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Research and innovation for industry

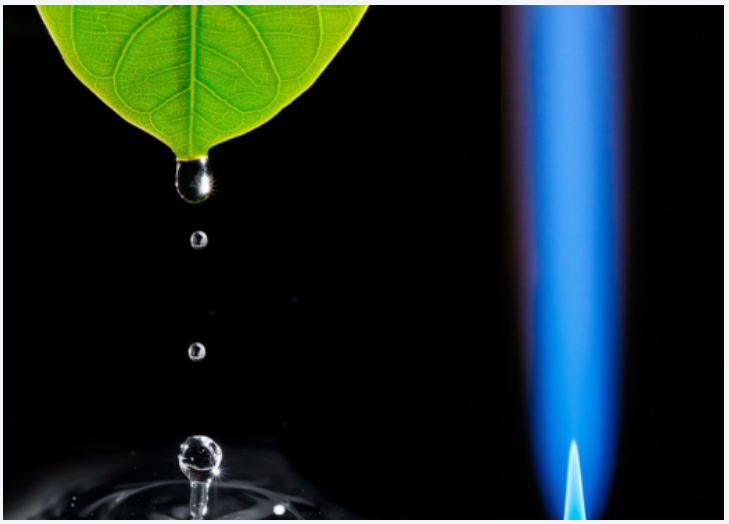
Partnership Carnot ISIFoR - Bulane

Boilers are using less carbon for combustion thanks to hydrogen produced locally from water and electricity

Bulane's Plug'In Hybrid dyomix® is a compact electrolyser that produces hydrogen using relatively little water and electricity. Thanks to Carnot ISIFoR's Fluid Mechanics Institute (IMFT), this hydrogen can be used to make gas boilers greener.

Supporting Innovation

Bulane is recognised as a pioneer in clean energy. Its Dyomix® system, which provides a cost-effective, safe and efficient heat source for welding or soldering without using acetylene, has already sold approximately 1 to harness000 units. The key ingredient in this success story is a miniaturised mobile electrolyser that supplies hydrogen and oxygen using just electricity and a few litres of water. The company has harnessed its technology to fossil gas boilers (using natural gas or propane): the hydrogen produced is blended with the gas to make the fossil gases greener.
IMFT (Toulouse Fluid Mechanics Institute) – part of Carnot ISIFoR – and Bulane have shown that at least 20% of natural gas can be replaced in standard burners. Using clean electricity can therefore make gas heating greener and hooking up to a smart grid will allow electricity to be consumed on a timely basis and take another step towards providing low-carbon heating for buildings.



The client needs

Bulane is a dynamic start-up created in 2009 which has become an expert in the continuous production of hydrogen and oxygen. It has adopted a sustained innovation policy to boost the attractiveness of its ethical products and pursue its international growth.
Bulane is beginning to diversify by looking into how its "plug and play" system could be adapted to standard gas boilers. Heating housing complexes could become a low-carbon activity by converting millions of existing gas boilers into instruments that serve the energy transition, without actually having to change the equipment. The heat produced on site by the electrolyser that supplies the hydrogen will also be harnessed for even greater efficiency.
To successfully deploy this project, it is necessary to carefully control the introduction of hydrogen into the standard boiler burner and know to what level the "hybridization rate" (i.e., the rate of substitution of hydrogen for natural gas) may be stretched, while continuing to harness the benefits of the existing boilers, which combine optimal performance driven by R&D and mass production at acceptable cost.

Partnership

IMFT, which is part of Carnot ISIFoR, is specialised in combustion physics and equipped with special dedicated equipment (UV cameras, thermal resistance testers, etc.) to perform combustion diagnostic testing. Research focused on the feasibility of introducing hydrogen into existing natural gas boiler burners. First, it was necessary to carefully control the mix of the two gases (one very light and the other heavy) with very different diffusion properties. A homogeneous mixture is essential for avoiding unstable combustion (phenomena of self-extinguished flame, flame flashback, etc.) and pollutant emissions linked to the presence of very high temperature zones generating nitrogen oxides.
Once the feasibility had been ascertained, the partnership attacked the development phase. Combining the solution with Dyomix® technology needs to be carefully managed in order to supply hydrogen correctly and obtain a high hybridization rate, while maintaining optimal output from the standard boiler. IMFT has enabled Bulane to unlock a new market and consolidate its status as an energy transition pioneer by hybridising fossil gas. Several million European gas boilers (which may or may not be connected to "town gas") represent a huge potential target.

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