Carbon Footprint Declaration

Declared unit: 1 kg of polypropylene (PP)
Geographic Scope: Global
Type: Cradle-to-gate

Product Description

The declared unit is 1 kilogram of polypropylene pellets (PP), polyolefin based polymer.

Application

PP is used as a raw material for conversion processes such as injection moulding, thermoforming and extrusion. It provides its value in market applications such as food and non-food packaging (caps & closures, cups & containers), medical supplies, housewares, geosynthetics, automotive industry, residential and commercial flooring, artificial turf and many others.

Description of the Organisation

Pinnacle Polymers is a member of Beaulieu International Group, which transform propylene into polypropylene pellets in the United States of America. It's site is located in Garvyille, Louisiana, with direct access to railroad infrastructure. The European counterpart of Pinnacle Polymers is Polychim industries. Our polypropylene facilities are not only supplying not domestically, but all over the globe.

Carbon Footprint Declaration

The climate declaration shows the emissions of greenhouse gasses, expressed as CO2-equivalents per kilogram of polypropylene produced. This number is the consolidated number of the total PP production within the group, with a global geographical scope.

This declaration is based on results from a reviewed life cycle assessment (LCA) in conformance with ISO 14040:2006, ISO 14044:2006 and following the requirements of EN 15804:2012+A2:2019/AC:2021. The LCA does not claim full conformance with EN 15804+A2 or ISO 14025, as an EPD has not been generated or published.

Contact Information

Pinnacle Polymers,
1 Pinnacle Ave, Garyville, LA 70051
Garyville, Louisiana, USA
insidesales@pinnaclepolymers.com

Global Warming Potential (GWP)
kg CO2e/kg PP

	Cradle-to-gate
GWP –fossil	0,99
GWP – biogenic	0,0031
GWP – luluc	0,0002
GWP – Total	**1,00**

This declaration only addresses one environmental impact category and does not assess other potential social, economic, and environmental impacts arising from the provision of this product. These aspects may be of equal or greater importance than the single impact category displayed.

Additional Background information

Polypropylene (PP)

Product specification

Name	Value	Unit
Name of the polymer	Polypropylene	-
CAS number	9003-07-0	-
Chemical formula of repeating unit	C3H6	-
Density	0,9	g/cm³

Product composition

Material	Weight%	Renewable material, weight%
polypropylene	100	0

Description of system boundaries:

This LCA study covers a Cradle-to-Gate study of polypropylene. This includes raw material supply, transport of raw materials and polymerization.

Regional and temporal scope

The geographical scope is the production of polypropylene at Pinnacle Polymers in Garyville, US and Polychim Industrie in Dunkirk, France. The temporal scope is the year 2022 for the Polychim PP production and the year 2023 for the Pinnacle PP production.

Limitations, assumptions and allocations

A cut-off of <1% is used for mass flows and primary energy flows. Only C3 (propylene) and C2 (ethylene) was included as a raw material, since other raw materials amounted to less than 1% of the total mass.

25% of GHG-fossil contribution is based on specific data input. The variation due to inclusion of two sites 20%, based on the highest difference in GHG-fossil impact from the average.

There are two types of polypropylene (PP) considered. PP homopolymers are polymerized from 100 % propylene monomer. It is the most widely used, general purpose grade of polypropylene, and is produced at both manufacturing sites. PP copolymers contain some ethylene, generally less than 5%. This type of PP is produced only at the manufacturing sites of Pinnacle. Because it was impossible to separate the different types of polypropylene in terms of process and energy use, all types of PP are included.

The total volume of production (mass) was used to divide the collected primary data (raw materials and energy) and reach the per kg data. No other products are produced in the polymerization plant other than those that are under scope. Further subdivision of unit processes and allocation of the data was not needed.

Although the waste and scraps have economic value and are sold to third-party waste treaters, all environmental burdens and environmental impact for transformation of waste to end-of-waste status were fully allocated to the declared unit. This approach was used to have a more conservative calculation which is not subject to variable market prices of the PP and waste. A cut-off approach is used for recycled waste. No benefit or avoided loads are considered for the secondary material derived from site waste that is externally recycled.

Regional US and French electricity grid mix was used for Pinnacle Polymers and Polychim Industrie respectively.

A data quality assessment and sensitivity analysis was performed. All data choices are consistent and in line with the defined data quality requirements.

The study consists of a cradle-to-gate analysis. Consequently, results should not be interpreted with regard to the full life cycle. Further processing, use phase and end-of-life treatment are not taken into account in this study and might have a big impact on the conclusions and interpretations that are made in this study.

Impact assessment method and reference documentation

LCA for Experts software from Sphera Gmbh 10.5.1 and 10.7.1.28 were used to model the LCAs, using database content version 2022.1 and 2023.2. EN 15804:2012+A2:2019/AC:2021 Climate Change indicators are reported.

LCA Background Documents:

Polypropylene – Global average of B.I.G., Pinnacle Polymers LLC, Polychim Industrie SAS SA, July 2024, version 1.1
Polypropylene – Pinnacle Polymers, Pinnacle Polymers LLC, July 2024, version 1.3
LCA Background Document Polychim Industrie SAS, Polychim Industrie SAS, February 2024, version 1.2

Critical review statements:

LCA of polypropylene – critical review statement and report, Beaulieu International Group (BIG) – Pinnacle Polymers, July 2024, Fishwick Environmental Ltd
CRITICAL REVIEW ATTESTATION, March 11 2024, Damien PRUNEL, LCIE Bureau Veritas

Any comparison of environmental data between different LCA studies, using different impact indicators and input data, is to be used with caution and might lead to potentially misleading conclusions if not interpreted accurately.

For additional information on the calculation methods, please contact Beaulieu International Group on beaulieu.sustainability@bintg.com.

A member of Beaulieu International Group

LCA of polypropylene – critical review statement and report

Beaulieu International Group (BIG) – Pinnacle Polymers

Prepared by Fishwick Environmental Ltd (Co. number: 12863179)
Mobile: 07909 573711
Email: matt@fishwickenvironmental.com
Address: 85 Great Portland Street, London, W1W 7LT
Website: fishwickenvironmental.com

July 2024

Private and Confidential

This critical review assessed an environmental life cycle assessment (LCA) of polypropylene. The study was prepared by Beaulieu International Group for Pinnacle Polymers in accordance with the international standards on LCA: ISO 14040:2006 and ISO 14044:2006. Details of this LCA study are provided below:

- **Title of study**: “LCA background report for polypropylene – Pinnacle Polymers”.
- **Commissioner of the study**: Pinnacle Polymers LLC, part of Beaulieu International Group (BIG) NV.
- **Practitioner of the study**: Femke Faelens, Beaulieu International Group (BIG).
- **Version of the report which the review statement belongs**: “2024 - LCA Background report Pinnacle v1.3.pdf”.
- **Assurance type**: third party assurance via critical review.

As the commissioner of this LCA may use headline results for publicly disclosed marketing materials, it is recommended that a critical peer review is carried out by an LCA expert. A review was therefore undertaken by the following reviewer based on ISO 14044:2020 Section 6.3. The reviewer was external and independent of the LCA project.

- **Matthew Fishwick** – *Environmental Consultant at Fishwick Environmental Ltd* – Matt has 17+ years of experience in life cycle assessment. Past clients in the chemicals industry include 3M, Lonza, BP, ABF, PepsiCo, Honeywell, Jotun, GSK, and Johnson & Johnson. He has PhD, MRes, MSc and BSc degrees in environmental chemistry and is a member of the Royal Society of Chemistry (MRSC).

Details of the review are provided in this critical review statement, which has been prepared in accordance with ISO-TS 14071:2016 and ISO 14044:2006.

The critical review process ensured that:

- The methods used to carry out the LCA are consistent with ISO 14040/44;
- The methods used to carry out the LCA are scientifically and technically valid;
- The data used are appropriate and reasonable in relation to the goal of the study;
- The interpretations reflect the limitations identified and the goal of the study; and
- The study report is transparent and consistent.

The critical review process involved a detailed review of the LCA report for conformance with ISO 14040/44. The review was undertaken at the end of the

study. The reviewer used a peer review template to log their comments, based on the example given in ISO-TS 14071. These comments were discussed with BIG. Responses to these comments were sent back to the reviewer along with an updated version of the LCA report to check. The reviewer proceeded to check that they were satisfied with the responses or requested final changes.

The reviewer was provided with a detailed LCA report, details of individual datasets, calculations, and screenshots of the LCA model. Having re-read the final report and responses to final comments, the reviewer is confident that this study is in conformance with ISO 14040:2006 and ISO 14044:2006.

Table 1 (ISO conformance comments) and Table 2 (general comments) comprise the critical review report, with comments from the reviewer and responses from BIG.

In addition, BIG produced global weighted average results for polypropylene using the Pinnacle Polymers LCA (described here) and a previously reviewed Polychim Industrie SAS LCA (by Bureau Veritas). This global report (“2024 - LCA Background report BIG PP Global v1.1.pdf”) was also checked as part of the review, insofar as ensuring the results matched the Pinnacle Polymers LCA and the weighting was correctly applied. The previously reviewed Polychim Industrie SAS LCA was not checked in any way.

Yours sincerely,

Matthew Fishwick

CRITICAL REVIEW ATTESTATION

LCIE n°	21225016 / 797603
CLIENT	BEAULIEU
LIFE CYCLE ASSESSMENT REPORT	**Title:** « 2024 - LCA Background report Polychim v1.2 » **Date and version:** February 2024, version 1.2 **Created by:** Simon De Meyer, Beaulieu International Group NV
CONFORMITY TO	The Life Cycle Assessment study is compliant with ISO 14040:2006, ISO 14044:2006 and EN 15804+A2. The critical review has been done in compliance with ISO 14071:2014. *Any change to the audited documents renders the certificate invalid. A new verification by Bureau Veritas is necessary.*
VERIFIER	Damien PRUNEL, LCIE Bureau Veritas
LOCATION, DATE	At Moirans March 11, 2024
SIGNATURE	LABORATOIRE CENTRAL DES INDUSTRIES ELECTRIQUES S.A.S au capital de 15.745.984 € RCS Nanterre B 408 363 174 33 avenue du Général Leclerc F - 92266 FONTENAY AUX ROSES

SCOPE OF THE AUDIT

PRODUCT NAME	Polypropylene (PP)
DECLARED UNIT	1 kg of polypropylene (PP) produced by Polychim Industrie
GEOGRAPHICAL SCOPE	Production in France
TEMPORAL SCOPE	The data utilized as the sample is representative of 2022 calendar year
DATABASE AND LCA SOFTWARE	LCA software GaBi Software 10.5.1 & GaBi Content Version 2022.1
SYSTEM BOUNDARIES	This LCA study covers the Cradle-to-Gate of polypropylene (PP): modules A1, A2, A3.
VALIDITY OF RESULTS	In general, it is recommended to update the results of an LCA study every 5 years, i.e. no later than January 2029.
ADDITIONAL COMMENT	The Life Cycle Assessment study has been released according to ISO 14040:2006, ISO 14044:2006 and EN 15804+A2. The audited documents do not constitute an Environmental Product Declaration (EPD) such as defined by ISO 14025. To comply with the ISO 14025 standard, Beaulieu must register its study in an operator program. On the eco-platform website, a non-exhaustive list of operator programs compliant with EN 15804+A2 and ISO 14025 is available. Link: https://www.eco-platform.org/the-eco-epd-programs.html