

Environmental Product Declaration



FORTA-FI®



ASTM INTERNATIONAL

According to
ISO 21930
ISO 14025

1. General Information

Manufacturer Name: FORTA – 100 Forta Drive Grove City, PA 16127-6399 USA

Program Operator: ASTM International
100 Barr Harbor Drive
West Conshohocken, PA
19428-2959, USA

Declaration Number: EPD 792

Reference PCR: ISO 21930: 2017

Date of Issuance: September 10, 2024

End of Validity: September 10, 2029

Product Name: FORTA-FI[®]

EPD Owner: FORTA

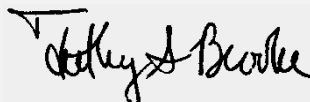
Declared Unit: 1 kg of FORTA-FI[®]

EPD Scope: Cradle-to-gate (A1, A2, and A3)

Prepared By: WAP Sustainability Consulting

Verification: ISO 21930 serves as the core PCR. Independent verification of the declaration according to ISO 14025 and ISO 21930. ☐ internal
☒ external

LCA Reviewer and EPD Verifier: Timothy S. Brooke
ASTM International



2. Product Information

2.1 Company Description

FORTA is a Grove City, PA., based company that supplies high quality synthetic reinforcement fibers to the global construction market. These fibers aim to reduce project costs by simultaneously extending the life of the asphalt and shortening the construction time. These reinforcement fibers are tested through research and development.

2.2 Product Description

The declared product is FORTA-FI[®] (shown in Figure 1), a high tensile strength synthetic fiber blend for asphalt. The mix of aramid and polyolefin fibers is designed to enhance your current mix design. Aramid fibers will not melt in the asphalt mix and are known for their strength and durability in both high and low temperatures.



Figure 1: FORTA-FI[®] product visual representation.

2.2 Technical Data

Table 1 provides physical property data for FORTA-FI[®].

Table 1: Technical Data	
Property	Value
Materials	Polyolefin/Aramid
Appearance	Yellow fibers
Specific Gravity	0.91/1.44

3. LCA Calculation Rules

3.1 Declared Unit

The declared unit is 1 kg of FORTA-FI[®] produced at FORTA's manufacturing facility.

3.2 System Boundary

The system boundary for this study is limited to a cradle-to-gate focus. (see also Table 4):

- **A1 Raw material supply:** Extraction, handling, and processing of input materials.
- **A2 Transportation:** Transportation of all input materials from the suppliers to the gate of the manufacturing facility.
- **A3 Manufacturing:** The preparation processes of FORTA's manufacturing facility. This phase also includes the operations of the manufacturing facility and all process emissions that occur at the production facility.

3.3 Estimates and Assumptions

All significant foreground data was gathered from the manufacturer based on measured values.

3.4 Cut-off Criteria

The cut-off criteria for all activity stage flows considered within the system boundary conform with ISO 21930: 2017 Section 7.1.8. Specifically, the cut-off criteria were applied as follows:

- All inputs and outputs for which data are available are included in the calculated effects and no collected core process data are excluded.
- A one percent cut-off is considered for renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process. The sum of the total neglected flows does not exceed 5% of all energy consumption and mass of inputs.
- All flows known to contribute a significant impact or to uncertainty are included.
- The cut-off rules are not applied to hazardous and toxic material flows – all of which are included in the life cycle inventory.

No material or energy input or output was knowingly excluded from the system boundary.

3.5 Background Data and 3.6 Data Quality

Data was gathered for the primary material and energy inputs used in production for calendar year 2022. Table 3 describes each LCI data source for raw materials (A1), transportation (A2) and the core manufacture process (A3). Table 3 also includes a data quality assessment on the basis of the technological, temporal, and geographical representativeness.

Table 2: Secondary Data Sources and Data Quality Assessment

A1: Raw Material Inputs

Inputs	LCI Data Source	Geography	Year	Data Quality Assessment
Polyolefin	Ecoinvent 3.9.1: Polypropylene, granulate {GLO} market for polypropylene, granulate Cut-off, U	Global	2022	Technology: good Time: very good Data is <5 years old Geography: good
Aramid	Ecoinvent 3.9.1: Nylon 6 {RoW} market for nylon 6 Cut-off, U	Global	2022	Technology: good Time: very good Data is <5 years old Geography: good

A2: Transportation

Inputs	LCI Data Source	Geography	Year	Data Quality Assessment
Trucking	USLCI: Transport, combination truck, average fuel mix/US	US	2018	Technology: very good Time: good Data is <10 years old Geography: very good
Rail	USLCI: Transport, train, diesel powered/US	US	2018	Technology: very good Time: good Data is <10 years old Geography: very good

A3: Manufacturing

Energy	LCI Data Source	Geography	Year	Data Quality Assessment
Electricity	Ecoinvent 3.9.1: Electricity, high voltage {NPCC, US only} market for electricity, high voltage Cut-off, U	Global	2022	Technology: very good Time: very good Data is <5 years old Geography: very good
Natural Gas	USLCI: Natural gas, combusted in industrial boiler/US	Global	2018	Technology: very good Time: good Data is <10 years old Geography: good.
Cardboard Sheets	USLCI: Corrugated board box {US} market for corrugated board box Cut-off, U	US	2022	Technology: very good Time: very good Data is <5 years old Geography: very good.
Pallets	USLCI: Dry rough lumber, at kiln, US SE NREL /US Packaging	US	2018	Technology: very good Time: good Data is <10 years old

				Geography: very good.
Water	Ecoinvent 3.9.1: Tap water {GLO} market group for tap water Cut-off, U	Global	2014	Technology: very good Time: good Data is <10 years old Geography: good.
Wastewater	Ecoinvent 3.9.1: Wastewater, average {RoW} market for wastewater, average Cut-off, U	Global	2022	Technology: very good Time: very good Data is <5 years old Geography: good.
Waste	Ecoinvent 3.9.1: Inert waste, for final disposal {RoW} treatment of inert waste, inert material landfill Cut-off, U	Global	2022	Technology: very good Time: very good Data is <5 years old Geography: good.

3.7 Period under Review

Data was gathered for the primary material and energy inputs used in the production for calendar year 2022.

3.8 Allocation

FORTA produces multiple products. Since the primary data for manufacturing was only available on a facility level, the environmental load among the products produced is allocated according to its mass. For waste that is recycled, the 'recycled content approach' was chosen. The recycling of waste generated by the product system is cut off.

3.9 Comparability

This LCA was created using industry average data for upstream materials. Data variation can result from differences in supplier locations, manufacturing processes, manufacturing efficiency and fuel types used.

3.10 Additional Environmental Information

No substances of very high concern were found to be contained or emitted from the product.

4. LCA Results

Life cycle impact assessment (LCIA) is the phase in which the set of results of the inventory analysis – the inventory flow table – is further processed and interpreted in terms of

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environmental impacts and resource use inventory metrics. Tables 4 and 5 below summarize the LCA results for the cradle-to-gate (A1-A3) product system.

Table 3: Description of the System Boundary (x: included in LCA; mnd: module not declared; mnr: module not reported)

Product			Construction Installation		Use								End-of-Life				Benefits Beyond the System Boundary			
Raw Material Supply	Transport	Manufacturing	Transport	Construction / Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Use	Energy	Operational Use	Water	De-Construction/ Demolition	Transport	Waste Processing	Disposal	Reuse	Recovery	Recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D		
x	x	x	mnd	mnd	mnd	mnd	mnr	mnr	mnr	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	

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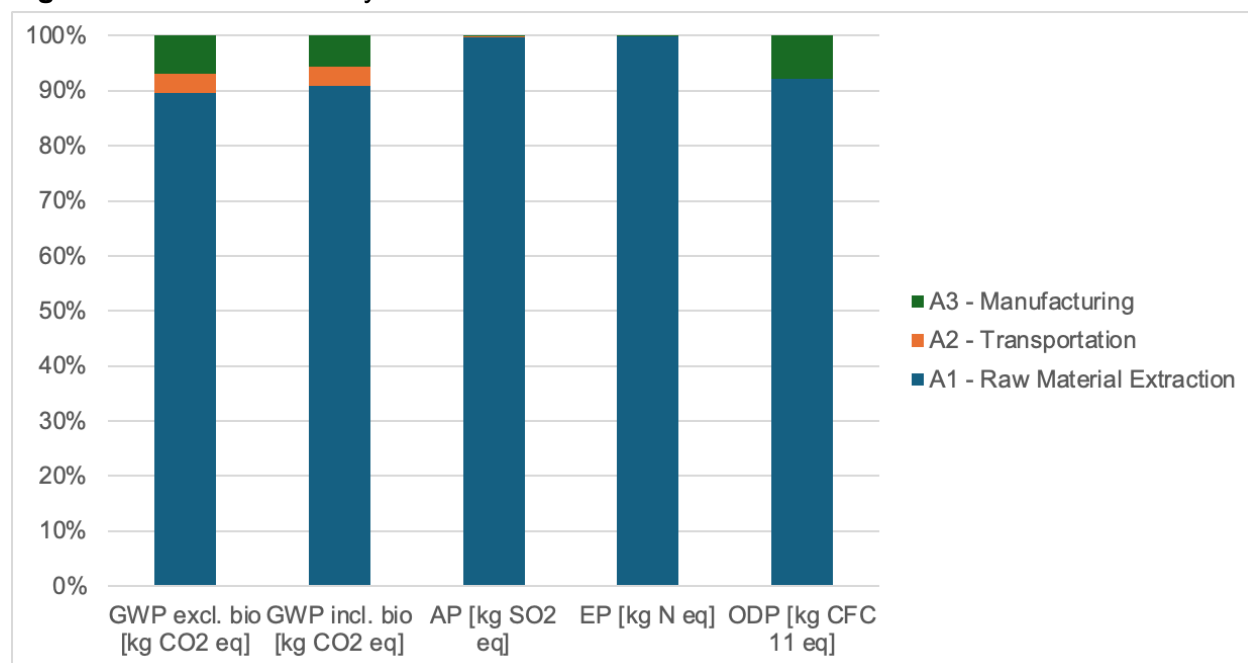
FORTA-FI

Table 4: LCA Results per 1kg Forta-fi				
Impact Category	A1-A3	A1	A2	A3
IPCC AR5				
GWP excl. bio [kg CO ₂ eq]	3.74E+00	3.35E+00	1.29E-01	2.58E-01
TRACI LCIA Impacts (North America)				
AP [kg SO ₂ eq]	3.38E-01	3.37E-01	7.62E-04	3.06E-04
EP [kg N eq]	2.98E-01	2.97E-01	3.90E-05	3.58E-04
ODP [kg CFC 11 eq]	1.14E-08	1.05E-08	4.87E-12	8.80E-10
SFP [kg O ₃ eq]	2.65E-02	8.00E-09	2.09E-02	5.64E-03
CML LCIA Impacts (Europe, Rest of World)				
ADPF [MJ]	8.68E+01	8.12E+01	1.64E+00	3.98E+00
Resource Use Indicators				
RPR _E [MJ]	2.03E+00	7.16E-01	0.00E+00	1.31E+00
RPR _M [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRPR _E [MJ]	1.02E+02	9.09E+01	1.75E+00	9.45E+00
NRPR _M [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m ³]	2.88E+00	2.86E+00	0.00E+00	1.70E-02
Output Flows and Waste Categories				
HWD [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD [kg]	6.74E-02	0.00E+00	0.00E+00	6.74E-02
HLRW [kg]	5.30E-10	0.00E+00	1.14E-12	5.29E-10
ILLRW [kg]	2.98E-09	0.00E+00	6.56E-12	2.97E-09
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00

5. Interpretation

Figure 2 shows the relative contribution to the cumulative impacts of the A1 through A3 phases of the cradle-to-gate life cycle. A1 – Raw Materials and Upstream Production is the largest driver of impact across all impact categories. This category is driven primarily by polyolefin and aramid fibers. A2 – Transportation and A3 – Manufacturing are not contributing largely to impacts.

Figure 2. Contribution analysis for FORTA-FI[®].



6. References

1. ASTM 2020 - ASTM Program Operator for Product Category Rules (PCR) and Environmental Product Declarations (EPDs) General Program Instructions v8, April 29th.
2. WAP Sustainability Consulting: 2023 - A Cradle-to-Gate Life Cycle Assessment of FORTA-FI[®] Manufactured by FORTA.
3. ISO 21930: 2017 Building construction – Sustainability in building construction – Environmental declaration of building products.
4. ISO 14025: 2006 Environmental labeling and declarations - Type III environmental declarations - Principles and procedures.
5. ISO 14044:2006/AMD 1:2017/ AMD 2:2020 - Environmental management - Life cycle assessment - Requirements and guidelines.
6. 14040:2006/AMD 1:2020 - Environmental management - Life cycle assessment - Principles and framework.