Brazil Pilots Green Hydrogen in Oxyfuel Processes for Steel Cutting

A cooperation between GIZ and Messer Cutting Systems

The challenge

The Brazilian metalworking industry accounts for 1.5% to 2% of the national GDP and more than two million jobs. It is critical to Brazil's industrial output and export base, supplying key components and materials to industries such as construction, oil and gas, energy, shipbuilding, mining, and transportation.

However, the sector is also energy-intensive and a significant contributor to greenhouse gas (GHG) emissions. The steel and metallurgical segments alone are responsible for roundabout 10 per cent of Brazil's industrial emissions. A significant share of this impact is associated with the use of fossil-based gases, such as liquefied petroleum gas (LPG), acetylene, and natural gas, in thermal cutting processes like oxyfuel. These gases emit substantial amounts of CO_2 and other pollutants, including nitrogen oxides and fine particulate matter, which affect not only the climate but also occupational health and safety.

The solution

One effective way of reducing greenhouse gas emissions is to replace LPG with green hydrogen in oxyfuel cutting applications in industrial processes. It contributes to zero CO2 emission targets and improves the safety, health and wellbeing in the working places. Measurements confirmed that this substitution significantly reduces the emission of CO_2, nitrous oxides, and dust particles. Compared to the fuel gases traditionally used in oxyfuel technology, this further enhances occupational health and safety

How it will be done

In a public-private partnership (PPP) cooperation, Messer Cutting and GIZ will demonstrate the use of green hydrogen in oxyfuel cutting machines as a viable alternative to fossil fuel gases in the Brazilian industry. The partnership will test and adapt Messer Cutting's machine for use with green hydrogen, replacing LPG as a fuel source.

The machine will be installed at Messer Cutting Systems do Brasil's facility in Jundiaí (SP), and will undergo testing to validate its performance in real industrial conditions. Furthermore, it will serve as a training and demonstration platform, accessible during the PPP duration and for at least two years beyond.

To promote scalability and replication, the project will also partner with SENAI to integrate hydrogen technologies into vocational training programs and deliver both theoretical and practical training to 1,000 professionals (workers, students, engineers, management professionals, and teachers). A mobile training unit will be created to reach industrial regions across Brazil and to promote awareness in the Brazilian domestic industrial market on the potential, opportunities, advantages and reduced risks associated with using hydrogen instead of other combustible gases.

The TerraBlade 4.0 thermal cutting machine is a robust, high-precision cutting tool. Photo: Messer Cutting Systems Brasil

Our services

Within the framework of this public-private cooperation, the partners will:

- Adapt and test a cutting machine using green hydrogen
- Create GHG inventories and monitoring tools
- Conduct environmental and occupational risk analyses
- Assess the technical and economic viability of the application
- Develop training and awareness-raising programs in partnership with SENAI
- Promote dissemination through technical fairs, universities, and publications

Expected impact

The PPP will demonstrate a pioneering industrial use case for green hydrogen in thermal cutting applications, offering a concrete example of how renewable energy carriers can be integrated into existing manufacturing processes.

The project will provide a comprehensive technical validation of the hydrogen-based cutting process under real operational conditions in Brazil. This includes assessing performance indicators such as cutting speed, quality, safety, and energy efficiency, as well as developing technical adaptations necessary for its widespread adoption in the local context.

The project envisions a broader transformation of industrial processes by demonstrating that green hydrogen can progressively replace fossil fuels across a wide range ofoxyfuel applications. Beyond cutting, future uses may include heating, welding, brazing, and other high-temperature operations, paving the way for decarbonised manufacturing systems that are both cleaner and safer.

The PPP will also produce and disseminate technical documentation and best practices to support replication, including operational guidelines, safety protocols, training materials, and case studies. These resources will serve as a foundation for other companies and training institutions interested in adopting similar technologies.

By fostering knowledge transfer, local capacity-building, and innovation, the initiative will strengthen Brazil's industrial ecosystem for hydrogen adoption.

The project at a glance	
Duration	May/2025 to September/2026
Country	Brazil. State of São Paulo
Objectives	The project aims to replace fossil fuels like LPG and acetylene with green hydrogen in industrial oxyfuel cutting to reduce CO_2 emissions and enhance workplace safety. It will develop and demonstrate hydrogen-based cutting technology and implement a vocational training program with SENAI to promote knowledge & awareness, on safe adoption of green hydrogen in Brazilian industry.
Partners	Messer Cutting and Messer Gases and SENAI, as supporting partners
Outputs	• A fully automated demonstration plant implemented & customized to local industrial conditions. • Over 1,000 skilled workers trained and 50 companies engaged throughout the project. • Awareness successfully raised across Brazil's industry about green hydrogen as a cleaner, safer, and more competitive alternative to conventional fuels.

The International Hydrogen Ramp-up Programme (H2Uppp) of the German Federal Ministry for Economic Affairs and Energy (BMWE) promotes projects and market development for green hydrogen in selected developing and emerging countries as part of the National Hydrogen Strategy.

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