



PER AND POLYFLUORINATED ALKYL SUBSTANCES IN GROUNDWATER: WATER TREATMENT FOR INDUSTRIAL USE IN THE SURFACE FINISHING INDUSTRY



Project co-funded by the EU LIFE Programme under GA Nr. 101074321

LIFE FOUNTAIN – NEWSLETTER

Issue nr. 1 | September 2023

Welcome!

Dear Reader,

we are delighted to present you **LIFE FOUNTAIN**, a project funded by the EU LIFE Programme under the Grant Agreement Nr. 101074321.

The project officially started on August 1, 2022 with the aim to develop a sustainable remediation solution for the reduction of groundwater and aquifer **PFAS** pollution.

After the kick-off meeting in October 2022, a number of activities provided for by the Grant Agreement have already been performed.

So now we are ready and happy to share some news with you.

In this first newsletter, we will give you an overview of the project, present the consortium and highlight some useful information.

Furthermore, you will find the **FOUNTAIN CALENDAR**: a list of upcoming events where you can meet us and collect information about the project.

We hope you enjoy reading our newsletter and we invite you to visit the website www.fountain-project.eu and to follow us on social media, so to keep yourself always up to date and interact with us.

The LIFE FOUNTAIN partners



PFASs pollution: the context of the LIFE FOUNTAIN Project

PFASs, Per- and Polyfluoroalkyl substances, are defined as

“Any substance that contains at least one fully fluorinated methyl (CF₃-) or methylene (-CF₂-) carbon atom (without any H/Cl/Br/I attached to it).”

Due to their high energy carbon-fluorine (CF) bonds, PFAS are not degradable, and therefore, accumulate in the environment and in the human body: that's why they are also known as “forever chemicals”.

PFAS are not broken down by any known natural process and it has been proven very difficult and extremely costly to remove PFASs when released to the environment. They can be transported in surface water or groundwater contaminating drinking water and water used in urban and industrial processes. In recent, years, scientists and policy makers have joint efforts to understand the links between PFAS sources of human

exposure and adverse health effects, including metabolism, infertility, disruption of hormonal, endocrinal and immune systems.

Without taking action, their concentrations will continue to increase, and their toxic and polluting effects will be difficult to reverse.

In order to develop systemic and sustainable solutions, interventions should be made at different levels of the PFAS cycle, paying a special attention to crucial points, such as prevention of the ongoing pollution from industries using these chemicals (e.g., the **surface finishing industry**), as well as effective decrease of the amount of PFAS load from drinking water. Moreover, it is essential not only to capture PFASs from wastewater, but also to be able to efficiently decompose them, thus eliminate the risks associated with their handling or disposing.





The three phases of the project

The **LIFE FOUNTAIN** project proposes a comprehensive multidisciplinary solution to restore the water source of surface water and groundwater streams contaminated over the decades with PFASs, and the use of such resources in industrial plants.

The proposed technology also facilitates the reuse of the treated water within the same processes resulting thus in a low water consumption and a sustainable approach.

The **LIFE FOUNTAIN** solution will be implemented in 3 phases:

1. In-situ monitoring of PFAS

This phase will focus on development of new methods and protocols for the proper monitoring of PFAS in the water environment with emphasis on surface water entering the surface finishing industrial processes and water streams used in this industry (e.g. aquifers, water evaporation tanks used in plating processes).

Surface Enhanced Raman Spectroscopy (SERS) that is based on the utilization of appropriately functionalized Magnetic Nano-particles

(MNPs) will be used for in-situ monitoring of PFASs.

2. Capture and decomposition of PFASs

During this phase, solutions targeting the capture of PFASs in two type of water streams will be used: on one hand, surface water / groundwater in the area of the Gaser TC premises and, on the other hand, process water coming from internal processes running in the surface finishing facilities (e.g., water from evaporation tanks etc).

Currently there is no simple method that can capture efficiently PFASs from water. The current capture technologies (e.g., Active Carbon Filters such as Granulated Activated Carbon - GAC) have to deal with water stream that often contain impurities that lead to the fast saturation of commercial filters or pure selectivity in the PFAS of interest.

Thus, **LIFE FOUNTAIN** approach is to utilize as adsorbents functionalized *Magnetic Sponges* exhibiting high surface area and high selectivity that will be used for the treat-

ment of contaminated groundwater and process water.

The adsorbent Magnetic Sponges will be then regenerated using appropriate solvents in order to be used again.

The captured PFASs on the surface of Magnetic Sponges will be treated with *Electrochemical Advanced Oxidation Process* (EAOP) technology for their complete decomposition.

This process will allow to safely use the groundwater for surface finishing processes and will also allow to reuse internally water that has already entered the plating processes and has evaporated. This way, the water demand will be decreased contributing thus to a circularity of the water source and minimizing wastewater streams.

3. Demonstration activities

The last phase includes the application of the first two phases in an industrial environment.

More specifically, the partners Gaser TC and PDSER will install two treatment plants based on MS treatment and with several monitoring points throughout the process in order to eliminate PFASs from the contaminated aquifer water stream and from treated process wastewater.

Thus, the proposed technologies will be demonstrated in two different environments and will deal with different sources and concentrations of PFASs: surface water/groundwater contaminated with PFAS in the case of Gaser TC and PFAS-contaminated wastewater in the case of PDSER.



The **LIFE FOUNTAIN** project focuses on the Vicenza province, Veneto Region, where the contamination is affecting the groundwater, the surface water and the drinking-water.

A significant PFAS contamination in that area was discovered in May 2013, following a moni-

toring campaign by the Regional Protection Agency.

The area affected by the PFAS contamination is continually expanding and the massive presence of PFAS in the environment has affected, and is still affecting, the health of the population.

A recent investigation by Greenpeace revealed a high concentration of PFAS also in Lombardy Region.

PFAS pollution is a geographically diffuse and alarming problem that needs for a fast reaction and the LIFE FOUNTAIN method could be an effective solution.

PFAS pollution in Italy

A brief look at the technologies

The Magnetic Sponges (MS)

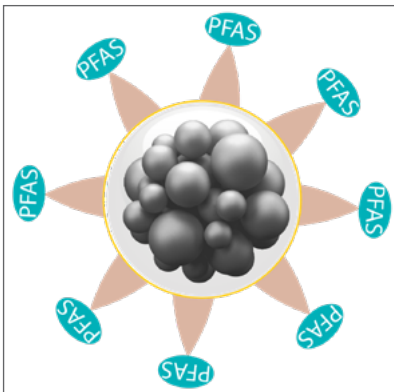
The MS are micro-aggregates of magnetic nanoparticles (MNP) with a high surface area.

They consist of a core (ferromagnetic material) and a coating (anchoring system) containing a mixture of a lipophilic and hydrophilic compounds.

The surface of MNP can be further modified by various functional moieties so to make the MS able to capture, remove and recovery the contaminants, or other unwanted species, from water.

The MS are produced by chemical precipitation in a controlled chemical and hydro-dynamical environment. The synthesis process is very competitive in terms of costs and easy scalable to high mass production.

Thanks to the ferromagnetic characteristic of the inner core, after the capturing process the MS are recoverable using a magnetic trap.



In the **LIFE FOUNTAIN** project, an appropriate functionalization of the surface of the MS will be selected to absorb PFASs that derive from surface water, groundwater or waste water of the industrial processes.

The Electrochemical Advanced Oxidation Process

The Electrochemical Advanced Oxidation Processes (EAOP) is an efficient and effective wastewater treatment technique that involves the generation of different reactive species (typically hydroxyl radicals) that can oxidatively degrade any class of organic pollutants.

Comparing to other oxidation techniques, in the EAOP the radicals can be generated in-situ via electrochemistry, which means the oxidation process can be driven by electricity rather than by chemicals to produce radicals. The EAOP has been proven to be an effective method for breaking down PFAS into smaller matters.

Apart from its high efficiency and powerful degradation capacity, compared to other oxidation techniques, the EAOP generates other advantages: environmental compatibility (using electricity rather than chemicals), versatility, and universal degradation capability, etc.

THE CONSORTIUM

The **LIFE FOUNTAIN** consortium is composed of 5 Italian partners that have a deep knowledge of the remediation techniques and the surface finishing industry.

The consortium includes **3 SMEs**, **1 RTD** and **1 Association** operating in the industrialized regions of Lombardy and Veneto:

- **Gaser T.C. Technical Coating Srl (GASER TC)**
PROJECT COORDINATOR
Specialised in chemical nickel coatings for the major oil and gas industries.
- **P.D. Service srl (PDSER)**
A surface treatment company with a strong specialization in fluorinated coatings.
- **Captive Systems srl (CaptiveS)**
The company has developed "MagnetoSponges", a technology for the removal of different types of pollutants from contaminated water.
- **Politecnico di Milano (PoliMi)**
A public scientific-technological university which trains engineers, architects and industrial designers.
- **A.I.F.M. - Italian Association of Metal Finishing (ASFIMET)**
No profit organization open to all the operators of the surface finishing sector.



PFAS restriction proposal

The national authorities of Denmark, Germany, the Netherlands, Norway and Sweden have submitted a proposal to ECHA to restrict around 10 000 PFASs under REACH.

On 7 February 2023, ECHA published the detailed proposal, one of the broadest in the EU's history. On March 22, ECHA opened a six-month consultation on the restriction proposal.

ECHA invites interested parties to send in scientific and technical information on the manufacture, placing on the market and use of PFASs by **25 September 2023**.



<https://echa.europa.eu/hot-topics/perfluoroalkyl-chemicals-pfas>

<https://echa.europa.eu/-/echa-publishes-pfas-restriction-proposal>

<https://echa.europa.eu/restrictions-under-consideration/-/substance-rev/72301/term>

The Activities

First monitoring visit

Last January 26, after five months from the official start of the project, the first monitoring visit took place at the Gaser T.C. premises in Isola Vicentina (VI).

Dr. Agnese Rigato (NEEMO EEIG), monitoring expert of the **FOUNTAIN** Project attended the meeting to evaluate the progress of the project.

All the partners presented the state of the art of the several tasks and the future actions and Dr. Rigato gave the partners some important tips for a smooth administration of the project and to ensure the compliance with the Grant Agreement.



After the technical sessions, the monitoring expert and the partners had the chance to visit the Gaser T.C. offices and production lines.

By the end of this year, a new monitoring visit will be arranged.

Recent dissemination events

From March 29 to March 31 in Bologna (Italy), ASFIMET and GASER TC participated in MECSPE, the international reference fair for the manufacturing industry.

During the event, the dissemination material of the **FOUNTAIN** Project has been displayed and distributed.



Moreover, on March 30 a workshop dedicated to the European Project regarding PFAS reduction in groundwater was organised by AIFM-ASFIMET. On this occasion, the partner POLIMI presented the context, objectives and actions to a target audience coming from the electroplating industry and the waste water sector.

The project was also showed at LAMIERA, the international exhibition dedicated to the industry of sheet metal working, that took place in Milano (Italy) from May 10 to May 13.



LIFE FOUNTAIN CALENDAR

In the second part of 2023 you will find us at:

20

Sep

REMTECH | Ferrara, Italy
International event dedicated to protection and sustainable development.

The **LIFE FOUNTAIN** project will be illustrated during a session organized by the sister project LIFE CAPTURE, dedicated to the latest advances in the field of PFAS contamination and remediation.

17 - 20

Oct

SICAM | Pordenone, Italy
International Exhibition of Components, Accessories and Semi-finished Products for the Furniture Industry.

The partner Asfimet will participate at the fair as exhibitor. The staff will distribute the dissemination material of **LIFE FOUNTAIN** and will be available for any clarification.

25 - 26

Oct

P&E COATING DAYS | Milano, Italy
The event dedicated to the technological innovation and sustainability in the field of surface treatments.

During the two days of seminars and exhibition, the partner Asfimet will be there to illustrate the benefits of the remediation solution proposed by the **LIFE FOUNTAIN** project.

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