

# Revolutionize the heating system

In the context of the fuel crisis and environmental pollution, Antonio Meucci Public High School in Carpi (Italy) has a boiler running on green hydrogen.



This is the first educational facility in the EU to use this fuel for heating with zero emissions, and opens up the opportunity to revolutionize the heating system.

Antonio Meucci in Carpi looks like any other high school in Europe. However, hidden in a far corner of the school yard is a fenced structure.

The site, which houses the EU's first green hydrogen-powered boiler to heat an educational site, is accessible only to qualified technicians and is emission-free. So how does a green hydrogen boiler work? Could this technology revolutionize our heating system, making it more sustainable?

## Potential

The Meucci School's green hydrogen boiler by Coopservice was designed in 2020. The project started on January 20, 2023 and received widespread acclaim for its progressive approach.

During this time, the EU is very interested in hydrogen as its member states look for more sustainable and energy-efficient alternatives to fossil fuels. That's when green hydrogen emerged as a potential solution.

Produced from renewable sources, green hydrogen is non-polluting and simplifies energy transportation and storage. This new fuel is the focus of many European financing programs for the energy transition, aimed at reducing high production costs. Spain and Germany are among the countries in the EU most promising in producing green hydrogen, but Italy is also contributing to the development of projects such as Meucci's boiler.

## **How does green hydrogen work?**

The boiler system heats Meucci School's gymnasium through a chemical process called electrolysis. Annalisa Vita is the engineer behind the above project. She explained that green hydrogen is produced from renewable energy taken from solar energy collected from the gym's roof.

This renewable energy activates the electrolysis process, meaning it splits water into oxygen and hydrogen. Oxygen is released into the air, while hydrogen is stored in the tank.

Thanks to their ability to store hydrogen, green hydrogen boilers are more reliable than simple renewable heating systems. As Vita explains, on overcast days, solar panels alone do not produce much energy. However, hydrogen allows us to store excess energy from sunny days and use it during the winter.

This feature is very suitable for northern Italian cities like Carpi, where the winter sky is often covered with clouds and fog.

A hydrogen-powered boiler has another advantage, which is that it does not produce any emissions. According to Vita, Meucci's boiler along with 20 other energy projects in Italy's Modena province are expected to reduce CO2 emissions by 717 tons per year, equivalent to the amount of CO2 emitted from 700 cars in a year.

Again, this point is especially significant for the town of Carpi, which is located in the polluted Po Valley. While visiting the school, local authorities expanded emergency measures in response to alarming air quality data.

## **Limitations**

If green hydrogen has so many advantages, why aren't all the homes, factories and schools heated with this technology yet? In practice, the use of green hydrogen in heating systems faces obstacles, mainly due to cost.

Meucci's project was made possible thanks to an investment of 350 thousand euros. This amount represents a financial barrier to widespread implementation of similar projects. Furthermore, European green hydrogen heating facilities must comply with strict safety regulations, which tend to reduce energy efficiency.

'We have designed the boiler to use 100% hydrogen in the future, but currently it operates at 20% hydrogen and 80% methane due to safety rules,' explains engineer Vita. This hybrid system minimizes the risks associated with the flammability of hydrogen and nitrogen oxide emissions from combustion, but also reduces the energy efficiency of the system.

Another equally important reason is that experts are strongly divided on the use of green hydrogen in heating systems. In 2022, the International Energy Agency (IEA) predicted a 'negligible role' for hydrogen in heating by 2030.

Laura Cozzi, the IEA's director of sustainability, technology and prospects, acknowledged the role of hydrogen in hard-to-decarbonize sectors such as steel, cement and petrochemicals. However, she emphasizes that for residential heating electric heat pumps can be equally environmentally friendly, while also offering lower operating costs and heat dispersion.

## **A potential first step**

Despite scientific doubts, Carpi's green hydrogen initiative has been hailed by the community as a step towards sustainability. Principal Viviana Valentini and her students are excited about the sustainability opportunity offered to the school and look forward to expanding the project.

According to engineer Vita, hydrogen may not be as energy efficient as other sources, but if we want to find greener solutions to build environmentally friendly energy in the future, we need pilot projects like this project. This.

'Our hydrogen heating system is like the first giant mobile phone. At first it seemed pathetic but it was a huge investment for the future' – Ms. Vita said.

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