ZEBRA-LIFE 101 series: In this first series we introduce the basis of the project overseeing the project value chain, starting with raw materials, moving into technology and into final products by reviewing their potential benefits. Stay tuned to learn more about ZEBRA-LIFE 101 series and its latest developments.

ANTIOXIDANTS APPLICATIONS

Whether you are aware or not, you have surely experienced oxidation in your daily life. To provide some context, when a polymer turns brittle, a rubber turns sticky or when some foods smell rancid, oxidation takes place. Other commodities such as creams or lotions can also undergo oxidation becoming aqueous and spoilt, and fuels and lubricants can develop deposits that endanger the engine of your car The two natural causes for these unsought reactions are the oxygen present in the air and the light from the sun, both of which we cannot live without. Fortunately, there is a solution for this. The use of antioxidants allows us to protect these materials from natural oxidation, reducing food wastage and expanding the lifetime and performance of our daily used goods.

Synthetic aromatic additives are added as antioxidants to a large variety of goods to extend their lifetime. BHA (Butylated Hydroxyanisole), BHT (Butylated Hydroxytoluene), TBHQ (Tert-Butyl Hydroquinone) and PG (Propyl Gallate) are some examples of the most common antioxidant additives used in the industry which are made of a non-renewable resource such as fossil fuels. Besides it has been demonstrated that these synthetic fuel-based antioxidants can be harmful to human health and the environment. For example, the chemical and physical active ingredients used presently in many products in the market such a sunscreen, have been shown to damage marine ecosystems by causing coral bleaching and oxidative damage to phytoplankton (an essential marine algae that helps preserve water quality). Therefore, looking for alternatives that come from sustainable sources and which safeguard human health and the environment, is crucial to ensure the planet's wellbeing.

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The ZEBRA-LIFE project aims to substitute the usage of synthetic additives by producing lignin-derived bio-aromatics (see our last blog post on Lignin here). These bio-aromatics coming from lignin could be used as antioxidants, UV blockers and formulation preserving agents. As an example, they can substitute synthetic sunlight protective actives, some antioxidant, and preservative ingredients. Adding those to the different targeted industries creates a new market line of products that are both environmentally and user friendly.

During the implementation of the ZEBRA-LIFE project, we expect to reduce the environmental impact of synthetic aromatic additives both on its production and use phase by substituting the synthetic additives by those produced with ZEBRA's technology.

- **Production:** ZEBRA-LIFE additives will be avoiding the utilisation of fossil fuel derived products, and instead, will be creating a circular process that will be valorising the lignin contained in the black liquor, a pulp and paper industry sub-product.
- **Use:** ZEBRA-LIFE additives are expected to have an antioxidant capacity up to twice compared to BHT, one of the mostly used synthetic antioxidant in several sectors including food.

The consortium aims to demonstrate their ability to lower the impact in human health and in biodiversity compared to synthetic additives. The preliminary essays on ZEBRA-LIFE products have shown that they are more stable and should reduce the adverse effects of synthetic additives. Comparatively, for example BHT which has low solubility and thermic stability, is highly degradable and produces transformation products that also pose environmental and health problems, a challenge ZEBRA-LIFE could be able to solve.

In this way, ZEBRA-LIFE will develop a renewable antioxidant product with direct use in multiple end user sectors (e.g., cosmetics, food, rubber, fuels & lubricants), displacing fossil fuel derived products and their adverse effects on the ecosystems and human health. This will promote more sustainable practices across several industries in Europe.

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