www.h2ports.eu
info@h2ports.eu

Coordinated by:

FUNDACIÓN VALENCIAPORT

Partners:

valenciaport Autoridad Portuaria de Valencia

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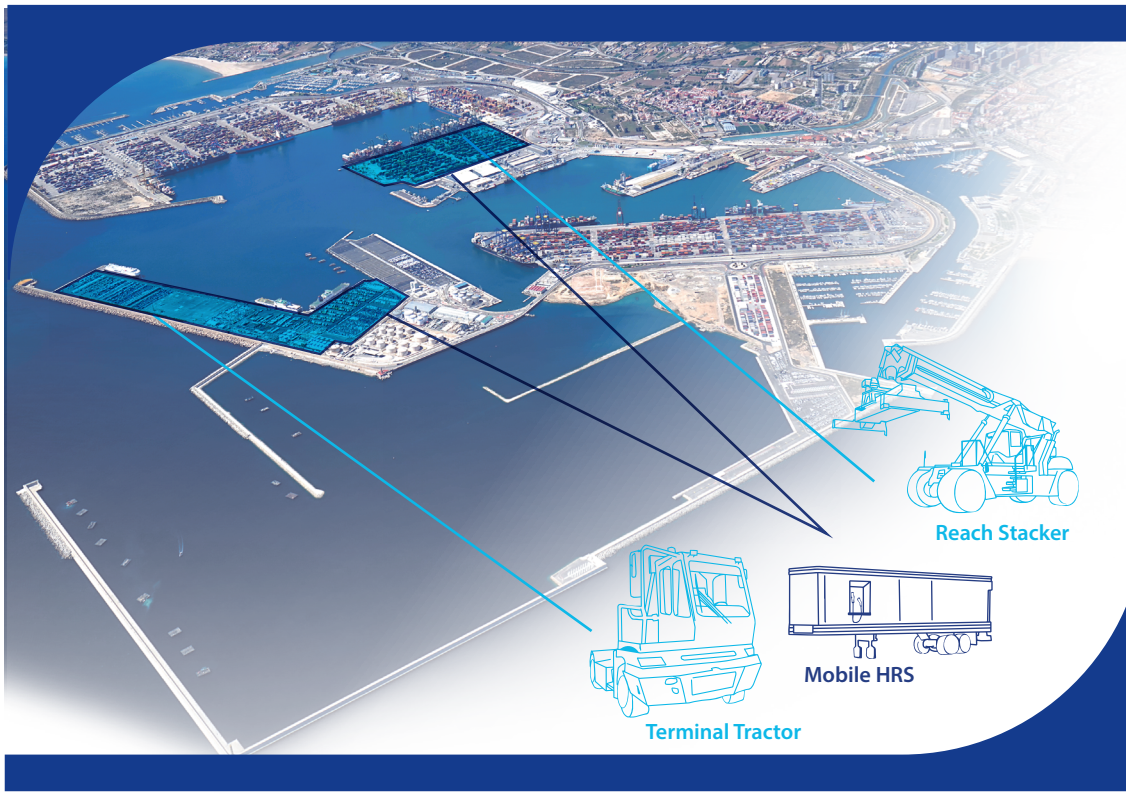
FCH | FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

H2 PORTS

First application of hydrogen technologies in port handling equipment in Europe

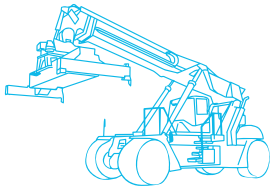


FCH | FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

Overview

H2Ports aims to boost the transition of the European port industry towards an effective low-carbon/zero-emission and safe operative model, piloting, evaluating and demonstrating new Fuel Cell (FC) technologies oriented to increase energy efficiency, decarbonisation and safety of port terminals. The pilots to be tested in the project will be the first experiences of the use of hydrogen technologies in port handling equipment in Europe.

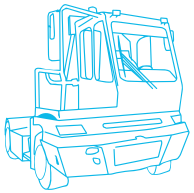
The project will demonstrate and validate at the Port of Valencia in real port operations two innovative solutions based on FC technologies and a hydrogen mobile supply station specifically designed for the project. A Reach Stacker to be tested in MSC Terminal Valencia and a Terminal Tractor to be tested in Valencia Terminal Europa (part of Grimaldi's group) have been selected as those specially fitted to the use of FC in port facilities. The project will run the equipment on a daily basis during two years of real operational activities and will analyse ways of improving the energy efficiency, performance and safety of operations with FC port equipment. The project will also take into account transversal issues such as the human factor, regulation, the future roll out of the technology on a fully commercial basis and the raise of awareness of the potential of hydrogen adoption as an alternative fuel in port equipment.



The **hydrogen Fuel Cell Reach Stacker** will be tested at MSC Terminal Valencia (MSCTV), one of the three container terminals operating in the port of Valencia (Spain), the leader container port of the Mediterranean.

This pilot is aligned with Hyster-Yale's Group strategy concerning emission reduction, which comprises the progressive evolution from their current diesel-mechanical powered to the achievement of zero emissions power solutions. As the first hydrogen solution of its kind, the Reach Stacker will be able to support continuous operations while providing zero emissions and achieving comparable full shift performance to a conventional Reach Stacker powered with a diesel engine. The highly demanding and varied duty cycles in these intense operations make recharging time a critical factor in the operational costs of the owners. The use of hydrogen FC stands out against other available technologies in these conditions, as it shows considerable autonomy and a reloading time comparable to conventional diesel.

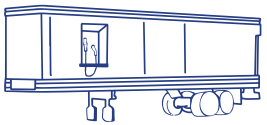
It is expected that maintenance costs will be reduced thanks to the removal of the engine, transmission and other mechanical-driven components. In addition, noise levels will be low, and if fuelled with green hydrogen, the carbon balance can be considered as almost neutral.



The **hydrogen Fuel Cell Terminal Tractor** will be tested at Valencia Terminal Europa (VALTE), part of the Grimaldi Group, one of the most important car and Ro-Ro port terminals in Southern Europe. VALTE handles considerable volumes of new cars and unaccompanied trailers for both import and export in Spain and overseas.

Terminal Tractors operate within the so-called 'horizontal transport subsystem' in port terminals, in charge of the goods transport between the berth and the yard as well as the internal circulation of goods. In the specific case of Terminal Tractors operating in ro-ro terminals, an additional requirement is they must be four-wheel drive, due to the steep slope to be climbed inside ro-ro vessels.

Terminal Tractors show potential benefits from their conversion from hybrid electric-battery power to hydrogen FC as the needed modifications are affordable and feasible. H2Ports proposes the development of a zero emission vehicle where the hydrogen Fuel Cell will act as range extender of the current autonomy of an electric Terminal Tractor. Hybrid power units will be developed by integrating batteries and Fuel Cell system. A hybrid power unit could have a small Fuel Cell stack and battery pack, meaning lower cost, along with a good operating range, short fuelling time, low maintenance cost and zero emission operation.



A **Hydrogen Refuelling Station (HRS)** will be developed in order to guarantee the simultaneous supply of hydrogen at adequate conditions during the parallel operation of the Reach Stacker and the Terminal Tractor to be tested in the project. As each of the two pilots will take place in different terminals of the port of Valencia (MSCTV and VALTE) the developed HRS must be a flexible and mobile solution, especially considering that port handling equipment is not allowed to circulate outside the terminals area.

The whole HRS system will consist on two main parts. The fixed part will be dedicated to the reception of and storage of hydrogen from an external supplier and the compression of hydrogen up to the delivery pressures (300 and 450 bar). The mobile part will store the compressed hydrogen and will include a hydrogen dispenser for the refuelling of the port equipment.

In addition to the actual construction of the HRS, H2Ports will also analyse the best approach for the hydrogen supply logistics and the best strategy for refuelling, not only for port machinery but also for alternative applications. The availability of supply infrastructure in the port of Valencia will create the perfect environment for the test of potential future uses for Fuel Cells in the port maritime sector, which is aimed to be exploited not only during the testing period but also afterwards.