



# PRODUCT CARBON FOOTPRINT

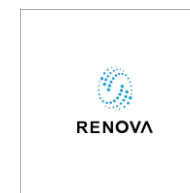
IN ACCORDANCE WITH ISO 14067 & ISO 14025

**Eggshell membranes (ESM) and eggshell calcium (ESC)**  
**Renova Technologies, LLC**



**EPD HUB, HUB-3228**

Published on 28.04.2025, last updated on 28.04.2025, valid until 27.04.2030



## GENERAL INFORMATION

### MANUFACTURER

Manufacturer	Renova Technologies, LLC
Address	2151 Dean Avenue, Des Moines, Iowa 50317
Contact details	gus@sw-companies.com
Website	<a href="https://shockwavetech.com/renova-1">https://shockwavetech.com/renova-1</a>

### STANDARDS, SCOPE AND VERIFICATION

Reference standard	ISO 14067 and ISO 14025
Sector	Manufactured product
Scope	Cradle to gate with end of life
Author	LCA Institute
Verification	Independent verification of this carbon footprint and data, according to ISO 14025: <input type="checkbox"/> Internal verification <input checked="" type="checkbox"/> External verification
Verifier	Nemanja Nedic, as an authorized verifier acting for EPD Hub Limited.

The manufacturer has the sole ownership, liability, and responsibility for the carbon footprint.

### PRODUCT

Product name	Eggshell membranes (ESM) and eggshell calcium (ESC)
Additional labels	ESM   ESC
Place of production	United States
Period for data	2024
Averaging	No averaging
Variation in GWP-fossil for A1-A3	- %

### ENVIRONMENTAL DATA SUMMARY

Declared unit	1 kg
Declared unit mass	1 kg
GWP-fossil, A1-A3 (kgCO <sub>2</sub> e)	<b>0.0065 kg CO<sub>2</sub>e for ESC</b>
GWP-fossil, A1-A3 (kgCO <sub>2</sub> e)	<b>0.0007 kg CO<sub>2</sub> for ESM</b>
Secondary material, inputs (%)	100% pre-consumer
Landfill avoidance (%)	100%
Benefits of reuse (ESC)	0.28 kgCO <sub>2</sub> e avoided in Module D
Benefits of reuse (ESM)	0.12 kgCO <sub>2</sub> e avoided in Module D



# PRODUCT AND MANUFACTURER

## ABOUT THE MANUFACTURER

Renova Technologies, LLC (Renova) specializes in innovative eggshell separation solutions, transforming a traditionally discarded by-product into valuable materials with diverse applications. Leveraging Renova’s processing technology, the company efficiently separates eggshell membranes (ESM) and eggshell calcium (ESC) to meet high-quality specifications.

## PRODUCT DESCRIPTION

ESM and ESC have distinct characteristics and broad applications across various industries. The ESM, primarily composed of protein, including collagen and other bioactive components.ESM is used in applications, such as wound healing and dietary supplements to support joint and skin health. In cosmetics, it can be incorporated into creams, lotions, and masks to reduce wrinkles, enhance hydration, and protect the skin. Its bioactive properties further make it a functional ingredient in food products. ESC, on the other hand, is composed mostly of calcium carbonate and rich in minerals like magnesium and phosphate. Its stability and eco-friendly nature make it an excellent alternative to mined calcium carbonate. In agriculture, ESC serves as a soil amendment, helping to neutralize pH and improve nutrient availability. In the food and animal feed industries, it can be used as a vital calcium source for dietary supplements and livestock nutrition. Its versatility extends to industrial applications, where it can be used as a filler material in plastics. Together, ESM and ESC exemplify how waste materials can be transformed into valuable resources, benefiting diverse industries while promoting sustainability. Renova’s innovative processes not only maximize the value of eggshell waste but also reduce environmental impact by replacing non-renewable materials across industries. Renova’s technology and applications represent a leap forward

in creating high-value products from natural resources, fostering health and sustainability globally. Further information can be found: <https://shockwavetech.com/renova-1>.

## PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	-	-
Minerals	100	US
Fossil materials	-	-
Bio-based materials	-	-

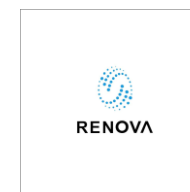
## BIOGENIC CARBON CONTENT

Product’s biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0
Biogenic carbon content in packaging, kg C	0,015

## FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1
Mass per declared unit	1 kg



# PRODUCT LIFE-CYCLE

## SYSTEM BOUNDARY

This carbon footprint covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage								End of life stage				Beyond the system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	D
x	x	x	ND	ND	MD	ND	ND	ND	ND	ND	ND		x	x	x	x	x
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use		Decommissioning	Transport	Waste processing	Disposal	Recycling

Modules not declared = ND. Modules not relevant = MNR.

## MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

Eggshell waste flows directly from the production line to the conveyor, where it is crushed and sent to the shockwave process following liquid

evaporation. The final products are separated and represent ESM and ESC. It's packed with cardboard and carried on pallets.

## TRANSPORT AND INSTALLATION (A4-A5)

Not in scope.

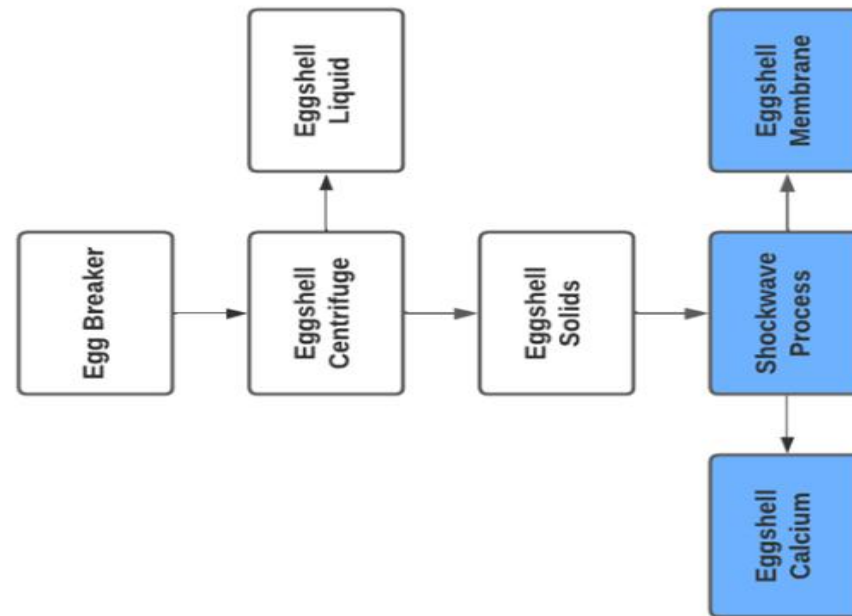
## PRODUCT USE AND MAINTENANCE (B1-B7)

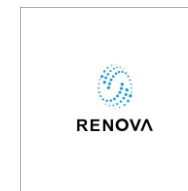
This carbon footprint does not cover the use phase.

## PRODUCT END OF LIFE (C1-C4, D)

Packaging is conservatively assumed to be landfilled, while ESM and ESC are fully reused. Landfill avoidance is modeled in C3, and the benefits of reuse are accounted for in Module D.

## MANUFACTURING PROCESS





## LIFE-CYCLE ASSESSMENT

### CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

### ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways and based on ISO21930 guidance from section 7.2.5.2, using proportion of revenue generated by every co-product. It was applied to background processes and energy while packaging and ancillary materials are based on physical (mass) allocation from factory level data.

Data type	Allocation
Raw materials	Economic allocation <sup>1</sup>
Packaging materials	Allocated by mass or volume
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Economic allocation

### AVERAGES AND VARIABILITY

Type of average	No averaging
Averaging method	Not applicable
Variation in GWP-fossil for A1-A3	-

This carbon footprint does not contain average calculations.

### LCA SOFTWARE AND BIBLIOGRAPHY

This carbon footprint has been created using One Click LCA software. The LCA and carbon footprint have been prepared according to the reference standards and ISO 14040/14044. Ecoinvent and One Click LCA databases were used as sources of environmental data.

<sup>1</sup> Economic allocation is applied as per ISO21930 7.2.5.2

## ENVIRONMENTAL IMPACT DATA

### CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total <sup>1)</sup>	kg CO <sub>2</sub> e	4,12E-03	2,26E-05	-3,92E-04	3,76E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,98E-01
GWP – fossil	kg CO <sub>2</sub> e	4,12E-03	2,26E-05	3,10E-03	7,24E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,98E-01
GWP – biogenic	kg CO <sub>2</sub> e	3,72E-06	0,00E+00	-3,50E-03	-3,50E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,85E-08	0,00E+00	3,50E-03	3,60E-04
GWP – LULUC	kg CO <sub>2</sub> e	4,16E-06	1,01E-08	9,11E-06	1,33E-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,60E-04

1) GWP = Global Warming Potential.

### ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

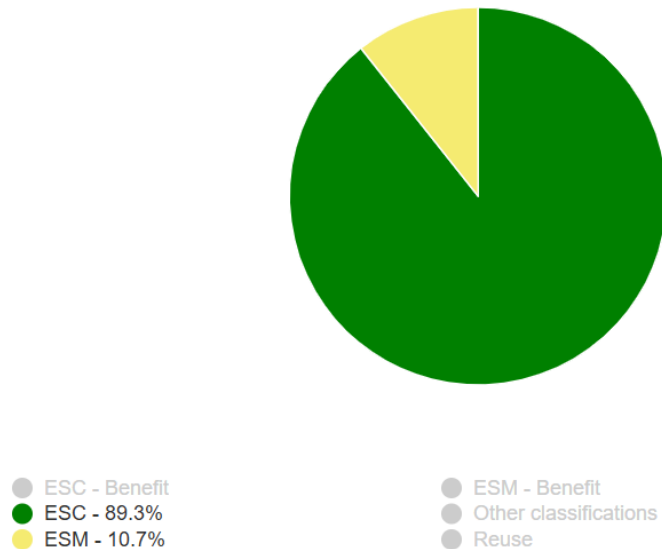
Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO <sub>2</sub> e	4,10E-03	2,25E-05	3,17E-03	7,30E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,96E-01



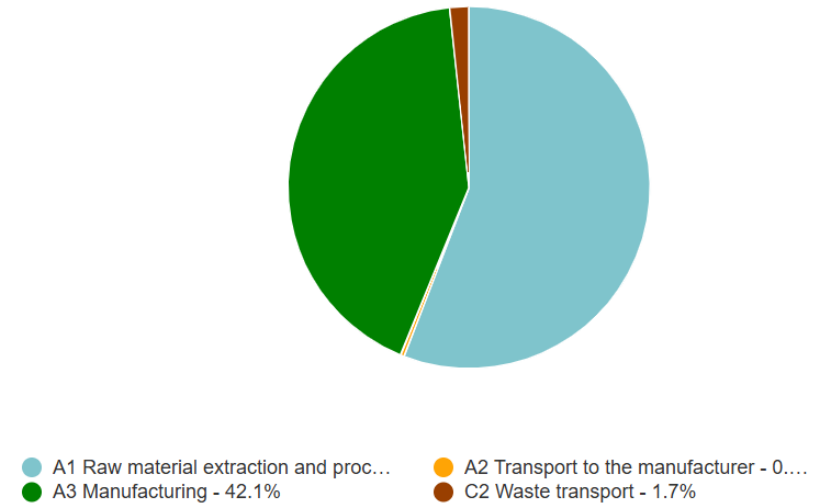
## LCA RESULT INTERPRETATION:

LCA STUDY SHOWED THAT IMPACTS ARE SPLIT BETWEEN ESC AND ESM IN FAVOR OF ESC, WHERE 56% OF THE IMPACTS ARE COMING FROM. HUGE AMOUNT OF IMPACTS IN THE WHOLE PROCESS ARE ACTUALLY LINKED TO ENERGY, WHERE 42% OF THE TOTAL IMPACT IS CAUSED. BENEFITS OF LANDFILL AVOIDANCE AND THE REUSE POTENTIAL OF THESE PRODUCTS ARE ACCOUNTED FOR AND SHOW A TOTAL OF 0.4 kg CO<sub>2</sub>e SAVINGS IN MODULE D.

Global Warming Potential fossil kg CO<sub>2</sub>e - Classifications



Global Warming Potential fossil kg CO<sub>2</sub>e - Life-cycle stages





### VERIFICATION PROCESS FOR THIS CARBON FOOTPRINT

This carbon footprint has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with reference standard, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Product Carbon Footprint
- The Life-Cycle Assessment used in this carbon footprint
- The digital background data for this carbon footprint

Why does verification transparency matter? [Read more online](#)

This carbon footprint has been generated by One Click LCA EPD generator, which has been verified and approved by the EPD Hub.

### THIRD-PARTY VERIFICATION STATEMENT

I hereby confirm that, following detailed examination, I have not established any relevant deviations by the studied Carbon Footprint of a Product, its LCA and project report, in terms of the data collected and used in the LCA calculations, the way the LCA-based calculations have been carried out, the presentation of environmental data in the carbon footprint, and other additional environmental information, as present with respect to the procedural and methodological requirements in ISO 14025:2010 and reference standard.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the owner of the carbon footprint is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the carbon footprint to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the carbon footprint and have no conflicts of interest regarding this verification.

Nemanja Nedic, as an authorized verifier acting for EPD Hub Limited.  
28.04.2025

