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News

IFPEN

This year, IFP Energies nouvelles (IFPEN) is celebrating its 80th anniversary. It was originally created as the Institut français du pétrole (IFP) at the end of the Second World War to develop petroleum technologies. Then in 2010, IFPEN evolved into IFP Energies nouvelles (New energies), and today, contributes to shaping a more sustainable, low-carbon energy mix. As heirs to a glorious history, our teams are constantly looking to the future, combining expertise and innovation to rise to the challenges of the 21st century.

From oil to the energy transition: a chronicle of evolution

Founded in the mid-1940s, IFP was tasked by the French government **with promoting the development of the French oil and gas industry through research, training and documentation**.

In the years that followed, **IFP forged its identity**: formalizing knowledge and high-quality teaching, structuring laboratory activities around a rigorous scientific methodology and knowledge base, and collaborating with prominent specialists from around the world. Objective: close the scientific and technological gap accumulated by the national oil industry.

In 1947, there were 298 employees at IFP. Today, IFPEN has 1,550 employees working in 50 different professions, 40 laboratories spread across its sites in Rueil-Malmaison (near Paris) and Solaize (in the Lyon metropolitan area’s chemical valley), as well as 500 students graduating from its school each year.

In 2024, the mission of its teams, alongside the training provided by the specialist engineering establishment IFP School, is very different. It aims to innovate for a low-carbon and sustainable world, dedicated to supporting the triple transition in terms of energy, ecology and digital technology.

How? By working on a vast array of technologies **in the fields of energy, mobility and the environment** to promote the recycling of products, materials and waste (metals, plastics, carbon), develop the use of renewable energies (wind power, geothermal energy, energy storage, biomass, biogas, etc.) or even to clean up transportation and make it more energy-efficient (electric powertrains, sustainable aviation fuels, etc.).

In the space of 80 years, **50 different professions, from geological engineering to powertrain engineering**, have been transformed to rise to the challenges of the 21st century. How did such a dramatic transformation take place?

When research joins forces with industry to shape the future of energy

> "All research work must be capable of being directly or indirectly associated with the pursuit of an objective for which the industrial benefit can at least be defined, if not already precisely analyzed", wrote René Navarre, General Manager of IFP, back in 1950.

André Giraud, a young engineer from the Corps des Mines who became Technical Director in 1956, adopted and conveyed this vision, believing **that research activities should be geared towards industrial transfer**, so that IFP could fully **adapt to the new technological challenges it would face in the future**.

By 2023, IFPEN had filed 154 first patent applications, including 125 in the field of energy transition.

In fact, from the 1950s and 60s onwards, **a profusion of new companies were set up** to take the fruits of such research to market. It was also at this time that IFP acquired new testing and industrial extrapolation resources, with the construction of the industrial research and development center (CEDI) in Solaize.

As an essential link in the process of taking IFP's technological innovations to market, the spectrum of activities at the Solaize site has steadily expanded over the years, with a growing influx of logistical resources and relevant skills.

Creating spin-offs for the triple transition

Since its inception, IFPEN has created more than 30 companies specializing within the fields of processes, geoscience software, connected mobility and training. Axens, which was founded in 2001, is a prime example of IFPEN's business start-up policy and of how the research carried out by its R&D department can be successfully transferred to industrial production by its subsidiaries. Axens is a market leader in refining,

petrochemicals and gas treatment, and today, it develops and markets solutions that provide access to clean fuels and environmentally-friendly plastics, while helping to diversify the resources that are used, from oil to bioresources.
>> Check out IFPEN's chemical plastics recycling processes

This new development consolidates IFPEN's unique multi-scale approach, which is used to validate the robustness and reliability of IFPEN's technologies under conditions resembling those encountered in industrial operations, by implementing various intermediate-sized pilots. The dedication of our teams has spawned pilots and pre-industrial demonstrators that are capable of testing and de-risking the innovations developed in our laboratories.
>> Read our article on the successful demonstration of the DMX™ CO2 capture process in Dunkirk

Coupled with a dynamic ecosystem of partnerships with research organizations and industrial players, this approach has brought IFPEN **into direct contact with the needs and challenges of industry and the market**, and has enabled it to **transform scientific results into low-carbon, sustainable solutions** that can be directly applied to the energy transition, while contributing to creating wealth and national sovereignty.

The most recent example is the creation of the IFPEN GreenWITS wind power subsidiary in 2023. GreenWITS is the culmination of more than a decade of cutting-edge research, backed by long-standing expertise in the offshore and control fields, and is well poised **to serve Europe's wind energy ambitions**.

Decarbonization: no favoritism

From the outset, IFPEN's industrial orientation also meant that it had to re-examine the very purpose of research, which is too often equated with the need to succeed in inventing something. "Sometimes it takes more intellectual and financial effort to obtain a result that is an "improvement", than it does to obtain a result that is an "innovation" [in the sense of invention]", André Giraud also explained in 1963, admitting **the importance of perfecting existing tools**.

Inspired by this approach, as well as by the analysis of scenarios conducted by organizations such as the IPCC to factor in complex changes in socio-economic systems, IFPEN's decarbonization strategy combines **pragmatism and adaptability**: it considers that there is no single answer to the energy transition, but rather that it requires a combination of technologies, **each with its own advantages and limitations**, aimed at supporting efforts to achieve energy sobriety and efficiency, alongside changes in behavior.

IFPEN's commitment to technological objectivity therefore implies **considering all existing technologies**, whether new or tried and tested, on the basis of their overall impact and **their ability to satisfy the objectives of the energy transition**.

For example, in the field of mobility, in addition to working on **electrification for passenger cars and heavy goods vehicles**, IFPEN teams, which have been continuously involved in the automotive sector since the 1960s, are pursuing other avenues for reducing emissions. These include innovations

in **combustion**, **hybridization** and **using low-carbon fuels**, not to mention **hydrogen** and **fuel cell solutions**, and even more generally, analyses **focusing on infrastructures** in a position to support this far-reaching technological transition.

The transitional years

These solutions, which are essential in the carbon-intensive transport sector, are t**he fruit of pioneering research**. In the 1980s, in response to changes in the oil industry and rising environmental concerns, IFP embarked on programs focusing on alternative fuels, the conversion of residues* and the design of clean, frugal engines.

IFPEN's focus on the environment was enshrined in 1994 with the creation of **an Environmental Coordination unit,** tasked with defining a truly comprehensive policy in this sphere. **In the early 2000s, IFPEN initiated a transition strategy** that was structured in the 2006-2010 Objectives and Performance Contract. It was designed to optimize the use of existing resources and diversify energy sources, based on the twofold imperatives of energy and the climate.

In 2008, IFPEN once again stepped up the pace, by founding the Sustainable Development Technologies division to consolidate its leadership as a **provider of sustainable solutions for the production and application of environmentally-friendly energy systems**.

> "Work with the public authorities to prepare for a carefully managed energy transition; consolidate existing industrial sectors and contribute to the emergence of new industrial sectors in the fields of energy, transport and the environment: this was the two-fold ambition of our previous objectives contract. The results of it were positive, with almost all the objectives achieved and even exceeded", explained Jean-Jacques Lacour, IFPEN's Strategic Implementation Director, in 2010.

So, **in 2010, IFP became IFP Energies nouvelles**. This new name reflects the purpose and current reality of the programs striving for an energy mix in transition from fossil fuels to renewable energies. The institute devotes almost half of its R&D programs to new energy technologies.

* Process by which heavy residues from petroleum refining are transformed into lighter, more valuable products, such as fuels or chemical feedstocks. It optimizes the use of fossil fuels and reduces waste, while at the same time improving energy efficiency.

Horizon 2035: aiming for carbon neutrality

Today, the transition no longer represents a challenge for the future, but **a necessity to be achieved in the present**. In 2023, IFPEN launched Horizon 2035, a major collective reflection project, to look to the future and **identify the technologies deemed to be of major public interest for this tangible transformation**. They were classified into three categories based on their level of maturity: the improvement of existing and mature technologies thus goes hand in hand with the exploration of

promising, forward-looking avenues.

So, while continuing to offer tried-and-tested, profitable solutions, our teams are also developing groundbreaking innovations for the future.

> In 2023, new energy technologies accounted for 76% of IFPEN R&I

This is the case for CO2 capture, with research into Direct Air Capture (DAC); certain biotechnologies for the production of biofuels, for which IFPEN is investigating new enzymes; recent advances in the recycling of battery materials; work in the field of the water cycle, aimed at encouraging efficient uses and optimizing upstream resource management; and the management of microplastic flows in the environment.

An approach that now **places IFPEN firmly in the energy landscape of tomorrow**.

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