LIFE
MULTI-AD

After-LIFE dissemination and communication plan.

LIFE17 ENV/ES/000331

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LIFE AGREEMENT

Title: High performance multiphase anaerobic rector for agroindustrial wastewater treatment (LIFE Multi-AD 4 AgroSMEs)

Agreement number: LIFE17 ENV /ES/000331

Coordinating beneficiary: AEMA

Associated beneficiaries: SIS, EGA, I&S and ITAINNOVA

Project duration: 01/09/2018 – 30/06/2023

Project budget: 2.177.143 €

Project location: La Rioja (Spain)

PROJECT CONTACT DETAILS

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1. Introduction

The purpose of the After-LIFE communication plan is to articulate how the dissemination of the LIFE Multi-AD 4 AgroSMEs (hereon LIFE Multi-AD), project's results and recommendations will continue after the project ends.

The first section of the plan provides a brief overview of the project's background, objectives, methodology and achievements.

The second section focuses on the After-LIFE communications strategy, describing the objectives, target audiences and methods of communication. A schedule of After-LIFE communication activity outlines the key activities, timing and resourcing envisaged for the five years after the end of the project.

2. Project overview

2.1. Challenge: wastewater, a global problem

Food and drink (F&D) industry, the largest manufacturing sector in the EU, is comprised of 290,000 small and medium enterprises (SMEs) – making up 99% of the entire industry. F&D SMEs are highly water-intensive sector worldwide, producing significant volume of wastewater. These industrial effluents are characterized by high concentration of biodegradable organic matter, which results a significant environment pressure.

Thus, they are most commonly treated by aerobic biological system at the industrial facility where the wastewater is generated. Due to the typical process selection, aerobic biological treatment, relative energy consumption is high. Moreover, due to typical on- or near- site disposal of biosolids without biogas recovery, there is little or no opportunity for carbon emission offset.

On the other hand, anaerobic system appears as a more environmentally friendly and economical process for treatment high-load wastewater. However, high-rate anaerobic reactors already on the market (*e.g.*, UASB, EGSB or IC) are optimised for large enterprises (>1,000 m^3/d, being 2,500m^3 a standard capacity) where economies of scale make vast technology investment affordable. In contract, the F&D sector, dominated by SMEs, does not discharge an enough organic load for existing anaerobic reactors to prove economically viable.

For this reason, it is necessary to develop anaerobic reactors economically affordable to F&D SMEs that allow to treat their wastewater efficiently, as indicated in the EU Water Framework Directive (2000/60/EC), and to produce renewable energy by biogas to contribute to the saving of natural resources, as described in Industrial Emissions Directive 2010/75/EU Integrated Pollution Prevention and Control (IPPC) and reducing CO_2 emissions in line with EC strategic long-term vision for climate neutrality by 2050.

2.2. Project achievements

LIFE Multi-AD was a collaborative capacity-building project aiming to design and industrialise a high performance multiphase anaerobic reactor that generates methane-rich biogas, tailormade for treating wastewater generated in F&D SMEs.

Being aware of the gap in the market, LIFE Multi-AD consortium scaled-up and automatized a high-performance multiphase anaerobic reactor from a patented 100 L prototype (ES-2541078-B1). The upscale process was supported by CFD simulation results in order to predict the performance of the new design, as well as reducing the risk and costs associated with uncertainty. The CFD model developed was used for optimizing the design of the first industrial unit, with special emphasis being placed on influent, chamber baffles and three-phase separator. The most significant modifications of the 1:1 industrial-scale Multi-AD reactor over the 100 L prototype were *i)* elimination of external biogas recirculation, *ii)* increment of diameter/height ratio (*i.e.*, reactor geometry), *iii)* reduction of number of chambers and *iv)* new design of feed distribution pipping and three-phase separator.

Multi-AD technological solution was industrial scale installed (1:1 scale) in the current WWTP of AGE winery (Fuenmayor, SPAIN), which is based on aerobic process by membrane bioreactor. Multi-AD reactor is a multi-staged anaerobic reactor with a volume of 110 m^3 (9.1 m of height and 3.35 m of diameter at the bottom) that has a maximum organic load of 2,000 kg COD/day and is capable of treating up to 200 m^3/day of wastewater. Multi-AD device is made up of an influent system distribution, an anaerobic reactor core (4 chambers bordered by 3 baffles) and a three-phase separator (Figure 1).

Figure 1. LIFE Multi-AD technological solution sky-line.

Thus, in the Multi-AD reactor, the wastewater is pumped from the bottom, uniformly into the reactor, where it moves upwards through the granular sludge bed (20 kg VS/m^3) located along the different chambers. At the top of the reactor, sludge, biogas and treated effluent are separated in a three-phase separator. On the one hand, treated water is sent to an aerobic process for a polishing treatment before it is discharged into the Ebro River, and, on the other hand, biogas is used as fuel in a boiler after desulfurization process by means of bio-scrubber system.

Multi-AD technological solution has an intelligent optimized control thanks to the development of a heuristic automation solution integrating current innovative technologies like Industry 4.0 and Internet of Things. This was achieved through a two-level decision approach ready to be adopted by F&D SMEs: one local and one for remote monitoring and control.

The control logic was developed using a "cause-effect" approach, as well as was implemented on a Siemens S7-1500 PLC with analog and digital IO modules. This approach allows to operate the innovative solution at constant organic load by means of a mass balance over the Multi-AD reactor. Two continuous COD-analyzer were situated in line at the inlet of the conditioning tank and the outlet of the effluent tank, respectively. The analysers produce a continuous measurement value every 2 minutes, that allows the PLC tunes raw wastewater flow to be treated by means a group of flowmeters and flow control valves.

The architecture to carry out the monitoring and control of Multi-AD technology was developed in order to achieve an unattended and fully automated operation. Equipment and instrumentation of demo unit were connected to the power and automation-control panel. The control panel, which integrates the PLC and HMI, was connected to the power panel and the remote-control centre using a SCADA application developed in PcVue.

Multi-AD innovative solution was operated in continuous mode for twelve months, 24 hours a day, 7 days a week. During this period, the anaerobic reactor treated more than 10,000 m^3 of winery wastewater at increasing organic load. Despite influent variability, organic load was gradually increased from 5 to 1,000 kg COD/day thanks to COD based control strategy.

The planned increase in organic took place once anaerobic reactor reaches the steady state. Thus, the values of the following process parameters were evaluated: pH, alkalinity, VFA and COD. pH, alkalinity and VFA had optimal values for the anaerobic digestion process, which shows that Multi-AD devise did not have any episodes of destabilisation or overloading. It is worth to note that the effluent COD concentration was always lower than 700 mg/L during the validation period. This fact, considering the influent COD

concentration, results in a mean degradation efficiency above 95%. These results are in line with previous study with this kind of wastewater.

It important to note that there is a decrease in soluble organic matter through Multi-AD reactor chambers. Thus, there is a stepwise conversion, chamber by chamber, in line with the design propose of a multi-stage reactor, where each chamber behaves as a CSTR. This fact may indicate that Multi-AD reactor is capable to achieve better degradation rates for the same volume than a conventional anaerobic reactor such as UASB.

Anaerobic degradation of winery wastewater generated biogas conversion of 0.36 m^3/kg COD removed, with a biogas production of 3.3 m^3/m^3·day at the highest studied organic load (*i.e.*, 1,000 kg/day). The combustible gas generated after Multi-AD technological solution was characterized by a methane mean value of 84%. Moreover, it is important to highlight that hydrogen sulphide concentration was lower than 10 ppm after bio-scrubber system.

A comprehensive process design was performed in this study to investigate the economic viability of Multi-AD innovative solution. Two different scenarios were selected for treatment of 100 m^3/day of winery wastewater: baseline, based on aerobic process, and Multi-AD scenario, based on anaerobic system coupled with post aerobic treatment.

The Multi-AD scenario would achieve savings in OPEX more than 56,000 €/year comparted to base line baseline scenario. This one-third potential reduction in operational costs is mainly due to energy, chemical and biosolids saving. The integration of anaerobic process in the WWTP allows to save 170,000 kWh/year (*i.e.*, 59%) and 68.000 kg of liquid oxygen as consequence of organic load reduction of aerobic process. In the same line, a notable decrease in biosolid management cost line (18,500 €/year *i.e.*, 79%) was also achieved by Multi-AD scenario due to the significant reduction in sludge produced by the anaerobic reactor operation.

Finally, a business strategy was performed in order to replicate and transfer Multi-AD technological solution on a wide scale, cross-border and trans-sectorial. For this purpose, *i)* an Anaerobic Reactor Design Tool was developed to define the optimal design of an Multi-AD devise for agro-industrial wastewater treatment, *ii)* CE certification was obtained, which means that the product conforms with European health, safety, and environmental protection standards and *iii*) required documentation to achieve intellectual property right protection to the whole Europe was performed under application number EP23382586.8: Reactor for high-performance multi-stage anaerobic system.

2.3. Project dissemination

LIFE Multi-AD raised awareness of the project and its achievements by targeting law enforcement agencies, potential clients.

The project dissemination reached its climax with a successful final conference in La Rioja.

The key communication methods used by the LIFE Multi-AD 4 project for dissemination purposes were:

- Professional (inter-agency) networking at conferences, events and workshops;
- Digital communications – lifesmartwaste.com website; e-mail marketing, webinars and social media (LinkedIn, FaceBook, X and YouTube);
- Media relations in order to increase the impact on policy makers in the years after the end of the project.

In addition to core technical reports, the project beneficiaries developed a variety of dissemination materials to appeal to each target audience, including:

- Web news articles;
- E-newsletters;
- Digital brochures;
- Information leaflets;
- Infographics;
- Social media posts;
- Videos;
- Dissemination reports;
- Notice boards;
- Display banners;
- Press releases.

Figure 2. LIFE Multi-AD dissemination and communication materials.

3. After LIFE dissemination strategy

3.1. Communication objectives

After-LIFE communication objectives are to:

1. Promote the use of the project's insights, tools, techniques and approaches
2. Raise awareness in the agri-food industries so that the use of aerobic reactors becomes commonplace
3. Disseminate the project's results
4. To divulge the progress made and results obtained in the course of the project
5. Educate stakeholders on the key issues that the LIFE project seeks to address, highlighting the importance and benefits of the proposed changes
6. Encourage the adoption of positive actions
7. Build and maintain trust by ensuring transparent communication, acknowledging challenges and providing regular updates on progress

3.2. Strategic approach

I&S will coordinate LIFE Multi-AD dissemination and engagement activities after the project ends, with input and support from the Associated Beneficiaries. Most notably, I&S will continue to disseminate project updates and news to its extensive network of members and other stakeholders in Europe and beyond.

I&S will measure the success of the After-LIFE communications plan against the project's original objectives for adoption of the project's capacity-building resources and recommendations.

Figure 3. Imagines of some LIFE Multi-AD dissemination and communication activities.

3.3. Target audience

After-LIFE communication activity will target to:

- Small and medium-sized enterprises in the agri-food sector
- Environmental regulators
- European 'wastewater' projects

3.4. Inbound digital communications

I&S will maintain the LIFE Multi-AD website (lifemultiad.eu) as the primary information hub for five years after the project end date (June, 2028). The website will provide wide access to key project information, including: project background; publications; videos, training materials; and contact information. I&S will also maintain the project's YouTube video playlist in support of the website.

Due to the official sensitivity of the content in some outputs, not all of the LIFE Multi-AD reports and resources are available on the open area of project's website. In the After-LIFE, the website will include clear guidance to enable representatives of competent authorities to request the required reports or training materials.

The Associated Beneficiaries will maintain web pages hosting project information and links to the LIFE Multi-AD web site.

Figure 4. Imagines of some LIFE Multi-AD dissemination and communication activities.

3.5. Outbound digital communications

I&S, in collaboration with rest of the consortium, will continue with outbound digital communication activity when the project ends to share key dissemination outputs with stakeholders. Activity will include e-mail, social media and webinar activity. One press release is planned to perform every year in order to show the evolution of the technological solution.

I&S will continue to issue e-newsletter updates to the LIFE Multi-AD project's database of engaged stakeholders. The content of these After-LIFE updates will include the project's final digital brochure, the Layman's report and guidance for accessing the project's reports, online tools and those resources not available online due to the sensitivity of the content.

The project's database consists of stakeholders who subscribed during the project to receive news and updates via e-mail.

Figure 5. Graphical abstract of LIFE Multi-AD dissemination and communication materials.

3.6. Display materials

Beneficiaries will continue to use the project's portable display banners as required at suitable events. AEMA will also continue to display a LIFE Multi-AD roll-up banner in a publicly accessible office location, if available, for three years after the project ends (May 2026).

3.7. Professional networking

LIFE Multi-AD project networks have established fruitful links and partnerships with various projects sharing similar objectives. This collaboration encourages the exchange of knowledge, the sharing of experience and the promotion of good practice in wastewater

treatment within the agri-food industry. Example here is a list of projects with which the LIFE Multi-AD project has established a network:

- LIFE ALGAECAN: Adding sustainability to the fruit and vegetable processing industry through solar-powered algal wastewater treatment (LIFE16 ENV/ES/000180). Area: Wastewater treatment in the agri-food industry.
- LIFE ANADRY: Dry anaerobic digestion as an alternative management & treatment solution for sewage sludge (LIFE14 ENV/ES/000524). Area: Anaerobic treatment.
- LIFE ECODIGESTION 2.0: Innovative technology scale-up for the control and automation of codigestion in WWTPs to produce green energy on demand (LIFE19 ENV/ES/000098). Area: Anaerobic treatment.
- LIFE PureAgroH2O: Pilot operation of innovative photo-catalytic nanofiltration technology for pollutant removal and water re-use of Agro-industrial effluents (LIFE17 ENV/GR/000387). Area: Water reuse in the agri-food industry.
- LIFE STO3RE: Synergic TPAD and O3 process in WWTPs for resource efficient waste management (LIFE15 ENV/ES/000379). Area: Anaerobic treatment.
- INBEC: Boosting and developing a sustainable economy through innovation and business cooperation (Proyect 0627_INBEC_6_E). Area: Waste management.
- MODEL2BIO: Modelling tool for giving value to agri-food residual streams in bio-based industries (H2020/887191). Area: Organic matter valorisation.

…and many more

This synergy of efforts among projects allows for the exchange of best practices, exploration of new approaches, and harmonization of solutions to address common challenges. Furthermore, it provides a platform to share results, innovations, and recommendations, thereby strengthening knowledge dissemination and impact potential.

3.8. Conferences, networking events and webinars

AEMA, and Associated Beneficiaries, will continue to seek opportunities to disseminate project results via a broad range of speaking and networking opportunities at conferences (including the General Assembly), seminars and webinars during the After-LIFE phase.

Some international congress where is planned show LIFE Multi-AD is the 17th and 18th Bioenergy Congress organized by AVEBIOM. This congress will be celebrated in Valladolid in 2024 and 2025.

Beneficiaries will continue to use the dissemination tools developed for this purpose, including the project's portable display banners, infographic information leaflets.

3.9. LIFE Multi Ad: the future of the communication plan

As part of our dedication to knowledge transfer and long-term impact, we pledge to showcase the LIFE Multi-AD guide at various events, fostering engagements with governmental bodies and industry stakeholders. The aim is to ensure that the insights gained and the technological advancements achieved through the project continue to influence and shape sustainable wastewater management practices.

In an effort to maintain an accessible repository of project information and resources, the LIFE Multi-AD website will be hosted for an additional 5 years beyond the project's conclusion. This extended online presence will serve as a valuable reference for interested parties, allowing them to access project details, research findings, and relevant documentation.

During and after the project's completion, we will actively manage the redirection of traffic from our primary LIFE Multi-AD website to its extended online presence. This strategic approach aims to ensure a seamless transition for users seeking information about the project, contributing to the continued success and impact of LIFE Multi-AD in the years to come.

3.10. The evaluation of the communication plan

The After-LIFE communication plan will be regularly reviewed and the effectiveness of activities evaluated. Some of the evaluation methods that will be used include:

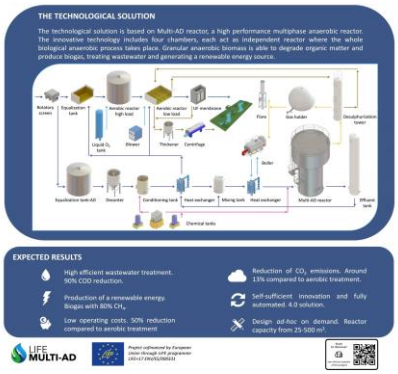
- Tracking the number of referrals to the LIFE Multi-AD website from partner websites and other websites, as well as other external digital sources;
- The number of presentations and demonstrations of the website made and tracking of any significant increase in traffic to the website and related products;
- The number of newsletters and staff briefings issued by all partners and tracking of any significant increase in traffic to the website and related products;

4. Annex

Annex A: LIFE Multi-AD communication and dissemination materials.


LIFE MULTI-AD
www.lifemultiad.eu
High performance multiphase anaerobic reactor for agroindustrial wastewater treatment
TRL 6
TRL 8
Project cofinanced by European Union through LIFE programme: LIFE+17 ENV/ES/000331
Total budget: 2,177,143 € (EU contribution: 60%)
Duration: 01/09/2018 – 28/02/2022
Partners:


THE PROJECT
Aerobic process (Baseline)
Multi-AD (Prototype performance)
OBJECTIVES


THE TECHNOLOGICAL SOLUTION
EXPECTED RESULTS


LIFE
MULTI-AD
0:01 / 5:29
Life Multi AD
LIFE Multi-AD 4 AgroS...
4 abonnés
3
Partager
Télécharger
Extrait
36 vues il y a 2 mois
...afficher plus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processes
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A Practical Approach for Biochemical Modeling in the CFD Evaluation of Novel Anaerobic Digester Concepts for Biogas Production


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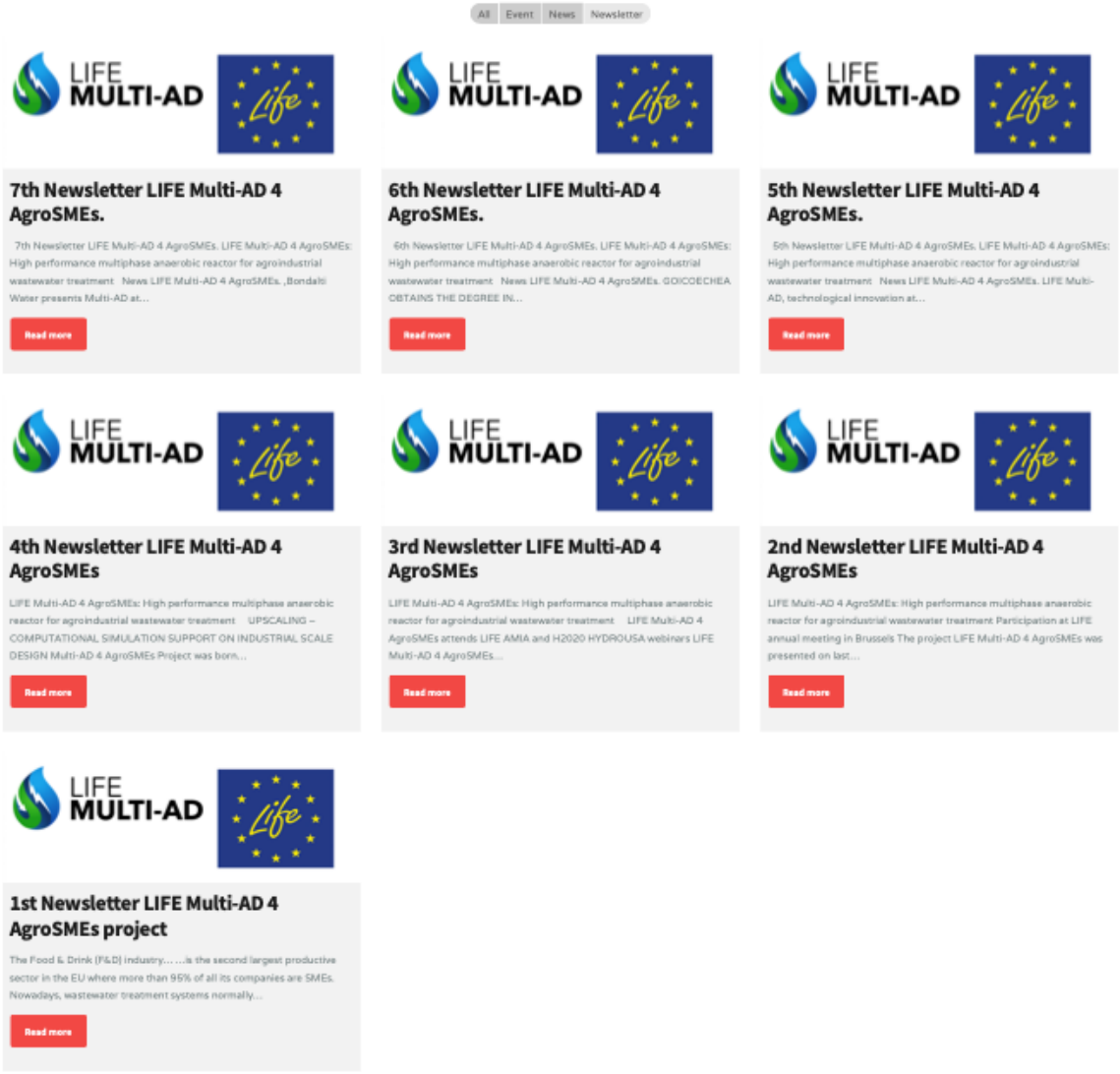

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