



POSITION PAPER: The role of enzymes as key enablers in the green transition and in enabling the European Commission’s sustainability ambitions in the EU Taxonomy and Sustainable Finance

The objective of this paper is to highlight the role of enzymes as key enablers in the green transition, including the European Commission’s sustainability ambitions in the EU Taxonomy and Sustainable Finance (SF). The paper recommends key elements to be amended in the draft technical screening criteria developed for the manufacture of chemicals and chemical products by the Sustainable Finance Platform (SFP).

AMFEP welcomes the Commission’s objective of a taxonomy of sustainable investments. The work to develop a common definition of what constitutes a sustainable investment is crucial to incentivise investments in sustainable solutions contributing to the six environmental and climate objectives of the EU Green Deal.

The report on preliminary recommendations on technical screening criteria for environmental objectives 3-6 of the EU taxonomy¹ published on 30 March 2022 by the SFP (herein after the Draft Criteria), however, overlooks the documented positive environmental benefits of enzymes. Therefore, AMFEP would like to highlight the enormous contribution which enzymes have brought and will continue bringing to the EU for realising their green ambition.

What is the problem?

The current Draft Criteria excludes enzyme production from the definition of environmentally sustainable activities under provision 2.1 “Manufacture of chemicals”². This exclusion is based solely on the fact that enzymes will be regarded as “substances of concern” (SoC) as they meet the classification criteria for respiratory sensitisation. However, enzymes have for decades been used safely by workers due to product design and guidance, and no consumer incidents have been reported in Europe for the last 50 years³.

In addition, the preliminary recommendations set out in the draft Report of the SFP’s Technical Working Group (TWG), published on 3 August 2021, excludes the production of enzyme-based chemical products from the definition of environmentally sustainable activities (2.4 “Manufacture of Chemical Products”)⁴.

Excluding biologically produced enzymes from the criteria due to this SoC listing would conflict with other EU objectives in the EU Bioeconomy Strategy and related objectives for replacing chemicals with

¹ Annex to the Report [“Platform on Sustainable Finance’s report with recommendations on technical screening criteria for the four remaining environmental objectives of the EU taxonomy”](#) (30 March 2020)

² Ibid

³ [New factsheet: The role of enzymes in detergent products: The industry’s commitment to safe and sustainable use - AISE](#) - Available here: <https://aise.eu/cust/documentrequest.aspx?UID=ecaa311b-701c-4a50-83ea-f66963f04d87>

⁴ Annex to the Draft Report [“Draft report by the Platform on Sustainable Finance on preliminary recommendations for technical screening criteria for the EU taxonomy”](#)



safe, bio-based, and sustainable alternatives. In addition, enzymes are critical and irreplaceable to achieve the aim of the Draft Criteria, “Substantial contribution to pollution prevention and control”.

Therefore, we encourage the EU to take a similar approach and recognise enzymes for their key role in reducing waste and effluents as well as the use of water, energy and raw materials, and derogate them from the exclusion of respiratory sensitisers from the criteria – as was done in EU Ecolabel and Nordic Ecolabel criteria for various products. Enzymes are already derogated from the exclusion of respiratory sensitisers from the criteria under 2.6 “Finishing of Textiles” in the Draft Criteria⁵ for the same reason.

AMFEP therefore proposes the exclusion of enzymes from the list of “substances of concern” based on:

- Substances contributing to the environmental objectives in Art 3 of the Taxonomy Regulation and/or
- Substances demonstrating safe use

1. Exclude enzymes from Substances of Concern (SoC)

Enzymes are proteins that catalyze very specific reactions under mild conditions such as low temperatures and moderate pH. Enzymes are used in many applications, including detergents, manufacture of bioenergy, textiles, pulp and paper, food, and feed additives.

Manufacturing products containing enzymes falls under activity 2.3 “Manufacture of Chemicals” and 2.4 “Manufacture of Chemical Products”, as set out in the Draft Report of the SPF’s Technical Working Group and contribute to the “Pollution Prevention and Control” objective in the Draft Criteria where ‘respiratory sensitisers’ are listed as substances of concern (SoC)’ and therefore, excluded. These enzyme products are used for example in detergents, cleaning products, and processing aids for activities listed under 2.6 “Finishing of Textile” or 2.9 “Tanning of leather” in the Draft Criteria⁶.

Due to enzymes’ classification as respiratory sensitisers, they are not considered a solution contributing to sustainability in provision 2.3 “Manufacture of Chemicals” and 2.4 “Manufacture of Chemical Products”⁷ in the Draft Report of August 2021. However, enzymatic desizing is allowed in 2.6 “Finishing of Textile” in the Draft Criteria. AMFEP therefore encourages the European Commission to address this inconsistency in the Draft Criteria by recognising the important contributions of enzymes to the green transition.

The safety and sustainability of enzymes has been enshrined in Ecolabels. While respiratory sensitising substances are often excluded from the Ecolabel criteria of the EU, Germany and Nordic countries,

⁵ Annex to the Report [“Platform on Sustainable Finance’s report with recommendations on technical screening criteria for the four remaining environmental objectives of the EU taxonomy”](#) (30 March 2020)

⁶ Ibid

⁷ Annex to the Draft Report [“Draft report by the Platform on Sustainable Finance on preliminary recommendations for technical screening criteria for the EU taxonomy”](#)



enzymes are specifically derogated due to their safety and benefits which cannot be achieved by other substances. Existing Ecolabel derogations for enzymes include:

- EU Ecolabel: [laundry detergents](#); [dishwasher detergents](#); [industrial and institutional dishwasher detergents](#); [hand dishwashing detergents](#); [industrial and institutional laundry detergents](#).
- Nordic Ecolabel: [laundry detergents and stain removers](#).
- German Blue Angel Ecolabel: [textiles](#).

2. Recognise Substantial contribution of enzymes to pollution prevention and control and other contributions to sustainability

Achieving a “Substantial contribution to pollution prevention and control” is the aim of the criteria for 2.1 “Manufacture of Chemicals” as outlined in the Draft Criteria⁸. Enzymes are essential substances to achieve the aim defined in the Draft Criteria for these sectors. Enzymes are able to significantly decrease CO₂ emissions and energy and reduce the amount of required raw material and waste⁹. The sustainable contributions of enzymes are well recognised and well described in a recent REACH RMOA report¹⁰.

“Enzymes [...] have a very specific targeted activity meaning that good results can be achieved with small quantities without the damage to process equipment and product that can occur when harsh chemicals such as acids or alkalis are used. [...] Enzymes allow processes to take place at lower temperatures making a significant contribution to lowering energy consumption and process wastes are less damaging to the environment. For these reasons, enzyme technologies make a valuable contribution to sustainable production initiatives and green chemistry”.

The detergent industry developed compact detergent products. Compaction means that the product is, amongst others, more concentrated and with a reduced chemical load to the environment. For example, the average dosage had been reduced by half and the aggregated saving of detergent had been estimated as 30 million tonnes in the period of 1997 and 2017¹¹. Enzymes are a key part of this compaction, since they have a high performance at low concentrations. Such innovation with enzymes has enabled significant environmental savings, while securing equivalent cleaning performance.

The World Wildlife Fund (WWF) has estimated the potential global efficiency improvements enabled by enzyme products by 2030. Enzymes can save up to 93 kg CO₂ per ton of laundry products¹². The

⁸ Annex to the Draft Report [“Annex to the draft report by the Platform on Sustainable Finance on preliminary recommendations for technical screening criteria for the EU taxonomy”](#)

⁹ Bano, T., Priyanka, and Padmadeo, S.R. (2017). Sustainable Industrial Development through Enzyme Technology: An approach toward cleaner production- a literature review. IOSR Journal of Biotechnology and Biochemistry (IOSR-JBB), 3(4), pp. 1-7.

¹⁰ Alpha-amylase REACH RMOA report [Justification for the selection of a candidate CoRAP substance \(europa.eu\)](#)

¹¹ A.I.S.E. Fact sheet 2019 [20190410111600-aise factsheet-2019 compaction_def.pdf](#)

¹² WWF 2009 [Biotechnology could cut CO2 sharply, help build green economy | WWF \(panda.org\)](#)

white paper on Life Cycle Analysis of enzymes used in laundry detergents showed significant reduction of CO₂ emissions and water consumption (Figure 1)¹³.



Figure 1. After 30% reduction of surfactants, enzyme products could still deliver 5% performance increase¹⁴

Enzymes act catalytically and can repeat their job over and over, resulting in high cleaning activity at very low concentrations, whereas surfactants act by forming micelles and are used up during the wash processes (Figure 1). Therefore, replacing parts of the conventional detergent ingredients by enzymes will result in a reduction of the total amount of detergent required per wash. Cutting down the amount of surfactant by using enzyme-based detergent formulations leads to a considerable reduction of CO₂ emissions caused by the manufacturing of detergent ingredients and also in a considerable reduction of the contribution to aquatic toxicity, and of the Critical Dilution Volume per wash.

Enzymes are readily biodegradable and their use in detergent formulations significantly contributes to the reduction of energy consumption and CO₂ emissions.

Figure 2 shows an example of improved stain removal performance at reduced temperatures with the use of enzymes. Washing performance of detergents at low temperature has been improved with increasing enzyme dosage since 1985, while the average washing temperature in EU has decreased from 62 °C to 41 °C (Figure 3). To further quantify the effect of energy saving, it is important to note that if all European households reduced their wash temperature by 20°C¹⁴, then energy corresponding to 5 million households could be saved¹⁵.

¹³ A white paper – A study on powder detergents in Latin America (Novozymes 2020) <https://www.novozymes.com/-/media/Project/Novozymes/Website/website/document-library/LCAs/White-paper-surfactan-replacement-LA-powder.pdf?la=en>

¹⁴ AISE enzyme factsheet. Link to HP [New factsheet: The role of enzymes in detergent products: The industry's commitment to safe and sustainable use - AISE](https://aise.eu/cust/documentrequest.aspx?UID=ecaa311b-701c-4a50-83ea-f66963f04d87) – Available: <https://aise.eu/cust/documentrequest.aspx?UID=ecaa311b-701c-4a50-83ea-f66963f04d87>

¹⁵ Novozymes Assessment based on LCA calculations, 2016

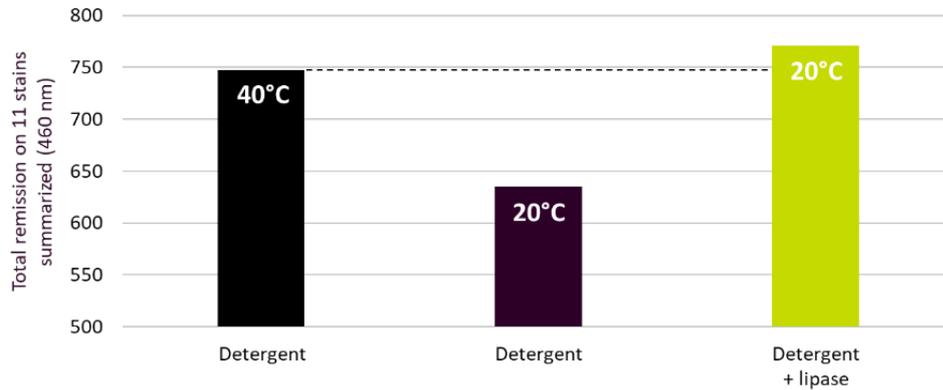


Figure 2. Example on Stain Removal at reduced temperature with Use of Enzymes¹⁶

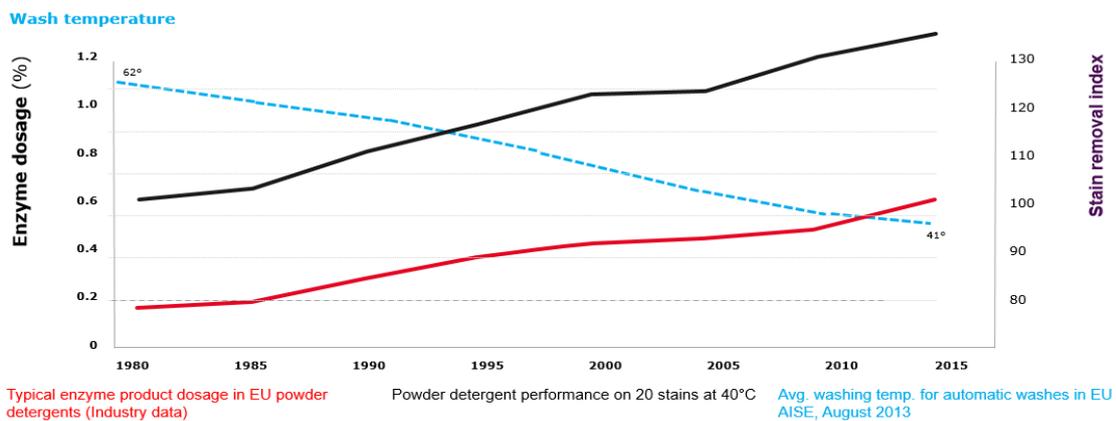


Figure 3. Enzymes enable low temperature washing¹⁷

¹⁶ Wash conditions: EU front loader, standard cotton wash program 20/40°C, 51 min. main wash, water hardness 15°dH, 4 kg ballast, stain set composed of 11 lipase sensitive stains, EU regular liquid detergent (75 ml/wash)

¹⁷ Industry data (2021) & AISE enzyme factsheet. Link to HP [New factsheet: The role of enzymes in detergent products: The industry's commitment to safe and sustainable use - AISE](#). Also available: <https://aise.eu/cust/documentrequest.aspx?UID=ecaa311b-701c-4a50-83ea-f66963f04d87>



3. Recognise Safety of enzymes

Enzymes are proteins and, like other known allergens such as house dust or pollen, can cause respiratory allergy, therefore enzymes meet the classification criteria for Respiratory Sensitisers Category 1. The industry has improved enzyme products to suppress enzyme exposure through product design, such as low volatile liquid formulation and low-dust enzyme granulate, thereby reducing the potential exposure to a level within control¹⁸. The safety in relation to consumer exposure has been demonstrated in studies that have shown that sensitization to enzymes is not an issue for the general population¹⁹ and it is not an issue for the most susceptible part of a population either. The safety in relation to occupational exposure has also been demonstrated via studies and exposure scenarios.

4. There is no alternative to enzymes

Enzymes are biocatalysts which work at low concentrations under mild conditions such as low temperature and moderate pH. In addition, enzymes are readily biodegradable. There are no alternatives to enzymes that are acceptable from the standpoint of environment and health in achieving the overall goal of the European Green Deal. There are no other substances which have the same functions and replace enzymes. Rather, enzymes are replacements of chemicals and they can clean equipment used for food manufacturing under low concentration and mild conditions with excellent washing performance. The equipment can last longer because enzymes are not corrosive. Furthermore, they reduce the chemical load to the environment and reduce water consumption. Enzymes have been widely used in detergents in EU. Removing enzymes from detergents would not only have a significant negative economic impact on the detergent and enzyme industry but would also result in the EU missing out on the enormous contribution that enzymes can have in reducing energy and CO₂ emissions.

5. Recommendation

Given the long history and ample evidence that enzymes are already used as substitutes for hazardous chemicals in a wide range of industrial and consumer products, contributing to the goals of the Taxonomy, AMFEP recommends that enzymes are derogated from the exclusion of “Substances of Concern” (SoCs) and products under activities 2.3 on the “Manufacture of Chemicals” and 2.4 on the “Manufacture of Chemical Products”²⁰. Failure to do so will discourage investments in safe and sustainable alternatives to chemicals and go against the environmental objective of Pollution Prevention and Control. Enzymes, and the broader Bioeconomy, are key enablers in the green transition and should therefore be recognized as such in the EU Taxonomy.

¹⁸ ACI 2019, [Guidance for the Risk Assessment of Enzyme-Containing Consumer Products](#).

¹⁹ Sarlo, K., Kirchner, D.B., Troyano, E., Smith, L.A., Carr, G.J., Rodriguez, C., 2010. Assessing the risk of type 1 allergy to enzymes present in laundry and cleaning products: evidence from the clinical data. *Toxicology* 271, 87-93.

²⁰ Annex to the Draft Report [“Annex to the draft report by the Platform on Sustainable Finance on preliminary recommendations for technical screening criteria for the EU taxonomy”](#)



Enzymes at a glance

Enzymes are a special class of proteins produced by fermentation. Enzymes are required by all living organisms, including humans, to conduct the physiological processes essential for growth and life.

They act as catalysts that speed up the rate of specific chemical reactions and are used to make and improve products, in industries from food and beverage, animal nutrition and textiles through to household cleaning, biofuels and energy generation.

All enzymes are readily biodegradable and hence pose no risk to the environment. Industrial enzymes have an excellent safety profile, with little ability to cause adverse responses in humans. For detailed information about enzymes and their technical, food and animal feed uses, see [About enzymes: definition, how they work and more - AMFEP](#)

About AMFEP

AMFEP, is a non-profit European industry association created in 1977. AMFEP currently has 30 members, representing over 90% of the European and over 80% of the world enzyme market. AMFEP serves as a hub for information exchange and dialogue between enzymes producers and formulators, industry organisations, the scientific community and policy makers and promotes co-operation on regulatory and safety aspects of enzymes. AMFEP informs its customers and other interested parties on the efficacy and safety aspects of its enzyme products and defends and promotes the enzyme industry. Members of AMFEP produce and sell enzymes for use in food, feed, detergents, and other non-food industries, excluding enzymes for pharmaceutical and diagnostic use. AMFEP fruitfully co-operates with European institutions and partner associations worldwide, has observer status in Codex Alimentarius, is Member of the EFSA Stakeholders Consultative platform, and is one of ECHA's accredited stakeholder organisations. For further information see here <https://amfep.org/about-amfep/>

For further information on the issues explored in this position paper please contact AMFEP@kellencompany.com

About EUROPABIO

EuropaBio, the European Association for Bioindustries, promotes an innovative and dynamic European biotechnology industry. EuropaBio and its members are committed to the socially responsible use of biotechnology to improve quality of life; to prevent, diagnose, treat, and cure diseases; to improve the quality and quantity of food and feedstuffs and to move towards a biobased and zero-waste economy. EuropaBio represents corporate and associate members, plus national biotechnology associations and bioregions.

Read more about our work at www.europabio.org