

Editing: **Amapola Società Benefit** 

Visual: Za!Factory

# **FABBRICHE** APERTE

**LOGBOOK** 

a year of workshops focused on listening and dialogue

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Listening, sharing and dialogue: the link connecting factory and community.

Hosting and accompanying citizens inside our factory to discover and experience first-hand where and how the molecules, polymers and special liquids that we export all over the world are made.

Visiting environmental remediation areas and facilities dedicated to water reclamation and protection.

Meeting and getting to know our people who work and largely live here in Spinetta Marengo.

Fabbriche Aperte LAB is all of this. The first edition of a cycle of meetings between the Syensqo team and the local community, focused on listening and dialogue, in 2023 hosted more than 300 citizens eager to take part in the guided tours and subsequent workshops at the discussion tables. Those who took part in the stages of the LAB represented many categories: trade unionists, trade association officials, teachers and students from universities and schools, local businessmen and women, family doctors and officials from the Local Health Authority, city councillors and local politicians but, above all, families and residents of the Spinetta Marengo suburb and the Fraschetta area.

The initiative is part of the "Fabbriche Aperte" format, the periodic event where we open the gates of our factory. At the last edition, which took place on 18 September 2022, over a thousand people entered the plant in a single day, with the success of the event confirming a widespread interest in getting to know the industrial reality up close. Following this outstanding experience, the team decided not to dissipate the wealth of expertise, passion and pride that our people managed to convey during the open day. And, at the same time, to keep alive the opportunity to discuss the present and future challenges of our factory: this led to the idea of the thematic "LAB" cycle.

This is the **architecture** of the first edition of Fabbriche Aperte LAB:

What is it? A series of meetings with field visits dedicated to issues of social responsibility and sustainable development for the territory and the community, co-designed by Syensqo together with Amapola Società Benefit.

**Where?** At the chemical factory site in Spinetta Marengo.

**When?** 5 meetings in 2023 from April to October and 1 final feedback session (November).

**How?** The meetings included a guided tour by shuttle bus to factories/departments/ areas of the site and a subsequent workshop focused on listening and dialogue.

**Who?** The factory's workers acted as volunteer tutors for the guided tours and facilitators for the subsequent workshops focused on listening and dialogue. For these roles they were trained and supported by Francesca Schirillo, an experienced professional facilitator.

Why? To guarantee a space where the company, the social partners and the local population can exchange ideas in order to extend and improve knowledge of the productions and development plans, and environmental safety protection.

A **fundamental element** is the role played by the **people who work here**: in this case, they not only acted as **guides** during the visits to the production departments and plants on the site, but they also worked turned their hand to the art of "facilitation" at the discussion tables with the citizens who participated. In order to do this, they received **training on specialised techniques** dedicated to developing the ability to listen to and manage the discussions. This provided an additional opportunity to learn about and receive "training" on how to communicate and interact with the queries of the local community and further confirmation of the widespread willingness of our people to carry out **activities on a voluntary basis** that can help to make the value of their work known. The following pages present topics covered in the five events of the first edition of FA LAB. They are useful to keep track of the issues seen and discussed with the participants and to have a small updated publication to consult to answer **requests for information, questions or doubts**.

We hope you enjoy reading it, and would like to share with you all a belief that inspires all our business actions: the most important energy of a territory is that of the people who inhabit and love it. Sharing and dialogue are the drive belt that enable us to convey and exchange this energy.



#### At the forefront of innovation

Thanks to the strong synergy that was created between research and application, Syensgo is a leader in the development of innovative materials recognised for their durability and resistance when subjected to mechanical, thermal and corrosive stress, even of high intensity. Products that meet the growing needs for alternative energy, clean water and quality of life.

These characteristics allow Syensqo products to be fundamental aids for industrial design in strategic sustainable development areas such as:





batteries



consumer electronics



aerospace



oil & gas



healthcare



construction

#### What we produce today

For a chemical factory with more than 100 years of history, it is understandable that a historical image of production — from acids to chromates and titanium dioxide — endures for those who look at us.

In the last 20 years, however, with the Solvay property, now Syensqo – supporting reclamation activities relating to past contamination — the "geography" of the site has changed drastically. People are often surprised to discover that the special polymers produced here "travel" around the world, serving markets that drive innovation with a sustainable focus.

The **Spinetta Marengo factory**, starting with **monomers** - molecules that combine with other molecules to **create special fluids and polymers** - produces key materials for the creation of:

- O **synthetic rubbers** particularly resistant to chemical agents, which are used in the production of semiconductors found in various everyday or industrial devices (aeroplanes, cars, motorcycles, electronic devices);
- O **seals and gaskets** that maintain their shape, resistance, and flexibility at extreme temperatures and in contact with gases, lubricants, additives, and other chemical products;
- O membranes for devices to store and convert electricity, such as fuel cells, electrolysers, and flow batteries, which are essential in integrating renewable energy in electrical networks, developing the green hydrogen production chain, and advancing sustainable mobility;
- O **lubricants** with unique characteristics in terms of thermal and chemical flexibility and stability, used in hard disks, car door opening devices, car transmissions and rear-view mirrors, and for lubrication in aerospace devices;
- O **functional fluids** designed specifically to treat surfaces such as paper, fabric, and screens, due to their excellent stain-proof properties and water- and oil-repellent features



## That's not all! The factory is constantly dedicated to addressing and anticipating new challenges and trends.

For example:

This is where we produce a particular molecule that allows you to clean your **smartphone** by simply rubbing it on your arm.

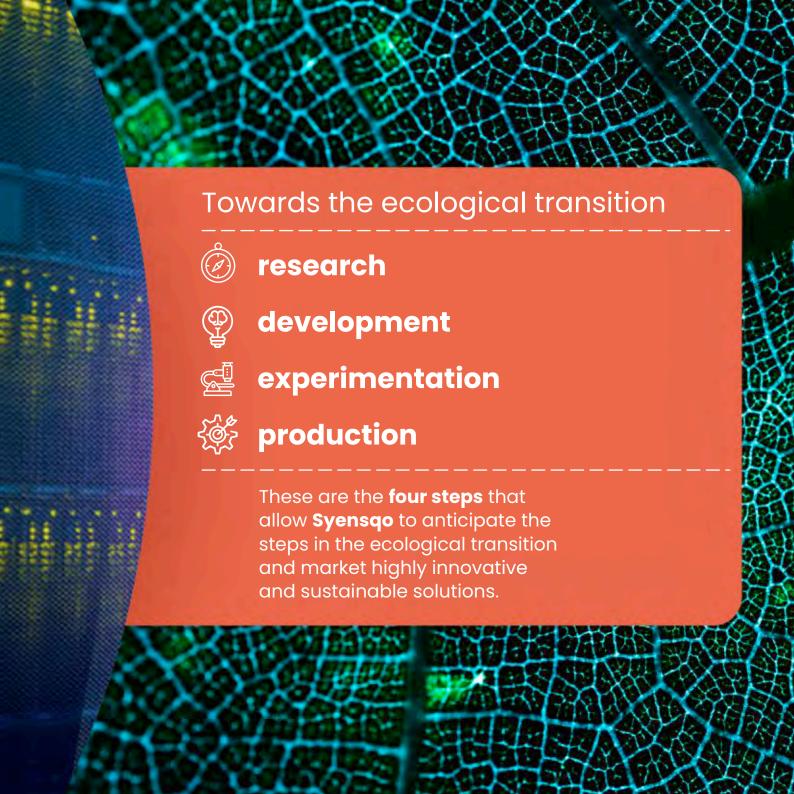
This is where we create special polymers for **sensors** based on semiconductors used in the **automotive** sector and for **bracelets and other wearable electronic devices** (smart watches, portable healthcare devices, wireless earphones, and smart clothes) that meet the need for lightness, durability, and resistance.

This is also where we produce special fluids for immersing **superprocessors** in cooling tanks on server farms, leading to tremendous energy savings over the current electrical fans.









## Green hydrogen and sustainable mobility: at the forefront with Aquivion®

Humanity is constantly searching for solutions to make means of transport more sustainable. In this respect, green hydrogen is emerging as one of the most promising — yet challenging — solutions. In 2023, the new Aquivion® prototype plant was introduced. This innovative technology for the production of polymer membrane materials is integrated into the sustainable, renewable, and carbon-free green hydrogen production chain.

#### What is green hydrogen?

Green hydrogen is produced through the electrolysis of water, a process that separates water molecules (H<sub>2</sub>O) into oxygen (O<sub>2</sub>) and hydrogen (H<sub>2</sub>) using electrical energy deriving from renewable sources such as the sun or wind. It is "green" precisely due to the use of these clean energy resources, in contrast to "grey" or "blue" hydrogen, whose production relies on fossil fuels with a higher carbon footprint.

Green hydrogen provides high-density energy, a feature that makes it particularly suitable for powering means of transport that require large amounts of energy or longer autonomy, such as lorries, trains, or even ships and planes. When hydrogen is used in a fuel cell to produce electricity, the only by-product is water, eliminating toxic emissions from exhaust pipes.



#### An advanced plant

The total investment is €12,370,000, for which the Italian Ministry for Business and Made in Italy is financing more than €2,791,350 in the form of contributions to expenditures. The Lombardy and Piedmont Regions are also participating in the project, for a total amount of more than €370,000.

The Spinetta factory can become a point of reference to **encourage local settlement** for companies integrating the industrial sustainable hydrogen **production chain** or those committed to the ecological transition and the development of **technologies** capable of guiding this transition.

The plant, equipped with more than 2 km of pipes, was completed in just over two years, with **36,000 hours of work** and following the highest safety standards, thanks to which there were no accidents.

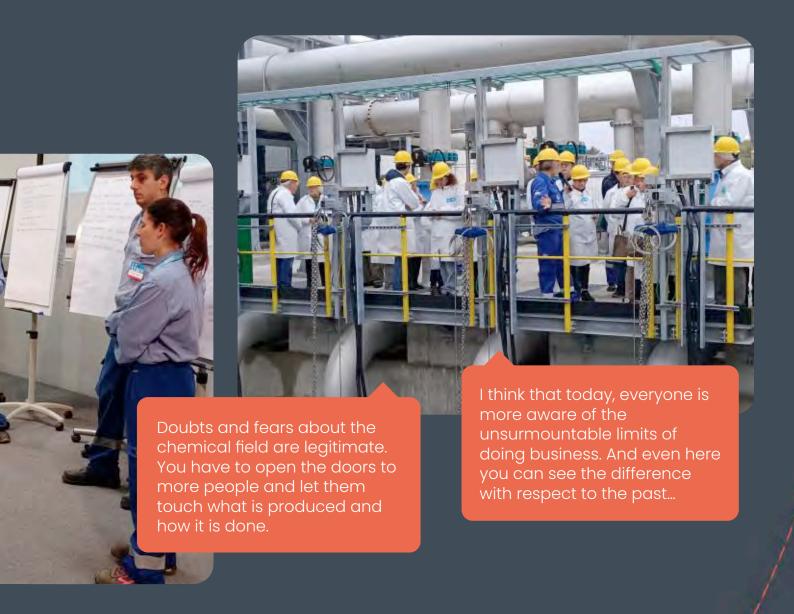
The **products** manufactured in the new **Aquivion® prototype** plant fit perfectly in a sustainable, renewable, and carbon-free hydrogen production chain. In fact, the production chain and use of green hydrogen feature a **double zero impact**: upstream, using renewable energy to store energy in flow batteries and generate hydrogen starting with water in electrolysers; and downstream, with only water vapour emitted into the atmosphere following energy production in the fuel cells.

The hydrogen economy is taking off, and with materials made at the new Aquivion® prototype plant, the factory stands at the **forefront** in focusing on the objectives of **decarbonization in energy storage**, **hydrogen production**, **and sustainable mobility**.





## Fabbriche Aperte LAB



## in words and images



## Fabbriche Aperte LAB



## in words and images



## The hydraulic barrier

The hydraulic barrier has been active since 2009. It consists of **81 wells** situated along the perimeter of the factory which intercept groundwater leaving the site so it can be sent to **the treatment plant** (groundwater treatment) for later use as industrial water.

With 11 million litres of water (about 4 Olympic-sized swimming pools) treated daily, a widespread monitoring and analysis system, and an innovative system relying on artificial intelligence, the "barrier" has proved to be effective and safe, while actually treating the water. The most recent data highlight the continued decrease in concentrations of all contaminants in the groundwater outside the site, confirming historically minimal values.

#### The numbers



more than **10 years** of operation



Increasing the **flow** to **570 m³/h** (equivalent to about 6 Olympic-sized swimming pools per day)



**31,5** million of m<sup>3</sup> of water treated each day (10 million litres/day)



81 wells



**300 points** of constant monitoring both on and off site



More than **375.000 chemical analyses** made



**310 manual measurements** of groundwater levels and **27 stations** for continuous measurement



Implementation of an innovative **artificial intelligence** system to anticipate trends in groundwater I evels at 1, 3, and 5 days



#### legend

location of the hydraulic barrier and internal pumps



## Recovering from historical contamination

The Solvay Group is not responsible for historical contamination of the Spinetta Marengo site, which was purchased in 2002. However, activities to decontaminate and secure the site, today Syensqo, have proceeded nonstop since the first day under new management, with a commitment to address and eliminate environmental problems inherited from more than a century of industrial use.

Decontamination activities have involved vears of environmental investigation, research, and experimentation, first in the lab and then in the field, as well as continuous refinement of decontamination designed according to the best available techniques and the application of new, innovative technologies specially designed by the company. Environmental restoration projects were implemented quickly in all contaminated areas of the site This was a complex, challenging operation involving specialized teams together with technical consultants and qualified partners such as Università del Piemonte Orientale, as well as constant collaboration and monitoring with public agencies.





#### Site's commitment to decontamination

€ 47.2 million € 26 million set aside for future activities

332

+430,000 analyses made

monitoring points

3 dedicated labs

external

#### The results to date

Syensqo on-site areas:

variations in concentrations of the main pollutants

	september 2009	december 2023	abatement
Hexavalent chromium	133 µg/l	52 μg/l	61%
Chloroform	3888 µg/l	19 µg/I	99%
Carbon tetrachloride	1250 µg/l	30 µg/I	97%
Trichlorofluoromethan	ne 132 μg/l	11 µg/I	92%
Trichloroethylene	1795 μg/I	15 μg/I	99%

#### Off-site areas:

variations in concentrations of the main pollutants

	september 2009	december 2023	abatement
Hexavalent chromium	73 µg/l	25 μg/l	65%
Chloroform	154 µg/l	13 µg/l	92%
Carbon tetrachloride	251 µg/l	18 µg/I	93%

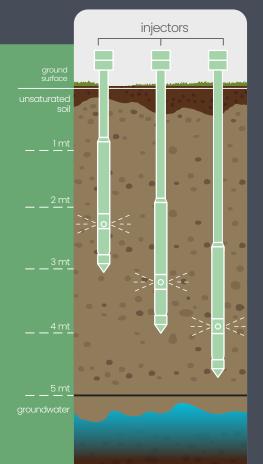
#### Hexavalent chromium decontamination

With regard to **hexavalent chromium** decontamination, the site has already conducted restoration activities on about 60% of the areas historically affected by this substance. ISCR (in-situ chemical reduction) technology was studied and developed in collaboration with the Università del Piemonte Orientale and validated by ARPA (Regional Environmental Protection Agency). The work consists in "injecting" a particular substance, sodium dithionite, into the soil. In its liquid form, this reagent reduces hexavalent chromium (toxic and highly mobile) into trivalent chromium (innocuous and practically immobile).

More than 10 years ago, the **two hazardous waste dumps** (C1 and C2) were secured. These derive from past activities when processing waste containing chromium was stored without any protection. Covers and sealants (capping) insulate the waste from the external environment and prevent rainwater infiltration, which is 'responsible' for carrying the contamination into the groundwater.

ISCR decontamination avoids:

- the removal of soil and transfer of the pollution elsewhere
- the use of new natural resources to find clean soil to fill the hole
- risks and additional environmental impacts related to transport



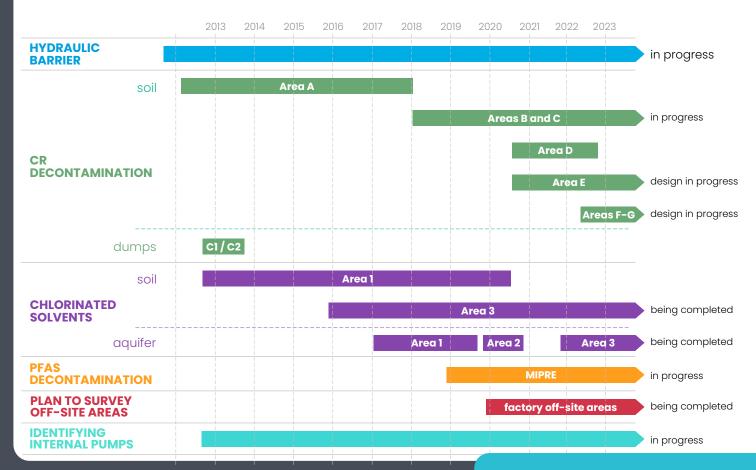
#### Removal of chlorinated solvents

Along with decontamination activities related to hexavalent chromium, the factory is committed to removing **chlorinated solvents** (primarily chloroform, carbon tetrachloride) **in both the soil and aquifer**. In the first case, the pollutants are removed by extracting the gas from the soil (SVE – soil vapour extraction), while chlorinated components are eliminated from groundwater through the introduction of organic microemulsions (ERD – enhanced reductive dechlorination). In addition, groundwater is **pumped specifically** from areas with greater concentrations.

#### Decontamination using the hydraulic barrier

The **hydraulic barrier** has been active since 2009. It consists of 81 wells situated along the perimeter of the factory which intercept groundwater leaving the site so it can be sent to the treatment plant (groundwater treatment) for later use as industrial water. With 11 million litres of water (about 4 Olympic-sized swimming pools) treated daily, a widespread monitoring and analysis system, and an innovative system relying on artificial intelligence, the "barrier" has proved to be effective and safe, while **actually treating the water**. The most recent data highlight the continued decrease in concentrations of all contaminants in the groundwater outside the site, confirming historically minimal values.

#### **Timeline**



#### **PFAS removal**

Preventive safety measures were implemented in agreement with public agencies to remove PFAS, artificial chemical substances called per- and polyfluoroalkyl substances that are widely used in industrial processes. In 2019, localized on-site intervention began in the area with the highest concentrations, where the water was filtered (adsorption) using an ion-exchange resin. Another decontamination activity involves the groundwater treatment plant, which is based on activated carbon filters and containment in the water barrier.

#### Drinking water at Spinetta Marengo is and has always been safe.

The depth of the local aquifer (more than 60 m) shows no contaminants, let alone PFAS compounds either on or off site.





#### Maps of interventions

Off-site areas

Confirming its constant commitment to environmental sustainability of the area around the production factory, **Syensqo** has voluntarily joined the reclamation project, previously Solvay, for off-site areas, presenting a survey plan useful for verifying the quality of the groundwater and land for an off-site area covering about 6 km<sup>2</sup>.

## Contamination: did you know that...

An international board of arbitration recently confirmed that when ownership of the Spinetta Marengo industrial site shifted from Edison to Solvay (2002), Edison provided Solvay with a falsified report on the state of environmental contamination at the site. Edison was therefore forced to pay Solvay for damages for misleading statements regarding the depth and extent of the contamination.

The Italian court determined that the environmental profile produced by the previous owner did not reflect the severity of contamination at the site in Alessandria due to past industrial production.

## PFAS: how chemical innovation involves unexpected challenges together with great benefits

When we think of chemical products, we often imagine substances contained in well-sealed jars and bottles used for cleaning products or maybe medication. In reality, many objects in our daily lives would not exist without one or more chemical compounds. These varied compounds include a group called PFAS, a rather complicated acronym for artificial chemical substances called "perand polyfluoroalkyl substances", which are used widely in industrial processes and present in different products that we use every day.

PFAS are known for their **extraordinary properties**: resistance to heat, oil, stains, and water. Due to these characteristics, PFAS are found practically everywhere: from nonstick pans to waterproof clothing, as well as firefighting foams and even some food packaging. They are also found in advanced applications such as electronics, hydrogen production, and electric batteries.

Over the years, it has emerged that specific compounds in the PFAS family (fluorosurfactants) tend to spread easily in the environment. This has led to growing attention towards their **potential effects on human health** and the need to raise awareness about these specific PFAS. On the other hand, most PFAS are not known to have an impact on the environment or people. In fact, although they are included in the PFAS family of compounds, fluoropolymers meet OCSE criteria for "low-risk polymers" and are **essential for our daily lives and the ecological and energy transition**, for example, lithium batteries, fuel cells, and green-hydrogen production, water treatment, energy efficiency, and the production of semiconductors.



Beyond the scientific evidence, the pressure of a few people have led public institutions to act, adopting measures to reduce or eliminate PFAS.

### Investments, technology and results

One fundamental premise: as confirmed by ARPA, researchers, and the authorities, **drinking water at Spinetta Marengo has never been contaminated with PFAS**. The depth of the aquifer does not show any danger of any contaminant, even less relating to PFAS outside the site.

Of course, the use of PFAS fluorosurfactants as additives in the production of some fluoropolymers is a global challenge for the entire chemical sector, and the site, here at its factory near Alessandria, immediately began to eliminate first-generation surfactants. It now produces only limited quantities of a fluorinated surfactant (C6O4), which has a safer toxicological profile as confirmed by various independent scientific studies, including those recently conducted by the universities of Padua, Pavia, and Turin.

That's not all. Since 2019, the site has **quadrupled investments** in research and innovation to develop new technologies that do not require the use of fluorosurfactants. In this respect, **Syensqo will be producing nearly all of its fluoropolymers without the use of fluorosurfactants** at its factory in Spinetta Marengo by 2026. Hence the recent interruption of two historical and important production lines that used fluorosurfactants. Only one small product line that is strategic for the semiconductor and energy industries — representing **less than 1% of the production volume** — will require further research to fully eliminate the use of fluorosurfactants. A **tightly controlled, zero-waste, closed-cycle** production process will be used for this line.

While this challenging path is being initiated, Syensqo continues to introduce advanced technology to eliminate emissions of these substances during production. The site has recently invested more than € 40 million in new plants at the Spinetta Marengo site (reverse osmosis and activated carbon) to further enhance the water treatment systems and guarantee the removal of fluorosurfactant emissions to nearly 100%, the "technical zero" level. Even before these investments, however, the Spinetta Marengo factory used treatment plants in line with the best available techniques (BAT) provided by European regulations to guarantee effective removal (more than 99%) of these compounds.



► PLAY NOW

Reinventing fluorosurfactants at Syensqo



**▶ PLAY NOW** 

Phasing out fluorosurfactants at Syensqo

#### New plants

These are the characteristics of the two **new plants** for reaching the **«technical zero»** level:

#### the **REVERSE OSMOSIS** plant

The reverse osmosis plant for treating production waste water is used to separate the PFAS surfactants from the water. The plant covers an area of 6,500 m² and treats 40 m³ of wastewater in a complex process involving ultrafiltration, reverse osmosis through 250 membranes, and a final electrodialysis step. The demineralized water is then reused in industrial processes at the site with a view to the circular economy.



#### the **ACTIVATED CARBON** plant

The activated carbon plant constitutes an innovative step for additional filtration of the industrial cooling water and rainwater. This highly technological plant, which covers I ha, consists of 40 filtration columns that treat up to 4,000 m³ of water per day, a capacity equal to 40 Olympic-sized swimming pools.



#### PFAS and water

In addition to the two new treatment plants (reverse osmosis and activated carbon), the factory has acquired numerous water treatment units in line with the best available technology (BAT) defined by European regulations:

treatment plants with ion-exchange resin

treated water 154 m³/h

7 treatment plants with activated carbon

treated water 632m³/h

control analyses
several hundred

reported every year to public agencies

Water emissions have always respected the applicable limits. Nevertheless, given this broad water treatment, the emission of the main PFAS fluorosurfactants have constantly halved year after year, reaching average concentrations in 2023 of around a fraction of a part per billion. To give an example of the quantities achieved, this would correspond to

a single grain of corn among

4 million cobs

#### PFAS and air

The current units installed for air treatment in line with the best available technology (BAT) defined by European regulations include:

treatment plants with activated carbon

water scrubber treatment plant

hydrofluoric acid recovery plant, the only one in the world

to reduce the consumption of raw material with a view to the circular economy

annual analyses in the suburbs of Spinetta Marengo

With regard to air emissions, the level for the main PFAS fluorosurfactants of the entire Spinetta Marengo factory is rather low and constantly decreasing, comparable to

a single Euro 6 car that emits

a few kilograms of hydrocarbons per year

reported each year to the public agencies in addition to constant emission checks stipulated by the integrated environmental authorization

#### PFAS: monitoring systems and analysis

Thirty people are employed full time in the three dedicated analysis labs (along with an external lab), and about 50,000 analyses are carried out each year. The technology used to for the PFAS analyses determines the substances present in concentrations well below one part per billion.

air number of samples and analyses

samples of personal PFAS exposure	100
outdoor samples for PFAS	270
smokestack PFAS samples	320

water number of samples and analyses

total samples for PFAS analysis	20,000
total analyses for PFAS analysis	50,000

#### The next steps in 2024

Following the path to strengthen the "technical zero" limit, additional abatement systems will be installed at the factory for an estimated investment of about €30 million, starting with the expansion of water treatment in the activated carbon plant for an additional 300 m³ per hour before final discharge.

«Knowledge of one's fellow has this special aspect: it passes necessarily through knowledge of oneself.» This sentence by Italo Calvino in 'Mr. Palomar' contains the meaning of the step-by-step experience in this first edition of Fabbriche Aperte LAB. We have tried to understand ourselves better through our "neighbours", sharing what we have learned in recent years and what we are doing to guarantee continuity for the Spinetta Marengo industrial site, both to remedy historical pollution at the site and reinforce environmental protection with a view to increasingly sustainable development. But above all, we have listened carefully to what is perceived by FA LAB participants regarding our work and our commitment. A lot of points emerged from these meetings, each worthy of attention and investigation by us to constantly foster our relationship with the local community. What was the main evidence that emerged from the perception of these stages?

- The direct relationship between participants and Syensqo personnel: Meeting many
  young professionals, sensing the expertise and passion, appreciating the relaxed,
  collaborative, and proactive atmosphere of the team led the participants to adopt an
  attitude that was more trusting and more open-minded;
- The opportunity to see and discover aspects of the factory that are hard to see from outside: The fact that people could enter, observe, and touch the production, being "physically" involved in the guided visits entering the production areas, wearing safety equipment, looking, and in some cases even handling objects and production materials involved the participants in depth and actively stimulated their curiosity;
- The willingness of the corporate team to "expose themselves" and be transparent:
   The decision to show, explain, interact, and use yes scientific expertise, but in an informal, colloquial way, and show empathy with the participants was particularly appreciated;
- The division into tables of no more than 8–10 people allowed everyone to participate actively, so everyone's voice and more questions could be heard;
- The invitation to extend and reinforce communication outwards, enhancing informational tools and opportunities to interact, as well as favouring outreach rather than a technical or institutional approach. With regard to the last point, it is important that some participants in the first stage of Fabbriche Aperte LAB suggested accompanying the newspaper and online announcements with paper invitations that would directly reach the families in the suburb and the Fraschetta area. This idea was readily accepted and adopted for all subsequent stages, with door-to-door distribution of about 40,000 invitations to workshops and informational brochures on the topics: concrete application of active listening and co-design that best gathered the spirit of the FA LAB initiative.

Our commitment is to not squander the opinions, questions, and suggestions acquired along the path, but rather to continue with new initiatives that can raise the bar even higher for frank, transparent interaction among the people working at the factory and those who represent the community. We are aware that technological innovation in our production process can lead to value only if accompanied by social innovation created with and for people.

