

“MFC4Sludge”: Microbial fuel cell technologies for combined wastewater sludge treatment and energy production

FP7-SME-2013, Grant Agreement No. 605893



Deliverable 6.6

Press releases, publications and other communication activities

Project details

Start date: 1st August, 2013

Duration: 24 months

Participant no.	Participant organization name	Participant short name	Country	Organisation type
1(Coord)	Ecotrend S.R.O.	ECO	Czech Republic	SME
2	Emefcy Ltd.	EMEFCY	Israel	SME
3	Automação e controle industrial, Lda	ACONTROL	Portugal	SME
4	Fraunhofer-Institute for Interfacial Engineering and Biotechnology IGB	FRAUNHOFER	Germany	RTD
5	Acondicionamiento Tarrasense Asociacion	LEITAT	Spain	RTD
6	Optimización orientada a la sostenibilidad S.L.	IDENER	Spain	RTD
7	Gipuzkoako Urak, S.A.	GURAK	Spain	PUBLIC BODY

Deliverable information

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Abstract

This deliverable provides a cumulative overview of the undertaken Project's dissemination activities that have been carried out during the whole project. These activities have been executed as main consequence of the Dissemination Plan implementation (for further information about the Dissemination Plan, please check the deliverable D6.5 "Final plan for use and dissemination of knowledge").

First section of this deliverable summarises information about MFC4Sludge project is provided in order to highlight main project objectives, research activities to be conducted and the S/T methodology behind the envisaged work to be performed. Information about project participants and main roles is also provided in this section.

Then, captions of the main dissemination tools such as project website, project brochure and project poster are included. Information about publications and events is also summarised, being possible to find the whole abstract of produced publications at the end of the document (see Annex I). Information about envisaged dissemination activities to be done after project end is also provided in this section.

To conclude, a table summarises all the aforementioned activities, providing information about the main partner involved, the target audience and the countries addressed by such a dissemination activity, being possible to have a quick idea of the dissemination activities carried out during the project.

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1. Introduction

MFC4Sludge is a research project that aims to develop, according to participating SME needs, an innovative solution consisting of a MFC coupled to a hydrolytic-acidogenic anaerobic digestion (HA-AD) to treat sewage sludge from wastewater treatment plants (WWTPs). The technologies to be developed herein will not only improve existing sludge treatments in environmental terms (even avoiding sludge disposal) but also in cost-effectiveness terms (generating electricity in the MFC in order to power the sludge treatment). The objective is to develop a reliable, cost-effective and efficient alternative to existing wastewater sludge treatments with minimum environmental impacts and without increasing energy consumption of current wastewater treatment plants.

This project 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.605893, Capacities programme, call “Research for the benefit of SMEs”. The aim of this call is to strengthen the 'innovation capacity' of small and medium-sized enterprises (SMEs) in Europe and their contribution to the development of new technology based products and markets. This funding instrument helps them outsource research, increase their research efforts, extend their networks, better exploit research results and acquire technological knowhow, bridging the gap between research and innovation.

Wastewater sludge (also called sewage sludge or sludge hereinafter) is the main by-product of the most-widely employed biological treatment of wastewater with activated sludge. In such a technology, microorganisms metabolise the organic waste and produce the aforementioned sludge as a result. Its production varies between 10 and 30 kg per capita in most European countries being Germany, Spain and Poland the major producing countries with 2.048.500, 1.065.000 and 501.300 tonnes by 2006 and a total production for the EU of around 9.000.000 tons dry solids per year in 2010. The disposing of this sludge easily reach up to 60% of the total operation cost of a treatment plant and consume vast quantities of energy [1]. In addition, urban growth and the proliferation of wastewater treatment plants have sharply increased and will continue increasing the production of municipal sludge worldwide. It is therefore essential to develop handling and disposal technologies that enable maximum valorisation of this waste and, at the same time, minimum environmental impact [2].

However, sludge disposal is not a trivial issue due to its microbiological and chemical characteristics; in fact it tends to concentrate heavy metals (which may be toxic to plants and humans [3]) and poorly biodegradable organic compounds as well as potentially pathogenic organisms (viruses, bacteria, etc.). Sludge composition determines the type of treatment required and defines disposal options: sludge can be landfilled, incinerated or transformed into compost. When disposed in landfills, one tone of biodegradable waste produces around 300m³ of landfill biogas and its leachate is a cause of contamination from organic acids, ammonia and other hazardous substances [4]. Sludge incineration is traditionally applied when the sludge has been significantly contaminated with heavy metals and is therefore unsuitable for application to agricultural land. When sludge is incinerated, exhaust gas containing greenhouse gases (GHG) such as CO₂ and NO_x (around 1.240 g NO_x/tDS) is produced.

Sludge treatment not only being an environmentally sensitive problem, it is also a growing problem world-wide since sludge production will continue to increase as new sewage treatment works are built and environmental quality standards become more stringent. With some traditional disposal routes coming under pressure and others such as sea disposal having been phased out, the challenge facing sludge managers is to find cost-effective and innovative solutions whilst responding to environmental, regulatory and public pressures. Recycling and use of wastes are the preferred options for sustainable development rather than incineration or landfilling, but they are not straight-forward options as for sludge because of perceptions over contaminants, pathogens and its faecal origin, particularly by the food retailers [5].

Within this context, some key European SMEs got in contact in the framework of MFC4Sludge proposal in order to conduct a joint effort aimed to develop and scale up a low-cost, sustainable and competitive solution consisting of

a microbial fuel cell (MFC) coupled to a hydrolytic-acidogenic anaerobic digestion (HA-AD) to treat sludge from wastewater treatment plants. The goal is to take advantage of the complementarities of both technologies in order to obtain a sustainable energy device with positive energy balance and ability to degrade more than 90% of chemical oxygen demand (COD). According to the several areas of knowledge and expertise required to reach such an objective, the participating SMEs have identified complementary research needs in three areas: sludge pre-treatment, MFC development and systems control and integration.

1.1 SMEs needs to be covered

MFC4Sludge project creates a framework where SMEs show their needs for advanced research in order to obtain a novel, cost-effective, efficient and integrated system to valorise the aforementioned sludge:

SME	Research need	Competitive position improvement
ECO	<ul style="list-style-type: none"> HA-AD as MFC pre-treatment Enhance microbial community knowledge 	<ul style="list-style-type: none"> Development of a company new product aimed at sludge pre-treatment Enhancement of microbial community knowledge which can be extrapolated to other company's AD applications enhancement Know-how about HA-AD performance optimization
EMEFCY	<ul style="list-style-type: none"> MFC design and architecture optimisation MFC biological community understanding 	<ul style="list-style-type: none"> Development of a new company's product by improving its existing portfolio with a solution suited for a broader MFC-based sludge management application range Consolidation of the company's market leading position in MFC and bioreactors by breaking the barriers that hinder its commercialization Increment of the company's know-how regarding MFC design and architecture
ACONTROL	<ul style="list-style-type: none"> MFC mathematical model Advanced control design Optimal solution configuration 	<ul style="list-style-type: none"> Broadening of the company's portfolio of control solutions Introduction to wastewater and sludge management markets Creation of synergies with the other project participants, which are also new potential clients

1.2 Project objectives

In order to overcome the aforementioned SME needs and thus a marketable solution, some project objectives in each of the corresponding areas are expected to be achieved.

SME research needs	Corresponding project's S/T objectives
Sludge pre-treatment	
HA-AD as MFC pre-treatment	<ul style="list-style-type: none"> Adapt hydrolytic-acidogenic anaerobic digestion (HA-AD) so it can be used as a pre-treatment of sludge to transform it to a suitable substrate for MFC Reduce the residence time of sludge to 7 days or less Keep the operating temperature below 30°C Avoid methane production and maximise concentrations of easily degradable volatile fatty acids (VFA) and other suitable substrates for the MFC
Enhance microbial community knowledge	<ul style="list-style-type: none"> Research and document the microbial community to be selected as for an optimal partial HA-AD and MFC processes combination Produce start-up cultures for the partial HA-AD processes to be developed herein

MFC development and performance	
MFC design	<ul style="list-style-type: none"> Obtain power output ratings of at least 250W/m³ Reduce MFC carbon impact in electricity generation to 0.3 kg CO₂/kWh by an optimized design and usage of materials
MFC scaling-up process	<ul style="list-style-type: none"> Develop novel fuel cell stack configurations in order to promote electrical contact between bacteria in suspension and the anode Increase the ratio of surface area of electrodes to volume by around 20%
MFC biological community understanding	<ul style="list-style-type: none"> Research and document the correlation between MFC inlet, energy output and COD degradation
MFC control and integration	
Mathematical model of the overall system	<ul style="list-style-type: none"> Non-linear, grey-box mathematical model combining first-principle physics with empirical data aimed to HA-AD-MFC process description (electrical performance, microbiology, mass and heat transfer, etc.).
Advanced control design	<ul style="list-style-type: none"> Develop a distributed control system (DCS) aimed to an optimal integration of HA-AD and MFC Implement a MPC controller in order to optimize HA-AD-MFC performance
Optimal plant configuration	<ul style="list-style-type: none"> Research and document the scaling-up process of the HA-AD-MFC process for sludge treatment Perform an overall efficiency assessment from a plant-level point of view Construct a prototype with a 10L-volume MFC Achieve at least 90% of COD degradation Reduce sludge volumes at least 75% Generate a higher electricity output than required by the HA-AD. Initial estimations foresee a net energy generation of 140 W/m³ or more

1.3 Participating RTD performers

According to the “Research for the Benefit of SMEs” program definition, achievement of the described project objectives requires performing research and development activities neither financially nor technically affordable by the participating SMEs at all. This is why first-level European RTD performers will be subcontracted by the SME participants during the project. Therefore, activities undertaken by the SMEs themselves will be essentially focused on initial specifications and, later, on validation and testing of the knowledge to be acquired. Specifically, next RTD performers are participating in MFC4Sludge project:

- FRAUNHOFER**, Germany's leading non-profit organization for application-oriented research with research units in Europe, the USA and Asia, will be mainly focused on the development of the pre-treatment process, namely HA-AD. Given FRAUNHOFER's strong background in microbiological communities, this research organization will be also involved in MFC design tasks. Finally, FRAUNHOFER will collaborate with the other RTDs in integration-related tasks.
- LEITAT**, a first-level Spanish technological centre which performs R&D activities in the areas of biotechnologies, environment, advanced materials science and energy among a number of other additional areas of knowledge such as surface treatments and new production processes. LEITAT will carry out tasks related to MFC architecture design (optimizing anode and cathode materials) and maximizing energy production. Moreover, characterisation of microbial communities and effluent properties will be also carried out in this centre. Finally LEITAT will cooperate with FRAUNHOFER in HA-AD development and with IDENER in overall system integration.
- IDENER**, a spin-off company specialized in control and systems engineering and rooted in the University of Seville's Department of Systems and Automation, which has ranked among the world's top 150 research groups under the category “Electrical Engineering” in the last *Performance Ranking of Scientific Papers for World*

Universities. IDENER will conduct research related to mathematical modelling and optimal control both of the overall system and of each single process. Activities aimed to integration of processes will also be carried out in close cooperation with the other RTD performers.

1.4 S/T methodology

In order to accomplish the main objectives defined in section 1.2, a work plan broken down into seven work packages (WPs) has been established. The WPs also include management tasks and assessment of progress and exploitation of results:

WP1. Hydrolytic-acidogenic (HA-AD) process development as pre-treatment for microbial fuel cells (MFCs). This WP focuses on the research required to suit a HA-AD process as a MFC pre-treatment

WP2. Microbial fuel cell (MFC) design and optimization. The purpose of this WP is to provide improved MFC designs aimed to better system performance and cost-efficient up-scaling process.

Intensive interaction between WP1 and WP2 is envisaged, and information will be often exchanged during their execution in order to achieve a compact solution and, additionally, avoid divergences that could affect WP4.

WP3. Advanced modelling and control strategies development. The activity of this WP will be related to the design of an advance predictive controller accounting for HA-AD-MFC process optimization while explicitly taking process constraints into account. To that end, a comprehensive modelling effort will be also conducted in this WP as for HA-AD and MFC processes as well as their interactions.

WP4. Hydrolytic-acidogenic (HA-AD) and microbial fuel cells (MFCs) integration at lab scale. The objective of this WP is to develop optimal integration strategies as for the HA-AD and MFC solutions developed in WP1 and WP2 respectively.

WP5. Innovative prototype at pre-commercial scale production. The broad aim of this WP is to demonstrate and validate the technologies proposed therein through prototyping and comprehensive field testing.

WP6. Exploitation and dissemination. This WP will ensure the proper dissemination and exploitation of project results so that a right flow of knowledge can flow from RTD performers to SME.

WP7. Project management. The aim of this WP is to ensure the fulfilment of the project's goals and assure the success of the project by coordinating and managing the project activities in administrative, technical and financial terms; and to provide a pro-active relation and communication medium between the project partners and the EC.

Main interactions among WPs are depicted in the next Pert diagram:

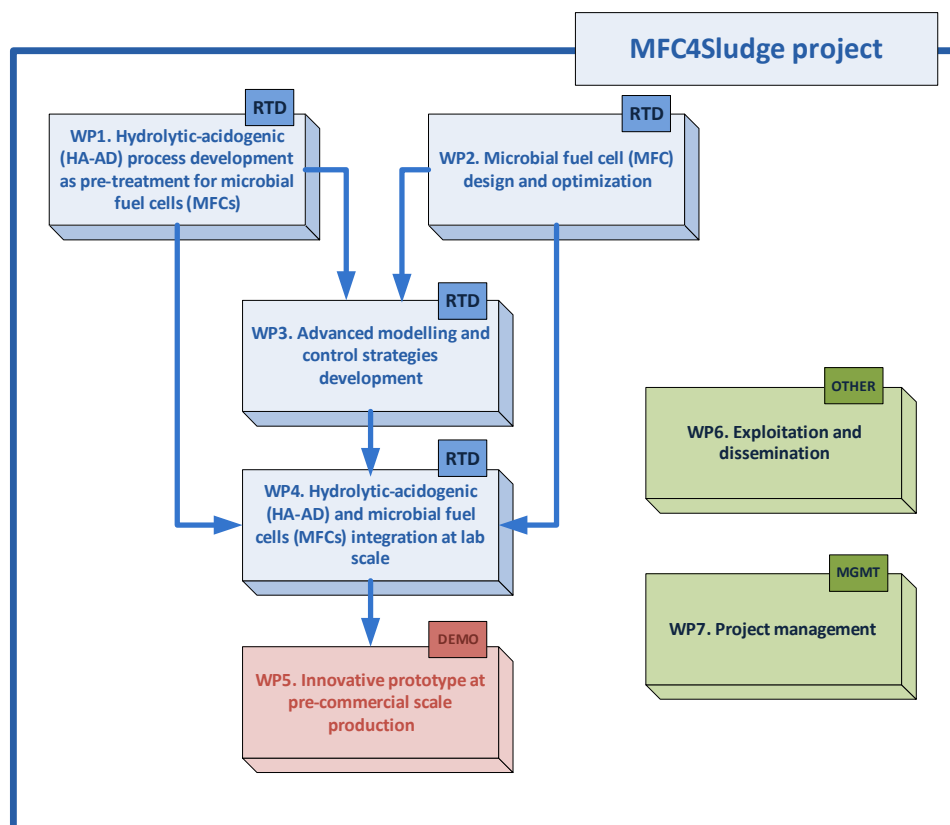


Figure 1. MFC4Sludge Pert diagram

Furthermore, the following figure shows the main areas where research will be conducted as well as the partners involved. The flow of knowledge exchange is also represented (from the RTD performers to the SMEs, adopting the “Research for the benefit of SMEs” approach).

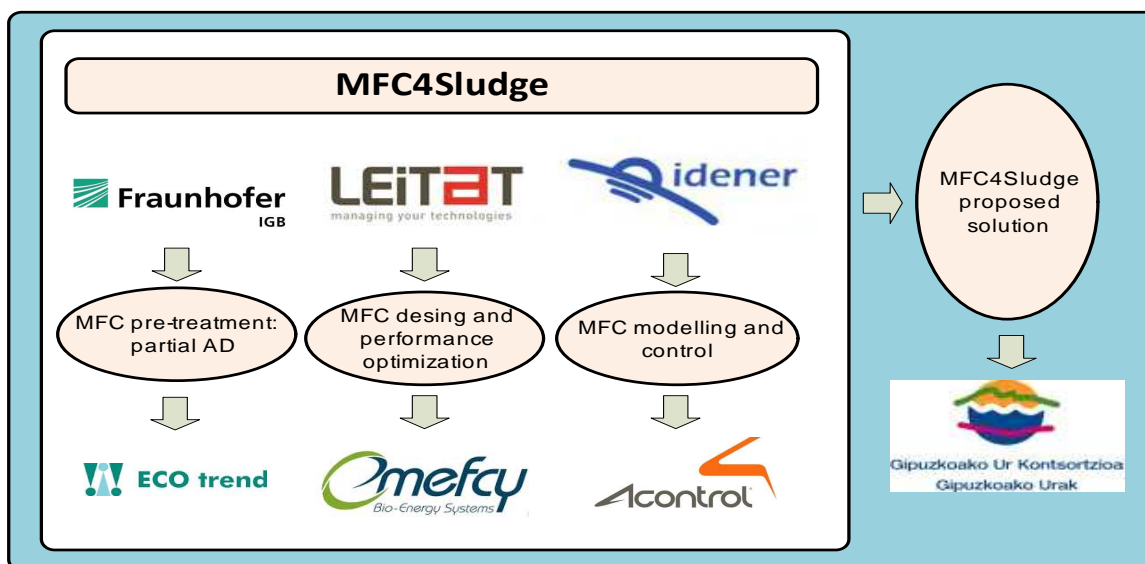


Figure 2. MFC4Sludge S/T methodology

2. Dissemination activities carried out

Activities carried out during project execution have been consistent with the Dissemination Plan as well as with the originally planned dissemination activities of the project proposal. Further information and a detailed description of the aforementioned plan can be found in D6.5 “Final plan for use and dissemination of knowledge”. The partners, as depicted in Table 1 from the Summary section, have used an array of mediums and tools in order to successfully disseminate the project to the relevant audience.

In order to raise this public awareness of the proposed technology, the partners have performed pre-marketing activities, including publications, project website launching, presentations and conference papers and the distribution of project promotional material.

2.1 Project logo and graphical identity

The graphical identity is in line with the public website and the general brochure and poster. It is important to follow the graphical identity, since good use of it will help to consistently communicate and disseminate the project. Guidelines and templates will also save time and effort for the members of the consortium, since no further design work will be necessary.

An important item to establish the project’s identity is the project’s logo. This logo was created by project partners and is usually included in all presentations, reports, documents, etc., of the project. The logo is shown in the below figure.



Figure 3. MFC4Sludge project logo

2.2 Project reports

Dissemination of projects results by making deliverables publicly available is regarded as one of the most important means to publish results. For that reason, this project consortium team is considering to review the dissemination level of deliverables (after the end of the project) in order to have more public reports published on the project website.

As for the reports and deliverables, and in order to maintain the project graphical identity, a template was provided to the partners using the Alfresco share tool linked to the project website private area.

All public deliverables are fully available at project website, section “DOWNLOAD” >> “Public deliverables”. Deliverables that can be found in this section are:

- D 6.1 Project website
- D 6.3 Press releases, publications and other communication activities during first reporting period
- D 6.4 Report on technical, economical and environmental aspects
- D 6.5 Press releases, publications and other communication activities
- D 6.7 Wikipedia page about the project
- D 6.8 Videoclip production about the project

D 6.6 Press releases, publications and other communication activities

Alternatively, after the end of the first reporting period, the consortium cooperated with CORDIS so as to produce a “Result in Brief” publication to be included in CORDIS website.

LINK for “Result in Brief” at CORDIS website: http://cordis.europa.eu/result/rcn/158604_en.html

Moreover, public summary included in the first reporting period is also available in CORDIS.

LINK for First Reporting Period public summary at CORDIS website: http://cordis.europa.eu/result/rcn/153300_en.html

2.3. Project presentations

In line with aforementioned idea of keeping an identity in order to make easier for target audiences to identify the project and as well as to provide uniformity when presenting project ideas, results or facts in a meeting, a template for a presentation has also been created and distributed to the partners through the above-mentioned internal sharing tool.

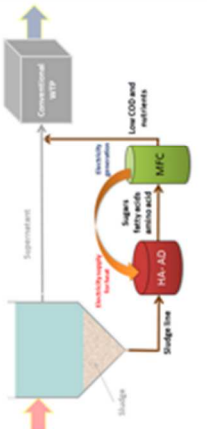
A caption of the main slides from the presentation template is included next.



Figure 4. MFC4Sludge presentation template

2.4 Brochures

For the purposes of effectively disseminating the project, a three-fold project brochure has been created. The brochure describes the main innovations that will be developed within the project and provides main contact details from project coordinator. In addition, all project participants logos are included as well as a reference to the EU funding. In order for the brochure to have a maximum effect on targeted audiences, one brochure per partner can be produced changing the partner profile, whereby a whole page is devoted to the description of that specific partner and their role within MFC4Sludge. In this way, it will prove much more efficient to attract local audiences and be particularly customized to be used nationally. The brochure is user-friendly, compact and easy to understand, being included as part of the Dissemination Plan. A caption of the aforementioned document can be found next.



"Your new solution for sewage sludge management and valorisation"

MFC4Sludge

NAME OF THE PARTNER
Partner description

PARTNER ROLE IN THE PROJECT
Main tasks to be carried out in the project by this partner are:

- ...
- ...
- ...

Contact Us
[contact details from partner, website, etc...](#)

Sewage sludge valorisation

The originality and innovation of the project can be summarized through the following contributions to technological progress:

- Wastewater sludge pre-treatment using partial anaerobic digestion (HA-AD);
- Microbial Fuel Cell (MFC) system development aimed at improving system efficiency and cost-effectiveness;
- Microbial Fuel Cell (MFC) control strategies design in order to reach an optimal performance;
- Integration of the different elements which compose the final solution.
- Demonstration of techno-economical and environmental feasibility of developed technologies for their implementation in wastewater treatment plants.
- Promotion of proposed solution application for distributed power production.

FP7 – Capacities Programme

MFC4Sludge 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. 605893.









Figure 5. MFC4Sludge brochure (inside)

MFC4Sludge
Microbial fuel cell
technologies for
combined wastewater
and sludge treatment and
energy production






Project partners : SME Participants



Project partners : RTD performers



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MFC4Sludge is an industrial research EU funded project that involves European SMEs and first class RTDs.

This project aim is to provide an innovative solution consisting of a Microbial Fuel Cell (MFC) coupled to a hydrolytic-acidogenic Anaerobic Digestion process (HA-AD) in order to develop a new strategy for sewage sludge from wastewater treatment plants (WWTPs) valorisation.

More info:
www.mfc4sludge.eu

Figure 6. MFC4Sludge brochure (outside)

2.5 Poster

The project poster has been developed in order to provide basic information about the project main goals, the technical approach, the expected achievements and a list of project participants and the consortium. This will serve as the project's "business card" and will be distributed, by the project beneficiaries, as widely as possible in any appropriate occasion. This document is available on the public website so all the audiences as well as partners can have access to it. A caption of such a document can be found next.

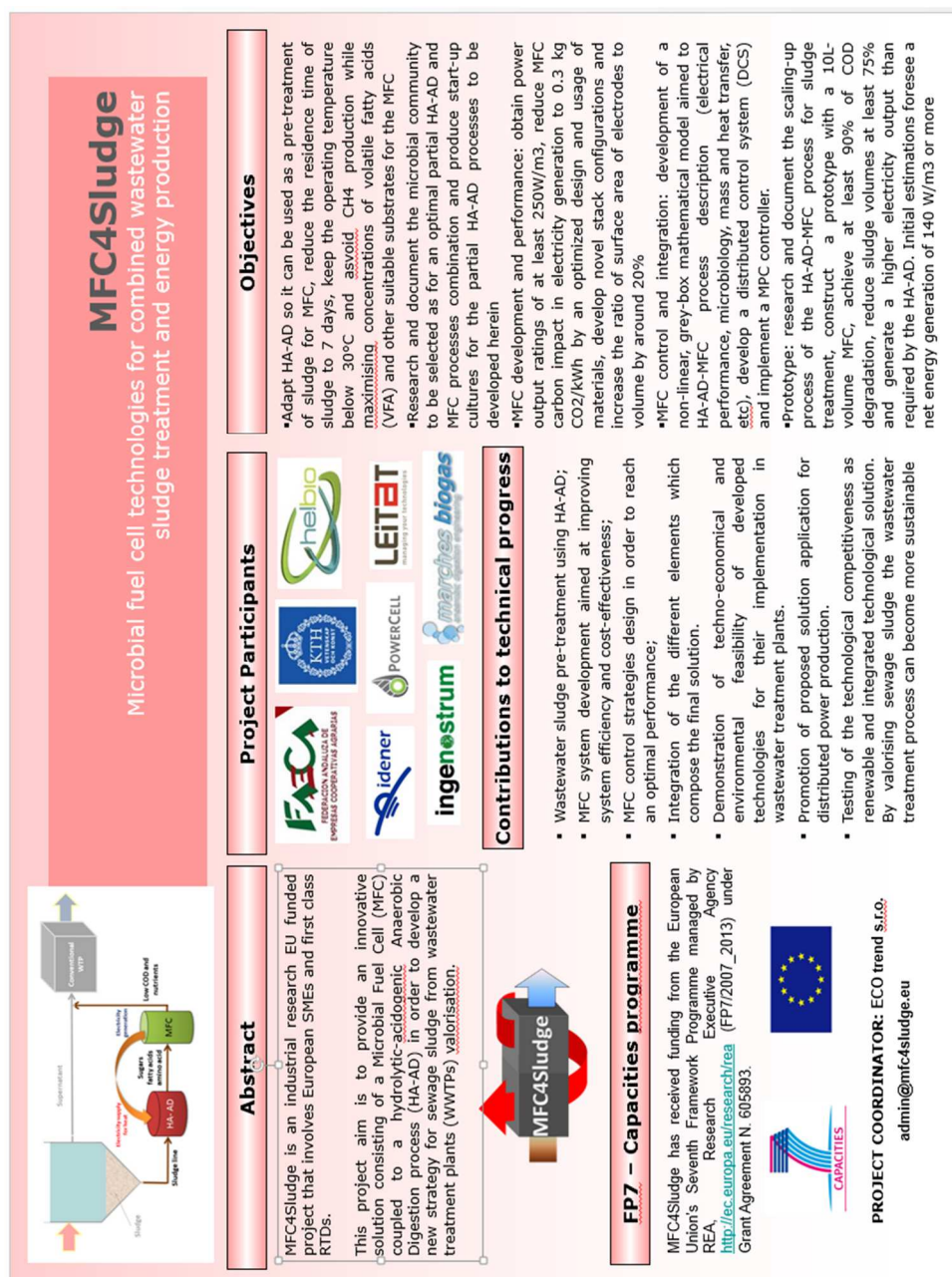


Figure 7. MFC4Sludge poster

2.6 Events

Project partners have disseminated project results through different events and conferences. Specific mention must be made in relation to the type of audience each event can be targeted, since the dissemination activities performed approached an array of interested parties, coming from different fields and areas of interest.

Universities and academic institutions, technology institutes and potential end-users are some examples of the type of audience the dissemination activities aimed at.

As it can be depicted from Table 1 in next Summary section, all events had a wide geographic approach, targeting audiences in Europe. All events took place over the entire project, thus maintaining a dynamic momentum of interest at a constant pace. In addition, some abstracts that have been sent are related to events that will take place after project end. This helps ensure the impact of project result in the long term.

2.3.1 Events targeted to scientific audience

Scientific audience is an important target in order to share project results, assess its content and exchange new ideas about potential developments that could increase the performance of the process or the project impact. Hence, the project participants have attended the following events in order to disseminate main results achieved:

- A representation of LEITAT attended the Seminar “Applications of Bio-Electrochemical Systems in effluents”, organised by Abengoa (14th February, Seville Spain) related to the project ValuefromUrine (FP7 308535). During this event, flyers of MFC4Sludge were spread among participants, mainly from industries and academia.
- The partner LEITAT participated in the seminar “Energy efficiency of wastewater treatment plants: sources of savings” carried out in Gdansk (Poland) during 5-7th of November. The seminar was organized by the Gdańska Fundacja Wody in the framework of the EU-7th Framework Program project “WaterDiss 2.0. Dissemination and uptake of FP water research results” (EBV.2010.5.1.0-1, N 265167). The seminar was dedicated to energy efficiency of wastewater treatment plants. Eduard Borràs, in representation of the MFC4Sludge consortium, gave a presentation of the objectives of the project and the significance it may have for the management of wastewater treatment plants.
- All RTD project partners (LEITAT, IGB and IDENER) attended EU-ISMET’14 and contributed in different ways. IDENER carried out an oral presentation titled “Development of on-site power generation modular system for wastewater sludge valorisation using a combination of partial anaerobic digestion and microbial fuel cell technologies” summarising project concept. In addition, two posters were presented: “Air-cathode MFCs to recover energy from Volatile Fatty Acids from an effluent of a hydrolytic-acidogenic anaerobic digester of wastewater sludge” by LEITAT about WP2 results and “Dynamic 2D mathematical model for tubular-air cathode microbial fuel cells using conduction-based approach for electrons transfer to the biofilm and volatile fatty acids as substrate” about WP3 results by IDENER.
- LEITAT conducted also an oral presentation about main results from technology integration at the event “Industrial Waste & Wastewater Treatment & Valorisation, Greece”, which was titled “Integration of Partial Anaerobic Digestion and Microbial Fuel Cell Technologies for treatment of sludge from wastewater treatment plants”.
- Finally, IGB carried out a specific oral presentation about partial AD development at the Hammer Bioenergietape in Germany. This presentation was titled “Klärschlammbehandlung durch anaerobe Vorversäuerung und Mikrobielle Brennstoffzelle”.

2.3.2 Events targeted to wider public

Wider public is also a target for the dissemination activities planned in the project since results end-users (wastewater treatment plants) and market related segments stakeholders (wastewater treatment products and

D 6.6 Press releases, publications and other communication activities

services companies) are included in this group. Events targeted to wider public where project partners have presented project concept and main results are:

- LEITAT hosted an event on 4th April 2014, the 3rd SME Pan-European Event where the project was also disseminated as part of LEITAT and IDENER presentation. This presentation was specifically targeted to SMEs and included information about project main concept.

2. 7 Publications

Publications, either in the form of Press Releases or as scientific papers with the intention of being published and/or in the process of being published, play a significant role in the dissemination of the project not only during its first months but also at the end of the project so as to present main outcomes to the different audiences and are elevated at an equal bearing as any other type of activities performed.

Aside from the publication of the contributions to each conference in the corresponding conference proceedings, the following publications have been carried out.

- ECO has published a press article in the Czech Biogas magazine. LINK: <http://www.czba.cz/files/ceska-bioplynova-asociace/newsletter/1436788237005197300/index.html?t1436791880.78>
- IGB has included information about project results in the Annual report from Fraunhofer IGB 2014-2015. LINK: <http://www.igb.fraunhofer.de/en/publications/annual-reports.html>

2. 8 Website

The project website (www.mfc4sludge.eu) acts as a dissemination platform with the aim to establish an efficient and effective dissemination and communication tool for the MFC4Sludge consortium for the duration of the project. The website construction and management consists of one of the main dissemination tools of the project, which will ensure the successful use of project results and non-confidential information to the widest possible audience (including the industrial, academic community and potential end-users).

D 6.6 Press releases, publications and other communication activities

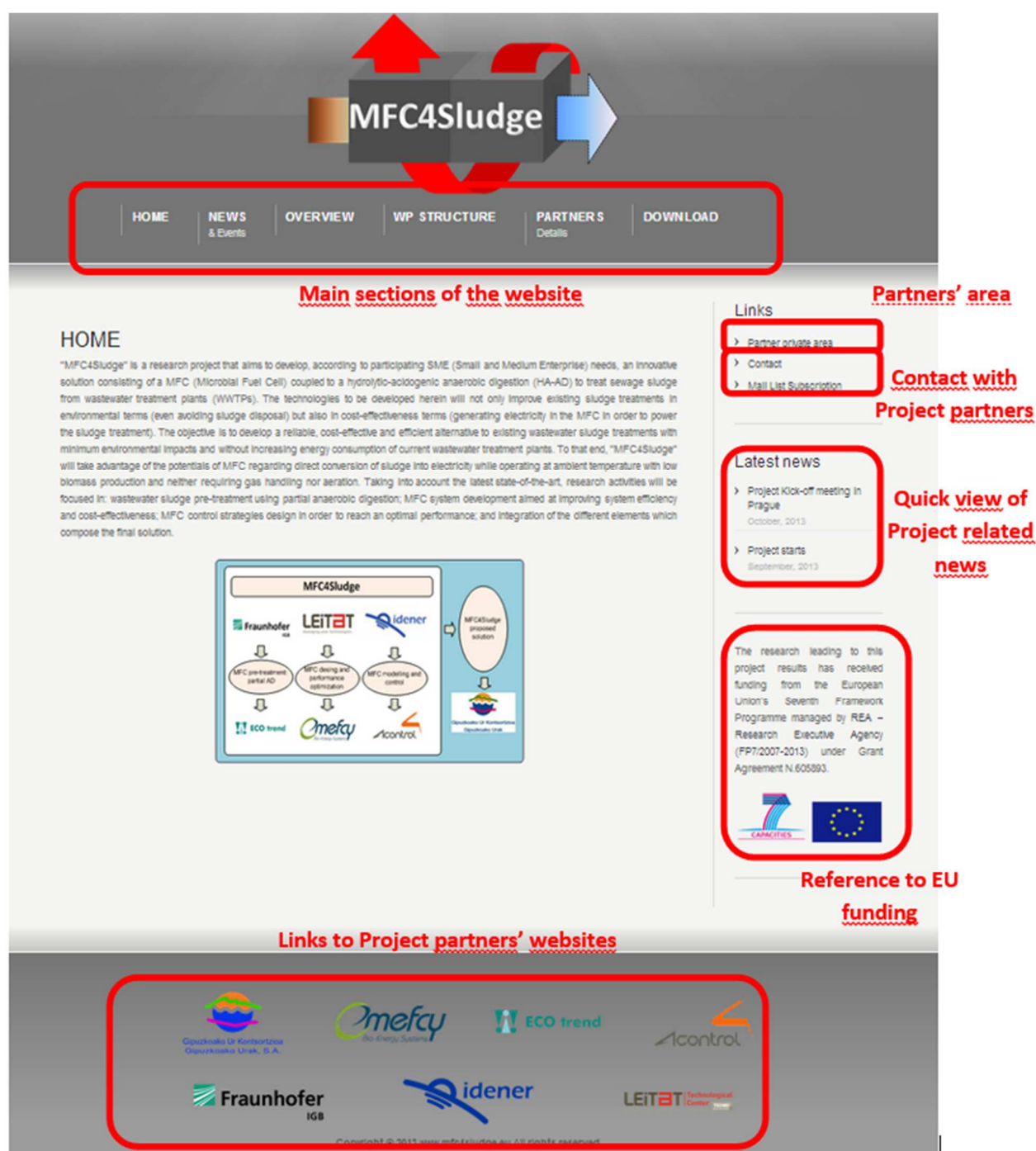


Figure 8. MFC4Sludge project website

The website has a clear structure with two types of webpage navigation depending on the type of user i.e. visitor (public) or Consortium member (private area). The potentials for navigation, document uploading and website alterations differ for each type of user. The aim of the website is on one hand to inform general public about the project and on the other hand to constitute a tool to communicate and to exchange information on the project between partners. Project website is often updated through the insertion of news, new data and events and activities that are related to the project area and could be interesting for website visitors. More detailed description of the project website is given in "D6.1 Website".

Concerning project website updates, information has been added to the website often. Main updates of project website have been:

D 6.6 Press releases, publications and other communication activities

- Include new public deliverables, press releases link, Wikipedia and YouTube links information and pictures about the prototype and all the complementary information available in the section Download
- Include news about project on-going:
 - Project starts – 26th Sept 2013
 - Project kick-off meeting in Prague – 7th Oct 2013
 - MFC4Sludge as part of WaterDiss activities – 20th Nov 2014
 - First semester meeting – 23rd Feb 2014
 - Project dissemination at the 3rd Pan European SME Event – 23rd April 2014
 - Dissemination activities: Abstracts sent to EU-ISMET 2014 – 7th May 2014
 - MFC4Sludge is one year old! – 1st Aug 2014
 - RTDs attend EU-ISMET 2014 in Madrid – 9th Sept 2014
 - 10L Pre-commercial prototype design – 2nd Dec 2014
 - 10L Pre-commercial prototype construction – 2nd March 2015
 - Start-up phase and integration – 14th May 2015
 - Project results dissemination and exploitation activities continue – 26th June 2015
 - Final meeting and Internal Workshop – 10th July

In addition, some partners have also added a web link to the project on its organization's website so as to maximise project website presence in Internet.

2.9 PhD positions

PhD and MSc theses contribute to the dissemination of MFC4Sludge results in the academia by involving other academic institutions and the people working in them. Additionally, this is a way to increase impact of project results since opens a new way of spreading generated knowledge across Europe (since MSc and PhD students usually spend time in other universities or RTD centres exchanging knowledge and techniques).

Within this project, the following MSs these has taken place:

- “Control software development for MFC-based processes”, on-going MSc thesis work, from Jose Ramón Salvador Ortiz at IDENER

2.10 Other dissemination material

According to the DoW and the Plan for Use and Dissemination of project results, a Wikipedia and a Video clip have been produced. More information about these tools and the corresponding procedure can be found in the corresponding deliverables, namely D6.7 and D6.8. A screenshot of the Video clip uploaded to You Tube website can be found in Annex I.

YouTube LINK: <https://www.youtube.com/watch?v=HKcGrrW9tZ4>

3. Summary

The following table includes a detailed list of all dissemination activities (publications, conferences, web sites/applications, press releases, and flyers, articles published in the popular press, media briefings, presentations, and posters) that have been carried out during the project.

Type of activities	Main partner involved	Title	Date	Type of audience	Countries addressed
Project website	ACONTROL	www.mfc4sludge.eu	M3	All	Europe
Project website update	ACONTROL	MFC4Sludge project starts	M2	All	Europe
Brochure	GURAK	MFC4Sludge Brochure	M3	All	Europe
Poster	GURAK	MFC4Sludge Poster	M3	All	Europe
Logo	GURAK	MFC4Sludge Logo	M3	All	Europe
Project website update	ACONTROL	Project Kick-off meeting in Prague	M3	All	Europe
Event	LEITAT	WaterDiss	M4	Scientific and All	All
Project website update	ACONTROL	MFC4Sludge as part of WaterDiss activities	M4	All	Europe
Abstract sending	LEITAT, IDENER, IGB	EU ISMET 2014	M9	Scientific	All
Website publication	LEITAT	`Publication of MFC4Sludge participation and link to project website in LEITAT IPO website	---	All	All
Website publication	IGB	`Publication of MFC4Sludge participation and link to project website in FRAUNHOFER IGB website	---	All	All
Website publication	IDENER	`Publication of MFC4Sludge participation and link to project website in IDENER website	---	All	All
Website publication	ECO	`Publication of MFC4Sludge participation and link to project website in ECO website	---	All	All
Flyers dissemination	LEITAT	Flyers dissemination at the Event "Applications of Bio-Electrochemical Systems in effluents", organised Abengoa (Sevilla, 14 February) related to the project ValuefromUrine (FP7 308535)	M7	Scientific	All
Project website update	ACONTROL	First semester meeting	M7	All	All
Event	LEITAT and IDENER	3 rd Pan-European SME event	M9	Scientific and All	All
Project website update	ACONTROL	Project dissemination at the 3rd Pan European SME Event	M9	All	All
Oral presentation to a scientific event	IDENER	EU –ISMET'14 conference: Development of on-site power generation modular system for wastewater sludge valorisation using a combination of partial anaerobic digestion and microbial fuel cell technologies	M14	Scientific and All	All
Poster	IDENER	EU – ISMET'14 conference: Dynamic 2D mathematical model for tubular-air cathode microbial fuel cells using conduction-based	M14	Scientific and All	All

D 6.6 Press releases, publications and other communication activities

		approach for electrons transfer to the biofilm and volatile fatty acids as substrate			
Poster	LEITAT	EU – ISMET’14 conference: Air-cathode MFCs to recover energy from Volatile Fatty Acids from an effluent of a hydrolytic-acidogenic anaerobic digester of wastewater sludge	M14	Scientific and All	All
Oral presentation to a scientific event	IDENER	Abstract sent to WASTES2015 scientific conference - Sent online, WASTES 2015 will take place in Portugal, 14-16 Sept 2015	M22	Scientific and All	All
Oral presentation to a scientific event	IDENER	Abstract about project main results sent to European Fuel Cell conference - Sent Online, European Fuel Cell conference to be carried out in Naples, Dec 2015	M23	Scientific and All	All
Web sites/Applications	ACONTROL	Project website update - MFC4Sludge is one year old!	M13	All	All
Web sites/Applications	ACONTROL	Project website update - RTDs attend EU-ISMET 2014 in Madrid	M14	All	All
Web sites/Applications	ACONTROL	Project website update - 10L Pre-commercial prototype design	M18	All	All
Web sites/Applications	ACONTROL	Project website update - Start-up phase and integration	M22	All	All
Web sites/Applications	ACONTROL	Project website update - 10L Pre-commercial prototype construction	M20	All	All
Web sites/Applications	ACONTROL	Project website update - Project results dissemination and exploitation activities continue	M23	All	All
Web sites/Applications	ACONTROL	Project website update - Final meeting and Internal Workshop	M24	All	All
Press release	ECO	Czech Biogas Association press release about project results	M23	All	Czech Republic
Web sites/Applications	ACONTROL	Wikipedia website	M24	All	All
Website/Applications	ACONTROL	YouTube videoclip	M24	All	All
Oral presentation to a scientific event	LEITAT	Industrial Waste & Wastewater Treatment & Valorisation, Greece - Integration of Partial Anaerobic Digestion and Microbial Fuel Cell Technologies for treatment of sludge from wastewater treatment plants	M22	All	All
Press release	IGB	Annual report Fraunhofer IGB 2014 - 2015	M24	All	All
Oral presentation to a scientific event	IGB	Hammer Bioenergietage - “Klärschlammbehandlung durch anaerobe Vorversäuerung und Mikrobielle Brennstoffzelle“	M24	All	All

The status of the MFC4Sludge project developed Dissemination Plan up during the whole project has been presented. It's expected that dissemination opportunities continue after project end. This will be done through further attendance to events, keeping the project website online and realising some press publications.

ANNEX I. Contributions to conferences and events

A DYNAMIC 2D MATHEMATICAL MODEL FOR TUBULAR-AIR CATHODE MICROBIAL FUEL CELLS USING CONDUCTION-BASED APPROACH FOR ELECTRONS TRANSFER TO THE BIOFILM AND VOLATILE FATTY ACIDS AS SUBSTRATE

Macias Aragonés, Marta¹; Leyva Guerrero, Carlos¹; del Real Torres, Alejandro J.¹

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A mathematical model has been produced and is currently being validated for a tubular-air cathode microbial fuel cell (MFC). Such model is a 2D dynamic model, hence allowing to simulate the MFC operation through time and providing the chance of implementing further control strategies such as Model Predictive Control.

Main issues covered by the model are:

- MFC morphology: single chamber tubular air-cathode. Specifically, these cells have an anodic chamber which contains the anolyte and where the biofilm grows attached to the anode. The cathode is in direct contact with the anolyte on one side and with air flow on the other side, hence oxygen is the electron acceptor. The water produced through the cathodic reaction flows to the anolyte and is eliminated through the outlet of the MFC along with the treated substrate. Thus, the anode is modelled as a plug flow reactor while cathode is modelled using a CSTR approach. 2D are considered, namely the x-axis related to the length of the MFC and the z-axis related to the biofilm thickness
- Electron transference: a conduction-based approach is considered and, accordingly, the biofilm is characterised by a conductivity factor K_{bio}
- MFC substrate: a sludge pre-treated through a partial anaerobic digestion is considered as the influent of the MFC, i.e., a stream rich in volatile fatty acids (acetate, propionate and butyrate are included in the model as substrates)
- MFC microorganisms/biofilm: active and inactive biomass are considered in the model as well as the differentiation between Electrogenically active bacteria and Methanogenic bacteria

This first-principles based model has been discretised for x and z-axis dependent variables and implemented in Matlab using a Zero Order Hold approach. Validation using real data from an operating MFC is expected to be completed in the upcoming months.

Request: Oral communication

DEVELOPMENT OF ON-SITE POWER GENERATION MODULAR SYSTEM FOR WASTEWATER SLUDGE VALORISATION USING A COMBINATION OF PARTIALANAEROBIC DIGESTION AND MICROBIAL FUEL CELL TECHNOLOGIES

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Sludge is the main by-product of the activated sludge process for wastewater treatment (total EU production circa 9.000.000 tons-DS/year, 2010). Its disposal easily reach up to 60% of total operation cost of a treatment plant and consume vast quantities of energy, being not a trivial issue due to its microbiological-chemical characteristics.

In this context, “MFC4Sludge: Microbial fuel cell technologies for combined wastewater sludge treatment and energy production” project is being carried out under the EU Seventh Framework Programme aiming to develop an innovative solution for this problem consisting of a Microbial Fuel cell (MFC) coupled to a Hydrolytic-Acidogenic Anaerobic Digestion (HA-AD).

Specifically, technologies to be developed do not only improve existing treatments in environmental terms (even avoiding disposal) but also in cost-effectiveness terms (generating electricity in the MFC in order to power the sludge treatment). The objective is to develop a reliable, cost-effective and efficient alternative with minimum environmental impacts and without increasing energy consumption. Expected results are:

- Regarding HA-AD as pre-treatment: reduce HRT to maximum 7 days, keep operating temperature below 30°C, avoid methane production and maximise suitable substrates for the MFC (volatile fatty acids)
- Concerning the MFC system development: obtain power output ratings of minimum 250W/m³, reduce impact in electricity generation to 0.3 kg CO₂/kWh by optimising the MFC design, develop novel stack configurations and increase the ratio “electrodes surface area/volume” circa 20%
- Research required microbial communities for an optimal HA-AD-MFC combination
- For MFC control and optimal performance: production of mathematical models combining first-principle physics with empirical data aimed to HA-AD-MFC process description, develop a distributed control system and implement a MPC controller
- For the scaled-up prototype of the integrated solution, achieve a 90% COD degradation while reducing sludge volume at least 75%. A net energy generation of minimum 140 W/m³ is estimated.

Request: Oral communication

PROGRAM OF THE WATERDISS 2.0 SEMINAR „ENERGY EFFICIENCY OF WASTEWATER TREATMENT PLANTS - SOURCES OF SAVINGS” GDANSK, 05 – 07 NOVEMBER 2013

05.11. 2013 r. (Tuesday)

- 09.00 Welcoming words. Introduction to the seminar.
Zbigniew Sobociński, Gdansk Water Foundation
- 09.15 Knowledge and experience transfer regarding water and wastewater management as one of the factors determining energy efficiency of water supply companies.
Matthias Worst, Bavarian Environmental Protection Agency, Hof
- 09.30 Bavarian approach to increase the energy efficiency, data, tools, institutions in charge... -current founding of energetic optimizing at WWTP's.
Claus Kumutat, Prezes Bawarskiej Agencji ds. Środowiska
- 10.30 Coffee break
- 10.45 Energy balance of a typical wastewater treatment plant as a basis for its energy efficiency.
Jan Surówka, Energy Engineering & Management Systems, Gliwice
- 11.30 Waste Water Treatment Plant energy balance - range, function, risk assessment of the exploiter.
- 12.15 Waste Water Treatment Plant - energy management.
Mirosław Włas, Energy Management Systems, Gdańsk
- 12:45 Quality of cogeneration devices and its service versus incomes.
Grzegorz Drabik, CES, Kraków
- 13.15 Lunch break
- 14.15 Energy Benchmarking of WWTP as a way to increase its energy efficiency
 - Energy indicators of WWTP – European and American experiences
 - From energy efficiency audit of wastewater treatment plant to its improvement**Jan Surówka, Energy Engineering & Management Systems, Gliwice**
- 15.00 Analysis of energy use in the context of benchmarking on WWTP
Marius Wilke, Aquabench GmbH, Hamburg - Kolonia
- 16.00 Enhancing energy efficiency balance on WWTP
Tymoteusz Jaroszyński, Technical University of Poznań
- 16:30 Evaluation of the energy and ecological effects of disintegration implementation conducted with the use of hydrodynamic cavitation generator
Tomasz Rybicki, MVA Green Energy,
- 16:45 Energy efficiency on WWTP –“BARITECH” and FP7 „CarBala” projects
Ewa Zaborowska, Technical University of Gdansk
- 17.15 End of the I day of the seminar.
- 18.30 Common dinner.

06.11.2013 r. (Wednesday)

- 09.00 Introduction to the II day of the seminar.
- 09.10 Starting points for the design and implementation of efficient aeration systems
Martin Gräsl, Rudolf Messner Umwelttechnik, Areation Technology, Adelsdorf
- 10.05 Control and optimization of energy use in small and medium WWTP – Spanish experiences using FP7 OptimEDAR solutions
Małgorzata Steckiewicz, ADASA Sistemas, Warszawa
- 10:35 Microbial Fuel Cell technologies for combined wastewater sludge treatment and energy production- FP7 MFC4 Sludge project
Eduard Borrás Camps, LEITAT Technological Center, Barcelona
- 11.05 Coffee break
- 11:15 Energy efficient Mixing Systems in the biological treatment steps/ Energy savings by use of an advanced aeration control
Peter Huber, Invent Umwelt und Verfahrenstechnik GmbH, Erlangen
- 12:00 Deammonification – energy efficient concentrate treatment .
Claus Lindenblatt, Environmental and Water Institute
- 13.00 Lunch break
- 14:00 DEMON+) Nitrogen removal – examples of efficiency enhancement on WWTP.
Robert Zarzycki, Stalbudom, Warszawa
- 14.45 Source of energy saving and generation during the processes of sludge treatment and removal.
Sebastian Kliemt, Huber SE, Berching
- 15.45 Optimal fermentation of sewage sludge- possibilities of improvement of WWTP energy balance. Can bio-refineries be treated as WWTP?
Andrzej Wójtowicz „Wodociągi Słupsk”
- 16.30 Model of dehydrated sewage sludge dryer – energy balance and economical effects.
Cezary Jędrzejewski, PEWIK Gdynia
- 16.45 Discussion
- 17.15 End of the II day of the seminar

07.11.2013 r. (Thursday)

- 09.00 Summary of the second day of the seminar
- 09.10 Energy consumption of sewage sludge incineration plant – experiences from international and national installations.
Leonard Szczepański, Gdańska Infrastruktura Wodno-Kanalizacyjna, Gdańsk
- 10.00 Experiences in the implementation of energy efficiency increase program in the group of Waste Water Treatment Plants.
Kinga Drensla, Erftverband, Bergheim
- 11.00 Coffee break
- 11.15 Energy efficiency technologies on waste water treatment and transport.
Marcin Fatdziński, Wilo Polska, Lesznowola
- 12.15 Quality of cogeneration equipment and its services versus the income.
CES, Kraków
- 12.45 The use of renewable energy sources to improve energy efficiency in the process of modernization of WWTP in "Dziarny" next to Iława.
Piotr Kowalski, Iławskie Wodociągi, Iława

WASTES: Solutions, Treatments and Opportunities

3rd International Conference

September 14th – 16th 2015**WASTEWATER SLUDGE VALORISATION THROUGH THE USE OF PARTIAL ANAEROBIC DIGESTION AS PRETREATMENT AND FURTHER USE OF MICROBIAL FUEL CELLS**M. Macias¹, K. Brüderle ² and E. Borrás³¹ IDENER, C\Earle Ovington 24, unit 8, 41300, La Rinconada – Sevilla, Spain; marta.macias@idener.es² Fraunhofer-Institute for Interfacial Engineering and Biotechnology (IGB), Nobelstraße 12, 70569 Stuttgart, Germany; klaus.bruederle@igb.fraunhofer.de³ Asociación Acondicionamiento Tarrasense (LEITAT), C/ de la Innovació, 2 - 08225 Terrassa (Barcelona), Spain; eborras@leitat.org**ABSTRACT**

Main purpose of the study is to develop a on-site modular system able to valorise sludge produced in wastewater treatment plants. To that end “MFC4Sludge: Microbial fuel cell technologies for combined wastewater sludge treatment and energy production” project is being carried out under the EU Seventh Framework Programme aiming to develop an innovative solution consisting of a Microbial Fuel cell (MFC) coupled to a Hydrolytic-Acidogenic Anaerobic Digestion (HA-AD), allowing to ensure that the influent will meet the MFC requirements. The final objective is to develop a reliable, cost-effective and efficient alternative with minimum environmental impacts and without increasing energy consumption.

Keywords: wastewater sludge, sewage, waste valorisation, microbial fuel cell, anaerobic digestion.

INTRODUCTION

Wastewater sludge (also called sewage sludge or “sludge” hereinafter) is the main by-product of wastewater treatment with activated sludge. Its production varies between 10 and 30 kg per capita in most European countries being Germany, Spain and Poland the major producing countries and a total production for the EU of around 9.000.000 tons dry solids per year in 2010. The disposing of this sludge easily reaches up to 60% of the total operation cost of a treatment plant and consumes vast quantities of energy [1]. However, sludge disposal is not a trivial issue due to its microbiological and chemical characteristics; in fact it tends to concentrate heavy metals (which may be toxic to plants and humans [2]) and poorly biodegradable organic compounds as well as potentially pathogenic organisms (viruses, bacteria, etc.). Sludge composition determines the type of treatment required and defines disposal options: sludge can be landfilled, incinerated or transformed into compost. Sludge treatment not only being an environmentally sensitive problem, it is also a growing problem world-wide since sludge production will continue to increase as new sewage treatment works are built and environmental quality standards become more stringent. The challenge is to find cost-effective and innovative solutions whilst responding to environmental, regulatory and public pressures. Recycling and use of wastes are the preferred options for sustainable development rather than incineration or landfilling, but they are not straight-forward options as for sludge because of perceptions over contaminants, pathogens and its faecal origin, particularly by the food retailers [4].

BRIEF STATE OF THE ART

Given the important drawbacks of current sludge management and disposal technologies, MFC technologies have lately gained much attention as a most-promising technology for a sustainable, cost-effective and environmentally friendly sludge treatment and valorisation [5]. Latest research trends in these topics can be classified in three main areas of development: pre-treatment processes to better suite sludge to MFC; MFC design and up-scaling; and system modelling and control. Given that MFC technology works better in low-load wastewater, sludge pre-treatment is considered a very convenient option as to optimize MFC inlets. However, just a few research activities have been carried out in order to determine which pre-treatment procedures provide a better MFC performance yield. Specifically, current state-of-the-art pre-treatment procedures of sludge for MFC operation are sterilization and base

pre-treatment [6] and ultrasound pre-treatment [7]. Regarding the MFC operation and design, operating principles of MFC technology are based in the following process: a bacterium in the anode compartment transfers electrons obtained from an electron donor (glucose or Volatile Fatty Acids) to the anode electrode. This occurs either through direct contact, nanowires, or mobile electron shuttles. During electron production protons are also produced in excess. These protons migrate through the cation exchange membrane (CEM) into the cathode chamber. The electrons flow from the anode through an external resistance (or load) to the cathode (thus generating energy) where they react with the final electron acceptor (oxygen) and protons producing water [8]. Many different configurations are possible for MFCs [9, 10, 11]. Regarding MFC control, no relevant publications are produced in this area, although different mathematical models have been produced [12].

Progress beyond state of the art

One of the main innovations is the project's integrated solution itself, which is shown in Fig. 1. On one hand, it is well established that MFC technology can be used to treat substrates with high COD (i.e., sludge), although it works better in low load wastewater. On the other hand, hydrolytic-acidogenic digestion (HA-AD) is a well-established and implemented technology for high load wastewater which however requires further effluent treatments to remove residual organic molecules such as alcohols, acetate, propionate and butyrate. The integration of these two processes has not been reported before, has the potential to generate very convenient synergies: 1) HA-AD can be used as a pre-treatment of sludge to transform it to a much suitable substrate for MFC; 2) Volatile fatty acids (VFA) of HA-AD effluents can be effectively consumed in MFCs; 3) The energy generated in the MFC can be used to decrease the overall energy demand of the wastewater treatment plant; and 4) HA-AD integration can improve the treatment capacity in terms of COD degradation and reduction of sludge generation. Consequently, MFC and HA-AD are not competitive technologies but complementary and can be coupled to treat wastewater sludge (which usually MFC are no able to treat by themselves) in a more efficient, competitive and sustainable process with respect to current state-of-the-art solutions.

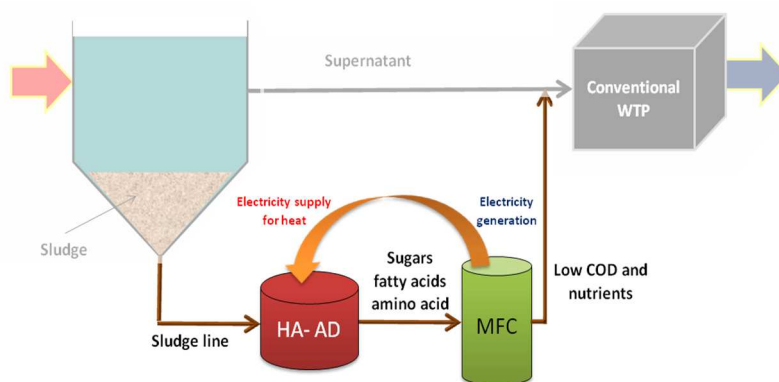


Fig. 1. Sludge valorization proposed solution.

MATERIALS AND METHODS

Real waste water sludge from Gipuzkoako Urak facilities has been used for laboratory scale test. The pilot prototype has been deployed at the aforementioned facilities.

The methodology that has been followed has been a proper technology upgrading, starting from the individual HA-AD, MFC and control strategies development at lab-scale, the integration of the whole system at lab scale (1L MFC operation) and finally implementation of a scale-up 10L MFC prototype in a real wastewater treatment plant (Fig. 2.) so as to retrieve data from operation in a real working environment.



Fig. 2. 10L working prototype deployed at a real wastewater treatment plant (left side: AD unit, right side: close-up of the MFC stack).

RESULTS

Main observed results during the project are (to be further completed):

- Regarding HA-AD as pre-treatment: reduction of HRT to 4.5 and below, operating temperature below 30°C, avoidance of methane production and maximisation of suitable substrates for the MFC (volatile fatty acids, acetate)
- Concerning the MFC system development: Four air-cathode 2.5L MFCs were developed and their biofilms were grown on a carbon nanofiber electrode until reaching a value of 0.1mA·cm⁻². These four MFCs were connected in parallel to generate up to 3200 uW·dm⁻³.
- MFC control through Fuzzy logic strategies development. Production of mathematical models combining first-principle physics with empirical data aimed to HA-AD-MFC process description.
- For the scaled-up prototype of the integrated solution, 90% COD degradation while reducing sludge volume.

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EUROPEAN FUEL CELL CONFERENCE – NAPLES December 2015**Abstract****MICROBIAL FUEL CELL TECHNOLOGIES AND USE OF PARTIAL ANAEROBIC DIGESTION AS PRE-TREATMENT STRATEGY FOR ON-SITE POWER GENERATION THROUGH WASTEWATER SLUDGE VALORISATION**

Main purpose of the study is to develop a on-site modular system able to valorize sludge produced in wastewater treatment plants (total EU production ca. 9.000.000 tons-DS/year, 2010). Its disposal easily reach up to 60% of total operation cost of a treatment plant and consume vast quantities of energy.

In this context, “MFC4Sludge: Microbial fuel cell technologies for combined wastewater sludge treatment and energy production” project is being carried out under the EU Seventh Framework Programme aiming to develop an innovative solution consisting of a Microbial Fuel cell (MFC) coupled to a Hydrolytic-Acidogenic Anaerobic Digestion (HA-AD), allowing to ensure that the influent will meet the MFC requirements.

The objective is to develop a reliable, cost-effective and efficient alternative with minimum environmental impacts and without increasing energy consumption. The methodology that has been followed has been a proper technology upgrading, starting from the individual Ha-AD, MFC and control strategies development at lab-scale, the integration of the whole system at lab scale (1L MFC operation) and finally implementation of a scale-up 10L MFC prototype in a real wastewater treatment plant so as to retrieve data from operation in a real working environment.

Main observed results during the project are (to be further completed):

- Regarding HA-AD as pre-treatment: reduction of HRT to 4.5, operating temperature below 30°C, avoidance of methane production and maximisation of suitable substrates for the MFC (volatile fatty acids)
- Concerning the MFC system development: Four air-cathode 2.5L MFCs were developed and their biofilms were grown on a carbon nanofiber electrode until reaching a value of $0.1\text{mA}\cdot\text{cm}^{-2}$. These four MFCs were connected in parallel to generate up to $3200\text{ uW}\cdot\text{dm}^{-3}$.
- MFC control through Fuzzy logic strategies development. Production of mathematical models combining first-principle physics with empirical data aimed to HA-AD-MFC process description.
- For the scaled-up prototype of the integrated solution, 90% COD degradation while reducing sludge volume at least 75%.

Main innovation is the possibility not only to improve existing sludge treatments in environmental terms (even avoiding disposal) but also in cost-effectiveness terms (generating electricity in the MFC in order to power the sludge treatment), aside from the individual development of the MFC cathode material and composition that allows better performance at lower costs.

Vision2020: The Horizon Network

Insights, organisation and networking for European research and innovation

3rd PAN EUROPEAN SME EVENT VISION 2020

4th April 2014
from 10:00 to 14:00

Casa Milà "La Pedrera"
Provença 261 - 265
Barcelona

POLICY PERSPECTIVE - OPPORTUNITIES WITHIN HORIZON 2020

- 10:00 - 10:10** LEITAT - Technological Center - Opening.
- 10:10 - 10:30** Abdul Rahim, Director of Vision2020. Presentation followed by Q&A session.
- 10:30 - 11:00** Samuel Maenhout - European Commission - Policy Officer from DG Research & Innovation B3 - SMEs, Financial Instruments and State Aid. Presentation followed by Q&A session.
- 11:00 - 11:30** David Rovirosa, ACCIO - Government of Catalonia - Enterprise Europe Network. Presentation followed by Q&A session.
- 11:30 - 12:00** Coffee & Networking.

EU FUNDED RESEARCH AND INNOVATION: COMMERCIAL CASE STUDIES + VISION 2020 RELEVANCE MEMBERS

- 12:00 - 12:15** Emilie Mespoulhes, LEITAT as a Partner for Technology for SME's. Presentation followed by Q&A session.
- 12:15 - 12:30** Oonagh McNerney, SME Success story, IRIS (INNOVACIO I RECERCA INDUSTRIAL I SOSTENIBLE SL), SME on the 5th place on the 6th monitoring Report as a participation under FP7 with 28 participations last year.) Presentation followed by Q&A session
- 12:30 - 12:45** Marta Macias, SME Success story (IDENER). (SME Member of Vision 2020.) Presentation followed by Q&A session.
- 12:45 - 13:00** Michael Brown, University Success story (Head of European Project - University College London RTO Member of Vision 2020). Presentation followed by Q&A session.

THE VISION2020 PLATFORM: CONNECTING SMES WITH RESEARCH & TECHNOLOGY ORGANISATIONS

- 13:00 - 14:00** Networking reception with LEITAT International project Managers from various disciplines (Health, Food, Energy, Transport, Materials, ICT, Manufacturing, Nanotechnologies, Biotechnology, Production/processing), Vision2020 members and collaborators from across Europe.

REGISTRATION LINK: <http://v2020sme3.eventbrite.co.uk>

Practical information

La Pedrera

Passeig de Gràcia 92 - 08008, Barcelona.

How to get there:

Bus: 7,16,17,22,24 and 28.

Underground: Lines 3 and 5,
Diagonal stop.

Train services: FGC: Provença station.

Train services: RENFE: Passeig de Gràcia station.

Nearest car park: Parking Saba Passeig de Gràcia.

Information:

LEITAT

T. (34) 937 882 300

atorres@leitat.org



Organized by:



Collaborators:



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 605893



INTERNATIONAL CONFERENCE



IWWATV

Industrial Waste & Wastewater Treatment & Valorisation

AGENDA

21-23 May 2015

President Hotel, Athens



National Technical
University of Athens
NTUA



Hellenic
Water
Association

www.iwwatv.uest.gr

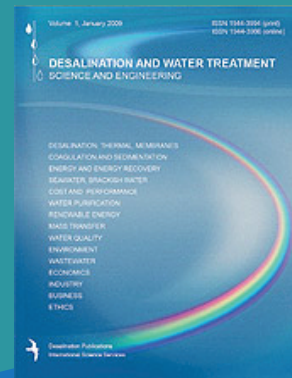
Scientific Committee

- **Maria Loizidou,**
National Technical University of Athens
- **Andreas Andreadakis,**
National Technical University of Athens
- **Agapios Agapiou,**
University of Cyprus
- **Apostolos Vlyssides,**
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The best papers
of the Conference
will be published



Thursday, 21 May 2015	
08:00 - 09:15	Registration
09:15 - 09:45	Welcome Speeches
09:45 - 11:00	<p>Chair: M. Loizidou, G. Lyberatos Keynote Speakers Christopher Cheeseman, Imperial College, "Engineering the Circular Economy" Rafael Luque, University of Cordoba, "General overview of possibilities for waste valorisation & the concept of modular biorefineries" Francesco Fatone, University of Verona, "Policy, legislation and advanced treatment technologies for industrial-environmental symbiosis within the Lagoon of Venice" Gerasimos Lyberatos, National Technical University of Athens, "Valorisation of agroindustrial waste for the production of energy, biofuels and biopolymers" Maria Loizidou, National Technical University of Athens, "Industrial Symbiosis & Waste Management: The way forward for resource efficiency and circular economy»</p>
11:00 - 11:30	Coffee Break
ROOM 1	<p>SESSION I: Symbiosis Aspects Chair: M. Loizidou, C. Cheeseman</p>
11:30 - 11:45	<p>Y. Zorzios, A. Migiakis, K. Valta, P. Damala, M. Kasidoni, V. Panaretou, K. Moustakas, D. Malamis, N. Markatos, M Loizidou, Prospects of the eSYMBIOSIS Platform for the promotion of the circular economy</p>
11:45 - 12:00	<p>R. Droop, Green Deals mobilize society and Government for greening the economy</p>
12:00 - 12:15	<p>N. Voulvoulis, Mining in the context of sustainable management of natural capital: the importance of waste recycling and reuse</p>
12:15 - 12:30	<p>L. Cutaia, G. Barberio, A. Luciano, E. Mancuso, S. Scaffoni, M. La Monica, C. Scagliarino, A systematic methodology for industrial symbiosis approach development at a regional scale</p>

12:30 - 12:45	C. Di Biccari, G. De Marco, C. Torrente, C. Rocco, Opportunities and perspectives for a SMEs network for re-manufacturing within the Apulian context and possible extensions
12:45 - 13:00	Guibo Qiu, Ben Peng, Changsheng Yue, Min Guo, Mei Zhang, Recycling and regeneration of spent refractory in ironmaking and steelmaking industry
13:00 - 13:15	L.M. Queiroz, I.O.C. Nascimento, S.A.B. Vieira de Melo, R.A. Kalid, Aerobic, anaerobic treatability and biogas production potential of a wastewater from a biodiesel industry
13:15 - 13:30	A.S. Dounavis, I. Ntaikou, G. Lyberatos, Production of advanced biobased hydrogen enriched methane from waste glycerol in a two stage continuous system
13:30 - 13:45	P. Manara, M. Ganesa Pillai, A. Zabaniotou, Microwave pretreatment of residual biomass blends with crude glycerol prior to pyrolysis by means of the GlyCo Bio-Diesel Project concept
13:45 - 14:00	N. Cakir, E. Alp, U. Yetis, Evaluation of environmental performance based on proximity to BAT associated resource utilization and emission values: A case study in a steel-making industry
14:00 - 14:15	V. Aggelatou, S. Dabitzias, Th. Zampetakis, A. Meidani, N. Arvanitidis, Utilisation of mining waste for the development of added value final products

ROOM 2	SESSION II: Wastewater Treatment I Chair: F. Dilek, S. Malamis
11:30 - 11:45	C. de la Paz, The LIFE Programme: Over 20 years improving waste and wastewater management in the EU
11:45 - 12:00	ZHANG Ruiping, WANG Xiaoyan, ZHANG Xiaoli, Decolorization of Brilliant Blue RAN By Laccase
12:00 - 12:15	J.T.G. Morais, K.P.O. Esquerre, A. Kiperstok, L.M. Queiroz, Prediction of organic matter removal from pulp and paper mill wastewater using artificial neural network
12:15 - 12:30	R.N. Coimbra, C.Escapa, A.I. García, M. Otero, A comparative study on the performance of a polymeric resin and an activated carbon for the adsorptive removal of diclofenac from water
12:30 - 12:45	A. Tawfik, A. EL Dissouky, A. Mostafa, Simultaneous bio-hydrogen production and treatment of gelatinous wastewater
12:45 - 13:00	A. Arampatzidou, E. Deliyanni, Ordered mesoporous carbon CMK-3 as a potential sorbent for endocrine disruptors (EDCs): application to the adsorption of bisphenol A from aqueous solutions
13:00 - 13:15	L. Hadjittofi, I. Pashalidis, Thorium removal from acidic aqueous solutions by activated biochar derived from cactus fibres

13:15 - 13:30	S. Van Hulle, Economical and ecological removal and/or recuperation of organic matter and ammonium from landfill leachate
13:30 - 13:45	M.A. Stylianou, V.J. Inglezakis, M. Loizidou, A. Agapiou, Equilibrium ion exchange studies of Zn ²⁺ , Cr ³⁺ and Mn ²⁺ on natural bentonite
13:45 - 14:00	D. Cingolani, A. L. Eusebi, P. Battistoni, Upgrading for zero liquid discharge of full scale industrial platform for leachate treatment: economical evaluations and performances optimization
14:00 - 14:15	Z.Z. Ismail, A.A. Habeeb, Simultaneous energy generation and organics removal from real industrial pharmaceutical wastewater by packed bed-microbial fuel cell
14:15 - 14:30	S. A. El-Bashir, A. Tawfik, Treatment of landfill leachate in a combined up-flow anaerobic sludge blanket (UASB) reactor followed by down-flow hanging sponge (DHS) system

ROOM 3	SESSION III: Water Treatment Chair: K.-J. Haralambous, I. Janajreh
11:30 - 11:45	D. Xevgenos, K.-J. Haralambous, M. Loizidou, Zero Liquid Discharge Desalination: A review
11:45 - 12:00	I. Janajreh, D. Suwwan, R. Hashaikh, Coupled Modelling of Membrane Desalination
12:00 - 12:15	Th. Valkouma, Water management & wastewater treatment in Egnatia Odos Motorway
12:15 - 12:30	K. Chatzikonstantinou, D. S. Tsoukleris, N. Tzamtzis, E. A. Pavlatou, A novel combination of a membrane and a photocatalytic reactor for water reclamation
12:30 - 12:45	R.C. Eusebio, M.A. Promentilla, H.S. Kim, Optimization of FO system for the Utilization of RO Brine
12:45 - 13:00	I. Petousi, G. Daskalakis, M. Fountoulakis, A. Papadaki, C. Tsompanidis, E. Dialynas, P. Tzaferou, T. Manios, Performance comparison of three compact systems in grey-water treatment
13:00 - 13:15	M.N. Chong, J.Y.C. Leong, P.E. Poh, Sustainable Urban Water Management in Green Buildings in Malaysia: A hybridised approach towards rainwater and greywater treatment, recycling and reuse scheme
13:15 - 13:30	O. Golshiri, M.R. Alavi Moghaddam, A survey of public perception and participation regarding water reuse applications in Yazd, Iran
13:30 - 13:45	Chaouki Ghenai, Modeling Water Consumption for Thermoelectric Power Generation

13:45 - 14:00	G. Panagiotoulas, V. Paraskevopoulou, M.J. Scoullas, Cooling Water Management in Steel Hot Rolling Mills
14:00 - 14:15	S. Boudia, M. Fiallo, P. Sharrock, Permeable reactive barriers made with zero valent iron-doped porous plaster for the treatment of organic nitro compounds on laboratory scale

ROOM 1	SESSION IV: Valorisation Chair: R. Luque, A. Zabaniotou, T. Manios
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15:00 - 15:15	B. Quattrocioni, N. Valle, C. Perrotto, F. Mercuri, L. Pasqualino, Valorization and awareness of the territory through wastewater treatment process: The project LIFE+ REWETLAND
15:15 - 15:30	N. Querques, M. Cesta, R. M. Santos, Y. W. Chiang, Phyco-Valorization: Integrated Resource Recovery through Microalgae
15:30 - 15:45	H.S.Jeswani, P. Choksi, N. Oke, A. Naik, R. Sayyed, N. Mahapatra, Use of porous concrete as water filter media
15:45 - 16:00	J.P. Bolivar, S. Pérez-Moreno, M.J. Gazquez, M. Contreras, R. García-Tenorio, Recycling of wastes coming from the pigment TiO ₂ industry
16:00 - 16:15	A. Farghaly, A. Tawfik, Application of surfactants for efficient hydrogen production from paperboard mill wastewater
16:15 - 16:30	J.P. Bolivar, M.J. Gazquez, S. Pérez-Moreno, R. García-Tenorio Uses of phosphogypsum in agriculture
16:30 - 16:45	K. Komnitsas, D. Zaharaki Co-utilization of construction/demolition wastes with metallurgical and mining wastes for the production of geopolymers
16:45 - 17:00	J. Rosales, F. Agrela, M. Cabrera, M.G. Beltrán, Application of stainless steel slag waste as a partial replacement to manufacture cement mortars
17:00 - 17:15	F. Galliou, A. Maragkaki, N. Markakis, G. Sabathianakis, C. Tsompanidis, G. Mavrogiannis, G. Koukakis, T. Manios, Solar drying of olive mill wastewater with manure for the production of organic fertilizers
17:15 - 17:30	S. Mavridou, E. Kaisidou, M. Kazdaglis, Construction and Demolition Wastes: Potential uses and current situation in Greece and Cyprus
17:30 - 17:45	S. Martínez-Martínez, L. Pérez-Villarejo, D. Eliche-Quesada, P. J. Sánchez-Soto, G.N. Angelopoulos, Ceramics from clays and by-product from biodiesel production: processing, properties and microstructural characterization
17:45 - 18:00	F. Chalkiopoulou, I. Chatzipanagis, C. Christidis, Perspectives for the production of industrial minerals from the exploitation of the waste stemming extraction of Greek white calcitic marble
18:00 - 18:15	Th. Valsamidis, M. Koumoutsakou, A. Papathanasoglou, Greek marble by-products - Limitations and Opportunities

18:15 - 18:30	N. D. Charisiou, C. A. Paraskeva, M. A. Goula, V. G. Papadakis, Techno-economical & Sustainability Analyses for Multilateral Exploitation of Olive Tree Cultivation Residues
18:30 - 18:45	Discussion - Conclusions

ROOM 2	SESSION V: Wastewater Treatment II Chair: M. Rusan, F. Fatone, E. Katsou
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15:00 - 15:15	V. Makrigianni, A. Giannakas, I. Konstantinou, Chromium (VI) removal from wastewater by acid-treated pyrolytic char derived from used rubber tires
15:15 - 15:30	Bheemaraju Sarada, Studies on bisorption of trivalent Chromium using Caulerpa fastigiata
15:30 - 15:45	I. Sinha, P. N. Singh, D. Tiwary, Functionalized iron oxide nanoadsorbents for chromium removal from aqueous solutions
15:45 - 16:00	A.G. Thanos, A. Sotiropoulos, S. Malamis, E. Katsou, E.A. Pavlatou, K.-J. Haralambous, Regeneration of organo-modified mineral loaded with chromate anions
16:00 - 16:15	T. Alvarino, N. Torregrosa, S. Suarez, J. Lema, F. Omil, The effect of activated carbon and membrane filtration in the removal of pharmaceutical products in hospital wastewaters
16:15 - 16:30	C. Escapa, R.N. Coimbra, A.I. García, M. Otero, Removal of pharmaceuticals from industrial wastewaters by microalgae culture
16:30 - 16:45	H.M. Paula, M.S.O. Ilha, A.P. Sarmento, Use of suspensions prepared with Moringa Oleifera seeds associated with chemical coagulants in the treatment of concrete plants wastewater
16:45 - 17:00	H. Arifin, T.S.Y Choong, F. Al-Razi Ahmadun, L. Chuah Abdullah, Forward osmosis: Treating palm oil mill effluent by using fertiliser as draw solutions
17:00 - 17:15	A. Zerva, E. Gkatzarou, D. Mioteli, M. Mousavi, G. Zervakis, P. Christakopoulos, E. Topakas, Degradation of olive mill waste waters by two wood-rot fungi and their effect on the induction of extracellular ligninolytic enzymes
17:15 - 17:30	J. Raiti, H. Kiai, A. Hafidi, Aqueous two phases extraction of phenolic compounds from pretreated olive mill wastewater
17:30 - 17:45	M. Al Rusan, Application of diluted olive mill wastewater enhances plant growth and changes soil fertility parameters
17:45 - 18:00	K. Tsigkou, A. Kotoulas, A. Kopsahelis, M. Kornaros, Development of a high-rate thermophilic anaerobic UPBR reactor for the treatment of three-phase olive mill wastewater (OMW)
18:00 - 18:15	L. Barbieri, I. Lancellotti, E. Passaglia, Italian chabazitic-zeolite for the treatment of wastewater
18:15 - 18:30	D. Kanellopoulos, E.M. Barampouti, S. Mai, A. Vlyssides, Chemical Oxidation of Cosmetic Industry Wastewater by Fenton Reagents
18:30 - 18:45	V. M. Bhandari, L. Gayatri Sorokhaibam, V. V. Ranade, Industrial wastewater treatment for fertilizer industry- A case study

18:45 - 19:00	R. Kumar Gautam, S. Banerjee, S. Soni, A. Mudhoo, M. Chandra Chattopadhyaya, Removal of Tartrazine by copper doped dithiooxamide metal organic frameworks (MOFs): Kinetics, equilibrium modeling and spectroscopic analysis
19:00 - 19:15	S. Kulshreshtha, N. Mathur, P. Bhatnagar, Treatment of cardboard industrial effluent in nutrient amended and non-amended condition
19:15 - 19:30	S. Georgopoulos, M. Panitsa, D. Vlastos, I.K. Konstantinou, M.I. Papadaki, Treatment of Cow-Farm Wastewaters using an Environmentally Friendly Method

ROOM 3	SESSION VI: Food Industries and waste treatment and products recovery
	Chair: M. Loizidou, D. Bolzonella
15:00 - 15:15	S. Malamis, E. Katsou, P. Damala, K. Chatzikonstantinou, A. Patsia Treatment of food industry wastewater using membrane bioreactors
15:15 - 15:30	C. Cavinato, C. Da Ros, P. Pavan, D. Bolzonella, Thermophilic anaerobic digestion of winery waste: trace elements supplementation
15:30 - 15:45	V. Varelas, E. Sotiropoulou, M. Liouni, E. T. Nerantzis, Production of β -Glucan from winery yeast waste biomass
15:45 - 16:00	E. I. Sotiropoulou, V. Varelas, M. Liouni, E. T. Nerantzis, Grape seed oil: From a winery waste to a value added cosmetic product
16:00 - 16:15	G. Z. Kyzas, D. N. Bikiaris, Molecularly Imprinted Polymers (MIPs) for recovery of resveratrol from winery effluents
16:15 - 16:30	E. Nikolaidou, M. Iossifidou, V. Tataki, A. Eftaxias, A. Aivasidis, V. Diamantis, Energy recovery and treatment of wine lees using a compact-portable anaerobic digester
16:30 - 16:45	D. Trasanidou, S. Grigorakis, A. Apostolakis, D. P. Makris, Implementation of Box-Behnken Experimental Design and Kinetics to Optimise Organic Solvent-Free Ultrasound-Assisted Extraction of Red Grape Pomace Polyphenols and Pigments
16:45 - 17:00	M. L. Montoro, M. L. Herrero, M. Di. Vallejo, M. F. Sardella, C. Deiana, Influence of pretreatment variables on the bioavailability of sugars for the production of bioethanol from melon
17:00 - 17:15	K. Kaderidis, A. M. Goula, K. G. Adamopoulos, An integrated process for utilization of pomegranate peels
17:15 - 17:30	L. Mailin López González, I. Pereda Reyes, O. Romero Romero, H. Vervaeren, Synergetic effects on methane yield from sugarcane press mud co-digested with vinasse
17:30 - 17:45	M. Alexandropoulou, G. Antonopoulou, G. Lyberatos, Fermentative hydrogen production from food – industry wastes
17:45 - 18:00	I.F. Strati, V. Oreopoulou, Recovery and isomerization of carotenoids from tomato processing by-products

18:00 - 18:15	K. Valta, E. Aggeli, G. Antonopoulou, D. Malamis, K.-J. Haralambous Waste and wastewater treatment from the Greek dairy industry: existing situation and valorisation opportunities
18:15 - 18:30	V. Diamantis, A. Aivasidis, A. Eftaxias, C. Achillas, K. Mimides, F. Pliakas, Agro-industrial residuals for enhanced food production in geothermal greenhouses
18:30 - 18:45	K. Valta, E. Orli, P. Damala, K. Moustakas, M. Loizidou Review and assessment of waste and wastewater treatment from fruit and vegetable processing industry in Greece
18:45 - 19:00	M. Ghimpusan, G.D. Nechifor, A. C. Nechifor, P. Passeri, Performance of combination of treatment processes for food industry wastewater depuration
19:00 - 19:15	A. Orfanos, H.K. Karapanagioti, I.D. Manariotis, Removal of methylene blue from food-industry byproducts
19:15 - 19:30	M. E. Abd El-Hack, S. A. Mahgoub, Mitigating harmful emissions from laying hens manure and enhancing productive performance through feeding on DDGS supplementation with enzymes and Bacillus spp

Poster Session

N.E. Belkhouche, N. Benyahia, Removal of Lead by emulsion organophosphorus liquid membrane: Response surface modeling	K. P. Stavropoulos, A. Kopsahelis, C. Zafiri, M. Kornaros, Life Cycle Assessment (LCA) of End-of-Life Dairy Products (EoL-DPs) management in Cyprus, via their energetic valorization through anaerobic co-digestion with agro-industrial wastes
A.N. Apergis, Small standard subirrigation plant processing units	M. Stylianou, Innovative Water Resources Management Plan: Cyprus Case Study
N. Gerogianni, A. Magganas, M. Stamatakis, P. Pomonis, Effectiveness of Olivine-Rich Ultrabasic Rocks from Greece on Acid Mine Drainage and Dairy Wastewater Treatment	M. Vilaseca, M.G. García-Jiménez, V. Buscio, M. Crespi, C. Gutiérrez-Bouzán, Reuse of textile effluents treated with nanofiltration membranes
D. Kołodzyńska, A. Skiba, Z. Hubicki, B. Górecka, Superabsorbents as an effective materials for uptake of metal complexes with biodegradable complexing agents	E.Önal, A.Ş.Yargıç, N.Özbay, Dye adsorption behavior in aqueous solutions of activated carbon prepared from peach stone
A. Adamczuk, W. Sofińska-Chmiel, D. Kołodzyńska, Chelating ion exchangers in heavy metal ions removal from acidic streams	L. Lintzos, K. Chatzikonstantinou, N. Tzamtzis, Performance evaluation of different membrane types in a pilot scale SMBR system
Ji Sun Kim, Cheong Seek Kim, Hyun Soo Shin, Ji Won Rhim, Application of Synthesized Anion and Cation Exchange Polymers to Membrane Capacitive Deionization (MCDI)	M. Vilaseca, V. López-Grimau, C. Gutiérrez-Bouzán, Valorisation of Moringa oleifera waste: treatment and reuse of textile dye effluents
D. Kołodzyńska, I.Pańczyk-Figura, Enhanced removal of metal ions in the presence of GLDA	C. Gutierrez-Bouzan, M. Sala, ElectroChemical techniques combined with UV irradiation for the treatment and reuse of textile dyeing wastewater
A. Adamczuk, D. Kołodzyńska, Fly ash coated chitosan as efficient adsorbent for removal of heavy metal ions from water and waste water	E. Ntinoudi, H. Yiannoulakis, Th. Zampetakis, A.I. Zouboulis, E. Pantazopoulou Stabilization of chromium in fly ash using magnesita
L. Barbieri, I. Lancellotti, E. Passaglia, Italian chabazitic-zeolite for the treatment of wastewater	
I. Janajreh, T. ElSamad, M. Hussain, Numerical Simulation of Transesterification	

Friday, 22 May 2015

08:00 - 09:30	Registration
09:30 - 10:15	Chair: F. Dilek, N. Colonna Keynote Speakers Filiz Dilek , Middle East Technical University, "Treating Micropollutants of Emerging Concern – A Case of Triclosan" Petros Gikas , Technical University of Crete, Towards energy sustainable wastewater treatment plants Toine Timmermans , WageningenUR, "The Fusions Project" Nicola Colonna, Valerio Miceli , Italian National Agency for New Technologies, Energy and Sustainable Economic Development, "Mediterranean agrofood organic waste streams: opportunities for value recovering through a cascade approach"
10:15 - 10:45	Coffee Break
ROOM 1	SESSION VII: Wastewater Treatment III Chair: G. Lyberatos, A. Zouboulis
10:45 - 11:00	I. Fernández, J. Dosta, J. Mata-Álvarez , A critical review of the future trends and perspectives for the implementation of Anammox in the main line of municipal WWTPs
11:00 - 11:15	G. Yuksek, D. Okutman Tas, E.Ubay Cokgor, G. Insel, B. Kirci, O. Erturan , Effects of Eco-friendly Production Technologies on Wastewater Characterization and Treatment Plant Performance
11:15 - 11:30	K. Abeliotis, K. Sheittane, K. Lasaridi , An environmental Life-Cycle study of the Limassol wastewater treatment plant
11:30 - 11:45	S. Milia, E. Mallocci, A. Carucci , Aerobic granulation with petrochemical wastewater in a sequencing batch reactor under different operating conditions
11:45 - 12:00	M. Jalili Ghzizade, L. Heidari, F. Tajabadi , Industrial waste management in PVC production process by focusing on caustic flake waste (Case study: Ghadeer Petrochemical Company, Mahshahr, Iran)
12:00 - 12:15	E.L.Batsari, A.K. Tolkou, A.I. Zouboulis, P.K. Gkotsis, E.N. Peleka Fouling control in MBR systems: comparison of several commercial applied coagulants
12:15 - 12:30	O.T. Komesli, M. Muz, S. Ak, S. Bakirdere, C.F. Gökçay , Comparison of EDCs Removal in Full and Pilot Scale Membrane Bioreactor Plants: Effect of flux rate on EDCs removal in short SRT
12:30 - 12:45	K. Chatzikonstantinou, N.Tzamtzis, N. Aretakis, A. Pappa , Application of high frequency power vibration (HFPV) on fouling limitation in submerged membrane modules of a pilot MBR system
12:45 - 13:00	R.C. Eusebio, M.A. Promentilla, H.S. Kim , Application of Integrated FO-MBR System to Utilize RO Concentrate as Draw Solution
13:00 - 13:15	Bo Wu, Lizhang Wang, Peng Li, Bo Zhang, Yuemin Zhao , Electrochemical performances of a novel packed-bed electrocatalysis reactor (PBECR) by using TiO ₂ -AC as electrode for efficient oxidation of organic pollutants

13:15 - 13:30	S. Mitra, N. Daltrophe, J. Gilron, Performance evaluation of a novel eductor-based MBR for the treatment of domestic wastewater
13:30 - 13:45	Th. Patsoules, Continuous improvement strategy for increasing the efficiency of wastewaters treatment facilities in the Black Sea coastal states

ROOM 2	SESSION VIII: Ash Chair: S. Agatzini - Leonardou, L. Lombardi
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10:45 - 11:00	L. Lombardi, E. Carnevale, A. Paradisi, Bottom ash treatment at the site of producing plant for reutilization
11:00 - 11:15	P. Samaras, V. Karayannis, A. Domopoulou, E. Papastergiadis, A. Baklavaridis, Valorization of medical waste incineration ash for ceramics preparation
11:15 - 11:30	G. Itskos, A. Koutsianos, V. Inglezakis, N. Koukoulzas, D. Torkmuzin, C. Vasilatos, Fly ash from Kazakhstan's coal fired-power stations: Characterization and utilization in wastewater purification
11:30 - 11:45	R. Taurino, E. Karamanova, L. Barbieri, S. Atanasova-Vladimirova, F. Andreola, I. Lancellotti, A. Karamanov, New ceramic bricks based on pretreated MSW bottom ash
11:45 - 12:00	M.G. Beltrán, F. Agrela, M. Cabrera, J. Rosales, Influence of processed biomass bottom ash on the mechanical and durability behaviour in mortars
12:00 - 12:15	V. A. Mymrin, K. P. Alekseev, R. E. Catai, R. L.S. Izzo, A. Nagalli, C. A. Romano, Hazardous Electric Arc Filter Dust utilization for producing of environment friendly ceramics
12:15 - 12:30	V. A. Mymrin, K. P. Alekseev, R. E. Catai, R. L.S. Izzo, A. Nagalli, C. A. Romano, Laundry sludge of water after industrial uniforms washing as valuable component of ceramics production
12:30 - 12:45	M.V.F. Varela, S. Rubert, C.A. Luz, Study of different cements and waste ceramic on the process of solidification/stabilization of galvanic sludge
12:45 - 13:00	M. Stefanidou, E. Anastasiou, O. Mantziou, E. Mpougla, E. Vasiliou, P.D. Konti, K. Antoniadis, Incorporation of glass particles in high-performance mortars
13:00 - 13:15	V. Montenegro, S. Agatzini - Leonardou, P. Oustadakis, P. Tsakiridis, Hydrometallurgical Treatment of EAF Dust by Direct Sulphuric Acid Leaching at Atmospheric Pressure
13:15 - 13:30	A. Cannone Falchetto, J. Grönniger, M. P. Wistuba, Reuse of Linz-Donawitz (LD) Slag in Asphalt Mixtures for Pavement Application
13:30 - 13:45	S. Martínez-Martínez, L. Pérez-Villarejo, D. Eliche-Quesada, P. J. Sánchez-Soto, G.N. Angelopoulos, Reuse of fly and bottom ash for clinker production

ROOM 3	SESSION IX: Biomass & Municipal Waste Chair: N. Voulvoulis, D. Malamis
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10:45 - 11:00	F. Riedel, CombiTech Waste Treatment Process for mixed unsegregated Municipal Waste with no Presorting and no Residues
11:00 - 11:15	Xiaoying Liu, Yanfeng He, Chang Chen, Wen Wang, Guangqing Liu, Set-up of CSTR for treating kitchen waste and effects of operation conditions on biodegradability performance

11:00 - 11:15	Xiaoying Liu, Yanfeng He, Chang Chen, Wen Wang, Guangqing Liu, Set-up of CSTR for treating kitchen waste and effects of operation conditions on biodegradability performance
11:15 - 11:30	C. Ghenai, I. Janajreh, Combustion of Biomass and Waste-Based Syngas Fuels
11:30 - 11:45	K. A. Spanos, I. Khah, D. Gaitanis, Utilisation of woody biomass from urban parks, street trees and plantations of fast growing forest trees - possibilities for energy production, chemical and biological conversion
11:45 - 12:00	N.D. Charisiou, G. Siakavelas, K.N. Papageridis, M.A. Goula, Effect of La ₂ O ₃ addition on Ni/Al ₂ O ₃ catalysts to produce H ₂ from glycerol
12:00 - 12:15	S. Nanda, R. Azargohar, J. A. Kozinski, A. K. Dalai, Valorization of pretreatment wastes from hydrolyzed biomass by slow pyrolysis
12:15 - 12:30	M. Loizidou, Integrated waste treatment system for food waste
12:30 - 12:45	N.D. Charisiou, A. Baklavaridis, V.G. Papadakis, M.A. Goula, Synthesis gas production via the biogas reforming reaction over Ni/MgO-Al ₂ O ₃ and Ni/CaO-Al ₂ O ₃ catalysts
12:45 - 13:00	C. Katsimpouras, P. Christakopoulos, E. Topakas, Enzymatic bioconversion and fermentation of corn stover at high-solids content for efficient ethanol production
13:00 - 13:15	V.K. Varshney, Assessment of wood based industries generated biomass residues for recovery of high value chemicals
13:15 - 13:30	Discussion - Conclusions

13.45 - 14.30	Lunch Break
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ROOM 1	SESSION X: Industrial Waste Management Chair: U. Yetis, G. Mancini
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14.30 - 14.45	S. Zanni, A. Bonoli, M. Luca Mancini, Abatement and bio-digestion of airborne contamination in precision mechanics: the case study of Beretta firearms
14.45 - 15.00	D. Kallidromitou, K. Korizi, K. Aravosis, Industrial Wastes and the National Waste Management Plan
15.00 - 15.15	G. Capar, U. Yetis, Development of a National Set of Environmental Performance Indicators for Turkey
15.15 - 15.30	M.M. Rajabi, M. Jalili Ghazizade, M.E. Ghanbari, B. Madadi, Waste Characterization and Management of the Phosphorus and Phosphoric Acid Industry
15.30 - 15.45	M. Padervanda, M. Vossoughia, Fabrication and antibacterial performance of Ag-Au nanoparticles decorated ionic liquid modified magnetic core-shell microspheres

15.45 - 16.00	B.B. Uzun-Akınlar, E. Yaman, Thermogravimetric Pyrolysis of Walnut Shell an Assessment of Kinetic Modeling
16.00 - 16.15	I. Karachristou, St. Chouvardas, A. Savvidou, Management of Radioactive Devices at the NCSR "Demokritos"
16.15 - 16.30	S. Dayana Priyadharshini, A.K.Bakthavatsalam, Biodegradation of Phenolic Effluent of Producer Gas Plant using <i>Scenedesmus</i> sp.
16.30 - 16.45	M. Panzica, S. Cappello, M. M. Yakimov, A. Luciano, G. Mancini, Small improvements in the treatment of oily wastes from marine transportation
16.45 - 17.00	C. Di Biccari, G. De Marco, C. Torrente, C. Rocco, A Study of Tools and Software for Implementing Environmental Management Systems in SMEs
17.00 - 17.15	L. Antonozzi, A. Bonoli, S. Zanni, Life Cycle Assessment applied to remediation technologies: methodological and practical issues
17.15 - 17.30	Discussion - Conclusions

ROOM 2	SESSION XI: Textile Sector & Dyes Chair: P. Gikas, V. Inglezakis
14.30 - 14.45	P. Damala, E. Katsou, K. Chatzikonstantinou, G. Karathanasi, S. Malamis, Application of MBR for the treatment of textile wastewater
14.45 - 15.00	N. Abidi, J. Duplay, A. Jada, R. Baltenweck-Guyot, E. Errais, M. Trabelsi-Ayadi, Removal of Anionic Dye from Textile Effluents by using Kaolinite as Adsorbent
15.00 - 15.15	Z. Zeybek, H. Ayyıldız, H. Hapoğlu, M. Albaz, In the treatment of textile wastewater with coagulation, modeling of treatment and pH control using artificial neural networks
15.15 - 15.30	W. Lemlikchi, N. Oubagha, P. Sharrock, M. Fiallo, M.O. Mecherri, Calcium phosphate precipitation for removal of textile dyes from industrial wastewaters
15.30 - 15.45	N. Abidi, J. Duplay, A. Jada, E. Errais, G. Sophie, F. Colin, F. Ayari, M. Trabelsi-Ayadi, Discoloration of textile effluent by natural clay. Effect of chemical dyeing additives on the adsorption of anionic dyes
15.45 - 16.00	A.S. Yargic, M.F. Gozukizil, E. Onal, N. Ozbay, The Comparative Study on Decolorization of Remazol Yellow Dye from Aqueous Solutions by Biosorption, Fenton and Photo-Fenton Processes
16.00 - 16.15	S. Karimifard, M.R. Alavi Moghaddam, Enhanced adsorption of a reactive dye on functionalized multi-walled carbon nanotubes: Isotherms and kinetics study
16.15 - 16.30	D. Tiwary, P. Kumar Mishra, L. Kumari, S. Awasthi, Biodegradation of Scarlet 4BS by bacterial consortium isolated from dye contaminated soil using Sequencing Air- lift Bioreactor
16.30 - 16.45	Rakesh Kumar, Converting nuisance into an opportunity through production of natural dyes from water hyacinth for textile applications
16.45 - 17.00	Discussion - Conclusions

ROOM 3		SESSION XII: Sludge Management Chair: A. Vlyssides, O. Komesli
14.30 - 14.45	D. Vouk, D. Nakic, N. Stirmer, Reuse of sewage sludge - problems and possibilities	
14.45 - 15.00	N. Kathijotes, E. Zlatareva, S. Marinova, V. Petrova, Application of Wastewater Sludge to Crop- Monitoring Changes in the "Soil-Fertilizer-Plant" System and Phosphorous Recovery Options	
15.00 - 15.15	I. Janajreh, A. Alshehhi, T. Arink, A. Al Katheerib, R. Ahmedb, Bioreactor Landfilling of Oil Sludge	
15.15 - 15.30	E. Pantazopoulou, O. Zebiliadou, A. Zouboulis, Stabilization of tannery waste using ferronickel sludge	
15.30 - 15.45	J.Kisser, H. Gattringer, M. Iordandopoulos-Kisser, Recovering metals from sewage sludge, waste incineration residues and similar substances with hyperaccumulative plants	
15.45 - 16.00	E. Borràs; P. Bosch-Jimenez, S. Martinez-Crespiera, O. Alonso, R. Shechter, Integration of Partial Anaerobic Digestion and Microbial Fuel Cell Technologies for treatment of sludges from wastewater treatment plants	
16.00 - 16.15	M. Jalili Ghzizade, Z. Golhosseini, F. Tajabadi, Characterization of bottom sludge waste in a thermal power plant evaporation pond (Case study: Damavand Combine-Cycle Power Plant, Tehran, Iran)	
16.15 - 16.30	M.J. San José, S. Alvarez, R. López, Preliminary study of anaerobic digestion process of biomass waste sludge in a Conical Spouted Bed reactor	
16.30 - 16.45	Discussion - Conclusions	

ROOM 1		CLOSING SESSION Chair: M. Loizidou, C. Cheeseman, G. Lyberatos, R. Luque, D. Bolzonella, F. Fatone, A. Zabaniotou, A. Vlyssides, N. Voulvoulis, F. Dilek, U. Yetis, S. Malamis
17.45 - 18.15	Synopsis of the IWWATV 2015 conclusions with the active participation of all Chair Persons	

Saturday, 23 May 2015	
08:45	Excursion-site visit to the NTUA Lavrion Technological & Cultural Park, the Sounion Temple of Poseidon and the "Mavro Lithari" beach
17:00	Estimated return to President Hotel



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Ε. Π. Ανταγωνιστικότητα και Επιχειρηματικότητα (ΕΠΑΝ II), ΠΕΠ Μακεδονίας - Θράκης, ΠΕΠ Κρήτης και Νήσων Αιγαίου,
ΠΕΠ Θεσσαλίας - Στερεάς Ελλάδας - Ηπείρου, ΠΕΠ Αττικής

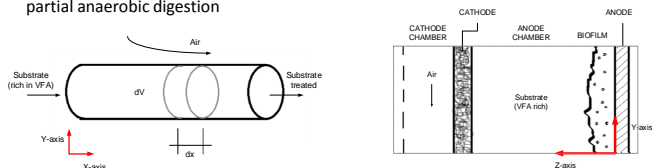
A DYNAMIC 2D MATHEMATICAL MODEL FOR TUBULAR-AIR CATHODE MICROBIAL FUEL CELLS USING CONDUCTION-BASED APPROACH FOR ELECTRONS TRANSFER TO THE BIOFILM AND VOLATILE FATTY ACIDS AS SUBSTRATE

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MOTIVATION

- The MFC to be modelled is a spirally wound MFC, which is similar to a single chamber tubular air-cathode cell. No practical models for tubular MFCs morphology -> Need of a new model
- The substrate considered for the MFC is a Volatile Fatty Acids mixture coming from a partial anaerobic digestion



Schematic section of the modelled MFC; Figure 6b schematic representation of the MFC as a plug flow reactor.

- OBJECTIVE:** Calculate the electrical current and voltage generated under different operational conditions considering spatial variations within the biofilm layer and across the tubular MFC

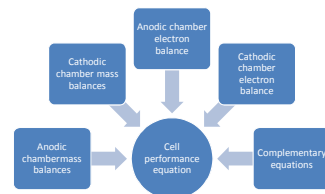
MAIN ASSUMPTIONS

- The MFC feedstock will flow along the x-axis. Components variations along y-axis will be considered as negligible. The biofilm grows along the z-axis perpendicular to the anode surface
- No added mediator to the anolyte => the **electrons transfer mechanism is conduction**
- The **anodic chamber of the MFC will be modelled as a plug flow reactor**
- For the **cathodic chamber**, oxygen concentration gradients in the air-side of the MFC will be considered negligible, thus a **CSTR approach will be followed**
- Part of the biomass will suffer an inactivation process (cells death, decomposition...) and will stop consuming substrate. As for the active biomass, a mixed microbial population, including methanogenic and anodophilic organisms will be considered. The MB will be able to transform acetate into methane and the EAB will produce electrons by reducing the feedstock carbon source. Both communities will produce electrons through respiration. Hence, the **biofilm will be a wild type mixed culture including bacteria competing for the resources**. No hydrolytic, acidogenic bacteria and acetogenic bacteria will be considered
- As for the VFA, the following composition is expected: acetate, propionate, butyrate, valerate and caproate, but only **acetate, propionate and butyrate will be considered as substrate**, i.e. carbon source according to literature

THEORETICAL MODEL

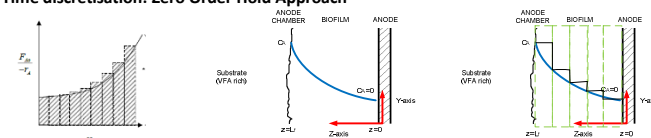
- Biofilm matrix is a conductor characterized by the **biofilm conductivity, k_{bio} ($mS\ cm^{-1}$)**.
- Use of **volumetric coefficient** (ϕ_v , inactive biomass volumetric coefficient, dimensionless; ϕ_v , active biomass volumetric coefficient, dimensionless.)
- Use of a parameter (σ_i where $i = EAB_A$ (acetate), EAB_p (propionate) and/or EAB_b (butyrate), dimensionless) aimed to implement the **selectivity of the biomass culture** as for the different VFAs

PROCESSES		
Process	Reaction	Place
1	Anodic oxidation by EAB	Anode
2	Propionate oxidation by EAB	Anode
3	Biofilm oxidation by EAB	Anode
4	EAB inactivation process	Anode
5	EAB respiration process	Anode
6	Anodic consumption by MB	Anode
7	MB inactivation process	Anode
8	MB respiration process	Anode
9	Oxygen reduction	Cathode
10	Biofilm formation and extension of MB	Anode
11	Biofilm formation and extension of MB	Anode
12	Biofilm erosion of EAB	Anode
13	Biofilm erosion of MB	Anode



MODEL IMPLEMENTATION

- Matlab implementation -> Simplification needed -> Model discretisation -> Change to a dimensionless and time-discrete model**
- Space variables discretisation: Finite Volume Method** i.e. the plug flow approach can be implemented as multiple CSTR (both for the anodic chamber and the biofilm)
- Time discretisation: Zero Order Hold Approach**



Reactor volumes for multiple CSTRs in series and comparison with Plug flow approach for the anodic chamber and the biofilm layer.

- Model being currently validated with experimental data coming from an air-cathode MFC operation using as substrate a VFA mixture coming from partial anaerobic digestion of wastewater sludge

FUTURE STEPS AND RESEARCH LINES

- Final model validation with more experimental data and sensitivity analysis
- Use of substrate in an elementary basis (C, H, O, N composition) in line with ADM1 approach