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Life cycle analysis (LCA) of biopolymer materials

Overview and aims of LCA

Project co-financed by the European Regional Development Fund

Packaging has a vital role in preserving the quality of a food product and extending its shelf life. However, packaging waste represents a significant environmental problem. Moreover, the entire life cycle of the packaging material can have a negative impact on the environment. The REINWASTE project makes it possible for the target groups to become acquainted with the concept of LCA and its increasing implementation in local and regional food sectors.

Figure 1. LCA

Evaluation of the environmental impact of each packaging material requires a broad approach. Life cycle analysis or assessment (LCA) is a process of calculation, where all inputs (raw materials, energy, etc.) and outputs (emissions: liquids, gases and solid waste) during the life cycle of certain packaging materials are summarized and analyzed. The basic methodology involves breaking down a product system into defined process steps, and then measuring the mass and energy flow in and out of each process step. Summarized results can be shown through eco points, or multifunctional indexing. The ultimate idea behind life cycle analysis is preservation of the environment.

The strategy behind LCA is dependent on the goals that need to be achieved. Overall, evaluation of the life cycle of the packaging material makes it possible to define the existing environmental burden, to identify possible improvements that would guide the development of production, or it can be used to support the eco-label award.
LCA is an inclusive approach because:

- LCA includes all components of the packaging system.
- LCA includes all inputs as well as all emissions from the system.
- LCA integrates over time, i.e. all inputs and emissions throughout the life cycle.
- LCA integrates the effects of all constituent processes throughout the packaging life cycle.

The LCA methodology is structured through a widely adopted framework reached by international consensus, which is in the form of ISO standards.

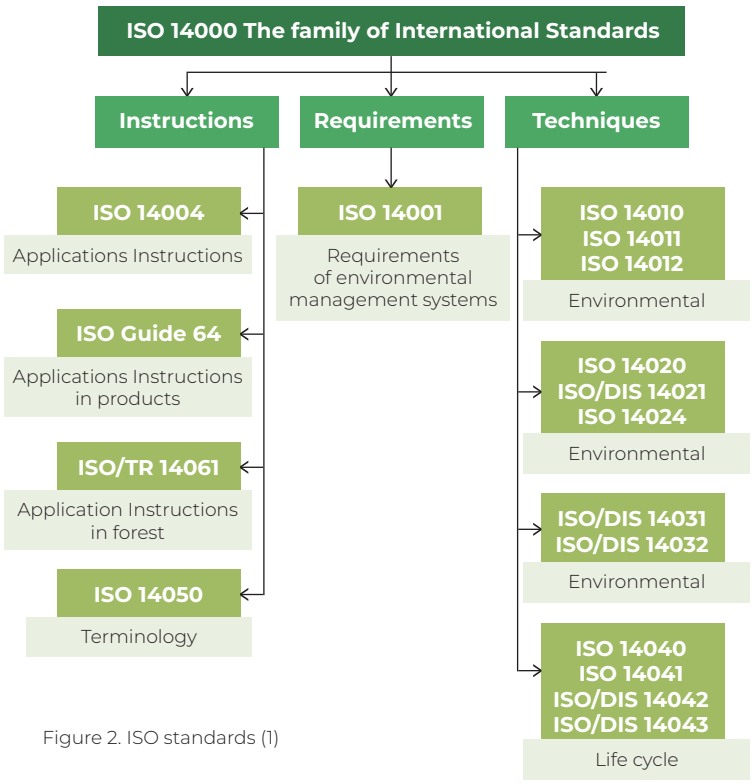
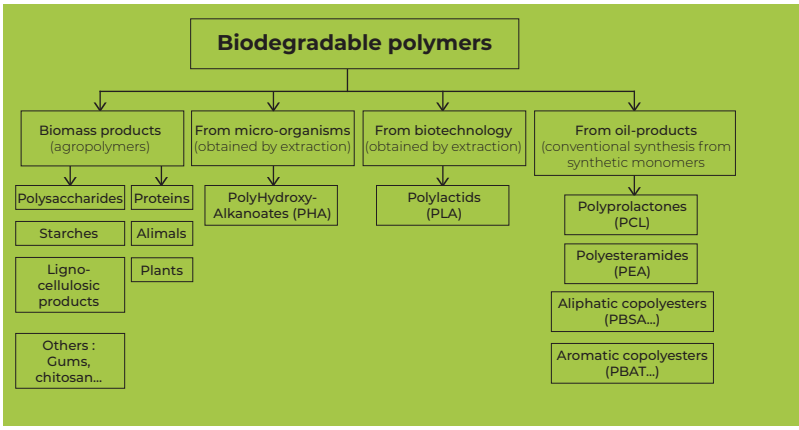


Figure 2. ISO standards (1)

TREND SOLUTIONS FOR:
Use of biodegradable polymers

The assumption that biopolymers are consistent with **sustainable development** must continue to be substantiated by relevant scientific facts. The biggest problem for biopolymers so far has been the lack of an optimal production process. However, much research is focused on constantly improving the functional properties of these products, along with lowering production costs. Biopolymers have shown some advantages over conventional materials, such as lower CO2 emissions, lower global warming impact, and lower consumption of non-renewable resources, etc.



TREND SOLUTIONS

The methodology behind LCA is structured through a widely adopted framework, reached by international consensus, which takes the form of an ISO standard. Thanks to this framework, the entire LCA procedure is divided into four distinctive stages:

- Defining the purpose and scope (ISO 14041);
- Inventory analysis (ISO 14041);
- Impact assessment (ISO 14042);
- Interpretation (ISO 14043).

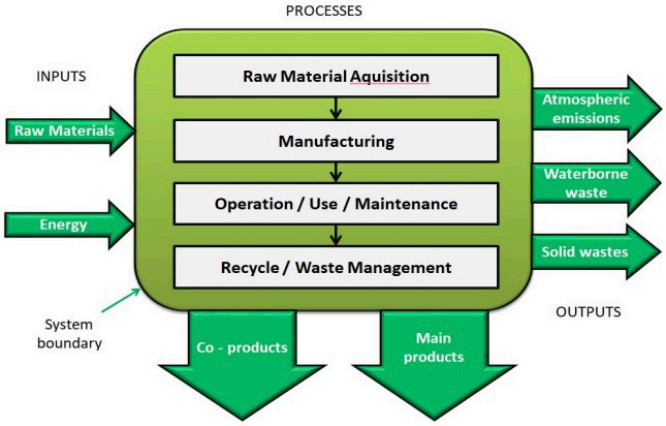


Figure 3. The main stages in life cycle analysis LCA (3)

REINWASTE ACTIONS

LCA monitoring of packaging materials

Monitoring the amount of waste and the methods of waste disposal is one of the conditions for maintaining a balance in nature. For Bosnia and Herzegovina and its neighboring countries, as well as for developing countries in general, it is important to take a systematic approach to addressing the problems of waste management.

Assistance and support to local producers

- Organizing trainings and working groups consisting of experts and representatives of local producers in the field of horticulture, meat and dairy industries, in order to promote the introduction of new types of materials.
- Presenting new packaging materials with a lower environmental impact to be incorporated into local and regional production processes.

Links to articles in relation with the subject

- (1) *http://backupspark.weebly.com/blog/download-iso-14000-implementation-steps-free*
- (2) Avérous, L. (2004). Biodegradable Multiphase Systems Based on Plasticized Starch: A Review. Journal of Macromolecular Science, Part C: Polymer Reviews, 44(3), 231–274. doi:10.1081/mc-200029326
- (3) Life Cycle Assessment (LCA) methodology, *https://www.e-education.psu.edu/eme807/node/690*
- (4) An AnAlysis of life CyCle Assessment in PACkAging for food & BeverAge APPliCAtions, *https://pdfs.semanticscholar.org/441e/40161cb5611b944a91f0f987411654f56632.pdf?_ga=2.237909696.1176797237.1582187882-1097052671.1582187882*
- (5) Chapter 23 – Biodegradable Polymers, *https://www.sciencedirect.com/science/article/pii/B9780123983589000239*

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