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Environmental Product Declaration- Thin Laminates

(Thin High Pressure Laminates-Less than 2.0mm)

In accordance with ISO 14025 & EN 15804:2012+A2:2019

EPD registration number:	S-P-09220
Publication date:	2023-07-02
Validity date:	2028-07-01
Geographical scope:	India

1. Introduction

Greenlam Industries Limited, herein after called as Greenlam, is the largest manufacturer of High Pressure Laminates in Asia & the third largest globally. With about three decades of experience and strong presence in the industry, Greenlam has established itself as a trusted name known for its commitment to quality, design excellence, and sustainability.

Greenlam's global footprint extends to more than 100 countries, where our products are well received and valued for their durability, aesthetics and quality. With its unmatched manufacturing capabilities, wide range of products, commitment to innovation & sustainability, global footprint, and customer centric approach, Greenlam continues to set new benchmarks in the laminate market.

Our Environment Product Declaration (EDP) serves as a transparent & comprehensive document that outlines the environmental impact of our laminate throughout its lifecycle. We believe in taking responsibility for our product's environment performance & providing accurate information to our stakeholders, empowering them to make informed decisions. The EPD provides detailed information about key environmental aspects such as resource consumption, energy efficiency, emissions, waste management and overall environmental footprint associated with our product. By obtaining this valuable insight, our stakeholders can evaluate the environmental performance of our product and understand the steps we have taken to reduce their impact on the environment.

Through our EPD, we are pleased to provide our stake holders a deeper understanding of our commitment to sustainability and the environmental performance of our laminate. By embracing sustainability as a core value, we aim to inspire change in the industry.

At Greenlam, we strive to integrate sustainability into every aspect of our business operation. We work together to build a greener, more sustainable world. From sourcing raw materials responsibly to implementing energy-efficient manufacturing processes, we prioritize environmentally conscious practices at every stage. Our commitment to sustainability extend beyond our product. We actively engage in initiatives aimed at water conservation, energy conservation, waste reduction and community welfare through collaborations with NGOs.

For the purpose of this EPD, the life cycle assessment study is conducted based on ISO 14040:2006 and ISO 14044:2006 standard in accordance with Product Category Rules for 'CONSTRUCTION PRODUCTS' version 1.2.5, 2019:14 for preparation of Environment Product Declaration for construction products. The EPD is in accordance with ISO 14025 & EN 15804+A2. EPD construction of material is not comparable if they do not comply with EN 15804+A2.

2. General Information

2.1 EPD, PCR, LCA Information

Table 1: EPD Information

Programme	The International EPD® System www.environdec.com	
Program operator	EPD International AB Box 210 60, SE-100 31 Stockholm, Sweden.	Indian Regional Hub www.envirodecindia.com
Declaration holder[1]	G S R A SHARMA Greenlam Industries Limited 2nd Floor, West Wing, Worldmark 1, Aerocity IGI Airport Hospitality District, New Delhi-110 037, India. Contact No: (+91) 9799495746 Email: gsra.sharma@greenlam.com Website: https://www.greenlam.co.in	
Product	High Pressure Laminates (HPL)	
CPC Code	314	
Reference standards	ISO 14025:2006, ISO 14040/44, EN 15804:2012 +A2:2019	

Table 2: PCR Information

Reference PCR	PCR CONSTRUCTION PRODUCTS' Version 1.2.5, 2019:14
Date of Issue	2022-11-01

Table 3: Verification Information

Demonstration of verification	External, independent verification
Third party verifier	Mr. Prabodha Acharya Independent Verifier, Mumbai, India Email: prabodha.acharya@gmail.com

Table 4: LCA Information

Title	Environmental Product Declaration of Thin High Pressure Laminates
Preparer	Dr. Rajesh Kumar Singh Sphera Solutions 707, Meadows, Sahar Plaza, Andheri Kurla Road, Andheri East, Mumbai - 400059, India. Email: rsingh@sphera.com
Reference standards	ISO 14040/44 standard

[1] EPD owner has the sole ownership, liability, and responsibility for the EPD

2.2 Reference Period of EPD Data

The reference period for the data used within this EPD is for the year April 2022-March 2023.

2.3 Geographical Scope of EPD Application

The geographical scope of this EPD is Global.

2.4 Additional Information about EPD

This EPD provides information concerning the production of High Pressure Laminates at Greenlam Industries Limited. Product Category Rules (PCR) for the assessment of the environmental performance of High- Pressure Laminates is 'Construction products, 2019:14, version 1.2.5' and complying with the standard EN 15804. Product classification is UN CPC 314 Boards and panels 2013:02 Version 1.02. This PCR is applicable to the product "High Pressure Laminates". EPD of construction products may not be comparable if they do not comply with EN 15804. The environmental impacts were calculated based on the functional unit wherein each flow related to material consumption, energy consumption, emissions, is scaled to the reference flow.

3. Product Description and System Boundaries

3.1 Product Identification and Usage

HPL, basically, is a product comprising of papers and resins. The product is made by thermal curing of saturated multiple layers of papers with respective phenolic resin and melamine resin in a multi daylight high pressure hydraulic press. The thickness range for thin laminates is from 0.5 mm to 1.8 mm

Greenlam produces HPLs at three manufacturing locations Behror-Rajasthan, Nalagarh-Himachal Pradesh and Prantij-Ahmedabad. The percentage of production volume of different thicknesses of laminates produced at various production sites is provided in Table 3-1.

Table 3-1 Production volume of various thick laminates

Sr. No	HPL Thickness (mm)	Production Volume (%)
1	0.5	15.31%
2	0.55	0.08%
3	0.65	2.06%
4	0.7	29.13%
5	0.75	1.35%
6	0.8	16.24%
7	0.9	0.57%
8	1.0	30.69%
9	1.2	0.45%
10	1.3	0.04%
11	1.5	0.19%
12	1.6	0.12%
13	1.8	3.77%

4. Life Cycle Assessment (LCA)

4.1 Information Sources and Data Quality

It is important that data quality is in accordance with the requirements of the declaration's goal and scope. This is essential to the reliability of the declaration and achievement of the intended application. The quality of the LCI data for modelling the life cycle stages have been assessed according to ISO 14044 (ISO, 2006b). Data quality is judged by its quality (measured, calculated or estimated), completeness (e.g. are there unreported emissions), consistency (degree of uniformity of the methodology applied on a study serving as a data source) and representativeness (geographical, time period, technology). To cover these requirements and to ensure reliable results, first-hand industry data in combination with consistent, upstream LCA information is used. The datasets have been used in LCA-models worldwide for several years in industrial and scientific applications for internal as well as critically reviewed studies. In the process of providing these datasets, they have been crosschecked with other databases and values from industry and science.

Greenlam Industries Limited provided accurate and representative data for HPL production. For all data requirements, primary data were used where possible, and finally upstream LCA data from LCA (FE) 10.6 professional database was used.

4.2 Methodological Details

4.2.1 Declared unit

The declared unit for the EPD is 1 m^2 of thin HPL.

4.3 Cut-off Criteria

No cut-off criteria are defined for this study. The system boundary was defined based on relevance to the goal of the study. For the processes within the system boundary, all available energy and material flow data have been included in the model.

4.4 Allocation

No allocation has been done. As no co-products are produced, the flow of materials and energy and the associated release of substances and energy into the environment is related exclusively to the product manufactured.

4.5 System Boundaries

The system boundary for HPL represents a Cradle-to-Gate with options, which covers production and End of life phase. The production phase includes the raw material extraction, upstream transportation, manufacturing process of the final product. End of life phase includes incineration of the product. The various lifecycle phases considered is provided in Table 4-1 and activities outside the scope of LCA is provided in Table 4-2

Table 4-1 System Boundary and Product Stages

EPD Module	Life Cycle Stages	Life Cycle Sub-stages	Definitions
A1	Materials	Primary raw material production	Raw materials: chemicals and paper
A2	Upstream Transport	-	Transport of raw material to the manufacturing site
A3	Manufacturing		Manufacturing of final product
A5	Installation	-	Treatment of packaging materials
C1	Demolition	-	-
C2	Transport	-	With a collection rate of 100%, the transports are carried out by truck over 100 km
C3	Waste Processing		Incineration is preferred for product, cutting wastes and packaging waste
C4	Disposal		Landfilling of the waste laminates
D	EOL	-	Benefits and Loads beyond the Building Life Cycle (D) credits

Figure 4 -1 System boundary included in the study

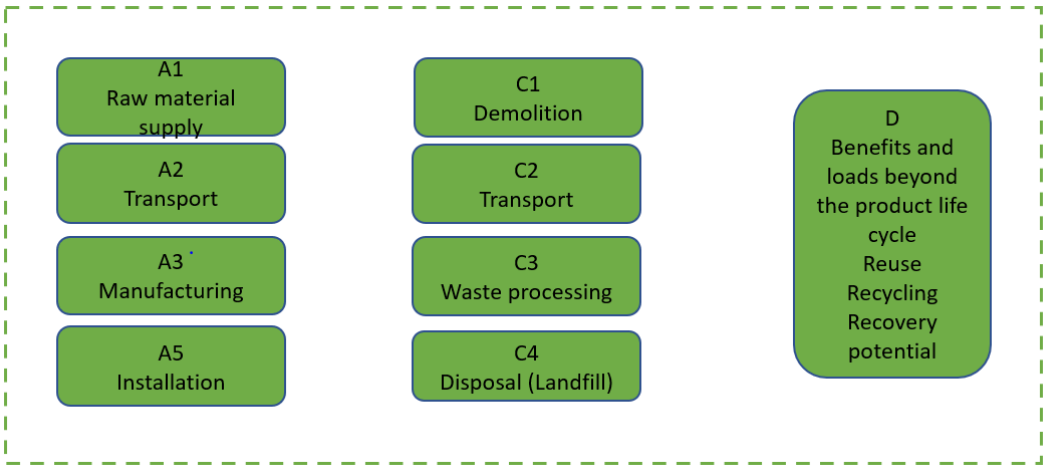


Table 4-2 Activities outside the scope of the LCA

Activity	Reason for exclusion
Maintenance and operation of equipment	It is expected that these impacts will be very small when allocated across the full production.
Human labour and employee transport	These aspects are not the central focus of the LCA and are not easily attributable to product impacts
Use phase of the product	No maintenance/consumption during use phase

4.5.1 Geographic System Boundaries

The geographical coverage of the study covers manufacturing in India. Country specific boundaries wherever possible have been adapted and others dataset were chosen from EU and GLO if no regional datasets were available.

4.5.2 Temporal System Boundaries

The data collection is related to one year of operation, and the year of the data is indicated in the questionnaire for each data point. The data is collected from year April 2022- March 2023 and is believed to be representative of production of laminates product in India.

4.5.3 Technology coverage

The exact technological configuration was used for the HPL product for representing the accurate environmental impacts. It was assumed that secondary data from databases that were used for this assessment, were temporally and technologically comparable to that of primary data and within the temporal coverage already addressed.

4.6 Software and database

The LCA model was created using the LCA (FE) 10.6 Software system for life cycle engineering, developed by Sphera Solutions. The LCA (FE) database provides the life cycle inventory data for several of the raw and process materials obtained from the upstream system. Detailed database documentation for LCA (FE) datasets can be accessed at http://www.LCA (FE)-software.com/international/support/LCA (FE)/LCA (FE)-database-2023-lci-documentation.

4.7 Comparability

According to the standards, EPDs do not compare the environmental performance of products in the sector. Any comparison of the declared environmental performance of products lies outside the scope of these standards and is suggested to be feasible only if all compared declarations follow equal standard provisions.

"EPDs within the same product category but registered in different EPD programs, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterization factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025."

4.8 Results

Modules of the life cycle included as per PCR is given in Table 4-6.

Table 4-3 Modules of Production life cycle included (X= Declared Module; MND = Module not declared)

Production			Installation		Use Stage							End of Life				Next Product System
Raw material supply (extrac-tion, processing, recycled mate-rial)	Transport to manufacturer	Manufacturing	Transport to site	Treatment of packaging products	Use / application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Demolition	Transport to EoL	Incineration	Disposal	Credits from incineration
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

4.8.1 LCIA and LCI Result

The LCIA results for 1 m^2 of thin HPL are given in Table 4-4 to Table 4-8

Table 4-4 Environmental impacts for 1 m^2 of thin HPL

Environmental impact indicators	Unit	A1-A3	A5	C1	C2	C3	C4	D
Climate Change - total	kg CO_2 eq.	1.19E+00	3.50E-02	0.00E+00	1.28E-02	1.41E+00	0.00E+00	-8.12E-01
Climate Change, fossil	kg CO_2 eq.	2.56E+00	3.50E-02	0.00E+00	1.28E-02	3.62E-02	0.00E+00	-8.07E-01
Climate Change, biogenic	kg CO_2 eq.	-1.38E+00	4.89E-06	0.00E+00	3.42E-05	1.38E+00	0.00E+00	-4.60E-03
Climate Change, land use and land use change	kg CO_2 eq.	1.35E-02	5.80E-07	0.00E+00	1.62E-07	3.93E-06	0.00E+00	-5.22E-05
Ozone depletion	kg CFC -11 eq.	5.40E-12	6.85E-15	0.00E+00	1.94E-16	1.87E-13	0.00E+00	-6.32E-12
Acidification	Mole of H+ eq.	2.43E-02	4.36E-06	0.00E+00	1.45E-04	9.05E-04	0.00E+00	-1.00E-03
Eutrophication, freshwater	kg P eq.	2.64E-05	1.84E-09	0.00E+00	2.62E-09	4.86E-08	0.00E+00	-1.30E-06
Eutrophication, marine	kg N eq.	5.89E-03	1.18E-06	0.00E+00	7.15E-05	4.30E-04	0.00E+00	-2.93E-04
Eutrophication, terrestrial	Mole of N eq.	6.41E-02	2.00E-05	0.00E+00	7.84E-04	4.98E-03	0.00E+00	-3.13E-03
Photochemical ozone formation, human health	kg NMVOC eq.	8.93E-01	3.40E-06	0.00E+00	1.33E-04	1.11E-03	0.00E+00	-8.15E-04
Resource use, mineral and metals	kg Sb eq.	4.22E-07	6.08E-11	0.00E+00	6.74E-11	1.76E-09	0.00E+00	-5.95E-08
Resource use, fossils	MJ	4.32E+01	1.56E-02	0.00E+00	1.74E-01	5.56E-01	0.00E+00	-1.47E+01
Water use	m^3 world equiv.	4.96E-01	3.32E-03	0.00E+00	1.46E-05	1.91E-01	0.00E+00	-7.67E-02

Table 4-5 Resource use Indicators for 1 m² of thin HPL

Resource use indicators	Unit	A1-A3	A5	C1	C2	C3	C4	D
Use of renewable primary energy (PERE)	MJ	2.26E+01	3.75E-03	0.00E+00	3.62E-04	1.17E-01	0.00E+00	-4.32E+00
Primary energy resources used as raw materials (PERM)	MJ	1.59E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.59E+01	0.00E+00
Total use of renewable primary energy resources (PERT)	MJ	3.85E+01	3.75E-03	0.00E+00	3.62E-04	1.17E-01	-1.58E+01	-4.32E+00
Use of non-renewable primary energy (PENRE)	MJ	4.27E+01	6.04E-01	0.00E+00	1.74E-01	5.56E-01	0.00E+00	-1.47E+01
Non-renewable primary energy resources used as raw materials (PENRM)	MJ	5.89E-01	-5.89E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources (PENRT)	MJ	4.33E+01	1.56E-02	0.00E+00	1.74E-01	5.56E-01	0.00E+00	-1.47E+01
Input of secondary material (SM)	kg	2.46E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non renewable secondary fuels (NRSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water (FW)	m^3	1.73E-02	7.91E-05	0.00E+00	4.63E-07	4.50E-03	0.00E+00	-3.50E-03

Table 4-6 Waste Categories and other Indicators for 1 m² of thin HPL

Output flows and waste categories	Units	A1-A3	A5	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	2.11E-07	1.24E-13	0.00E+00	1.51E-14	3.69E-11	0.00E+00	-7.72E-10
Non-hazardous waste disposed (NHWD)	kg	7.05E-02	3.23E-03	0.00E+00	2.45E-06	1.39E-02	0.00E+00	-7.20E-03
Radioactive waste disposed (RWD)	kg	4.37E-04	5.59E-07	0.00E+00	1.93E-08	2.63E-05	0.00E+00	-1.15E-03
Components for re-use (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for Recycling (MFR)	kg	0.00E+00	4.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for Energy Recovery (MER)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported electrical energy (EEE)	MJ	1.64E+00	6.36E-02	0.00E+00	0.00E+00	2.11E+00	0.00E+00	0.00E+00
Exported thermal energy (EET)	MJ	2.92E+00	1.14E-01	0.00E+00	0.00E+00	3.75E+00	0.00E+00	0.00E+00

4-7 Biogenic Carbon content of 1 m² of thin HPL

Biogenic carbon content	Unit	A1-A3	A5	C1	C2	C3	C4	D
Biogenic carbon content in product [kg]	kg	4.03E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon content in packaging [kg]	kg	1.36E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

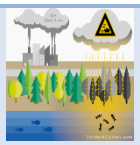
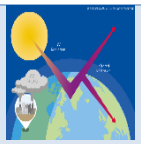
Table 4-8: Additional Parameters for 1 m² of thin HPL

Optional indicators	Unit	A1-A3	A5	C1	C2	C3	C4	D
Particulate matter	Disease incidences	1.00E+00	5.34E-11	0.00E+00	8.00E-10	2.71E-09	0.00E+00	-8.52E-09
Ionising radiation, human health	kBq U235 eq.	6.48E-02	7.70E-05	0.00E+00	1.76E-06	4.19E-03	0.00E+00	-1.90E-01
Ecotoxicity, freshwater	CTUe	1.92E+02	9.50E-03	0.00E+00	7.11E-02	2.06E-01	0.00E+00	-3.25E+00
Human toxicity, cancer	CTUh	1.32E-05	5.40E-13	0.00E+00	1.20E-12	1.33E-11	0.00E+00	-1.64E-10
Human toxicity, non-cancer	CTUh	7.44E-07	5.22E-11	0.00E+00	5.76E-11	4.58E-10	0.00E+00	-5.08E-09
Land Use	Pt	2.17E+02	3.72E-03	0.00E+00	1.73E-04	1.39E-01	0.00E+00	-2.84E+00

4.9 Interpretation

The interpretation of the results of 1 m^2 of thick HPL are presented in Table 4-11.

Table 4-11 Interpretation of most significant contributors to life cycle parameters (1 m^2 of HPL Products)

Parameter		Most significant contributor
Acidification Potential (AP)		The Cradle to gate (A1-A3) Acidification Potential (AP) is 0.024 Mole of H+ eq. The contribution by the manufacturing stage is 61% while the raw material stage (A1) contribution is 25%, while the raw material transportation stage (A2) contributes to 14%
Eutrophication Potential (EP)		The Cradle to Gate Eutrophication potential (EP) is 2.64E-05 kg P eq. The contribution by the raw material stage is 67% while the manufacturing stage (A3) contributes 33%.
Global Warming Potential (GWP 100 years)		The Cradle to gate Climate change total (GWP) is 1.19 kg CO2 eq. The contribution from the manufacturing stage (A3) is 63% followed by raw material stage (A1) which contributes 29%
Photochemical Ozone Creation Potential (POCP)		The Cradle to Gate Photochemical ozone creation potential (POCP) is 0.893 kg NMVOC eq. The major contribution is from manufacturing stage (A3) which is around 99%
Abiotic depletion potential (ADP) - Fossil		The total resource use fossil is 43.2 MJ. The major contribution is from raw material stage (A1) which is around 63% and from the manufacturing stage it is around 28%

Concluding, the LCA study provides fair understanding of environmental impacts during the various life cycle stages of HPL product production. It also identifies the hot spots in the value chain where improvement activities can be prioritised and accordingly investment can be planned. The scope covers the ecological information to be divided into raw material production (A1), transportation (A2) and Manufacturing (A3) along with the end of life (C1-C4).

5. LCA Terminology

Cradle to Gate	Scope of study extends from mining of natural resources to the completed product ready for shipping from the manufacturing dispatch "gate", known as Modules A1-A3.
Cradle to Grave	Scope of study extends from mining of natural resources to manufacture, use and disposal of products at End of Life, including all Modules A-D.
End of life	Post-use phase life cycle stages involving collection and processing of materials (e.g., scrap) and recycling or disposal, known as Modules C and D.

6. Other Environmental Information

The constituent materials used within our products are responsibly sourced and we apply the principles of Sustainable Development and of Environmental Stewardship as a standard business practice in our operations. Protecting the environment by preserving non-renewable natural resources, increasing energy efficiency, reducing the environmental emissions, limiting the impact of materials transportation to and from our operations is part of our way in doing business.
Products do not contain any substances that can be included in "Candidate List of Substances of Very High Concern for Authorization" and raw materials used are not part of the EU REACH regulation.

7. References

- LCA (FE) 10.6_2022: Dokumentation der LCA (FE)-Datensätze der Datenbank zur Ganzheitlichen Bilanzierung. LBP, Universität Stuttgart und Sphera Solutions Pvt Ltd GmbH
- LCA (FE) 10_2021: Software und Datenbank zur Ganzheitlichen Bilanzierung. LBP, Universität Stuttgart und Sphera Solutions Pvt Ltd GmbH
- ISO 14020:2000 Environmental labels and declarations - General principles
- ISO 14025:2006 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- ISO 14040:2006 Environmental management- Life cycle assessment - Principles and framework
- ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines
- PCR 2019:14, Product Category Rules (PCR) for 'CONSTRUCTION PRODUCT' Version 1.2.5

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