Type III Environmental Product Declaration No. 644/2024

Issuance date: 28.06.2024
Validity date: 28.06.2029

Modified starches

Owner of the EPD:

Zakłady Chemiczne BOCHEM Sp. z o.o
Address: Działki Suskowolskie 22B
26-670 Pionki, Poland
Website: www.bochem.pl
Contact: bochem@bochem.pl

EPD Program Operator:

Instytut Techniki Budowlanej (ITB)
Address: Filtrowa 1
00-611 Warsaw, Poland
Website: www.itb.pl
Contact: energia@itb.pl

ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment. Their aspects were verified by the independent body according to ISO 14025. Basically, a comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

Life cycle analysis (LCA): A1-A3 in accordance with EN 15804+A2 (Cradle-to-Gate)
The year of preparing the EPD: 2024
Service Life: N/A
PCR: ITB-PCR A, v.1.6
Declared unit: 1 kg
Reasons for performing LCA: B2B
Representativeness: Polish, European

MANUFACTURER

Bochem Chemical Plants Ltd is one of manufacturers of industrial adhesives in Poland. The company was established in 1991 and it currently employs more than 120 people.

Bochem produces adhesives for the furniture, footwear, leather goods, automotive and construction industries in addition to professional adhesives. The company is also a manufacturer of adhesives based on modified starch, which are widely used in the production of plasterboard, as well as the paper and textile industries. Moreover, Bochem provides modified starches for the food industry and companies producing briquettes. Bochem also offers its customers finished laminates as well as bonding and laminating services of materials used in the footwear, furniture, clothing and automotive industries. Composites used in construction and interior finishing sectors are also offered.

The company has its own research laboratory in which new products are developed and quality controls are carried out on a regular basis.

Figure 1. A view of Zakłady Chemiczne Bochem Sp. z o.o production plant located in Suskowola (Poland).

PRODUCTS DESCRIPTION AND APPLICATION

Modified starches are used as a binder for further wide industrial applications (used in the construction, textile, briquetting, paper, wood, shipbuilding and artificial fertilizer industries). Table 1 shows physicochemical properties of modified starches:

Table. 1. Physicochemical properties of modified starches.

	Borcet SPD / Borcet CHE	**Borgips SKD / Borgips CHD**	**Borcet BRY**
Starch – type	wheat starch	maize starch	wheat starch
Starch [%]	99.5	99.3	99.0
Modifying agent [%]	0.5	0.7	1.0
Ash [%]	0.3	0.25	0.2
Bulk weight [g/m^3]	550	600	700
pH	6.0	6.5	7.0
Color	white	white	slightly creamy
Residue on the sieve 200 µm [%]	1.0	1.3	1.5

The basic raw material in the above-mentioned groups is starch, and they are distinguished by the degree of modification depending on the percentage of modifying agents (from 0,5 % to 1 %).

More information can be found on Zakłady Chemiczne Bochem Sp. z o.o. website: www.bochem.pl

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declaration refers to declared unit (DU) – 1 kg of modified starch

System boundary

Modules A1-A3 are taken into consideration in the LCA: A1 Production of preliminary products, A2 Transport to plant, A3 Production (incl. provision of energy, production of auxiliaries and consumables or waste treatment) in accordance with EN 15804+A2 and ITB PCR A, v. 1.6. Modified starches were identified as physically integrated with other products during installation so they cannot be physically separated from them at the end of life and no longer identifiable at the end of life as a result of a physical or chemical transformation process. Therefore, they may omit the declaration of modules C1-C4 and D. This type of EPD declaration is called "cradle to gate".

Allocation

The allocation rules used for this EPD are based on general ITB PCR A, v. 1.6. Production of the modified starches is a line process conducted in the factory of Zakłady Chemiczne Bochem Sp. z o.o. located in Suskowola (Poland). Allocation was done on product mass basis. All impacts from raw materials extraction and processing are allocated in module A1 of the LCA. Impacts from the Zakłady Chemiczne Bochem Sp. z o.o. production were inventoried on the annual production volume expressed in kg. Water and energy consumption, associated emissions and generated wastes are allocated to module A3. Packaging materials were taken into consideration.

System limits

According to the standard EN 15804+A2, products used for the production of other products should be declared at the production stage. Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculations. Office impacts were also taken into consideration. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

Modules A1 and A2: *Raw materials supply and transport*

The products covered by this EPD contain starch as a base material, additives and ancillary materials. Raw materials come from Polish and international suppliers. Data on transport of the different products to the manufacturing plant is collected and modelled for factory by assessor. Means of transport include trucks and Polish and European fuel averages are applied. Means of transport include small trucks (< 10 t e.g. couriers) and big trucks (> 16 t) are applied.

Module A3: *Production*

The production/formulation is done by Zakłady Chemiczne Bochem Sp. z o.o. plant in Suskowola, Poland. A scheme of modified starches production process is presented in Figure 2. The facility is ISO 9001, ISO 14001 and ISO 45001 certified.

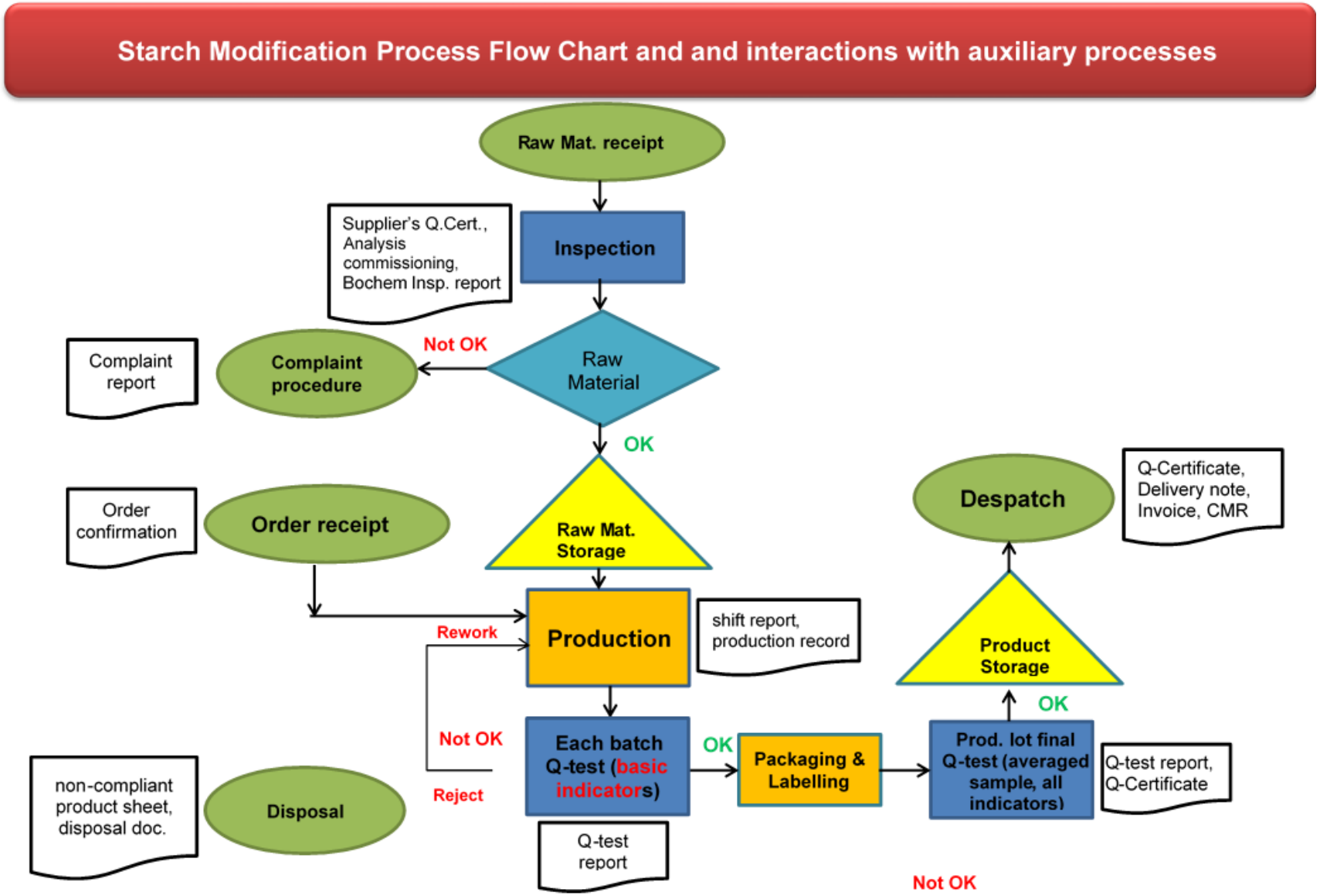

Figure 2. The scheme of starch modification process by Zakłady Chemiczne Bochem Sp. z o.o.

Data quality
The data selected for LCA analysis originates from ITB-LCI questionnaires completed by Zakłady Chemiczne Bochem Sp. z o.o. using the inventory data, ITB database, Ecoinvent database v. 3.10 and KOBiZE. KOBiZE data is supplemented with Ecoinvent v. 3.10 data on the national electricity mix impact where no specific indicator data is provided. No specific data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency are judged as good.

Data collection period
Primary data provided by Zakłady Chemiczne Bochem Sp. z o.o. covers a period of 01.01.2023 – 31.12.2023 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Assumptions and estimates
The impacts of the representative Borcet SPD / Borcet CHE, Borgips SKD / Borgips CHD, Borcet BRY products were aggregated using average. The impacts of the representative product of modified starches were inventoried and calculated for all products presented in Tables 3-6.

Calculation rules
LCA was performed using ITB-LCA tool developed in accordance with EN 15804 + A2.

Databases
The data for the processes comes from Ecoinvent v. 3.10 and ITB-Database. Specific data quality analysis was a part of external audit. Polish electricity mix used (production) is 0.685 kg CO_2/kWh (KOBiZE 2023).

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit
The declaration refers to declared unit (DU) – 1 kg of modified starch.

Table 2. System boundaries for the environmental characteristic of modified starch produced by Zakłady Chemiczne Bochem Sp. z o.o.

Environmental assessment information (MD – Module Declared, MND – Module Not Declared, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse-recovery-recycling potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
MD	**MD**	**MD**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**

Table 3. Life cycle assessment (LCA) results of modified starch produced by Zakłady Chemiczne Bochem Sp. z o.o. - environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3
Global Warming Potential	eq. kg CO_2	1.31E-01	1.05E-01	9.13E-02	3.28E-01
Greenhouse gas potential - fossil	eq. kg CO_2	1.33E+00	1.05E-01	9.07E-02	1.52E+00
Greenhouse gas potential - biogenic	eq. kg CO_2	-1.66E+00	9.16E-05	6.05E-04	-1.66E+00
Global warming potential - land use and land use change	eq. kg CO_2	4.67E-01	5.20E-05	3.18E-05	4.67E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	7.85E-08	2.29E-09	2.37E-09	8.31E-08
Soil and water acidification potential	eq. mol H+	2.23E-02	2.30E-04	8.03E-04	2.34E-02
Eutrophication potential - freshwater	eq. kg P	6.52E-04	7.48E-06	1.30E-04	7.90E-04
Eutrophication potential - seawater	eq. kg N	1.54E-02	5.80E-05	1.24E-04	1.56E-02
Eutrophication potential - terrestrial	eq. mol N	8.97E-02	5.90E-04	1.04E-03	9.14E-02
Potential for photochemical ozone synthesis	eq. kg NMVOC	7.16E-03	3.57E-04	3.36E-04	7.85E-03
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.59E-05	3.52E-07	9.49E-08	1.64E-05
Abiotic depletion potential - fossil fuels	MJ	1.43E+01	1.51E+00	1.82E+00	1.77E+01
Water deprivation potential	eq. m^3	7.84E+00	7.48E-03	2.60E-02	7.87E+00

Table 4. Life cycle assessment (LCA) results of modified starch produced by Zakłady Chemiczne Bochem Sp. z o.o. - additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3
Particulate matter	disease incidence	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA

Table 5. Life cycle assessment (LCA) results of modified starch produced by Zakłady Chemiczne Bochem Sp. z o.o. - environmental aspects related to resource use (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.84E+00	2.35E-02	1.39E-01	3.00E+00
Consumption of renewable primary energy resources used as raw materials	MJ	1.16E+01	0.00E+00	0.00E+00	1.16E+01
Total consumption of renewable primary energy resources	MJ	1.44E+01	2.35E-02	1.39E-01	1.46E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.77E+01	1.51E+00	1.33E+00	2.06E+01
Consumption of non-renewable primary energy resources used as raw materials	MJ	5.75E-02	0.00E+00	4.71E-01	5.29E-01
Total consumption of non-renewable primary energy resources	MJ	1.78E+01	1.51E+00	1.82E+00	2.11E+01
Consumption of secondary materials	kg	9.28E-03	6.88E-04	2.10E-04	1.02E-02
Consumption of renewable secondary fuels	MJ	1.02E-03	8.75E-06	7.25E-07	1.02E-03
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater resources	m^3	1.75E-01	1.82E-04	3.33E-03	1.78E-01

Table 6. Life cycle assessment (LCA) results of modified starch produced by Zakłady Chemiczne Bochem Sp. z o.o. - environmental information describing waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3
Hazardous waste. neutralized	kg	1.97E-01	1.02E-03	1.34E-02	2.12E-01
Non-hazardous waste neutralised	kg	3.12E+00	3.11E-02	6.38E-01	3.79E+00
Radioactive waste	kg	1.23E-05	4.92E-07	1.14E-06	1.39E-05
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	9.24E-04	1.12E-05	6.52E-05	1.00E-03
Materials for energy recovery	kg	2.53E-06	9.39E-08	6.08E-04	6.11E-04
Energy exported	MJ	1.23E-02	5.68E-04	1.71E-03	1.45E-02

Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804+A2 and ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3.) [x] external [ ] internal
External verification of EPD: Halina Prejzner, PhD Eng LCA, LCI audit and input data verification: Mateusz Kozicki, PhD Verification of LCA: Michał Piasecki, PhD. DSc. Eng

Note 1: The declaration owner has the sole ownership, liability and responsibility for the information provided and contained in EPD. Declarations within the same product category but from different programmes may not be comparable. Declarations of construction products may not be comparable if they do not comply with EN 15804 + A2. For further information about comparability, see EN 15804 + A2 and ISO 14025. Depending on the application, a corresponding conversion factor such as the specific weight per surface area must be taken into consideration.

Note 2: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (17065/17025 certified). ITB-EPD program is recognized and registered member of The European Platform – Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

Signature Not Verified
Dokument podpisany przez Mateusz Kozicki, ITB
Data: 2024.06.28 10:08:18 CEST

- ITB PCR A, v 1.6 General Product Category Rules for Construction Products
- ISO 14025:2006. Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- ISO 20915:2018 Life cycle inventory calculation methodology for steel products
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases - Carbon footprint of products — Requirements and guidelines for quantification
- EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- KOBiZE Emissions (CO_2, SO_2, NO_x, CO and total dust) from electricity, 2022

Instytut Techniki Budowlanej

Elektronicznie podpisany przez Agnieszka Winkler-Skalna; ITB
Data: 2024.06.28 10:54:39 +02'00'

Instytut Techniki Budowlanej
00-611 Warsaw, Filtrowa 1

Thermal Physics, Acoustics and Environment Department
02-656 Warsaw, Ksawerów 21

CERTIFICATE № 644/2024
of TYPE III ENVIRONMENTAL DECLARATION

Products:

Modified Starches

Manufacturer:

Zakłady Chemiczne BOCHEM Sp. z o.o.

Działki Suskowolskie 22B, 26-670 Pionki, Poland

confirms the correctness of the data included in the development of Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued on 28th June 2024 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics and Environment Department
Agnieszka Winkler-Skalna, PhD

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director
for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, June 2024