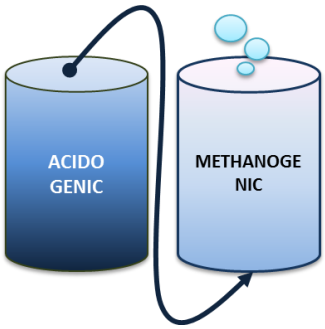

PROJECT FINAL REPORT

Final Publishable Summary Report

Grant Agreement number: 602007

Project acronym: PHASEPLIT

Project title: Two-Phase Acid/Gas Anaerobic Reactor for Industrial Wastewater of Food & Drink SME Industries

Funding Scheme: FP7-SME-2013-1

Date of latest version of Annex I against which the assessment will be made: 2016-03-23

Final report: 1st ☐ 2nd X☐ 3rd ☐ 4th ☐

Period covered: from 01/06/2015 to 30/11/2016

Name, title and organisation of the scientific representative of the project's coordinator[1]:

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Project website[2] address: http://www.phaseplit-fp7.com/

[1] Usually the contact person of the coordinator as specified in Art. 8.1. of the grant agreement

[2] The home page of the website should contain the generic European flag and the FP7 logo which are available in electronic format at the Europa website (logo of the European flag: http://europa.eu/abc/symbols/emblem/index_en.htm; logo of the 7th FP: http://ec.europa.eu/research/fp7/index_en.cfm?pg=logos). The area of activity of the project should also be mentioned.

Declaration by the scientific representative of the project coordinator[1]

I, as scientific representative of the coordinator1 of this project and in line with the obligations as stated in Article II.2.3 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate):

  ☐ has fully achieved its objectives and technical goals for the period;

  ☒ has achieved most of its objectives and technical goals for the period with relatively minor deviations[3];

  • has failed to achieve critical objectives and/or is not at all on schedule[4].

- The public website is up to date, if applicable.
- To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 6) and if applicable with the certificate on financial statement.
- All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 5 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name of scientific representative of the Coordinator: Ms. Estibaliz Huete

Date: 24/02/2017

Signature of scientific representative of the Coordinator:

[3] If either of these boxes is ticked, the report should reflect these and any remedial actions taken.

[4] If either of these boxes is ticked, the report should reflect these and any remedial actions taken.

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1. Executive Summary

The Food & Drink industry (F&D) is the second largest manufacturing sector in the EU. More than 95% of all companies in this sector are small enterprises (less than 50 employees) suffering from lack of environmental competitiveness, mainly due to:

- The F&D industry is still a main source of biodegradable organic pollution in European rivers with wastewater with high concentration of biodegradable organic matter -up to 30kg/m3 Chemical Oxygen Demand (COD).
- This F&D wastewater is inefficiently treated in centralised plants which do not treat separately their residues from urban residues. Additionally, F&D SMEs must pay costly treatment fees to municipal treatment plants, so wastewater treatment represents an average of 5% of turnover for medium size F&D SMEs. The relative investment and operation costs are two times higher for SMEs in comparison to large enterprises.
- F&D SMEs are very intensive in the use electricity and heat, which accounts for up to 5% of the average price of F&D products. Saving energy is an urgent need to reduce production costs and compensate the expected increases in the price of agricultural raw materials and in energy.

One of the current alternatives to treat F&D wastewaters and produce biogas is the use Anaerobic Digestion (AD) that present advantages compared to classical aerobic treatment. But current AD solutions have some limitations for being used in F&D SME size industries, such as limited biomass activity, low reactor stability, sensitivity to toxic H2S, very susceptible to acidification and limited % of CH4 in biogas (<70%). In addition, current Anaerobic reactors available in the market are extremely expensive (in €/m3) for an SME of this sector.

PhasepliT is a multidisciplinary consortium comprised of scientifics from both commercial sector (**AEMA,** Spanish SME**; SIS,** Romanian SME**; Industrial Moreypi,** Spanish SME**; Sumol+Compal,** Portuguese large company; **Prodeval,** French SME and **BEL**, French SME), and research centers (**IBET,** Portugal and **Inspiralia,** Spain) who joined together to develop a decentralized wastewater reactor customized for its installation at small and medium F&D companies. This technology will allow SMEs to comply with current restrictive EU regulations and to reduce organic pollution in rivers, at the same time makes the solution affordable to SMEs thanks to a reduction of investment costs and in operation costs. PhasepliT will cover its own energy consumption and generate a surplus of renewable electricity and heat for the SME to be used in other areas of the process.

PhasepliT is based on two-phase (acid/gas) anaerobic process, where the acidogenic stage and the methanogenic stage are separated. Main benefits are:

- Improving reactor stability, overcoming many problems of the classical solution.
- Easier and better monitoring and control system, saving costly operator hours.
- Increase of wastewater cleaning efficiency (>95%) with no need of expensive polishing treatment, therefore reducing costs.
- Biogas quality increased (>80% of CH4), meaning more energetic solution.
- Reduce the dependence of big reactor size, being optimized.

Although PhasepliT will maximize biodegradable COD removal from wastewater in the F&D highest priority sectors (Fruit & Vegetables, Meat, Bakery, Fish & Seafood and Drinks, …), this is also an affordable and high-performance solution for any SME wastewater that has a high content of biodegradable organic matter (sugar, fats and proteins).

The feasibility analysis of a Phaseplit real plant unit has revealed that is it possible to produce a profitable system at SME size (payback<5 years) for those cases with high waste water flows and high biodegradable COD, where the SMEs have the capacity to internally use the heat and power generated by the Phaseplit plant in other part of their facilities and already count with an easy access to an aerobic treatment plant. Those countries with incentives to produce green energy will put this technology in even better situation.

2. Summary description of project context and objectives

The Food & Drink industry (F&D) is the second largest manufacturing sector in the EU. More than 95% of all companies in this sector are small enterprises (less than 50 employees). They F&D SMEs exploit small-scale economies based on traditional food preferences between different EU regions, what means very difficult to compete to big companies (economies of scale and productivity). F&D SMEs suffer from lack of environmental competitiveness, mainly due to:

- The F&D industry is still a main source of biodegradable organic pollution in European rivers with wastewater with high concentration of biodegradable organic matter -up to 30kg/m3 Chemical Oxygen Demand (COD).
- This F&D wastewater is inefficiently treated in centralised plants which do not treat separately their residues from urban residues. Additionally, F&D SMEs must pay costly treatment fees to municipal treatment plants, so wastewater treatment represents an average of 5% of turnover for medium size F&D SMEs, and relative investment and operation costs are two times bigger for SMEs in comparison to large enterprises.
- F&D SMEs are very intensive in the use electricity and heat (up to 200 kWh/ton and 3 GJ/ton respectively for medium size F&D SMEs), which accounts for up to 5% of the average price of F&D products. Saving energy is an urgent need to reduce production costs and compensate the expected future increases in the price of agricultural raw materials and in energy.

Several alternatives to cost-efficient wastewater treatments are available in the market. The classical aerobic treatment is very spread in the sector because it easiness of application but their cost in energy consumptions and sludge disposal increases as the concentration of organic matter does, being un-affordable for many SME. Another alternative to treat F&D wastewaters is the use Anaerobic Digestion (AD) that present advantages compared to classical aerobic treatment because produce valuable biogas.

However, current AD solutions have some limitations for being used in F&D SME size industries, such as limited biomass activity, low reactor stability, sensitivity to toxic H2S, very susceptible to acidification and limited % of CH4 in biogas (<70%). In addition, current Anaerobic reactors available in the market are extremely expensive (in €/m3) for an SME of this sector. Thus, SMEs need an urgent solution in order to improve their production efficiency by means of getting access to cost-efficient wastewater treatments

The PhasepliT partnership has been ideally placed to cover the supply chain to develop and exploit this technology. The consortium comprises four European SME suppliers of environmental services and technologies (AEMA, MOREYPI, SIS and PRODEVAL) from three different countries (Spain, Romania and France) and two F&D end users (BEL and SUMOL) from two different countries (France and Portugal), and AEMA, MOREYPI and SIS as SMEs have limited R&D capability, resources and expertise of their own to unlock the anaerobic technology knowledge protected by large enterprises, so they recruited two reseach centers: Instituto de Biologia Experimental e Tecnológica (IBET, Portugal) to support in characterisation and operation of the two-phase microbial process and Tecnologías Avanzadas Inspiralia (INSP, Spain) supporting in the Supervisory Control Systems with advanced in-plant monitoring and also in the definition of the key reactor components.

PhasepliT project looks for some scientific and technological objectives:

Scientific objectives:

1. To study and determine the range of operational conditions for a preliminary COD removal >75% and >50% CH4 in biogas from the methanogenic phase at laboratory scale.
2. To identify the main species, present in the hydrolytic/acidogenic and methanogenic sludge and determine their metabolic activity and kinetics.
3. To identify the operational conditions that control the stability of the system and to determine their optimal range for high performance (COD removal >95%, >80% CH4 in biogas) at pilot scale.
4. To study the effect of changes in selected operational conditions and wastewater composition on reactor stability and performance at pilot scale.

Technological objectives:

1. Laboratory scale integrated set-up for two-phase anaerobic reactor with separate hydrolytic/acidogenic and methanogenic bacterial consortiums treating end users' wastewater.
2. Pilot scale two-phase anaerobic flow reactor with separate and granulated hydrolytic/acidogenic and methanogenic bacterial consortiums treating end users' wastewater.
3. To implement a successful fuzzy logic-based SCADA on pilot scale two-phase reactor.
4. To optimise the engineering design and techno-economics of a pilot two-phase reactor into a high-performance prototype.

3. Description of main S & T results/foregrounds

The actual developments obtained for each result after the execution of the PHASEPLIT project have been:

1. Identification and characterization of the most interesting source of wastewater from the end-user and its physical and chemical characterization (COD, TSS, VS, N, P, etc), checking its suitability for the process. Several sources of wasterwater inside the F&D facilities were studied and those used from the washing of the food were found of less interest due to their relative low content of biodegradable COD compared to those wastewater coming from their direct processing (mainly extracts of different kind). One liquid residues from each source containing those extracts were selected from the End-users as promising feedstocks for anaerobic digestion in two-phases: spoiled juices and winery wastewater.

2. Design of laboratory set-up (5-L) full equipped for the two phases including gas flowmeter and on-line CH4 and CO2 analyser able to work for long periods with autonomy as the basic first approach to the process equipment. Hydraulic tests were performed, confirming that the reactors were ready to be operated using the feedstock supplied by SUMOL-COMPAL and AEMA in order to mature and separate hydrolytic/acidogenic and methanogenic microbial consortia from a single-phase sludge seed.

3. Better Knowledge about the factors that affect the operational efficiency of a two-phase anaerobic reactor for the Food and Drink wastewater studied, providing the best operation condition to up-scale form 5-L reactors to 100 L scale. These factors have been: the working temperature, the type of aggregation of the microbial consortia, the hydraulic retention time (HRT), the solids retention time (SRT), the organic loading rate (OLR), the chemical oxygen demand (COD) of influent and effluent of each phase. Another result is the need to supply nutrients as supplement to reach the adequate (C/N) ratio.

4. An identification of the microbial communities occurring in each reactor, their abundance and their ability to agglomerate in granules by fluorescence in situ hybridation (FISH) and 16S rDNA gene clones libraries were done, firstly al 5-l scale and later on confirmed at 100 l scale. The microbial communities present in the bioreactors of this two-phase system were shown to be very different, both in terms of microbial composition and the degree of granulation. The operational conditions of the acidogenic reactor are the ideal ones to inhibit methanogenesis, thus illustrating that the reactor operation is suitable for the acidogenesis process. Contrarily, methanogens were abundantly observed in FISH experiments and identified through DNA sequencing.

5. Development of a calibrated metabolic model able to describe the metabolism of the different phenotypic microbial groups in terms of reactants and groups. This model can predict the stability and performance of the reactor as a function of the monitored operational conditions. Firstly created with data from 5-L scale, it has been validated with data from operation at pilot scale. The investigation of the

hydraulic and metabolic balance and stability between phases has led to the selection of the optimum conditions and to identify parameters that suits fuzzy logic rules in order to create a decision support system. The model showed that the initial composition of the inoculum plays a very important role in the methanogenic activity.

6. Development of a numerical model for EGSB reactor simulation to remark the performance of the different parts using the commercial CFD software ANSYS Fluent 16.0. The hydrodynamics of the three “fluid” phases have been included in the model: wastewater, biogas and sludge. The modelling approach has been verified by comparing the results with those from a CFD model from the published literature and validated by comparing the sludge concentration distribution and the biogas production rate with measurements made from the 100L conventional EGSB reactor. The agreement between the CFD model and the test measurements is acceptable demonstrating that the model is able to reproduce the main features of the physics of the flow in the reactor.

7. The numerical model developed and validated has been used to simulate the performance of conventional EGSB and see the room of improvement, identifying different key component for the Phaseplit 100L solution. As result of several design iterations with the model, 3D design of key components was defined and sent to the industrial partner to build the parts that are inside the reactor.

8. A control system based of fuzzy-logic algorithms has been implemented in the electrical cabinet, receiving information from the instrumentation of the plant, analysing the values and taking decisions. HW is composed of instrumentation and actuators, PLC and an interactive HMI panel (enclosed in the cabinet), while SW includes the programing logic and the screens of the HMI.

9. Advanced programing has been built using a Logic Control Data base formed by fuzzy control rules and linguistic terms which has modelled the operation conditions, controllable variables, monitored parameters and interdependence between them. It has used linguistic terms such as “IF-THEN” Fuzzy Logic rules have been defined according to rules proposed by the experience and operation.

10. The control system + electric cabinet has been implanted in a pilot plant prototype containing the reactors for two-phases, settler and auxiliary equipment (equalization tanks, pump and instruments). They are placed in a self-supporting steel structure equipped with self-steering wheels. Phaseplit pilot plant is a complex biogas generation process able to work unattended in several locations. The plant has been provided with a remote system to monitor the plant status and make plant analysis though SCADA tools.

11. The plant prototype of the Phaseplit technology (100 L) has been validated with different type of wastewater at end-user facilities: Sumol + Compal (spoiled juices) and AEMA (winery wastewater). Plant was successfully operated in both locations and the ability of process developed to treat this type of residues was proved. The acidogenic reactor has presented high levels of conversion and production of VFAs with both wastes. Methanogenic reactor presented high levels of COD conversion and gas production with both types of influent. Gas Yield obtained reached almost

the maximum theoretical one (0.35 gCH4/(gCOD.d) and high percentages of CH4 and CO2 guarantee a good quality biogas to be used in energy production.

12. The feasibility of a Phaseplit real plant unit has been evaluated in terms of operation and investment cost and with an analysis of profitability. The analysis has been constructed with the estimation of the different parts supplied by the partners. From the different scenarios of biogas production at SME scale, those that provide high waste water flows and high biodegradable COD are considered profitable (payback<5 years).

4 Potential impact and main dissemination activities and exploitation results.

POTENTIAL IMPACT ON EU SOCIETY

There are a number of benefits to the EU that will be provided by the PhasepliT project and these include

1. Reduction of organic pollution in river water

PhasepliT will be a decentralised solution installed at each SME. Contrarily to public wastewater plants treating effluents from several industries, if a reactor at one SME temporarily fails, the rest will keep working and the impact in dumping of untreated wastewater to rivers will be dramatically reduced to a minimum. It has been estimated that the costs of organic pollution in rivers are on average €10/kg COD dumped. Assuming that just 1% of the F&D wastewater COD goes to rivers, and considering that the annual COD load of the total European F&D industry is 0,6 Mtonnes (308,000 SMEs, average 27,600 m3/year and 7 kg/m3 COD), the current costs of organic pollution are EUR 595 million. If PhasepliT finally penetrates 1%, it will save €59 million by improving water quality.

2. Contribution to 20% of renewable energy in 2020

PhasepliT will help achieve this European objective because biogas is officially considered a renewable source of energy. According to the EEA the renewable electricity consumption in Europe is around 17% of 3374 TWh. Since PhasepliT is expected to produce 3 Kwh/kg COD and our market is 1% (0,59 Mtonnes COD/year), this project will produce 1,78 TWh and therefore help the EU global objective by increasing 0,5% the current use of renewable electricity. It also saves energy derived from scarce resources like fossil fuels.

POTENTIAL IMPACT ON PARTICIPANTS

The project is going to provide SME´s opportunities to strengthen their current market position, increasing shares in their respective markets, and entering in new markets. They also increase their competitiveness with added values derived from the acquired new knowledge by overcoming the following challenges:

• **Making the anaerobic reactor larger as the best way for the engineering improvements to be cost-effective at industrial scale**.

Investment costs per volume of wastewater treated increase exponentially for small sizes. Therefore, current anaerobic reactors are only suitable for large F&D enterprises. Although 75% of the worldwide anaerobic treatment capacity of industrial wastewater is done in Food & Drink industries, the profile of the industries currently using anaerobic reactors corresponds to large enterprises. The volume of PhasepliT reactors can be reduced and still maintain high performance because they are tailor-made for SMEs (compact). Both features will reduce investment costs. Also the smaller volume will also reduce the time and costs of start-up.

• Key components for these reactors are patented by large enterprises

The key components of the reactors are usually patented, giving license access rights for its production only to a few companies. Consequently, around only 20% of the installed anaerobic reactors where constructed by small environmental services enterprises or by the industries themselves (UASB or less efficient designs) and the remaining 80% are built by just dozens of large European companies. Phaseplit technology will provide partner´s SME clients with a useful tool to treat their wastewater a reduced price.

• Extra cost in aerobic polishing steps to comply with acceptable discharge limits

Even though these systems enjoy advanced engineering solution, they are based on single-phase operation and commonly they have efficiencies of around 70-80% COD removal. Large companies can afford extra investment and operation costs associated to polishing by activated sludge thanks to their large wastewater volumes. SMEs cannot afford bigger polishing cost and need the highest COD removal to comply with Wastewater Treatment Directives. Phaseplit will minimise polishing costs of wastewater and improves cleaning efficiency (95% COD removal).

• **Energy recovered from biogas does rarely cover reactor's energy consumption.**

Only the Internal Circulator reactor (IC) has a patented design that saves operation costs by gas recirculation. Also, deficient control systems waste the potential of energy efficiency. These high consumptions cannot be covered by the low concentration of methane (<70%) in the biogas and the limited amount of biogas produced (average of 80-85% COD removal) resulting from their operation in single phase conditions. The resulting renewable biogas of Phaseplit has a higher energy content per unit COD removed (>80% CH4). This will produce more electricity and heat by conventional biogas-to-energy conversion system. Energy costs (electricity and heat) will also be cut because PhasepliT is expected to generate surplus energy for its use by SMEs (2 kWh/kgCOD). So, PhasepliT can increase the economic benefits derived from biogas.

DISSEMINATION ACTIVITIES

Relevant dissemination action where PhasepliT has been present are shown next:

1. **WEB PRESENCE:** The PhasepliT project website has been developed by Dissemination Manager, and is being keeping updated during the whole life of the project. This website has allowed partners from the Consortium, European Commission, or external companies or agents to know what the project is about and promote it.

   The website has covered two sides:

   - A public site that can be accessed by anyone with public general information about the project. The link to this page needs to be easily reachable and accessible from common web search engines like Google or Yahoo.
   - A private area within the website only accessible by the members of the consortium that makes possible the collaborative work.

The “public area” has different pages with project information:

- General description of the project concept, need, etc.
- Detailed information of the main objectives of the project.
- Information about the partners of the project, contact information, R&D performers and SMEs involved.

The “private area” is placed in the same site as the public website but login name and password are required to access that content. A user account is given to every member of the consortium in order to facilitate the access to the private area of the website.

Once a user logs into the website, he/she can access any time to important information for project development, such as:

- Contracts: Last version of DOW, GA and CA.
- Meeting information: Minutes and presentation.
- Technical information: technical deliverables and reports.
- Other: videos, images or any type of file.

SMEs can also access to this section to get these files and check the status of the project.

2. **TRAINING ACTIVITIES**: INSP and IBET have organize training sessions and all SME attended. In addition to general aspects of PhasepliT technology, they have been focused in specific fields as showing PLC control functionalities and advantages (to SIS), reactors technical features (to AEMA) and benefits of novel design (to MOREYPI). Key features of the technology developed has been used by these SMEs for the description and marketing of their products. SIS, AEMA and MOREYPI will in turn become trainers of third parties exploiting licenses after the project.
3. **PhasepliT VIDEO CLIP**: one promotional video clip has been produced to show the problem of the SME food and drink sector, the PhasepliT technology as an effective solution to the problem, the benefits for the end-users and the role of the partners in the Consortium. Video clip has been uploaded at www.youtube.com in the following link https://youtu.be/OjLkVzoXx3k. Furthermore, the video has been uploaded to the main social networks sites such as Facebook, Twitter and LinkedIn
4. **FACE-TO-FACE VISITS WITH SMEs**: AEMA and SIS have been carried out several face-to-face visits to the F&D SMEs to show and explain the new proposed technology, advantages over the current solution and capabilities of new technology. MOREYPI has presented the project and the PhasepliT technology to companies in their natural business areas mainly to penetrate in spill over markets and interested stakeholders.
5. **DISSEMINATION TO EUROPEAN LOBBIES**: We have been in contact with The European Association of Fruit and Vegetables (PEIFL), who has received PhasepliT with a warm welcome and put our consortium in contact with Distillerie BEL who finally become partner in the project. The European Fruit Juice Association (AIJN) has been informed about the progress of the PhasepliT though its member SUMOL.

We also have count with the support of European F&D associations like Beaujolais Cluster and the Brewers of Europe.

6. **PhasepliT PUBLIC ACCESSIBLE PUBLICATIONS**: some partners AEMA and SIS have produced several press releases to advertise the technology in industrial magazines, mainly on-line, such as: “Industria Química.es”, “Aguasresiduales.info”, “Blog del Agua”, “iagua.es”. IBET plans to write between two and three scientific articles in journals of the bioengineering sector such as Water Research.
7. **PARTICIPATION IN FAIRS, EVENTS AND CONFERENCES:** PhasepliT Consortium has participated in workshops and trade fairs from the beginning of 2015. SIS, AEMA and PRODEVAL have selected the best events and they have attended them, like the International Conference on Control Systems and Computer Science, IWATER (International conference on the integral water cycle) or POLLUTECH (International exhibition of environmental equipment technologies and services). Furthermore, AEMA has prepared several conferences with the winery sector in which the PhasepliT project has been presented. Regarding the RTDs, IBET has presented the PhasepliT project in the 14th world congress on anaerobic digestion and in 10th ISEB International Society for environmental Biotechnology Conference Barcelona (Spain).
8. **DISSEMINATION MATERIAL**: All members of the consortium have participated in preparing some dissemination material to be distributed in the events they attend. For external dissemination:

    - Press release: A general text was agreed in the Consortium in English and members have translate them to the different languages and delivered to their natural communication channels to announce the nature of the project and the objective it pursues. Press Releases have been sent to specialized reviews and newspapers during the project execution to announce the main technological developments.
    - Brochures and leaflets have been produced and distributed by partners in those dissemination event they attend. They contain the essential information about the PhasepliT Technology and what it is more important, the relevant contact details to receive more information and attract potential stakeholders. They have been updated along the project.
    - Posters. Several posters have been prepared for specific events, for instance the “14th world congress on anaerobic digestion in Viña del Mar, Chile, 15-18 Novembre 2015” or “Inventika trade fair” in Romania. Their content was adapted to the target audience.
    - Newsletters and bulletins issued by partners contains news about the progress of the project. The content is usually brief but highlighting the contact details to seek the interest of the potential stakeholders. They have been usually sent by electronic means to their list of business contacts.

    Any dissemination material, project publications and project website will include the following mention: The research leading to these results has received funding from the European Union's Seventh Framework Programme managed by REA –

Research Executive Agency http://ec.europa.eu/research/rea (FP7/2007_2013) under Grant Agreement N. 602007.

EXPLOITATION OF RESULTS

PhasepliT project involves partners form different European countries Spain, France, Portugal and Romania. This will facilitate the initial reach-out to European market, through first dissemination and later on exploitation endeavours.

The PhasepliT project Foreground exploitation strategy is constructed under following pillars:

- To identify key user groups who have influence in their own regions.
- To work with end users groups to test and trial product ensuring the end product is what the market needs
- To develop product Champions throughout Key European markets.

Consortium has done a market search identifying: market needs, target customers, market segment, competitors. A strategic approach for investments and commercial activity and an implementation schedule has been developed. The business plan has estimated pricing for the final results and a sales forecast.

PhasepliT will maximize biodegradable COD removal (95%) from wastewater in the F&D highest priority sectors (Fruit & Vegetables, Meat, Fish & Seafood, Bakery and confectionery, Dairy and Drinks) PhasepliT is an affordable and high-performance solution for SME wastewater that has a high content of biodegradable organic matter (sugar, fats, proteins). Our consortium will first focus on our natural Food and Drink markets, first at local scale, then at national level and finally at international level.

As secondary market, anaerobic process has also been proved effective in treating wastewater with organic matter that is not easily biodegradable by aerobic bacteria (organic chemical). These industries will be our spill over markets (14% of installed anaerobic technology): chemical, petrochemical, pharmaceutical, sludge liquor, landfill leachate, acid mine water, and textile industries. Acidogenic anaerobic bacteria in the first tank of PhasepliT is very resistant and can metabolise even organic chemicals. Finally, the reduced size of PhasepliT and its self-supply of energy may be two features of great interest for water and sanitation projects in developing countries, using it as a portable wastewater treatment micro-plant for isolated regions.

Once the project results have been obtained, their novelty with respect to the state of the art and the free of operation have been checked and a preliminary decision of protection of the result have been taken by the SME partners. Management of IPRs will be performed following the IAPED methodology: Identify–Assess–Protect–Exploit-Disseminate. All exploitable results will be identified, assessed and protected first, and only then their wider dissemination will take place. However, this general statement needs further development into detail of implementation and depends on market features.

SME partners agreed in following the expressed implementation guidelines for IPR protection once the technology reach the market and sales expectations compensate the cost of the highest protection; until that results will be keep as industrial secret.

The PhasepliT Consortium has agreed a product production strategy taking into account that partner manufacturing capabilities will satisfy the needs of the supply chain, bringing together our final PhasepliT product. The manufacture of PhasepliT solution involve several components that inter relate to each other to bring together the final product. MOREYPI (Spain) will manufacture the reactor and steel equipment needed for the plant. SIS (Romanía) will provide the control system. PRODEVAL (France) will manufacture the equipment related to biogas production and purification. Finally, AEMA (Spain) will be in charge of integrating all components, decide the necessary pre-and post-treatment and promote the solution

Regarding market penetration strategy and schedule, the PhasepliT technology needs to reach the market in an effective manner to have a wide impact. Different stages have been defined: During the project execution (2014 to 2016) the SME have absorbed and assimilated PhasepliT knowledge and know-how by collaborating with RTD performers. After project execution, by the end of 2016, it has been estimated a time to market of 2 years (2017 to 2018) where SME will optimize the solution and at the end of 2018 being able to produce PhasepliT reactors at industrial scale. Next, the Sourthen of Europe will be our initial targeted market during the years 2018 and 2019. Next, during the years 2020 to 2022, EU 10 and EU 27 countries will be marketed with PhasepliT product.

GENDER ISSUES/ ETHICAL ISSUES

Regarding gender aspects, the best consideration is to put aside the gender and value people for what they are capable of. We did not force or avoid the participation of women or men, and it turned out that 33% of the personnel involved in the project are women. In fact, women of PhasepliT are among the best qualified staff of our consortium: Dr. Huete (AEMA) will the Project Coordinator and Dr. Reis (IBET) will be the Technical & Risk Manager. These two are the most important positions of the project and we considered that these two women were the best qualified based on their experience and preparation, regardless of their gender

Additionally, the consortium is ensured no discrimination against researchers in any way based on age, ethnic, national or social origin, religion or belief, sexual orientation, language, disability, political opinion or social or economic condition.

5. Address of project public website and relevant contact details

5.1. Consortium Members

Partner	short name	Country	Contact e-mail
AGUA, ENERGIA Y MEDIOAMBIENTE SERVICIOS INTEGRALES SLU	AEMA	SPAIN	phaseplit@aemaservicios.com
INDUSTRIAL MOREYPI SA	MOREYPI	SPAIN	moreypi@moreypi.com
SOCIETATEA DE INGINERIE SISTEME SA	SIS	ROMANIA	sis@sis.ro
PRODEVAL SAS	PRODEVAL	FRANCE	prodeval@prodeval.eu
SARL Distillerie Bel	BEL	FRANCE	www.distilleriebel.com
SUMOL+COMPAL MARCAS SA	SUMOL	PORTUGAL	Ana.Martinho@sumolcompal.pt
TECNOLOGIAS AVANZADAS INSPIRALIA SL	INSPIRALIA	SPAIN	nfo@inspiralia.com
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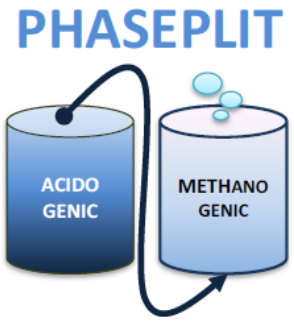
5.2. Project Contact and Logo



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