SIKA RESINOUS SOLUTIONS FOR STRUCTURAL STRENGTHENING, SEALING AND BONDING

BUILDING TRUST
CONSTRUIRE LA CONFIANCE

ENVIRONMENTAL PRODUCT DECLARATION

Included products

- Sikadur®-30
- Sikadur®-300
- Sikadur®-31 Hi-Mod Gel
- Sikadur®-32 Hi-Mod
- Sikadur®-330
- Sikadur®-42 Grout Pak LE[CA]
- Sika® Level-01 Primer[CA]
- Sika® Loadflex®-524 EZ

The development of this environmental product declaration (EPD) for Sika resinous solutions for structural strengthening, sealing and bonding manufactured in Canada was commissioned by Sika Canada. These components are not part of a specific flooring or wall system (see the Sika Resinous & Cementitious Flooring Systems and the Sika Architectural and Protective Wall Coatings EPDs) and are used alone for a specific goal. This EPD was developed in compliance with CAN/CSA-ISO 14025 and ISO 21930 by Groupe AGÉCO and has been verified by Athena Sustainable Materials Institute.

This EPD includes life cycle assessment (LCA) results for the production stage only (cradle-to-gate).

For more information about Sika Canada, please go to www.sika.ca

Issue date: July 10, 2019

Minor Amendment: August 1, 2024; validity period extension.

Environmental Product Declaration
CSA Group Registered Based on ISO 14025 and Other Requirements
For more information visit csaregistries.ca/epd
2303-2843
July 2019-January 2025

This environmental product declaration (EPD) for Sika resinous solutions for structural strengthening, sealing and bonding is in accordance with ISO 14025:2006 and ISO 21930:2017. EPDs within the same product category but from different programs may not be comparable. Moreover, EPDs of construction products may not be comparable if they do not comply with EN 15804. Any EPD comparison must be performed in conformance with ISO 21930 guidelines. Care should be taken when comparing results since differences in certain assumptions, data quality and datasets are unavoidable, even when using the same product category rules (PCR). This declaration shall solely be used in a Business to Business (B2B) capacity.

Program operator	**CSA Group** 178 Rexdale Blvd, Toronto, ON, Canada M9W 1R3 | www.csagroup.org
Product	Sika resinous solutions for structural strengthening, sealing and bonding
EPD registration number	2303-2843
EPD recipient organization	**Sika Canada** 601 Delmar Ave., Pointe-Claire (Quebec) H9R 4A9 | www.sika.ca
Reference PCR	2012:01 Construction products and construction services (version 2.3) UN CPC code: 369 The International EPD® System | Valid until March 3, 2020
Date of issue (approval)	July 10, 2019
Period of validity	July 10, 2019 – January 09, 2025

The PCR review was conducted by	The Technical Committee of the International EPD® System. Chair: Massimo Marino.
The LCA and EPD were prepared by	**Groupe AGÉCO** | www.groupeageco.ca | ageco@groupeageco.ca
This EPD and related data were independently verified by an external verifier, Lindita Bushi, according to CAN/CSA-ISO 14025:2006 and ISO 21930:2017.	__ Internal **x External** *Lindita Bushi* (signature) Lindita Bushi, Ph.D. Athena Sustainable Materials Institute 280 Albert St., Suite 404, Ottawa, Ontario, Canada K1P 5G8 lindita.bushi@athenasmi.org | www.athenasmi.org

Declared unit	1 kg of product
Content of the products	See section 2 for complete description
Data quality assessment score	Medium to good
Manufacturing location	Pointe-Claire, Quebec, Canada

Environmental Product Declaration Summary Sheet

Sika Canada | Sika Resinous Solutions for Structural Strengthening, Sealing and Bonding

This is a summary of the environmental product declaration (EPD) describing the environmental performance of resinous solutions for structural strengthening, sealing and bonding manufactured by Sika Canada.

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EPD commissioner and owner	Period of validity	Program operator and registration number	Product Category Rule	LCA and EPD consultants
Sika Canada	July 10, 2019 – January 09, 2025	CSA Group 2303-2843	Construction products and construction services v.2.3 (2018)	Groupe AGÉCO

What is a Life Cycle Assessment (LCA)?

LCA is a science-based and internationally recognized tool to evaluate the relative potential environmental impacts of products and services throughout their life cycle, beginning with raw material extraction and including all aspects of transportation, production, use, and end-of-life treatment. The method is defined by the International Organization for Standardization (ISO) 14040 and 14044 standards. For EPD development, Product Category Rules (PCR) give additional guidelines on how to conduct the LCA of the product.

Why an EPD?

Sika Canada is seeking to provide the industry, decision-makers, influencers, and the general public with more transparency, in terms of its sustainability efforts and environmental performance of its products, relying on a rigorous and recognized communication tool, the EPD. By selecting products with an EPD, building projects can earn credits towards the Leadership in Energy and Environmental Design (LEED) rating system certification. In the latest LEED version (v4), points are awarded in the Materials and Resources category.

Product description

Epoxy and acrylic-based products used for structural strengthening and reinforcement purposes, such as impregnation resins, structural adhesives, concrete primers/sealers and joint control fillers

Declared unit

One kilogram (1 kg) of resinous component.

Scope and system boundary

Cradle-to-gate: production stage (A1-A3).

Components included in the EPD

Sikadur®-30 • Sikadur®-300
Sikadur®-31 Hi-Mod Gel[CA] • Sikadur®-32 Hi-Mod
Sikadur®-330 • Sikadur®-42 Grout Pak LE[CA]
Sika® Level-01 Primer[CA] • Sika® Loadflex®-524 EZ

CSA GROUP™

Potential environmental impacts

The potential environmental impacts of **1 kg of resinous component** are summarized below for each system assessed and for the main environmental indicators (based on life cycle impact assessment method TRACI 2.1). Refer to the full EPD for more detailed results.

Cradle-to-gate results for 1 kg of resinous components over the production stage (A1 to A3)

Components	Sikadur®-30	Sikadur®-300	Sikadur®-31 Hi-Mod Gel	Sikadur®-32 Hi-Mod
Global warming (kg CO_2 eq.)	2.10E+0	5.95E+0	2.41E+0	4.44E+0
Acidification (kg SO_2 eq.)	1.00E-2	2.59E-2	1.09E-2	1.96E-2
Eutrophication (kg N eq.)	8.55E-3	2.30E-2	8.49E-3	1.58E-2
Smog (kg O_3 eq.)	1.16E-1	3.19E-1	1.37E-1	2.50E-1
Ozone depletion (kg CFC-11 eq.)	3.06E-7	9.20E-7	3.52E-7	6.16E-7

Components	Sikadur®-330	Sikadur®-42 Grout Pak LE^{CA}	Sika® Level-01 Primer^{CA}	Sika® Loadflex®-524 EZ
Global warming (kg CO_2 eq.)	5.01E+0	1.14E+0	2.36E+0	4.36E+0
Acidification (kg SO_2 eq.)	2.22E-2	5.43E-3	8.95E-3	2.02E-2
Eutrophication (kg N eq.)	1.92E-2	4.63E-3	3.22E-3	6.27E-3
Smog (kg O_3 eq.)	2.77E-1	7.38E-2	8.58E-2	2.50E-1
Ozone depletion (kg CFC-11 eq.)	6.80E-7	1.43E-7	1.06E-7	2.15E-7

Note: "2.8E-1" means the result is 0.28.

Additional environmental information

This section provides additional relevant environmental information about the manufacturer and the resinous components that was not derived from the LCA.

Sika's Commitment to sustainability

Providing long lasting and high-performance solutions to the benefit of our customers, Sika is committed to pioneering sustainable solutions that are safer, have the lowest impact on resources and address global environmental challenges. Therefore, Sika assumes the responsibility to provide sustainable solutions in order to improve material, water and energy efficiency in construction and transportation. Sika strives to create more value for all its stakeholders with its products, systems and solutions along the whole value chain and throughout the entire life span of its products. Sika is committed to measure, improve and communicate sustainable value creation: "More value, less impact" refers to the company's commitment to maximize the value of its solutions to all stakeholders while reducing resource consumption and impact on the environment.

VOC content

Individual products in this EPD contain between ≤ 5 and 25 grams of VOC per litre. The VOC content was measured according to EPA 24, ASTM D2369 or SCAQMD 304 standard methods. All products were compliant with national standards and the SCAQMD rule 1168 for adhesive and sealant applications at the time of the study. Sika Canada discloses the VOC content of its products.

Waste packaging management

Sika Canada encourages its customers to responsibly dispose of used packaging. Most of them are recyclable. To make recycling easier, it is recommended to separate used packaging according to their material (paper, plastic and metal). Ask information to local municipalities about recycling programs for industrial coating packaging.

For more information: www.sika.ca

1. Description of Sika Canada

Sika Canada Inc., a member of the Sika Group, is a leader in the field of specialty chemicals for construction. Sika's product portfolio encompasses a vast range of construction solutions, "From Foundations Upwards", including waterproofing solutions, concrete production (ready mix and precast), concrete repair and protection, joint sealing, elastic & structural bonding, specialized flooring including industrial, commercial, institutional & decorative systems and roofing systems. This extensive range of products enables tailor-made solutions, in new construction as well as refurbishment. Beyond the quality and performance of its products, Sika has earned its reputation by offering an unparalleled level of expertise and support, from conception to completion.

2. Description of product

2.1. Definition and product classification

This EPD developed with the Product Category Rule (PCR) for Construction products and construction services version 2.3 from The International EPD® System, covers 8 resinous products. These products are epoxy or acrylic-based and used for structural strengthening and reinforcement purposes. They include various impregnation resins, structural adhesive, concrete primers/sealers and joint control fillers.

Figure 1: Example of the application of a resinous component

More information on these systems is available on Sika Canada's website: https://can.sika.com/en/solutions-and-products.html

2.2. Material content

The material composition of each component as disclosed in SDS (Safety Data Sheets) are provided in **Table 1**. The complete component formulations were used to calculate the LCA results.

Table 1: Composition of resinous components included in this EPD

Components	Ingredients[1]	CAS No.	Concentration (%w/w)
Sikadur®-30	(Part A) Quartz (SiO2)	140808-60-7	>= 70 - < 80
	(Part A) bisphenol-A-(epichlorhydrin) epoxy resin	25068-38-6	>= 10 - < 20
	(Part A) 1,4-bis(2,3 epoxypropoxy)butane	2425-79-8	>= 2 - < 5
	(Part B) Quartz (SiO2)	140808-60-7	>= 60 - < 70
	(Part B) 2,2,4(or 2,4,4)-trimethylhexane-1,6-diamine	25513-64-8	>= 10 - < 20
	(Part B) Quartz (SiO2)<5µm	140808-60-7	>= 0 - < 1
Sikadur®-300	(Part A) bisphenol-A-(epichlorhydrin) epoxy resin	25068-38-6	>= 90 - <= 100
	(Part B) Polyoxypropylenediamine	9046-10-0	>= 90 - <= 100

[1] Components are usually sold in two or three separate parts that are mixed on site prior to application. When this is the case, the part in which the ingredient is contained is indicated with a letter.

Components	Ingredients[1]	CAS No.	Concentration (%w/w)
	(Part B) Polyoxypropylenediamine (polymer)	9046-10-0	>= 5 - < 10
Sikadur®-31 Hi-Mod Gel[CA]	(Part A) Quartz (SiO2)	140808-60-7	>= 40 - < 50
	(Part A) bisphenol-A-(epichlorhydrin) epoxy resin	25068-38-6	>= 30 - < 40
	(Part A) Quartz (SiO2)<5µm	140808-60-7	>= 0 - < 1
	(Part B) Quartz (SiO2)	140808-60-7	>= 65 - < 75
	(Part B) Benzyl alcohol	100-51-6	>= 2 - < 5
	(Part B) triethylenetetramine	112-24-3	>= 2 - < 5
	(Part B) solvent naphtha (petroleum), heavy arom.	64742-94-5	>= 2 - < 5
	(Part B) 2,4,6-tris(dimethylaminomethyl)phenol	90-72-2	>= 2 - < 5
	(Part B) m-phenylenebis(methylamine)	1477-55-0	>= 2 - < 5
	(Part B) Reaction product of BADGE with TETA	38294-69-8	>= 0 - < 1
	(Part B) Quartz (SiO2)<5µm	14808-60-7	>= 0 - < 1
Sikadur®-32 Hi-Mod	(Part A) bisphenol-A-(epichlorhydrin) epoxy resin	25068-38-6	>= 80 - < 90
	(Part A) Phenol, 4-nonyl-, branched	84852-15-3	>= 5 - < 10
	(Part A) 2,3-epoxypropyl o-tolyl ether	2210-79-9	>= 2 - < 5
	(Part A) solvent naphtha (petroleum), heavy arom.	64742-94-5	>= 2 - < 5
	(Part B) Quartz (SiO2)	140808-60-7	>= 55 - < 65
	(Part B) Phenol, 4-nonyl-, branched	84852-15-3	>= 5 - < 10
	(Part B) Isophoronediamine	2855-13-2	>= 5 - < 10
	(Part B) Polyoxypropylenediamine (polymer)	9046-10-0	>= 5 - < 10
	(Part B) 2-piperazin-1-ylethylamine	140-31-8	>= 2 - < 5
	(Part B) solvent naphtha (petroleum), heavy arom.	64742-94-5	>= 2 - < 5
	(Part B) Benzyl alcohol	100-51-6	>= 2 - < 5
	(Part B) 2,4,6-tris(dimethylaminomethyl)phenol	90-72-2	>= 1 - < 2
	(Part B) Quartz (SiO2)<5µm	140808-60-7	>= 0 - < 1
	(Part B) 2,2'-iminodiethylamine	111-40-0	>= 0 - < 1
	(Part B) 3,6,9-triazaundecamethylenediamine	112-57-2	>= 0 - < 1
Sikadur®-330	(Part A) bisphenol-A-(epichlorhydrin) epoxy resin	25068-38-6	>= 50 - < 60
	(Part A) 1,4-bis(2,3 epoxypropoxy)butane	2425-79-8	>= 10 - < 20
	(Part B) 2,2,4(or 2,4,4)-trimethylhexane-1,6-diamine	25513-64-8	>= 60 - < 70
Sikadur®-42 Grout Pak LE[CA]	bisphenol-A-(epichlorhydrin) epoxy resin	25068-38-6	>= 85 - < 95
	solvent naphtha (petroleum), heavy arom.	64742-94-5	>= 5 - < 10
	[[(2-ethylhexyl)oxy]methyl]oxirane (2-ethylhexyl glycidyl ether)	2461-15-6	>= 2 - < 5
	2-methylnaphthalene	91-57-6	>= 2 - < 5
Sika® Level-01 Primer[CA]	No ingredients reported in the SDS		
Sika® Loadflex®-524 EZ	(Part A) Poly[oxy(methyl-1,2-ethanediyl)], .alpha.-hydro-.omega.-hydroxy-, polymer with 1,1'-methylenebis[isocyanatobenzene]	39420-98-9	>= 50 - <= 100
	(Part A) 4,4'-methylenediphenyl diisocyanate	101-68-8	>= 10 - < 20
	(Part A) Alkane, C14-17-, chloro-	85535-85-9	>= 10 - < 20
	(Part B) Dibutylphthalate	84-74-2	>= 50 - <= 100
	(Part B) diethylmethylbenzenediamine	68479-98-1	>= 10 - < 20
	(Part B) Ethylene diamine propoxilate	102-60-3	>= 2 - < 5
	(Part B) dibutyltin dilaurate	77-58-7	>= 0 - < 1

3. Scope of EPD

3.1. Declared unit

A declared unit is used in lieu of a functional unit in accordance with the PCR since the precise function of some products cannot be defined. The declared unit is defined as follows:

One kilogram (1 kg) of resinous component

Since this is cradle-to-gate EPD, which does not take into account the use stage, no service lives are reported.

3.2. System boundaries

This cradle-to-gate LCA includes modules related to the production stage as shown in **Table 2** and described in this section. Modules not declared are considered not relevant for the covered systems. Figure 2 on page 9 shows the cradle-to-gate processes for the manufacturing of resinous components included in this EPD.

Table 2: Life cycle stages included or not considered in the system boundaries

Production stage			Construction stage		Use stage							End-of-life stage				
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw materials	Transport	Manufacturing	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
x	x	x	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Legend:

X: considered in the system boundaries *MND: Module not declared*

A1 – Raw material supply

The products are composed of components made of many different ingredients (intermediate materials), such as epoxy for resinous components. They are manufactured in other parts of Canada, United States, Europe, South America, Asia and Australia. This module includes the production of the ingredients needed for the mixing at the Sika plants, including raw material extraction and transformation, and energy production.

A2 – Transport to manufacturing plants

Materials are transported from suppliers to the Sika's manufacturing plants by truck, and boat if shipped from oversees. This module includes the transport air emissions as well as fuel, vehicle, and infrastructure production.

A3 – MANUFACTURING

This module covers the manufacturing of resinous components. Once delivered to the Sika manufacturing plant, liquid materials for resinous components are stored until their use. Then, materials are mixed together in a tank according to a recipe. The mix goes under quality control, is packed in polyethylene (PE) or metallic pails and stored until shipping. Cardboard is also used for packaging.

Electricity is the main source of energy used at the manufacturing plant. In Quebec, the electricity grid mix is mainly composed of hydroelectricity. Natural gas is used for heating.

Most of the liquid waste is generated at the mixing stations and is mainly sent to incineration.

This module also includes the production and transport of primary packaging for the final products. Sika products are sold in a variety of packaging as described in Table 3.

Table 3: Packaging description

Packaging type	End-of-life treament	Mass (in kg)	Source	Biogenic carbon content** (kg C)
Paper bag (contains 25 kg)	Landfill	0.10	Estimated	0.05
Paper bag (contains 25 kg)	Landfill	0.11	Estimated	0.055
Cardboard box (contains 4 x 4 l)	Landfill	0.42	Estimated	0.21
Metallic can (3.78 l)	Landfill*	0.43	Estimated	0
PE canister (4 l)	Landfill	0.5	Estimated	0
PE pail (10 l)	Landfill	1.0	Manufacturer	0
PE pail (20 l)	Landfill	1.5	Manufacturer	0
PE pail (5 l)	Landfill	0.5	Manufacturer	0
Metallic pail (12 l)	Landfill*	0.77	Manufacturer	0
Metallic pail (15 l)	Landfill*	0.88	Manufacturer	0
Metallic pail (21 l)	Landfill*	1.13	Manufacturer	0
Metallic pail (7.56 l)	Landfill*	0.59	Estimated	0
PE sleeve	Landfill	0.13	Estimated	0

** Metallic containers may be recycled at the construction site, especially in a LEED project. However, it was judge that it would not be a representative case of how this packaging waste is usually treated.*
*** Source: ecoinvent (default 50 % C-content assumption)*

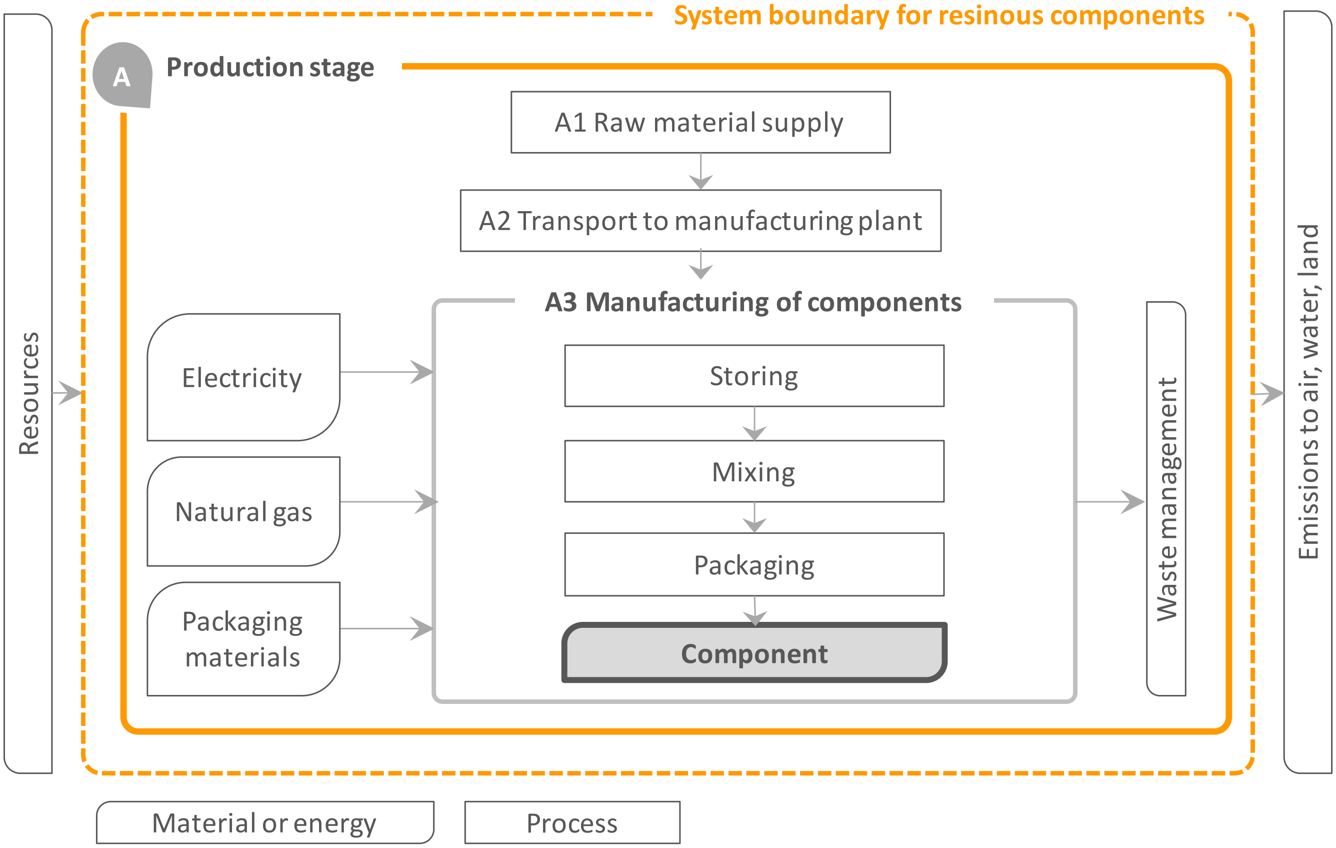


Figure 2: Process flow for all life cycle modules considered

3.3. Geographical and temporal boundaries

The geographical boundaries are representative of current equipment and processes associated with resinous component manufacturing, use and disposal in Canada. Since the data were collected for the year 2017, they are considered temporally representative (i.e. less than 5 years old). All data were modelled using the ecoinvent 3.4 database released in 2017 (ecoinvent, 2017), which meets the PCR requirements.

4. Potential environmental impacts assessment

This cradle-to-gate life cycle assessment has been conducted according to ISO 14040 and 14044 standards and the PCR for Construction products and construction services, version 2.3 (The International EPD® System, 2018). Potential environmental impacts were calculated with the impact assessment method TRACI 2.1 (US EPA, 2012) and CML baseline 3.04. The description of these indicators reported are provided in the glossary (section 6.2).

4.1. Assumptions

When specific data was not available, generic data which fulfilled the minimum criteria of the PCR were used. The ecoinvent database v3.4 recycled content allocation served as the main source of secondary data. It should be noted that most, though not all, of the data within ecoinvent is of European origin and developed to represent European industrial conditions and processes. Therefore, in some cases, these modules were further adapted in order to enhance their representativeness of the products and contexts being examined. However, in the recent updates of the ecoinvent database, a lot of efforts have been put into creating market groups for regions, countries and products. Other assumptions included in this LCA were related to raw material modelling, colours and transportation.

4.2. Criteria for the exclusion of inputs and outputs

Processes or elementary flows may be excluded if the life cycle inventory (LCI) data amounts to a minimum of 95 % of total inflows in terms of mass and energy to the upstream and core module. The following processes were excluded from the study due to their expected low contribution and the lack of readily available data:

- Personnel impacts
- Research and development activities
- Business travel
- Any secondary packaging
- All point of sale infrastructure
- Applicator

4.3. Data quality

Data sources

Specific data were collected from Sika Canada for operations occurring in 2017 (less than 5 years old). **Generic data** collected for the upstream processes were representative of the Quebec context and technologies used.

The LCA model was developed with the SimaPro 8.5 software using ecoinvent 3.4 database, which was released in 2017 (less than 2 years). Since most of the data within ecoinvent is of European origin and produced to represent European industrial conditions and processes, several data were adapted to enhance their representativeness of the products and contexts being examined.

Data quality

The overall data quality ratings show that the data used were either good or medium (only for one product, i.e. Sikadur-300®). This data quality assessment confirms the sufficient reliability, representativeness (technological, geographical and time-related), completeness, and consistency of the information and data used for this study.

4.4. Allocation

Allocation of multi-output processes

When unavoidable allocation was done by mass, or other physical relationship. Economic value allocation was not used.

Allocation at Sika's manufacturing plant

Sika's plants produce many different products, including several that are not part of the scope of this study. Product ingredients were available for each product and did not need to be allocated. However, general inputs such as electricity, natural gas, and water were allocated based on the production volume in tonnes. Percentages were calculated by the manufacturers through the data collection.

Allocation for end-of-life processes

As stated in the PCR, a recycled content approach (i.e. cut-off approach) was applied when a product is recycled. The impacts associated with the recycling process are thus attributed to the products using these materials.

ecoinvent processes with allocation

Many of the processes in the ecoinvent database also provide multiple functions, and allocation is required to provide inventory data per function (or per process). This study accepts the allocation method used by ecoinvent for those processes. The ecoinvent system model used was "Allocation, cut-off". It should be noted that the allocation methods used in ecoinvent for background processes (i.e. processes representing the complete supply chain of a good or service used in the life cycle of a resinous component) may be inconsistent with the approach used to model the foreground system (i.e. to model the manufacturing of a resinous component with data collected in the literature and from manufacturers). While this allocation is appropriate for foreground processes, continuation of this methodology into the background datasets would add complexity without substantially improving the quality of the study.

4.5. Life cycle impact assessment – results

Table 4 presents the results for 1 kg of resinous components over the production stage (modules A1 to A3).

Table 4: Cradle-to-gate results (modules A1 to A3) for 1 kg of resinous solutions for structural strengthening, sealing and bonding

Indicators	Units	Sikadur®-30	Sikadur®-300	Sikadur®-31 Hi-Mod Gel	Sikadur®-32 Hi-Mod	Sikadur®-330	Sikadur®-42 Grout Pak LE[CA]	Sika® Level-01 Primer[CA]	Sika® Loadflex®-524 EZ
Environmental indicators									
Global warming potential	kg CO_2 eq.	2.10E+0	5.95E+0	2.41E+0	4.44E+0	5.01E+0	1.14E+0	2.36E+0	4.36E+0
Acidification potential	kg SO_2 eq.	1.00E-2	2.59E-2	1.09E-2	1.96E-2	2.22E-2	5.43E-3	8.95E-3	2.02E-2
Eutrophication potential	kg N eq.	8.55E-3	2.30E-2	8.49E-3	1.58E-2	1.92E-2	4.63E-3	3.22E-3	6.27E-3
Smog formation potential	kg O_3 eq.	1.16E-1	3.19E-1	1.37E-1	2.50E-1	2.77E-1	7.38E-2	8.58E-2	2.50E-1
Ozone depletion potential	kg CFC-11 eq.	3.06E-7	9.20E-7	3.52E-7	6.16E-7	6.80E-7	1.43E-7	1.06E-7	2.15E-7
Depletion of abiotic resources (elements)	kg Sb eq.	4.78E-5	6.27E-5	3.98E-5	5.83E-5	7.56E-5	1.25E-5	4.15E-6	2.64E-5
Depletion of abiotic resources (fossil)	MJ	2.97E+1	9.67E+1	3.46E+1	7.35E+1	7.52E+1	1.53E+1	4.45E+1	7.98E+1
Resource use									
Renewable primary energy	MJ	3.77E+0	6.39E+0	3.92E+0	5.22E+0	5.79E+0	9.78E-1	1.56E+0	5.26E+0
Renewable primary materials	MJ	0	0	0	0	0	6.56E-2	0	0
Total renewable resources	MJ	3.77E+0	6.39E+0	3.92E+0	5.22E+0	5.79E+0	1.04E+0	1.56E+0	5.26E+0
Non-renewable primary energy	MJ	2.49E+1	7.28E+1	2.73E+1	5.24E+1	5.91E+1	1.29E+1	2.47E+1	6.13E+1
Non-renewable primary materials	MJ	6.75E+0	3.05E+1	9.34E+0	2.55E+1	2.12E+1	3.41E+0	2.20E+1	2.51E+1
Total non-renew. resources	MJ	3.16E+1	1.03E+2	3.67E+1	7.79E+1	8.03E+1	1.63E+1	4.67E+1	8.63E+1
Secondary materials	kg	0	0	0	0	0	0	0	0
Renewable secondary fuels	MJ	0	0	0	0	0	0	0	0
Non-renewable secondary fuels	MJ	0	0	0	0	0	0	0	0
Fresh water	m^3	3.13E-2	8.29E-2	3.44E-2	5.54E-2	6.17E-2	1.93E-2	3.45E-2	9.67E-2
Waste									
Hazardous waste disposed	kg	3.17E-2	3.17E-2	3.17E-2	3.17E-2	3.17E-2	3.36E-3	1.41E-2	1.27E-2
Non-hazardous waste disposed	kg	0	0	0	0	0	1.19E-2	0	0
Radioactive waste disposed	kg	0	0	0	0	0	0	0	0

Note: "E±Y" means "× 10 $^{\pm Y}$". E.g. "2.8E-1" means 0.28.

4.6. Life cycle impact assessment – interpretation

Sikadur®-31 Hi-Mod Gel^CA

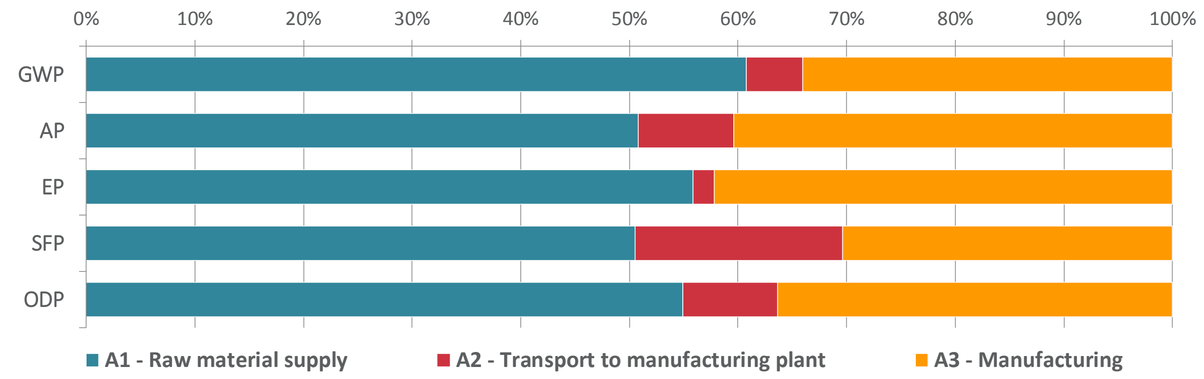
The result interpretation of the Sikadur®-31 Hi-Mod Gel^CA is presented in this section. Due to the high number of studied products, this component was selected as a typical component for the interpretation.

Potential environmental impact indicators

Figure 3 shows that the raw material supply (A1) is the main contributor to most indicators (51 % to 61 % of all impacts).

After raw material supply, manufacturing (A3) contributes between 30 % and 42 % of impact indicators, which is high compared to the small contribution of A3 in relation to A1 in previously analyzed systems. Higher natural gas consumption per kg at the plants for this type and the production of the tin packaging are main contributors of the manufacturing module.

The electricity grid mix used at the Quebec and B.C. plants has a low impact as it is composed mainly of hydroelectricity. However, hydroelectricity contributes significantly to the Fresh water indicator as more than 60 % of hydroelectricity in Quebec is produced with hydroelectric dams which necessitate large artificial water reservoirs. The ecoinvent datasets assume that reservoirs contribute to an increase of the water evaporation rate.



GWP	Global warming potential	EP	Eutrophication potential	ODP	Ozone depletion potential
AP	Acidification potential	SFP	Smog formation potential		

Figure 3: Relative contribution of life cycle modules for the production of 1 kg of Sikadur®-31 Hi-Mod Gel^CA (potential environmental impacts)

Use of resources indicators (total primary energy consumption and material resources consumption)

The electricity grid mix used at the Quebec and B.C. plants has a low impact as it is composed mainly of hydroelectricity, which contributes to the renewable energy use during manufacturing (A3). The tin packaging contributes to the importance of A3 for the abiotic resource depletion indicator. Fresh water is mostly consumed during raw material supply (A1) and manufacturing (A3).

Waste generation indicators

Since the inventory of waste is a rough estimate only based on foreground processes, there is no waste accounted for over the raw material supply stage (A1) and transport (A2). The bulk of the waste generated comes from the manufacturing (A3) and consists mainly of hazardous waste sent to incineration.

5. Additional environmental information

This section provides additional relevant environmental information about the manufacturer and the resinous components that was not derived from the LCA.

Sika's Commitment to sustainability

Providing high-performance solutions to the benefit of our customers, Sika is committed to pioneering sustainable solutions that address global environmental challenges, are safer and have the lowest impact on resources. Therefore, Sika assumes the responsibility to provide sustainable solutions in order to improve material, water and energy efficiency in construction and transportation. Sika strives to create more value for all its stakeholders with its products, systems and solutions along the whole value chain and throughout the entire life span of its products. Sika is committed to measure, improve and communicate sustainable value creation: "More value, less impact" refers to the company's commitment to maximize the value of its solutions to all stakeholders while reducing resource consumption and impact on the environment. consumption and impact on the environment.

With the aim of enhancing utility and reducing impacts, the company continues to work on its six strategic target areas, namely economic performance, sustainable solutions, local communities/society, energy, waste/water, and occupational safety. Year after year, Sika honors its responsibility through reporting its performance in a sustainability report in line with the highest standards, the Global Reporting Initiative (GRI). More particularly, the implementation of life-cycle thinking throughout all phases from product development to the use of the products by customers marks Sika's goal to move away from being a mere product supplier to a provider of innovative solutions which enhances the efficiency, durability, and aesthetic appeal of buildings, infrastructure, and installations.

VOC content

Sika components covered by this EPD contain between ≤ 5 and 25 grams of VOC per litre, which is in conformity with national standards and the SCAQMD rule 1168 for adhesive and sealant applications (see Table 5 for detailed VOC content per component). The VOC content was measured according to EPA 24, ASTM D2369 or SCAQMD 304 standard methods.

Table 5: VOC content of components

Components	VOC content (g/L)
Sikadur®-30	≤ 10
Sikadur®-300	≤ 5
Sikadur®-31 Hi-Mod Gel[CA]	≤ 10
Sikadur®-32 Hi-Mod	≤ 20
Sikadur®-330	≤ 15
Sikadur®-42 Grout Pak LE[CA]	25
Sika® Level-01 Primer[CA]	≤ 10
Sika® Loadflex®-524 EZ	≤ 12

Waste packaging management

Sika Canada encourages its customers to responsibly dispose of used packaging. Most of them are recyclable. To make recycling easier, it is recommended to separate used packaging according to their material (paper, plastic and metal). Ask information to local municipalities about recycling programs for industrial coating packaging.

6. GLOSSARY

6.1. Acronyms

AP	Acidification potential
CSA	Canadian Standards Association
EP	Eutrophication potential
GHG	Greenhouse gas
GWP	Global warming potential
ISO	International Organization for Standardization
kg CFC-11 eq.	Kilogram of trichlorofluoromethane equivalent
kg CO_2 eq.	Kilogram of carbon dioxide equivalent
kg N eq.	Kilogram of nitrogen equivalent
kg O_3 eq.	Kilogram of ozone equivalent
kg Sb eq.	Kilogram of antimony equivalent
kg SO_2 eq.	Kilogram of sulphur dioxide equivalent
L	Litre
LCA	Life cycle assessment
LEED	Leadership in Energy and Environmental Design
LHV	Lower heating value
MJ	Megajoule
m^3	Cubic meter
ODP	Ozone depletion potential
PCR	Product category rules
SFP	Smog formation potential
VOC	Volatile organic compound

6.2. Environmental impact categories and parameters assessed

The **acidification potential** refers to the change in acidity (i.e. reduction in pH) in soil and water due to human activity. The increase in NO_x and SO_2 emissions generated by the transportation, manufacturing and energy sectors are the main causes of this impact category. The acidification of land and water has multiple consequences: degradation of aquatic and terrestrial ecosystems, endangering numerous species and food security. The concentration of the gases responsible for the acidification is expressed in sulphur dioxide equivalents (**kg SO_2 equivalent**).

The **eutrophication potential** measures the enrichment of an aquatic or terrestrial ecosystem due to the release of nutrients (e.g. nitrates, phosphates) resulting from natural or human activity (e.g. the discharge of wastewater into watercourses). In an aquatic environment, this activity results in the growth of algae which consume dissolved oxygen present in water when they degrade and thus affect species sensitive to the concentration of dissolved oxygen. Also, the increase in nutrients in soils makes it difficult for the terrestrial environment to manage the excess of biomass produced. The concentration of nutrients causing this impact is expressed in nitrogen equivalents **(kg N equivalent)**.

Net fresh water consumption accounts for the imbalance in the natural water cycle created by the water evaporated, consumed by a system or released to a different watershed (i.e. not its original source). This imbalance can cause water scarcity and affect biodiversity. This indicator refers to the waste of the resource rather than its pollution. Also, it does not refer to water that is used but returned to the original source (e.g. water for hydroelectric turbines, cooling or river transportation) or lost from a natural system (e.g. due to evaporation of rainwater). The quantity of freshwater consumed is expressed as a volume of water in meter cube **(m^3 of water consumed)**.

The **global warming potential** refers to the impact of a temperature increase on the global climate patterns (e.g. severe flooding and drought events, accelerated melting of glaciers) due to the release of greenhouse gases (GHG) (e.g. carbon dioxide and methane from fossil fuel combustion). GHG emissions contribute to the increase in the absorption of radiation from the sun at the earth's surface. These emissions are expressed in units of kg of carbon dioxide equivalents **(kg CO_2 equivalent)**.

The **ozone depletion potential** indicator measures the potential of stratospheric ozone level reduction due to the release of some molecules such as refrigerants used in cooling systems (e.g. chlorofluorocarbons). When they react with ozone (O_3), the ozone concentration in the stratosphere diminishes and is no longer sufficient to absorb ultraviolet (UV) radiation which can cause high risks to human health (e.g. skin cancers and cataracts) and the terrestrial environment. The concentration of molecules that are responsible of ozone depletion is expressed in kilograms of trichlorofluoromethane equivalents **(kg CFC-11 equivalent).**

The **smog formation potential** indicator covers the emissions of pollutants such as nitrogen oxides and volatile organic compounds (VOCs) into the atmosphere. They are mainly generated by motor vehicles, power plants and industrial facilities. When reacting with the sunlight, these pollutants create smog which can affect human health and cause various respiratory problems. The concentration of pollutants causing smog are expressed in kg of ozone equivalents **(kg O_3 equivalent)**.

The **renewable/non-renewable primary energy consumption** parameters refer to the use of energy from renewable resources (e.g., wind, solar, hydro) and non-renewable resources (e.g., natural gas, coal, petroleum). The quantity of primary energy used is expressed in megajoules, on the basis of the lower heating value of the resources **(MJ, LHV).**

The **renewable/non-renewable material resources consumption** parameters represent the quantity of material made from renewable resources or non-renewable resources used to manufacture a product, excluding recovered or recycled materials. The quantity of these resources is reported in megajoules (**MJ**).

7. REFERENCES

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