The procedures to obtain ISO 14001 (Environment) and ISO 45001 (Safety) system certifications started.

2015

The third extrusion plant for recycled PVC compound went into operation. Construction of an in-house laboratory to analyse incoming raw materials and finished products.

2018

Laborplast turns 60.
Production of full and hollowed PVC rods for various industrial sectors, primarily the chemical industry.

2020

Construction of a new plant for compound production and internal logistics. This reached a floor area of approximately 32,000 m^2.

2021

The fourth recycled PVC compound production plant went into operation, and could produce compound from grinded and virgin PVC compound.
The first Life Cycle Assessment (LCA) study on the company's products, for 2020, showed lower environmental impact of recycled PVC products compared to similar virgin PVC ones. Laborplast prepared its Code of Ethics and achieved compliance with Legislative Decree 231/2001 on corporate liability.

2022

Laborplast srl became Laborplast Spa.
Laborplast had 5 plants producing recycled PVC compound, 5 plants producing reel cores and 2 plants for full and hollowed rods, with a production capacity of 6,500 kg/h.
The company obtained the CSI Recycled Plastic certification.
The company's first Carbon Footprint calculation was performed. The purchase of green energy from the market laid the foundations for the company's decarbonisation strategy. The first Corporate Sustainability Report (for 2021) was drawn up.

2023

A company photovoltaic system with a power of 270 kW was installed, meeting approximately 5% of the annual electricity requirement.
Laborplast joined the Operation Clean Sweep project, to fight pollution from microplastic dispersion.
The company's product LCA study was updated.
Laborplast was admitted to Euronext's ELITE programme.

Purposes of the Study

The purpose of the study is to analyse the environmental impacts of PVC compounds and cores produced by the company. The analysis is conducted using the LCA (Life Cycle Assessment) methodology, in accordance with the requirements of the international standards for life cycle assessment currently in force: UNI EN ISO 14040:2021 Environmental management - Life cycle assessment - Principles and framework and UNI EN ISO 14044:2021 Environmental management - Life cycle assessment - Requirements and guidelines.

The **structure of the LCA study** can be summarised in four main phases:

- **Purpose and scope:** preliminary phase in which the purpose of the study , the functional unit, the boundaries of the system studied, the data requirements and the assumptions are defined
- **Inventory analysis:** quantification of inflows and outflows for all LCA processes
- **Impact assessment:** using scientific models, inventory results are aggregated into groups of potential environmental impacts
- **Interpretation of results:** the results of the LCA are interpreted in order to derive conclusions and recommendations.

The study has been conducted by CESAP S.r.l. CONSORTILE, Via Velleia 4 – 20900 MONZA (MB), www.cesap.com and carried out by the following professional experts in LCA: Anna Atti.

The products analysed

Product	Description	Main area o f use
LABORPVC-RI-EPR	LABORPVC-EPR formulations are mainly made from milled profiles, window profiles, calendered and thermoformed profiles, exclusively post-industrial and pre-consumer, to which calcium carbonate is added in varying percentages to optimise the mechanical properties of the product. During the process, additives such as paraffin waxes, Ca/Zn stabilisers and impact modifier agents are used to improve processability	Technical profiles, spiral hoses, sheet piling, building profiles
LABORPVC-RI-EPI	LABORPVC-EPI formulations are predominantly made from milled pipes and thick profiles of post-industrial, pre-consumer and post-consumer (but comparable in quality to pre-consumer) origin, to which calcium carbonate is added in varying percentages to optimise the mechanical properties of the product. During the process, additives such as paraffin waxes, Ca/Zn stabilisers and impact modifier agents are used to improve processability	Cores for winding and pipes for construction and plant engineering
LABORPVC-RI-INJ	The types of PVC compounds intended for the production of moulded articles are designed to obtain a product with excellent aesthetic characteristics, without sacrificing ease of processing and mechanical performance. LABORPVC-INJ formulations are mainly made from window profiles, calendered, thermoformed regrinds and injection-moulded articles, exclusively post-industrial and pre-consumer. During the process, additives such as paraffin waxes, Ca/Zn stabilisers and impact modifier agents are used to improve processability	Technical articles, building fittings
LABORPVC-PR-EPI	These formulations are a variant of LABORPVC-RI-EPI. The difference is that in these formulations a percentage of between 30 and 50% is made up of virgin resin, in order to improve the mechanical properties	Cores for winding and pipes for construction and plant engineering
LABORPVC-PR-EPR	These formulations are a variant of LABORPVC-RI-EPR. The difference is that in these formulations a percentage of between 40 and 50% is made up of virgin resin, in order to improve the mechanical properties	Technical profiles, spiral hoses, sheet piling, building profiles

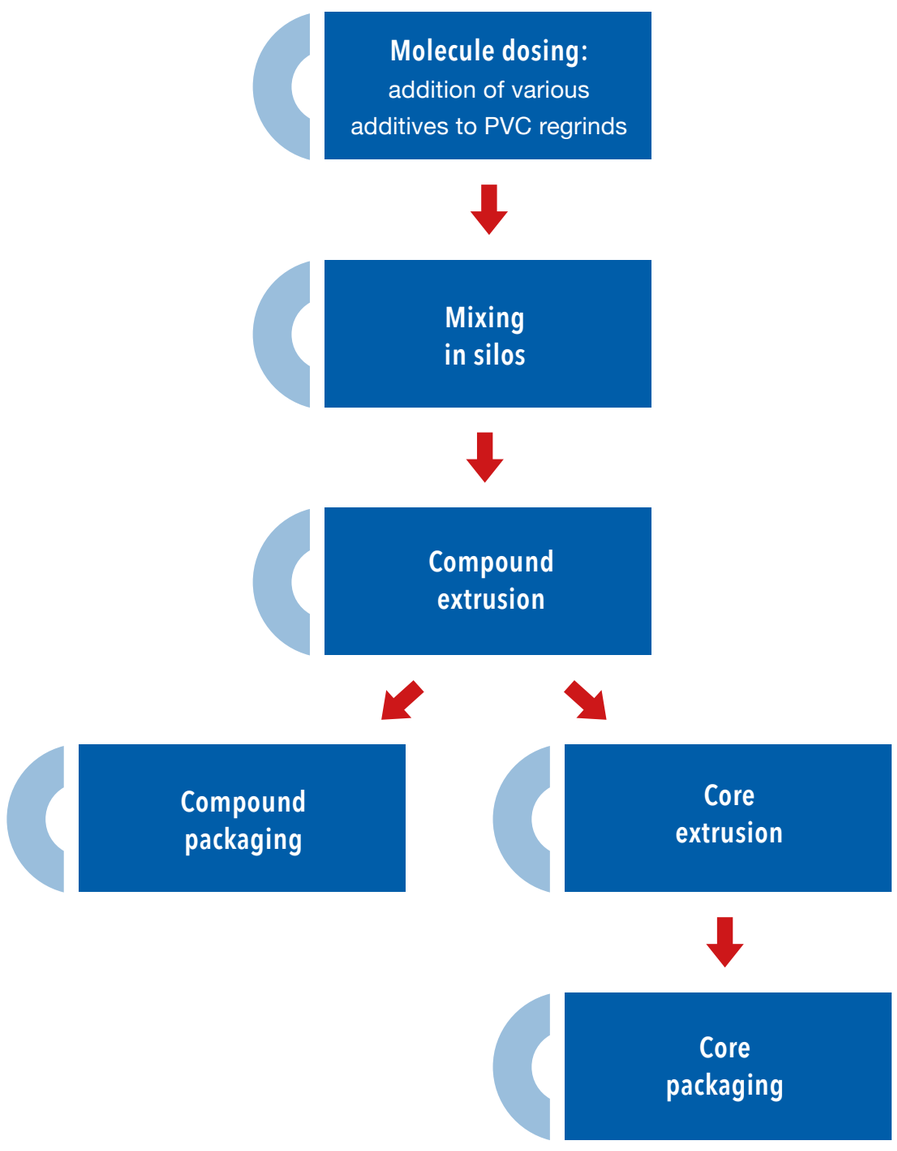
Trade name	CPC Code	Classification of the polymer according to GHS
PVC Compound	3473 - Polymers of vinyl chloride or other halogenated olefins, in primary forms	Non-hazardous mixture according to Regulation No. 1272/2008/EC

Since they are mixtures, the ISO polymer code, CAS number and IUPAC name are not applicable.

Product	Description	Main area o f use
PVC Cores	The cores are manufactured from recycled PVC compound in various thickness	Winding of industrial films, agricultural films, textiles and geo fabrics

The production process

The incoming material used for compound production is recycled PVC, 70% of which is obtained from pre-consumer PVC (PVC profiles, calendars, fittings, pipes regrinds) and 30% from post-consumer PVC recycling. PVC recycling is carried out at suppliers, from whom Laborplast obtains its supplies. The diagram of the production process carried out at Busto Arsizio site is the following:



Methodological framework

Declared unit

For the compound study the stated unit of the study, in analogy to PCR, is 1kg of PVC compound, while for the core study is 1kg of core.

Product category rules

For the study of compounds, the Product Category Rules (PCR) of the EPD system were used: “PLASTICS IN PRIMARY FORMS - PRODUCT CATEGORY CLASSIFICATION: UN CPC 347 - VERSION 3.0.2 “ of 17/08/2022. No reference PCRs are available for the study of cores.

System boundaries

The study is from the cradle to the customer’s gate, thus including the distribution of the product from Laborplast to the customer. The use and end-of-life phases, which are optional for PCRs, have not been included as the products are intended for multiple markets and uses, of which there is no information. For the study of compounds, the end-of-life of packaging was also included, as per PCR.

Company products are not classifiable as construction products according to Article 2 of REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 and therefore EN 15804 is not applicable.

The boundaries of the system are as follows:

Upstream

- Collection of PVC waste at the recycling plant
- PVC Recycling
- Production of additives
- Production of products used in maintenance
- Packaging production

Core

- Transport of all raw materials to the plant
- Energy consumption of the compound production process
- Emissions from the extrusion process
- General consumption
- Plant waste management

Downstream

- Transporting the product to customers
- End-of-life packaging

Exclusion criteria

A cut-off of 1% was used, in terms of environmental relevance. In the cut-off, labels affixed to products during shipment and the packaging of materials used in maintenance were considered.

Time boundaries

The year taken as the reference for the study is 2022.

Geographical representativeness

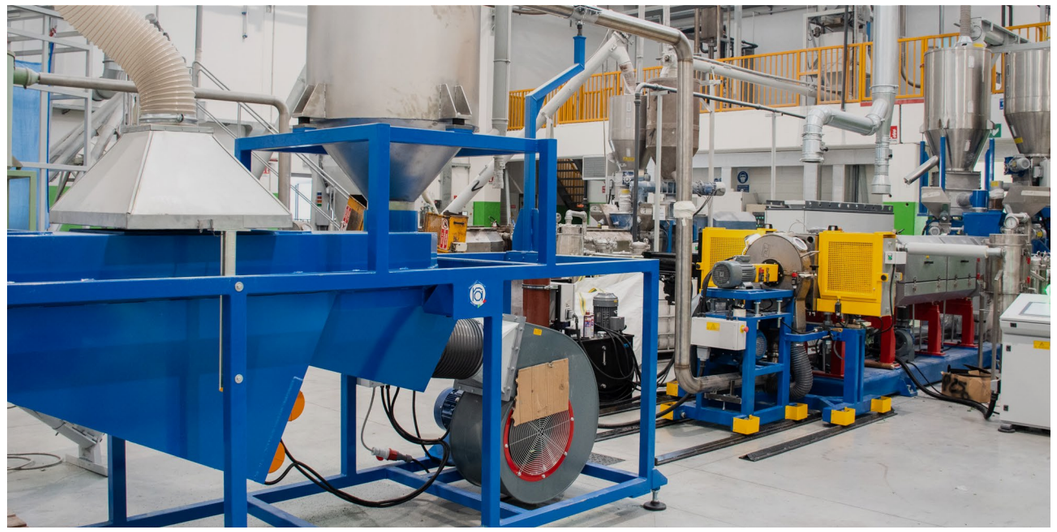
In relation to the geographical representativeness of the databases used:

- European data were used for plastics
- the specific Italian process mix was used for electricity
- European data were used for additives, where available
- European data were used for transport.

Boundaries with the environment and other systems

Emissions to air, water and waste from production processes were included in the LCA. With regard to the modelling of waste destined for recovery operations and the modelling of materials resulting from their recycling, the “Polluter-Pays (PP) allocation method” was used, in which the waste producer takes charge of the impacts of the waste with the following case studies, described in the GPI:

- if the waste is sent to landfill, all impacts of landfill disposal are borne by the waste producer
- if the waste is sent for recycling, the impacts up to the entry of the sorting and recycling plant are borne by the waste producer; 100% of the impacts and benefits of recycling operations are borne by the subsequent product system in which the recycled material will be used
- when sending the product to waste-to-energy: the impacts of waste-to-energy are borne by the producer of the waste, while the benefits of the heat generated are borne by the product in which it is re-used.



Recycled PVC

The input material used for compound production is pre-consumer and post-consumer recycled PVC. Therefore, for this material, 100% of the impacts and benefits of the operations from waste collection and subsequent recycling operations have been considered to be borne by the product.

Waste generated

In the case of business waste, the transport operations were considered as having been sent for recycling:

- CER 15.01.01 paper and cardboard
- CER 15.01.02 plastic
- CER 15.01.03 wood
- CER 17.04.05 iron and steel
- EWC 07.02.13 waste plastics
- EWC 12.01.05 plastic filings and shavings

On the other hand, the following wastes were considered to be sent for treatment other than recycling — thus also considering their impacts:

- EWC 07.02.01 aqueous solutions
- CER 08.03.18 spent printer toner
- EWC 13.02.08 other engine, gear and lubricating oils
- EWC 15.01.06 mixed material packaging
- EWC 16.02.16 components removed from discarded equipment
- EWC 15.01.10 packaging containing residues of or contaminated by dangerous substances
- EWC 20.03.07 bulky waste
- EWC 15.02.02 filters, absorbent materials, protective clothing
- EWC 20.01.21 fluorescent tubes and other components containing mercury

Energy mix

From 1 April 2022 to 31 December 2022, the electricity purchased by Laborplast for the company's plants is covered by Guarantees of Origin and accounts for 73% of the reference year's consumption. Therefore, the electricity consumed by the plant has been modelled as follows:

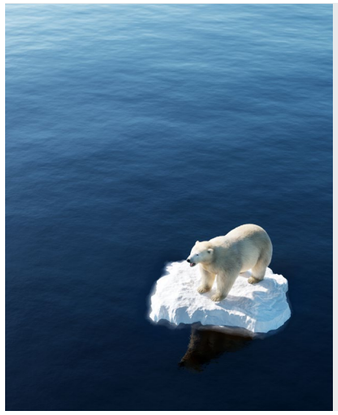
- 73% renewables mix as found in the Ecoinvent dataset for Italian electricity
- 27% residual energy mix, taken from the document European Residual Mixes 2021 - Association of Issuing Bodies. The residual mix was modelled from the contributions of the different electricity sources in the document.

The electrical energy was transformed to medium voltage, taking into account the transformation losses in the Ecoinvent 3.8 database.

Method used

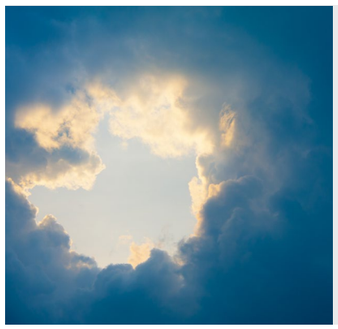
The method version used is Sima Pro's EN 15804 +A2 Method v.1.03, which uses the methods referred to in EN 15804+A2.

Below is a brief description of the main impact categories.



GLOBAL WARMING

Global warming is the phenomenon of an increase in the average temperature of the Earth's surface that cannot be attributed to natural causes. This change is largely attributed to the emission of increasing amounts of greenhouse gases (mainly carbon dioxide, methane, nitrous oxide and refrigerant gases) into the atmosphere. The impact is calculated using both the IPCC 2021 GWP-GHG method from the Carbon Footprint and the method from EN 15804 (Climate change).



OZONE DEPLETION

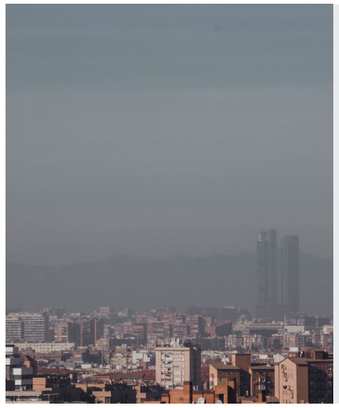
The ozone layer is a natural gas layer in the stratosphere that protects humans and other living beings from harmful ultraviolet (UV) radiation from the sun. The depletion potential of the ozone layer is an indicator of the damage caused by increased UV radiation as a result of the emission of ozone-depleting substances into the air.

ABIOTIC RESOURCES DEPLETION

The indicator quantifies the reduction of non-renewable raw materials, i.e. with a regeneration time of more than 500, years related to the extraction of minerals and fossil fuels and is determined on the basis of concentration reserves and the rate of deaccumulation.

ACIDIFICATION

Emissions of compounds from the combustion of fossil fuels, in particular sulphur oxides and nitrogen oxides, are mainly responsible for the phenomenon of acid rain, which causes the pH of lakes, forests and soil to drop, with serious consequences for living organisms, ecosystems and materials.



PHOTOCHEMICAL OZONE FORMATION

Photochemical smog, a phenomenon characteristic of daylight hours in large urban areas in the summertime, is a complex mixture of air pollutants consisting of ozone and other oxidising chemicals, nitrogen dioxide (NO2) and fine particulate matter. The most important component is ozone, due to its impact on human health and natural ecosystems. Ozone is not emitted directly but is formed in the troposphere under the influence of solar radiation, as a result of photochemical reactions involving volatile organic compounds (VOCs) and nitrogen oxides (NOx).

WATER USE

The category indicator represents the water remaining per area after meeting the demand for humans and ecosystems. It assesses the potential of water deprivation based on the assumption that the less water remains available per area, the more likely it is that another use will be deprived. Results are expressed as ^{m3}.

Product composition

PVC COMPOUND

LABORPVC-RI-EPI

- Recycled PVC regrinds
- Calcium carbonate
- Ca-Zn stabilisers
- Lubricants
- Other <1%

PVC COMPOUND

LABORPVC-RI-EPR

- Recycled PVC regrinds
- Calcium carbonate
- Ca-Zn stabilisers
- Lubricants
- Impact modifier additives
- Other <1%

PVC COMPOUND

LABORPVC-RI-INJ

- Recycled PVC regrinds
- Calcium carbonate
- Ca-Zn stabilisers
- Lubricants
- Impact modifier additives
- Other <1%

PVC COMPOUND

LABORPVC-PR-EPI

- Recycled PVC regrinds
- PVC virgin resin
- Calcium carbonate
- Ca-Zn stabilisers
- Lubricants
- Other <1%

PVC COMPOUND

LABORPVC-PR-EPR

- Recycled PVC regrinds
- PVC virgin resin
- Calcium carbonate
- Ca-Zn stabilisers
- Lubricants
- Impact modifier additives
- Other <1%

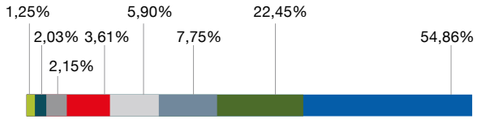
PVC CORES

- Regenerated PVC compound LABORPVC-RI-EPI

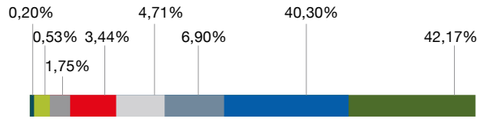
Start-up and shutdown waste is fed back into the production process.

Evaluation of compound impacts

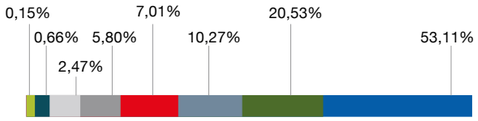
LABORPVC-RI-EPI



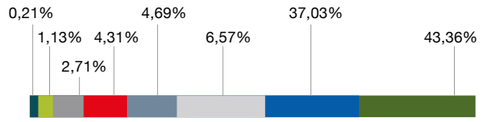
Global Warming (IPCC GWP 100a)



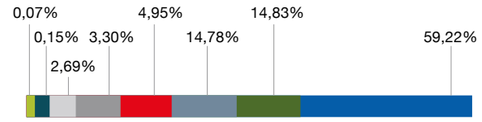
Acidification



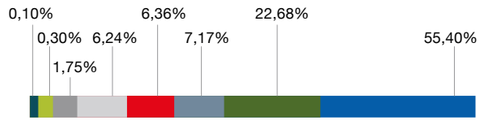
Eutrophication, freshwater



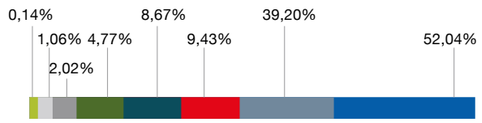
Photochemical ozone formation



Resource use, minerals and metals



Resource use, fossils



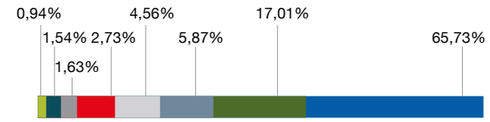
Water use

Legend

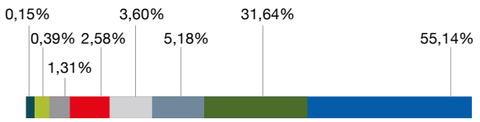
- Raw materials
- Inbound transport
- General consumption
- Product Logistics
- Packaging
- Electricity consumption
- Plant waste
- End-of-life packaging

Category impact	Units	LABORPVC-RI-EPI with end package life	LABORPVC-RI-EPI (hp: 100% resin)	Comparison Compound recycled PVC and virgin PVC
IPCC GWP 100a	kg CO2 eq	0,256	1,54	-83,38%
Acidification	mol H+ eq	1,77E-03	7,05E-03	-74,89%
Eutrophication, freshwater	kg P eq	5,06E-05	5,10E-04	-90,80%
Photochemical ozone formation	kg NMVOC eq	1,36E-03	4,47E-03	-69,51%
Resource use, minerals and metals	kg Sb eq	1,74E-06	2,63E-05	-93,38%
Resource use, fossils	MJ	5,0	37,9	-86,81%
Water use	m3 depriv.	0,101	2,01	-94,98%

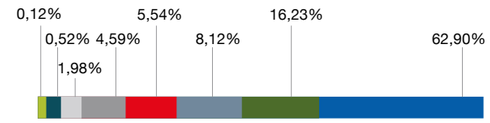
LABORPVC-RI-EPR



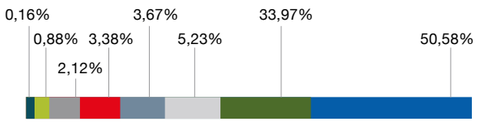
Global Warming (IPCC GWP 100a)



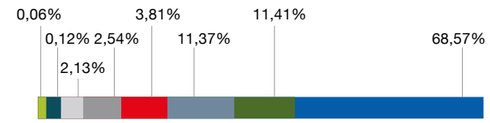
Acidification



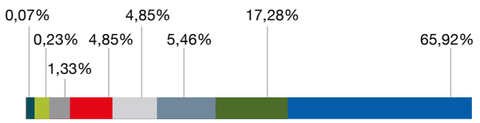
Eutrophication, freshwater



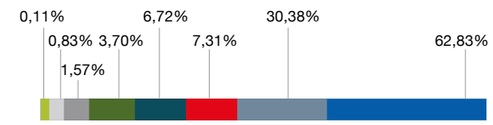
Photochemical ozone formation



Resource use, minerals and metals



Resource use, fossils



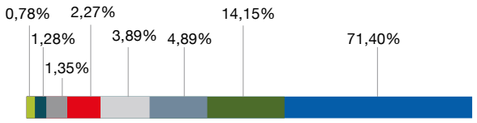
Water use

Legend

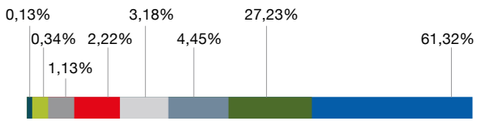
- Raw materials
- Inbound transport
- General consumption
- Product Logistics
- Packaging
- Electricity consumption
- Plant waste
- End-of-life packaging

Category impact	Units	LABORPVC-RI-EPR with end package life	LABORPVC-RI-EPR (hp: 100% resin)	Comparison Compound recycled PVC and virgin PVC
IPCC GWP 100a	kg CO2 eq	0,442	1,77	-75,03%
Acidification	mol H+ eq	2,36E-03	8,18E-03	-71,15%
Eutrophication, freshwater	kg P eq	6,40E-05	5,66E-04	-88,69%
Photochemical ozone formation	kg NMVOC eq	1,73E-03	5,19E-03	-66,69%
Resource use, minerals and metals	kg Sb eq	2,26E-06	2,91E-05	-92,23%
Resource use, fossils	MJ	6,5	42,5	-84,71%
Water use	m3 depriv.	0,131	2,21	-94,07%

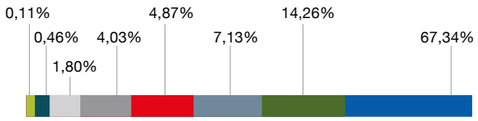
LABORPVC-RI-INJ



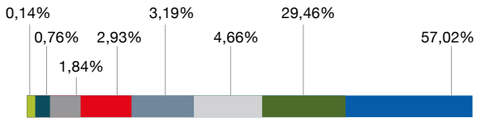
Global Warming (IPCC GWP 100a)



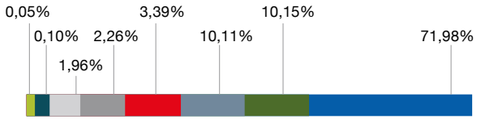
Acidification



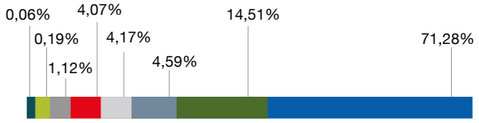
Eutrophication, freshwater



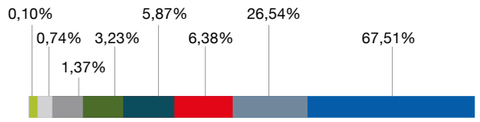
Photochemical ozone formation



Resource use, minerals and metals



Resource use, fossils



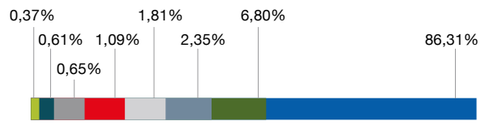
Water use

Legend

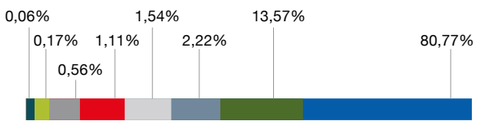
- Raw materials
- Inbound transport
- General consumption
- Product Logistics
- Packaging
- Electricity consumption
- Plant waste
- End-of-life packaging

Category impact	Units	LABORPVC-RI-INJ with end package life	LABORPVC-RI-INJ (hp: 100% resin)	Comparison Compound recycled PVC and virgin PVC
IPCC GWP 100a	kg CO2 eq	0,533	2,26	-76,42%
Acidification	mol H+ eq	2,74E-03	1,05E-02	-73,90%
Eutrophication, freshwater	kg P eq	7,29E-05	7,24E-04	-89,93%
Photochemical ozone formation	kg NMVOC eq	1,99E-03	6,63E-03	-69,69%
Resource use, minerals and metals	kg Sb eq	2,54E-06	3,72E-05	-93,17%
Resource use, fossils	MJ	7,8	54,6	-85,71%
Water use	m3 depriv.	0,149	2,84	-94,75%

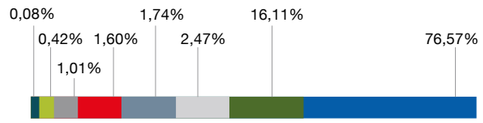
LABORPVC-PR-EPI



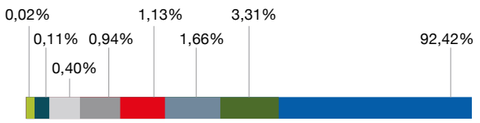
Global Warming (IPCC GWP 100a)



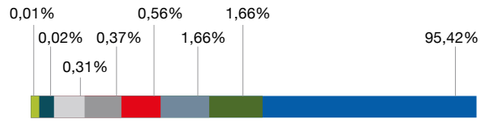
Acidification



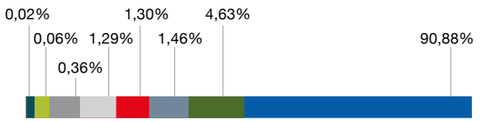
Eutrophication, freshwater



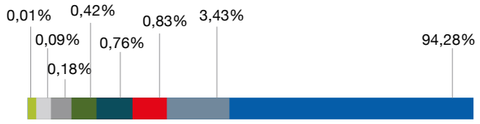
Photochemical ozone formation



Resource use, minerals and metals



Resource use, fossils



Water use

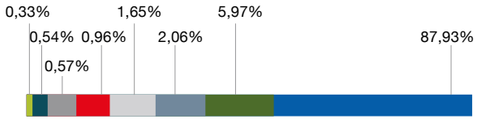
Legend

- Raw materials
- Inbound transport
- General consumption
- Product Logistics
- Packaging
- Electricity consumption
- Plant waste
- End-of-life packaging

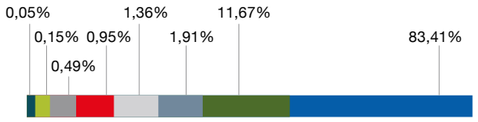
Category impact	Units	LABORPVC-PR-EPI with end package life	LABORPVC-PR-EPI (hp: 100% resin)	Comparison Compound recycled PVC and virgin PVC
IPCC GWP 100a	kg CO2 eq	1,108	1,70	-34,82%
Acidification	mol H+ eq	5,50E-03	7,87E-03	-30,11%
Eutrophication, freshwater	kg P eq	3,13E-04	5,47E-04	-42,78%
Photochemical ozone formation	kg NMVOC eq	3,66E-03	4,99E-03	-26,65%
Resource use, minerals and metals	kg Sb eq	1,55E-05	2,81E-05	-44.84%
Resource use, fossils	MJ	24,4	40,9	-40,33%
Water use	m3 depriv.	1,140	2,13	-46,48%

Evaluation of compound impacts

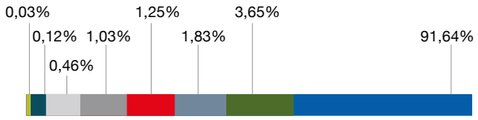
LABORPVC-PR-EPR



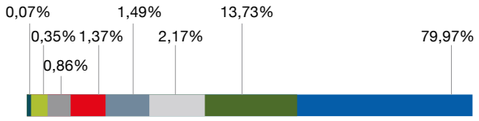
Global Warming (IPCC GWP 100a)



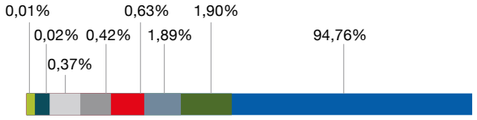
Acidification



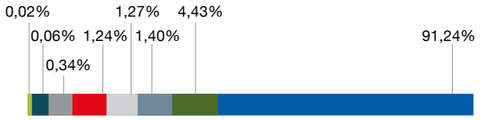
Eutrophication, freshwater



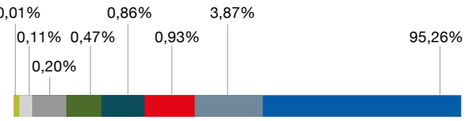
Photochemical ozone formation



Resource use, minerals and metals



Resource use, fossils



Water use

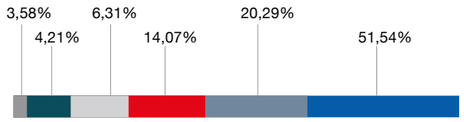
Legend

- Raw materials
- Inbound transport
- General consumption
- Product Logistics
- Packaging
- Electricity consumption
- Plant waste
- End-of-life packaging

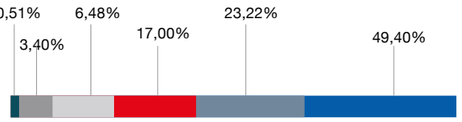
Category impact	Units	LABORPVC-PR-EPR with end package life	LABORPVC-PR-EPR (hp: 100% resin)	Comparison Compound recycled PVC and virgin PVC
IPCC GWP 100a	kg CO2 eq	1,258	2,20	-42,82%
Acidification	mol H+ eq	6,38E-03	1,04E-02	-38,65%
Eutrophication, freshwater	kg P eq	2,85E-04	6,47E-04	-55,95%
Photochemical ozone formation	kg NMVOC eq	4,29E-03	6,63E-03	-35,29%
Resource use, minerals and metals	kg Sb eq	1,36E-05	3,30E-05	-58,79%
Resource use, fossils	MJ	25,6	51,4	-50,19%
Water use	m3 depriv.	1,024	2,54	-59,59%

Evaluation of cores impacts

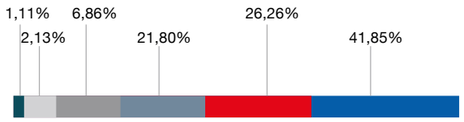
PVC cores - length < 1m



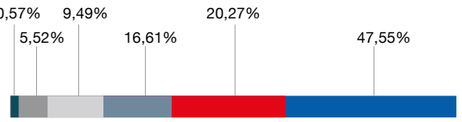
Global Warming (IPCC GWP 100a)



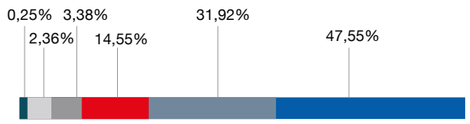
Acidification



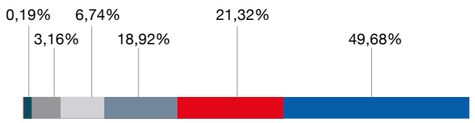
Eutrophication, freshwater



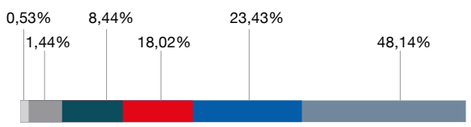
Photochemical ozone formation



Resource use, minerals and metals



Resource use, fossils



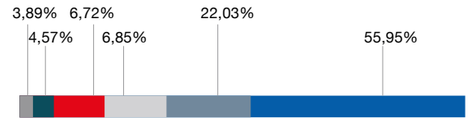
Water use

Legend

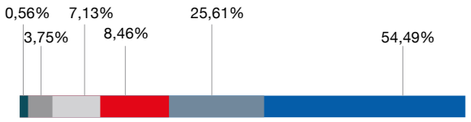
- Raw materials
- Inbound transport
- General consumption
- Packaging
- Electricity consumption
- Plant waste

Impact category	Units	Souls of length <1 m in recycled PVC	Souls of length >1 m in virgin PVC	Comparison of recycled and virgin PVC cores
IPCC GWP 100a	kg CO2 eq	0,337	1,54	-78,12%
Acidification	mol H+ eq	1,38E-03	6,91E-03	-80,34%
Eutrophication, freshwater	kg P eq	6,29E-05	5,03E-04	-87,50%
Photochemical ozone formation	kg NMVOC eq	1,01E-03	4,50E-03	-77,50%
Resource use, minerals and metals	kg Sb eq	2,12E-06	2,54E-05	-91,63%
Resource use, fossils	MJ	5,0	36,8	-86,53%
Water use	m3 depriv.	0,181	1,97	-90,83%

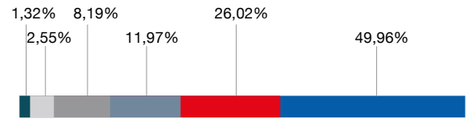
PVC cores - length > 1m



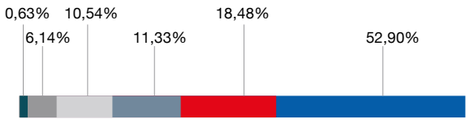
Global Warming (IPCC GWP 100a)



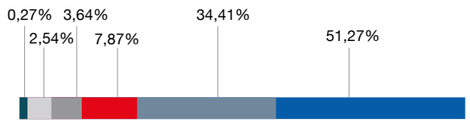
Acidification



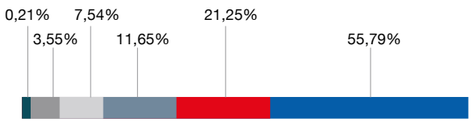
Eutrophication, freshwater



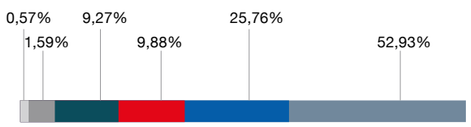
Photochemical ozone formation



Resource use, minerals and metals



Resource use, fossils



Water use

Legend

- Raw materials
- Inbound transport
- General consumption
- Packaging
- Electricity consumption
- Plant waste

Impact category	Units	Souls of length <1 m in recycled PVC	Souls of length >1 m in virgin PVC	Comparison of recycled and virgin PVC cores
IPCC GWP 100a	kg CO2 eq	0,309	1,51	-79,58%
Acidification	mol H+ eq	1,25E-03	6,90E-03	-81,92%
Eutrophication, freshwater	kg P eq	5,23E-05	4,92E-04	-89,37%
Photochemical ozone formation	kg NMVOC eq	9,04E-04	4,39E-03	-79,39%
Resource use, minerals and metals	kg Sb eq	1,96E-06	2,52E-05	-92,23%
Resource use, fossils	MJ	4,4	36,3	-87,92%
Water use	m3 depriv.	0,160	1,95	-91,81%

Conclusions

The study examined the impacts related to the production of company compounds (up to the customer's gate, as required by the PCRs) and cores, up to the company gate. Analysing the compound data, it emerges that the environmental impacts of the different compounds vary significantly between the various products analysed, with the greatest impacts relating to the two PR products, i.e. semi-virgin, as they contain virgin PVC resin; this is followed by the INJ product, EPR, EPI and finally the compound for internal uses.

Analysing the impacts of compounds up to the customer's gate, for all compounds the major contribution is made by:

- consumption of raw materials, varying between 55% a n d 88% of the global warming effect of products. The impacts of raw materials are mostly related to the virgin PVC content, the recycled PVC content, the impact modifier additive and the calcium-zinc stabiliser. On the other hand, the contribution of calcium carbonate (resulting from grinding and not from precipitation) is negligible;
- electricity consumption in the plant, varying between 2% and 12% of the effect on global warming of products, which has been sharply reduced by the purchase of guarantees of origin;
- transport to the customer which accounts for 6-22% of global warming, increasing due to the acquisition of non-EU markets to a lesser extent, incoming transport (2-9%) and packaging (1-4%) contribute.

In conclusion, it can be seen that all data indicate a strong reduction in the environmental impact of recycled PVC compared to virgin PVC. Below is a summary diagram referring to the most representative category: Climate change - Fossil:

- Recycled vs. virgin compounds: -80%.
- Prime compound vs. virgin compounds: -40%.
- Recycled vs. virgin cores: -78%.

To further improve the data quality of the study, it is suggested to expand the data collection from recycled PVC suppliers.

Bibliography

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