



Project title: Sustainable Microbial Valorisation of Waste Lipids into Biosurfactants (Waste2Surf)

Project No. 1.1.1.1/19/A/047

Source of funding: European Regional Development Fund Specific Objective 1.1.1

“Improve research and innovation capacity and the ability of Latvian research institutions to attract external funding, by investing in human capital and infrastructure” 1.1.1.1. measure “Support for applied research”. Project application selection round No.3.

Project partners: [JSC “Biotehniskais Centrs”](#)

Project period: 01.10.2020. – 30.09.2023. (36 months)

Project costs: 647 877 EUR (374 472.90 EUR from ERDF funding)

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Objective: to establish a process design workflow for biotechnological production including long-term sustainability modelling, microbial strain design and bioprocess development for sustainable bioconversion of industrial biowaste – waste lipids (used cooking oil, animal fats and others) collected from food production and catering industry into highly valuable biosurfactants.

Summary: Production of high volume valuables from high volume waste is where knowledge-based bioeconomy approach has its greatest potential. The global generation of organic waste is dramatically increasing each year. Waste fats, oils and grease (W-FOG) from food production and catering industry have become a major stream of organic waste in urban areas. According to the EU estimations, each person generates on average 8 litres of used cooking oil per year. The worldwide generation of used cooking oil is about 29 million tons per year. Meanwhile, disposal of W-FOG is challenging, and utilization is limited to bioenergy production. The Waste2Surf project proposes a novel utilization route for W-FOG, i.e. as a low-cost feedstock for production of biosurfactants (BS) – an alternative to non-biodegradable synthetic surfactants synthesized from petroleum, a non-renewable source, through chemical synthesis routes that can be environmentally hazardous.

Surfactants are one of the most important bulk chemicals that are used in almost every product of human daily life – cleaning products, cosmetics, food, pharmaceuticals, etc. In 2024, the global surfactant market is expected to exceed 41 billion euro. The main advantages of BS include their renewable origin, biodegradability, low toxicity, better foaming properties, and stable activity at a wide range of conditions. Considering their advantages BS have a huge market potential, especially when produced from waste.

The project will address the Smart Specialization Strategy’s (RIS3) priority area Knowledge intensive bio-economy, and several target groups will exploit the project’s results.

The main activities of the project will include the development of a novel process design workflow by integrating model-based metabolic engineering of BS producing yeast strains, waste-to-product bioprocess development, and long-term life cycle sustainability assessment of waste-to-product-to-market system. A list of model-based waste bioconversion designs will be delivered ranked according to an integrated criterion considering environmental sustainability, business parameters and social effects. Finally, integration of unconventional separation and aeration techniques into automated bioreactor system will be designed. The bioreactor will be equipped with an advanced model-predictive fermentation control system. As a result, a cost efficient and sustainable system for BS production from W-FOG will be delivered as a new technology prototype (TRL4).

The lab-scale BS' production will be implemented together with the industrial partner – experienced producer of bioreactors, JSC "Biotehniskais centrs", established in 1996.