TAJ FLOORING
GLOBAL SOURCING, LOCAL SERVICING

VERIFIED by SCS GLOBAL SERVICES
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner:

TAJ Flooring, Inc.
740 Church Road, Elgin, IL 60123
info@tajflooring.com | www.tajflooring.com

Products

Majestic Sheet Vinyl Flooring

Functional Unit

1 m^2 (square meter) of floor covering provided and maintained for a period of 60 years

EPD Number and Period of Validity

SCS-EPD-04496
Valid: Beginning Date: May 17, 2017 - End Date: May 16, 2022

Product Category Rule

Product Category Rule (PCR) for preparing an Environmental Product Declaration (EPD) for Flooring: Carpet, Resilient, Laminate, Ceramic, Wood. NSF International. Version 2. 2014

Program Operator

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608
+1.510.452.8000 | www.SCSglobalServices.com

SCSglobal SERVICES

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Disclaimers: *This Environmental Product Declaration (EPD) conforms to ISO 14025, 14040, ISO 14044, and ISO 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

PCR Review Chair	Jack Geibig, Ecoform, Email: jgeibig@ecoform.com
Approved: May 17, 2017 through May 16, 2022	
Independent verification of the declaration and data, according to ISO 14025:2006 and ISO 21930:2007.	☐ internal ☑ external
Third party verifier	Tom Gloria, PhD, Industrial Ecology Consultants

PRODUCT DESCRIPTION

Majestic Sheet Vinyl is a high performance phthalate free fiberglass reinforced low maintenance anti-microbial heterogeneous commercial sheet vinyl product with ceramic bead infused UV cured urethane coating. Includes a polyurethane finish, making the floor a no wax system, and Protech Plus ceramic bead infused, an EPA approved anti-bacterial, anti-fungal UV cured urethane coating technology. Provides two times better scratch resistance than typical urethane coatings.

PRODUCT APPLICATION

Majestic Sheet Vinyl flooring can be used in various applications including commercial offices, schools, banks, retail, hospitals and healthcare centers, corridors and other high traffic areas.

PRODUCT PERFORMANCE

Table 1. *Product performance test results for TAJ Majestic Sheet Vinyl flooring.*

Property	Test Method	Result
Flexibility	F137	Passes, 6 mm Mandrel
Thickness	F386	0.077 inch
Wear Layer Thickness	F410	0.020 inch (0.50 mm)
Chemical and Stain Resistance	F925	Excellent
Static Load Limit	F970	Passes at 1,100 psi
Heat Stability	F1514	ΔE <8.0
Light Stability	F1515	ΔE <8.0
Short Term Indentation	F1914	-0.002 Inch (2.78%) at 50 lbs.
Coefficient of Friction	ASTM C1028-89	>0.6
Coefficient of Friction	DIN 51139:2014	R12
Flame Spread	E648	>0.45, Class 3
Smoke Density	E662	<452

Table 2. *Material content and resource availability for TAJ Flooring Majestic Sheet Vinyl.*

Component	Materials	Mass %	Availability			Origin of Raw Materials
			Renewable	Non-Renewable	Recycled (% pre-/post-consumer)	
PVC	Polyvinyl chloride	49%		Fossil, Limited		Global
Filler	Natural, ground calcium carbonate	26%	Mineral, Abundant			Global
Plasticizer	Plasticizer	20%		Fossil, Limited		Global
Glass Paper	Glass fiber, Pulp, acryl compound	1.5%	Mineral, Abundant	Fossil, Limited		Global
Stabilizer	Ba-Zn organic liquid complex	1.2%	Mineral, Abundant	Fossil, Limited		Global
Toner	Titanium dioxide, Di Ethanolamine, Dioctyl Terephthalate compound	0.71%		Fossil, Limited		Global
UV coating	Hydroxyethyl Acrylate	0.71%		Fossil, Limited		Global
Diluent	Distillates, petroleum	0.28%		Fossil, Limited		Global
Dispersing Agent	Polyoxyethylene nonylpheyl ether	0.11%		Fossil, Limited		Global

The following regulated hazardous chemicals may be present based on a review of Safety Data Sheets for the product component materials.

- Calcium carbonate (CAS# 471-34-1)
- Cocamide Diethanolamine (CAS# 68603-42-9)
- Fiber Glass Continuous Filament (CAS# 65997-17-3)
- 2-[2-(2-Butoxyethoxy)ethoxy]ethanol (CAS# 143-22-6)
- Polyoxyethylene nonylphenyl ether (CAS# 9016-45-9)

PRODUCTION OF MAIN MATERIALS

Calcium Carbonate: An abundant mineral found worldwide and a common substance found in rocks. It can be ground into varying particle sizes.

Glass Paper (Fiber): Nonwoven glass scrim comprised of chopped glass fibers and binder. Its major ingredients are silica sand, limestone, soda ash, and petrochemicals.

Polyvinyl Chloride (PVC): Derived from fossil fuel and salt. Petroleum or natural gas is processed to make ethylene, and salt is subjected to electrolysis to separate out the natural element chlorine. Ethylene and chlorine are combined to produce ethylene dichloride, which is further processed into vinyl chloride monomer (VCM) gas. Finally, in polymerization the VCM molecule forms chains, converting the gas into fine, white powder—vinyl resin.

Plasticizer: Plasticizers are used to make vinyl soft and flexible. Diisononyl phthalate (DINP) was used in the life cycle assessment model to represent plasticizers used to manufacture products covered by this EPD such as Butyl Benzyl Phthalate (BBP) and Diisooctyl terephthalate (DOTP).

Stabilizers: Stabilizers (metal compounds) are used to prevent the decomposition which occurs as PVC is heated to soften during the extrusion or molding process. Stabilizers also provide enhanced resistance to daylight, weathering and heat aging and have an important influence on the physical properties of PVC. The main constituents are metal soaps, metal salts and organometallic compounds. The major metals contained in stabilizers include lead (Pb), barium (Ba), calcium (Ca), and tin (Sn) and are classified into Pb stabilizers, Ba-Zn stabilizers, Ca-Zn stabilizers, and Sn stabilizers

Toner: A compounded mixture of pigment (titanium dioxide) and a polymer carrier used as a colorant.

Diluents: A diluent (also referred to as a dilutant or thinner) is a diluting agent added in order to decrease the viscosity of the binders used in various production processes.

Blowing Agents: A blowing agent is a substance which is capable of producing a cellular structure via a foaming process in a variety of materials that undergo hardening or phase transition, such as polymers, plastics, and metals. They are typically applied when the blown material is in a liquid stage. The cellular structure in a matrix reduces density, increasing thermal and acoustic insulation, while increasing relative stiffness of the original polymer.

Wax: Waxes are organic compounds consisting of long alkyl chains and may also include various functional groups such as fatty acids, primary and secondary long chain alcohols, unsaturated bonds, aromatics, amides, ketones, and aldehydes. They frequently contain fatty acid esters as well. Waxes can be of natural origin (from plant and animals) or synthetic derived from hydrocarbons (alkanes or paraffins). Waxes are used industrially as components of complex formulations, including coatings and colorants for plastics, as well as release agents.

PRODUCT CHARACTERISTICS

Table 3. *Summary of product characteristics for TAJ Flooring Majestic Sheet Vinyl.*

Product Characteristics			Average value	Unit	Minimum Value	Maximum Value
Product Thickness (wear layer + backing)			2.0 (0.0787)	mm (in)	1.9 (0.076)	2.0 (0.078)
Wear layer thickness			0.5 (0.0197)	mm (in)	0.48 (0.019)	0.51 (0.020)
Product Weight			3.04 (9.96)	kg/m^2 (oz/ft^2)	3.04 (10)	3.04 (10)
VOC emissions test method			FloorScore®			
Sustainable certifications			FloorScore®; ISO 14001			
Product Form	Sheet	Width	1,829 (72)	mm (in)	1829 (72)	1829 (72)
		Length	20 (66)	M (ft)	20 (66)	20 (66)

LIFE CYCLE ASSESSMENT

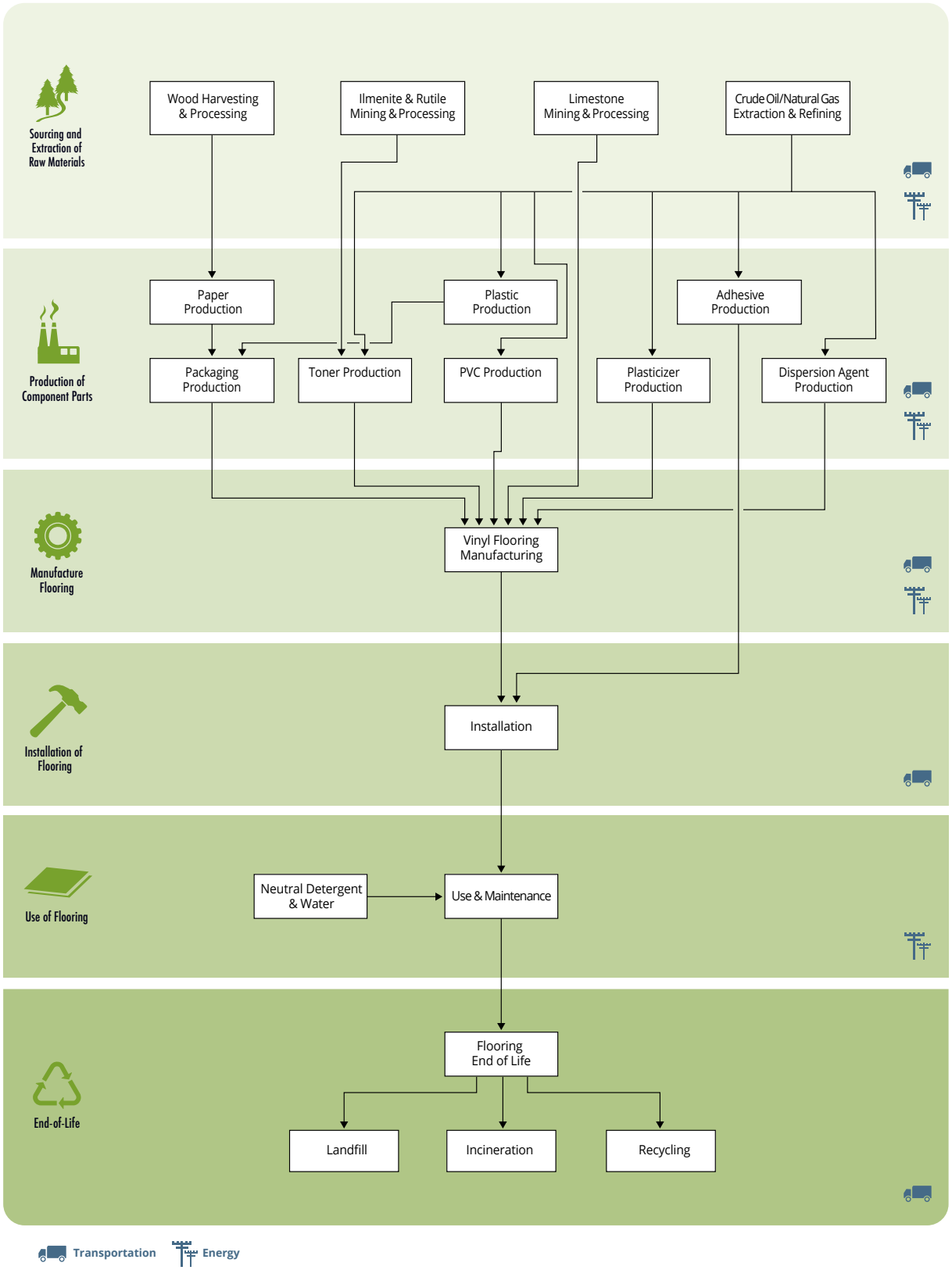
A cradle to grave life cycle assessment (LCA) was completed for this product group in accordance with ISO 14040, ISO 14044, and Product Category Rule for Environmental Product Declarations Flooring: Carpet, Resilient, Laminate, Ceramic, Wood (Version 2).

FUNCTIONAL UNIT

The functional unit is according to the PCR the total impact for the expected life of the building (60 years). But the service life is depending on the product, 15 years in this case. The PCR consequently requires separate reporting of LCA results: A) for 1 m^2 of floor covering - extraction/processing, manufacturing, delivery & installation and end of life; and B) the average 1-year use stage; and C) for a 60-year period of use, as combined using A) and B), calculated from the reference service life (RSL) of the products.

PRODUCT LIFE CYCLE FLOW DIAGRAM

The diagram below is a representation of the most significant contributions to the production for TAJ Flooring Majestic Sheet Vinyl. This includes resource extraction and processing, product manufacture, transport, installation, use, maintenance and end-of-life.




LIFE CYCLE ASSESSMENT STAGES AND REPORTED EPD INFORMATION

Raw Material Extraction and Processing Stage

This stage includes extraction of virgin materials and reclamation of non-virgin feedstock, including the upstream transport and transport to the manufacturing site. Resource use and emissions associated with both the extraction of the raw materials used in the products, as well as those associated with the processing of raw materials are included

Manufacturing Stage

Majestic Sheet Vinyl flooring is manufactured in an ISO 9001 and ISO 14001 facility in South Korea.

This stage includes all the relevant manufacturing processes and flows, including the impacts from energy use and emissions associated with the processes occurring at the manufacturing facility. This stage also includes the production and disposal (including transport) of the product packaging materials. Production of capital goods, infrastructure, production of manufacturing equipment, and personnel-related activities are not included.

Delivery and Installation Stage

Delivery:

This stage includes delivery of TAJ vinyl flooring to the point of installation. Modeling used in the life cycle assessment assumed product distribution as 1,750 miles (2,820 km) by diesel truck, 1,865 miles (3,000 km) by rail and 3,230 miles (5,200 km) by ocean freighter.

Installation:

Eco Bond Sheet adhesive or TAJ-585 is recommended for proper installation of TAJ Majestic Sheet Vinyl. Adhesive is typically required for installation; Eco Bond Sheet adhesive or TAJ-585 is recommended for proper installation of TAJ Flooring Majestic Sheet Vinyl. For more information on the product installation, see http://www.tajflooring.com/Technical-Information/Sheet-Vinyls_2

Waste:

During installation, waste may be generated. Waste material can be disposed of in a landfill or incinerated.

Packaging

Table 4. *Packaging Material for Majestic Sheet Vinyl. Shown per square meter of flooring.*

Material	Value(kg/m^2)
Corrugated board	$3.7x10^{-2}$
Kraft paper	$1.1x10^{-2}$
Plastic cap (HDPE)	$4.1x10^{-3}$

Use Stage

Cleaning and maintenance:

Product cleaning and maintenance activities are summarized in Table 5.

Table 5. *Cleaning and Maintenance for TAJ Flooring Majestic Sheet Vinyl.*

Product Installation: TAJ Majestic Sheet Vinyl Flooring				
▪ Pressure sensitive adhesive				
▪ Application rate approximately 300 grams / square meter (0.30 kg/m^2)				
Cleaning Process	**Cleaning Frequency / Traffic Level**			**Energy & Resource Use**
	Light	**Moderate**	**Heavy**	
Dust mop	Daily (260 d/y)	Daily (260 d/y)	Daily (260 d/y)	None
Damp mop / neutral cleaner	Bi-weekly (26 d/y)	Weekly (52 d/y)	Twice weekly (104 d/y)	Hot water + Neutral detergent
Vacuum / finish restorer	Bi-monthly (6 d/y)	Monthly (12 d/y)	Twice monthly (24 d/y)	Floor finish Electricity

End-of-Life Stage

Recycling, reuse, or repurpose

Data for estimation of recycling rates for the product and packaging are based on data prepared by the US Environmental Protection Agency's Municipal Solid Waste Report. These data provide 2014 statistics on US disposal, including recycling rates.

Table 6. *Recycling rates based on 2014 US EPA Municipal Solid Waste statistics.*

Material	Durable Goods	Packaging
Paper and paperboard	n/a	75.4%
Plastics	7.5%	14.8%

Disposal

For disposal of materials not recycled, it is assumed that 20% are incinerated, and 80% go to a landfill, based on the US EPA data. Transportation of waste materials at end of life assumes a 20-mile average distance to disposal, consistent with assumptions used in the US EPA WARM model.




LIFE CYCLE INVENTORY

In accordance with ISO 21930, the following aggregated inventory flows are included in the EPD.

- Use of renewable material resources
- Consumption of freshwater
- Hazardous wastes
- Non-hazardous wastes

All results are calculated using the SimaPro 8.2 model using primary and secondary inventory data. Classification for Use of Renewable Material Resources is based on review of elementary flows and resources considered renewable on a human time scale. Elementary flows related to use of wood, minerals, and land occupation were not included. Water consumption is not included, as it is reported separately. Based on this classification process, the use of renewable material resources for the product system is considered to be negligible.

Table 7. *TAJ Flooring Majestic Sheet Vinyl: Aggregated life cycle inventory for an average building life of 60 years..*

Category	Sourcing & Extraction	Manufacturing	Delivery & Installation	Use	Disposal	Total
Use of renewable material resources (kg)	negligible	negligible	negligible	negligible	negligible	negligible
Consumption of freshwater (m^3)	3,500	310	150	700	78	4,800
Hazardous waste (kg)	$5.9x10^{-4}$	$8.0x10^{-4}$	$7.8x10^{-4}$	$1.7x10^{-4}$	$7.7x10^{-5}$	$2.4x10^{-3}$
Non-hazardous waste (kg)	1.4	0.19	3.5	0.19	7.3	13

LIFE CYCLE IMPACT ASSESSMENT

Life cycle impact assessment is the process of converting the life cycle inventory results into a representation of environmental and human health impacts. For example, emissions such as carbon dioxide, methane, and nitrous oxide (inventory) together contribute to climate change (impact assessment). The impact assessment for the EPD is conducted in accordance with requirements of the PCR. Impact category indicators were estimated using the CML 2001 (Oct 2013, v. 3.0) characterization method. Aggregated inventory flows for energy use and wastes were also calculated. The LCIA and inventory flow results were calculated using SimaPro 8.2 software.

Table 7 shows results for 1 m^2 of Sheet Vinyl flooring, including extraction of raw materials through installation and end of life (Table A). Table 8 shows the average use stage impacts for 1 m^2 of flooring over 1 year (Table B). Table 9 lists the assumptions used for product maintenance. Table 10 shows the life cycle impact assessment results for 1 m^2 of Sheet Vinyl flooring over a 60-year period (Table C).

Table 8. *Cradle to install and end of life potential impacts for an average 1 m^2 TAJ Majestic Sheet Vinyl. (Table A of the PCR).*

Impact Category	Unit	Sourcing & Extraction	Manufacturing	Delivery & Installation	Disposal	Total
Global Warming Potential, 100-year time horizon	kg CO_2 eq	5.6	1.0	1.9	1.2	9.6
		58%	10%	19%	12%	100%
Acidification potential	kg SO_2 eq	$2.0x10^{-2}$	$3.2x10^{-3}$	$1.2x10^{-2}$	$1.1x10^{-3}$	$3.6x10^{-2}$
		55%	9%	33%	3.1%	100%
Ozone depletion potential	kg CFC-11 eq	$2.3x10^{-7}$	$7.3x10^{-8}$	$3.1x10^{-7}$	$8.3x10^{-8}$	$6.9x10^{-7}$
		33%	11%	45%	12%	100%
Photochemical oxidation creation potential	kg C_2H_4	$1.1x10^{-3}$	$1.3x10^{-4}$	$5.0x10^{-4}$	$1.8x10^{-4}$	$1.9x10^{-3}$
		58%	7.0%	26%	9%	100%
Eutrophication potential	kg PO_4^{3-} eq	$4.8x10^{-3}$	$2.1x10^{-3}$	$2.4x10^{-3}$	$5.2x10^{-3}$	$1.5x10^{-2}$
		33%	15%	17%	36%	100%
Abiotic depletion potential, elements	kg Sb eq	$3.8x10^{-6}$	$3.9x10^{-7}$	$4.9x10^{-6}$	$6.5x10^{-7}$	$9.8x10^{-6}$
		39%	4.0%	50%	6.6%	100%
Abiotic depletion potential, fossil fuels	MJ	130	14	29	2.7	180
		74%	8.1%	16%	1.5%	100%
Renewable Energy	MJ	3.5	0.92	0.58	0.23	5.2
		67%	18%	11.3%	4.4%	100%
Non-renewable Energy	MJ	150	17	31	2.7	200
		75%	8.3%	15%	1.3%	100%
Water Use	m^3	880	77	37	19	1,000
		87%	7.6%	3.6%	1.9%	100%

Table 9. *Average 1-year use stage impacts for an average 1 m^2 TAJ Flooring Majestic Sheet Vinyl. (Table B of the PCR).*

Impact Category	Unit	Use & Maintenance
Global Warming Potential, 100-year time horizon	kg CO_2 eq	$5.4x10^{-2}$
Acidification potential	kg SO_2 eq	$3.4x10^{-4}$
Ozone depletion potential	kg CFC-11 eq	$3.2x10^{-9}$
Photochemical oxidation creation potential	kg C_2H_4 eq	$1.8x10^{-5}$
Eutrophication potential	kg PO_4^{3-} eq	$1.0x10^{-4}$
Abiotic depletion potential, elements	kg Sb eq	$1.4x10^{-7}$
Abiotic depletion potential, fossil fuels	MJ	0.93
Renewable Energy	MJ eq	$9.7x10^{-2}$
Non-renewable Energy	MJ eq	0.99
Water Use	m^3	12

Table 10. *List of Use and Maintenance Activities for TAJ Flooring Majestic Sheet Vinyl.*

Maintenance Activity	Frequency over Reference Service Lifetime of product
Reference Service Life (RSL)	15 yr (~10-20 yr)
Dust mop	Daily (260 d/yr)
Damp mop / neutral cleaner	Weekly (52 d/yr)
Vacuum / finish restorer	Monthly (12 d/yr)

Table 11. *TAJ Flooring Majestic Sheet Vinyl: Potential impacts by life cycle stage for 1 m^2 of floorcovering for a 60-year period. (Table C of the PCR)*

Impact Category	Unit	Sourcing & Extraction	Manufacturing	Delivery & Installation	Use	Disposal	Total
Global Warming Potential, 100-year time horizon	kg CO_2 eq	22	4.0	7.4	3.2	4.6	42
		54%	10%	18%	7.8%	11%	100%
Acidification potential	kg SO_2 eq	$7.9x10^{-2}$	$1.3x10^{-2}$	$4.6x10^{-2}$	$2.0x10^{-2}$	$4.4x10^{-3}$	0.16
		48%	7.9%	29%	12%	2.7%	100%
Ozone depletion potential	kg CFC-11 eq	$9.1x10^{-7}$	$2.9x10^{-7}$	$1.2x10^{-6}$	$1.9x10^{-7}$	$3.3x10^{-7}$	$3.0x10^{-6}$
		31%	10%	42%	6.6%	11%	100%
Photochemical oxidation creation potential	kg C_2H_4	$4.4x10^{-3}$	$5.3x10^{-4}$	$2.0x10^{-3}$	$1.1x10^{-3}$	$7.1x10^{-4}$	$8.7x10^{-3}$
		50%	6.1%	23%	12%	8.2%	100%
Eutrophication potential	kg PO_4^{3-} eq	$1.9x10^{-2}$	$8.5x10^{-3}$	$9.7x10^{-3}$	$6.3x10^{-3}$	$2.1x10^{-2}$	$6.5x10^{-2}$
		30%	13%	15%	9.7%	32%	100%
Abiotic depletion potential, elements	kg Sb eq	$1.5x10^{-5}$	$1.6x10^{-6}$	$2.0x10^{-5}$	$8.2x10^{-6}$	$2.6x10^{-6}$	$4.7x10^{-5}$
		32%	3.3%	42%	17%	5.5%	100%
Abiotic depletion potential, fossil fuels	MJ	520	58	120	56	11	760
		69%	7.6%	15%	7.3%	1.4%	100%
Renewable Energy	MJ	14	3.7	2.3	5.8	0.90	27
		52%	14%	8.8%	22%	3.4%	100%
Non-renewable Energy	MJ	610	67	120	59	11	870
		70%	7.8%	14%	6.8%	1.3%	100%
Water Use	m^3	3,500	310	150	700	78	4,800
		74%	6.5%	3.1%	15%	1.6%	100%

ADDITIONAL ENVIRONMENTAL INFORMATION

TAJ Flooring is a member of the US Green Building Council, and the Collaborative for High Performance Schools.

Majestic Sheet Vinyl is certified FloorScore® for meeting California section 01350 for volatile organic chemical (VOC) emission requirements, and is manufactured without the use of phthalates.

Majestic Sheet Vinyl is manufactured in an ISO 9001 and ISO 14001 certified facility.

SUPPORTING TECHNICAL INFORMATION

Data sources

Unit processes were developed within SimaPro 8.2, drawing upon data from multiple sources. Primary data were provided by by the manufacturer. The primary source of secondary LCI data was the Ecoinvent v3.2 LCI database.

Table 12. *Data sources used for the LCA.*

Material	Flow Name	Data Source	Publication Date
PRODUCT(S)			
Polyvinyl chloride (PVC)	Polyvinylchloride, emulsion polymerised {GLO} | market for | Alloc Rec	EI v3.2	2015
Plasticizer	2-ethylhexyl phthalate (DEHP) {GLO} | market for | Alloc Rec	EI v3.2	2015
Filler (CaCO3)	Limestone, crushed, for mill {GLO} | market for | Alloc Rec	EI v3.2	2015
Glass Paper	Glass fibre {GLO}| market for | Alloc Rec	EI v3.2	2015
	Cellulose fibre, inclusive blowing in {GLO}| market for | Alloc Rec	EI v3.2	2015
	Vinyl acetate {GLO}| market for | Alloc Rec	EI v3.2	2015
Stabilizer (Ba-Zn)	Barite {GLO}| market for | Alloc Rec	EI v3.2	2015
	Fatty acid {GLO}| market for | Alloc Rec	EI v3.2	2015
	Zinc oxide {GLO}| market for | Alloc Rec	EI v3.2	2015
	Phosphoryl chloride {GLO}| market for | Alloc Rec	EI v3.2	2015
	Phenol {GLO}| market for | Alloc Rec	EI v3.2	2015
Toner	Titanium dioxide {RoW}| market for | Alloc Rec	EI v3.2	2015
	Diethanolamine {GLO}| market for | Alloc Rec	EI v3.2	2015
	Dimethyl p-phthalate {GLO}| market for | Alloc Rec	EI v3.2	2015
Diluent	Chemical, organic {GLO}| market for | Alloc Rec	EI v3.2	2015
Dispersing agent	Chemical, organic {GLO}| market for | Alloc Rec	EI v3.2	2015
UV coating	Chemical, organic {GLO}| market for | Alloc Rec	EI v3.2	2015
Blowing agent	Chemical, organic {GLO}| market for | Alloc Rec	EI v3.2	2015
Wax	Paraffin {GLO}| market for | Alloc Rec	EI v3.2	2015
PACKAGING			
Paper	Kraft paper, unbleached {GLO}| market for | Alloc Rec	EI v3.2	2015
Corrugated board	Corrugated board box {GLO}| market for corrugated board box | Alloc Rec	EI v3.2	2015
Packaging film	Packaging film, low density polyethylene {GLO}| market for | Alloc Rec	EI v3.2	2015
Plastic cap	Packaging film, low density polyethylene {GLO}| market for | Alloc Rec	EI v3.2	2015
TRANSPORTATION			
Road transport	Transport, freight, lorry 16-32 metric ton, EURO4 {GLO}| market for | Alloc Rec	EI v3.2	2015
RESOURCES			
Electricity	Electricity, medium voltage {KR} | market for | Alloc Rec	EI v3.2	2015
Heat	Natural gas, combusted in industrial boiler {RoW} | market for | Alloc Rec	EI v3.2	2015

Data Quality

Table 13. *Data quality of Life Cycle Inventory.*

Parameter Description	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected.	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are representative of 2015 or more recent. All of the data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data (primary data) are based on annualized production for 2016.
Geographical Coverage: Geographical area from which data for unit processes is collected.	The data used in the analysis provide the best possible representation available with current data. Electricity use for product manufacture is modeled using representative data for South Korea. Surrogate data used in the assessment are representative of global or European operations. Data representative of European operations are considered sufficiently similar to actual processes. Data representing product disposal are based on US statistics.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative fabrication datasets, specific to the type of material, are used to represent the actual processes, as appropriate..
Precision: Measure of the variability of the data values for each data expressed.	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the construction products. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded. In total, these missing data represent less than 5% of the mass or energy flows.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources, and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used with a bias towards Ecoinvent v3.2 data where available. Different portions of the product life cycle are equally considered.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the data: Description of primary and secondar data sources	Data representing energy use at the manufacturer's South Korea facilities represent an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI datasets, Ecoinvent v2.2 and v3.2 LCI data are used, with a bias towards Ecoinvent v3.2 data.
Uncertainty of the information: E.g. data, models, and assumptions	Uncertainty related to materials in the flooring products and packaging is low. Actual supplier data for upstream operations was not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years), but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

Allocation

Resource use at the manufacturing facilities in South Korea (e.g., water and energy) was allocated to the product based on the product mass as a fraction of the total facility production volume.

The TAJ Majestic Sheet Vinyl product systems include recycled materials, which were allocated using the recycled content allocation method (also known as the 100-0 cut off method). Using the recycled content allocation approach, system inputs with recycled content do not receive any burden from the previous life cycle other than reprocessing of the waste material. At end of life, materials which are recycled leave the system boundaries with no additional burden.

Impacts from transportation, including product distribution to point of sale, were allocated based on the mass of material and distance transported.

Cut-off criteria

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact must be included in the inventory. In the present study, except as noted, all known materials and processes were included in the life cycle inventory.

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For more information contact:
TAJ Flooring, Inc.
740 Church Road, Elgin, IL 60123
+1.888.652.2111 | info@tajflooring.com | www.tajflooring.com

SCS Global Services
2000 Powell Street, Ste. 600
Emeryville, CA 94608 USA
main +1.510.452.8000 | fax +1.510.452.8001