

The LIFECAB project: Biogas and digestate with controlled ammonia content by a virtuous biowaste cycle with integrated biological and chemical processes

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In this study, the objectives and the general scope of LIFECAB project are presented, illustrating a novel approach of converting a municipal biowaste treatment plant into a biorefinery producing biofuel and value added bio-based products. One of the main targets of the project is the production of a soluble new bio-based products (SBO) by hydrolysing compost derived from digestate of municipal solid wastes (MSW) and gardening biomass. The addition of 0.5 – 2 % SBO to the anaerobic digestion process of the organic fraction of MSW improves the biomethane production, while decreasing the ammonia content of the digestate. Currently, digestate rich in ammonia require a costly secondary treatment to reduce NH₃ content, by stripping and/or oxidizing/reducing by nitrifying and denitrifying bacteria. Based on the above facts, the first objective of the LIFECAB project is to validate this process at larger scale in real or close to real operational conditions, and prove that CAPEX and OPEX of a SBO production unit are far less than those of the conventional digestate secondary treatment. During the LIFECAB project, a hydrolysis prototype facility of 50 t/y SBO production capacity will be built. Then the produced SBO will be used as additive in anaerobic digestion reactors fed with MSW to demonstrate that digestate with controlled NH₃ content can be obtained, while increasing biogas productivity and quality. In this study, the SBO obtained by hydrolysis of the composted digestate will be added in one of the two reactors constructed at Organohumiki Thrakis (OT) facilities, allowing a direct comparison with the other reactor used as control in real time. Organohumiki Thrakis is a new founded company that produces a soil conditioner from olive mill wastes and it is located in Alexandroupolis, north-east of Greece. The experimental plan of using the SBO will be replicated at Italy (ACEA) and Cyprus (SBLA) partners' locations, to account for day to day and country to country biowaste variability. The second objective of the LIFECAB project is to prove that biowastes can yield bio-based products, which in turn can be used to improve the fermentation process of the sourcing biowaste and its environmental impact.

LIFECAB is a pilot project aiming to validate in real or close to real operational environment, and in different EU countries the above new process for the production of biogas and digestate with reduced ammonia content from the organic fraction of MSW. LIFECAB scopes to demonstrate the virtuous biowaste cycle. In brief, the main process steps are: (i) the MSW (mostly kitchen wastes) are fed to the anaerobic digestion reactor to produce biogas and digestate; (ii) the digestate is mixed with gardening wastes and composted to produce a compost; (iii) the compost is hydrolyzed in order to generate soluble bio-based substances (SBO); (iv) the SBO are added at 0.5 – 2 % level to the biogas feed slurry to yield biogas and digestate with reduced ammonia content. The validation of the process will be replicated in Italy, in Cyprus and in Greece, through collaboration of the project partners in these countries. LIFECAB will validate the two following biowastes processes: 1) hydrolysis of composted biowastes for the production of SBO; 2) anaerobic digestion of MBW organic humid fraction from separate source collection performed in the presence of added SBO. The anaerobic digestion trials will be optimized at each partner site to account for the biowastes variability across the three different locations. Finally, life cycle assessment of the new process will be conducted in order to assess the economic and environmental impact as a function of the MBW nature at the different partners' location.

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