H2 PORTS

First application of hydrogen technologies in port handling equipment in Europe

Newsletter

May 2021

FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

Hydrogen is receiving a lot of attention from many sectors as the technology has received a clear push in Europe from many institutions through the publication of the European Hydrogen Strategy and also Roadmaps from several countries. The technology has the potential to decarbonize sectors and applications to which the use of other options present serious challenges, so it will be a key element of a future decarbonised Europe. This future requires a considerable amount of initiatives to be successfully carried out, such as hydrogen production plants, a distribution network and a massive introduction of applications and vehicles running on this compound. The key factor for this deployment to become a reality is the point of view of final users: only if they select this technology among those available, the market will react by providing all the elements necessary for a hydrogen economy.

This Newsletter focus on the point of view of three final users: MSCTV and Grimaldi Group (part of H2Ports consortium) and Balearia. In addition, Green Hysland project will also be presented as an initiative capable of creating a hydrogen hub in the Balearic Island.

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MSC Terminal Valencia taking the lead to achieve Zero Emissions at the Terminals

Sven Valentin
General Manager - **MSC Terminal Valencia**

As stated in the Paris Agreement, "developed countries must lead the way in reducing CO_2 emissions".

MSCTV is convinced that as a final user of heavy-duty port equipment, the Container Terminals should be an active part of this process. Therefore, we believe that it is mandatory to participate in innovative projects that can achieve the objectives set in said Agreement.

MSCTV's partnership in the H2 Ports project is being used as a reference within the TiL/ MSC Group for possible future projects and development of similar technology and alternative energy sources for heavy-duty port equipment used by terminals within the Group.

The objective of MSCTV in this H2Ports Consortium is to offer a real testing-site with a demanding activity.

The H2 Hyster Reachstacker prototype manufactured by HYSTER, will be tested considering all the operational and technical aspects, in such a way that reliable conclusions are drawn in terms of safety, functionality, performance, consumption, infrastructure, etc. The experience of MSCTV's technical and operational staff will help HYSTER in providing the improvement and adaptation needed not only for the prototype itself, but also on the refueling process, making hydrogen an optimal energy alternative for port machinery in the future.

One of the main objectives of this first prototype is also involving the port community, so that our workers, dockers, truckers, etc… become aware of the need to implement less polluting alternative energies. It will be a priority for MSCTV to implement the necessary adjustments to ensure that the H2 Reachstacker prototype offers maximum safety, ergonomics, and comfort during handling operations. The safety and satisfaction of the drivers is one of the priorities in making this H2 Reach-stacker Project a success.

MSCTV is in close cooperation with HYSTER, manufacturer of the prototype, and the Fundación Valenciaport, as Project Coordinator, to convey all the needs and requirements that this machine must meet so that it can adapt to the standards of the Port of Valencia, obtaining a solution that is fully compatible with the intense activity at the Terminal.

Any new technology or energy solution to be introduced into the port equipment is a great challenge that requires an effort to adapt material resources for the necessary infrastructures and new processes, as well as human resources, due to the need for training and adjustments of all the parties involved (drivers, operations personnel, maintenance technicians, etc.). This effort will be more than compensated when Zero Emissions Port Equipment is available in the market.

Hydrogen as a low polluting fuel for the Grimaldi Group

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Project Manager Energy Saving Department - **Grimaldi**

Cosimo Cervicato
Executive Engineer Energy Saving Department - **Grimaldi**

Hydrogen is an alternative fuel that can replace fossil fuels, such as petrol or diesel. The Grimaldi Group is studying together with other stakeholders how hydrogen for ships supply could be produced in port using renewable electricity thanks to shore connection systems and how it could be seen as a necessary medium-to-long-term alternative that can help to achieve a sustainable, carbon-free economy. Whereas the use of fossil fuels generates carbon dioxide emissions, which contribute to climate change, as well as many other pollutants that have a severe impact on human health (NOx or particulates), the use of renewable hydrogen in combination with fuel cells produces only water vapour and has no impact on the environment.

Grimaldi Group Energy Saving team's mission is to contribute to R&D and test efficient solutions for ships that will facilitate a rapid transition from a fossil fuel-based to a low-carbon, zero-emissions technology. The use of hydrogen for vehicles and machinery will be tested in different terminals managed by the group to evaluate different pilots to bridge the gap between prototypes and pre-commercial products. Thanks to these initiatives, Grimaldi's terminals will be the first in Europe to incorporate hydrogen energy to reduce the environmental impact of their operations.

Specifically, within the framework of the H2PORTS project, a pilot initiative will be tested in real-world operating conditions at Valencia Terminal Europa: a terminal tractor for ro-ro operations, powered by hydrogen fuel cells. Another initiative will be at Antwerp Euro Terminal which has received the exploitation allowance to install temporarily a hydrogen fuel station on the terminal. Starting from April 2021 onsite tests for the Terberg Hydrogen Tugmaster will be done. Adding to this, a 2 tonnnes Toyota hydrogen forklift will also be tested.

In the next years, the Grimaldi Group will test and validate hydrogen technologies for port machinery to achieve applicable, real-world solutions that produce zero local emissions, without affecting the performance and safety of port operations.

One of the aims of the Group for the future is to develop research projects for the use of hydrogen fuel cells to replace fossil fuels to power ships. Currently, Grimaldi researchers together with Italian Universities are studying new solutions for hydrogen storage containers and fuel cell systems that will be tested in the next coming years onboard newbuildings.

Through the implementation of several projects, the Grimaldi Group continues the search for less polluting fuels for use in ports. In this way, the Group is contributing to the decarbonization of transport-related activities.

Hydrogen as an energy carrier for zero emission passenger's

Javier Cervera
Energy Transition Manager - **Baleària**

Hydrogen is an energy carrier not an energy source, which means that its potential role has similarities with that of electricity. Most projects nowadays are focused to produce renewable hydrogen as a chemical element to substitute grey hydrogen in industry, or in important descarbonisation transport projects, but not many for stationary electricity production.

Baleària is the leading shipping line for passenger and freight transport on Balearic Islands crossings, while also linking Ceuta, Melilla and the Canaries to the Spanish mainland. At the international level it provides services in Morocco, Algeria and the Caribbean (between the United States and the Bahamas).

Apart from that, Baleària has been selected in 2020 for the construction and management of the new public passenger terminal in the Port of València.

The proposal by the Baleària company guarantees that 100% of the electrical energy required for the operation of the terminal will be produced at the facilities themselves and will be of renewable origin.

Is in this project a small scale hydrogen production plant, is going to be implemented to produce electricity for the terminal, instead of big new facilities to provide a huge number of daily tonnes of hydrogen for not sure demand.

Buildings and passenger terminals rarely draw attention at ports, as their energy demands are relatively low compared to the container and other cargo terminals. Moreover, renewable energy sources are hardly ever present at port buildings and passenger terminals due to the complexity of their integration in existing premises and space availability restrictions. The objective of the new terminal is to demonstrate that a passenger terminal can be 100% energy self-sufficient and consume 100% clean energy by integrating multiple energy renewable technologies working together for the production, storage and consumption of clean energy. Real time monitoring and eco-design practices will be integrated in the zero-emission terminal building.

Renewable energy will be generated and stored in the terminal. Energy will be generated with photovoltaic and mini-wind production, using storage in lithium batteries and in the form of hydrogen, to be able to obtain clean energy for 100% of the demand at any time of need of the terminal. The renewable hydrogen storage system is composed of a small electrolyser, its compression system, its storage, the regulation system, and a fuel cell producing electricity and heat.

The photovoltaic generation of the terminal will have surplus production during the hours of greatest photovoltaic production, accumulating part of that energy in lithium batteries, and the surplus will be used for the production of hydrogen, which will be compressed and stored in high pressure cylinders to be used in the fuel cell, which will recharge the lithium storage of the system, in order to use this energy for the terminal itself. Between 5 and 10% of the terminal's electric consumption will be generated using hydrogen, taking advantage of the surplus of photovoltaic generation, which would be wasted if not used to produce hydrogen since it is not allowed to inject electricity generated at a port concession, in the port energy network.

The development of hydrogen hubs: the case of the Balearic Islands (GREEN HYSLAND)

María Jaén

Green Hysland Coordinator
Innovation and Renewable Gases Department - **Enagás**

Mallorca is one of the world's leading island tourist destinations receiving more than 16 million tourists annually and it consistently ranks among the world's top 10 island destinations. As such, it offers great potential to become an international showcase for hydrogen and fuel cell integration at island scale.

In this context, and within the framework of an Agreement between the Ministry of Industry, Trade and Tourism and the Balearic Government with Enagás, Acciona, CEMEX and Redexis to reindustrialise the area of Lloseta (Mallorca), the "Green Hysland" initiative, which proposes the development of a hydrogen-based energy ecosystem in Mallorca was created, offering clean and economically viable solutions for the decarbonisation and sustainable economic development of the island. This action is articulated on three fundamental pillars:

- The development of a renewable hydrogen ecosystem and all associated infrastructures, covering the entire chain (production, storage, transport, distribution and uses at six sites on the island of Mallorca).

- The development of a roadmap to 2050 in Mallorca towards energy decarbonisation, led by the Balearic Government, in which hydrogen plays a fundamental role in the development of a large-scale sustainable economy. This roadmap will be an evolution of the current regional roadmap for the deployment of renewable energies and the energy transition.

- The development of replication experiences in five other EU islands: Madeira (PT), Tenerife (ES), Aran (IE), Greek Islands and Ameland (NL) as well as Chile and Morocco.

A consortium of 30 partners from 11 different countries (9 of them from the EU, as well as Chile and Morocco), from the industry, science and public sectors has been set up to develop the initiative. In addition, the initiative has the support of the Balearic Government (which declared the initiative a Strategic Industrial Project of the Balearic Islands in May 2019), the Spanish Ministry of Industry, Trade and Tourism and the Spanish Ministry for Ecological Transition and the Demographic Challenge through the Institute for Energy Diversification and Saving (IDAE).

The project envisages the production and consumption on the island of at least 330 tonnes per year of green hydrogen from newly built photovoltaic plants. This hydrogen will then be transported by virtual pipeline from the production plant to the final applications, including the generation of heat and power for commercial and public buildings, the supply of auxiliary power for ferries and port operations and the creation of a hydrogen refuelling station for fleets of buses and fuel cell rental vehicles. The project includes green hydrogen injection into the island's gas pipeline network through a Guarantee of Origin System to decarbonise the gas supply. It aims to reduce the CO2 emissions of Mallorca up to 20,700 tons per year by the end of the project.

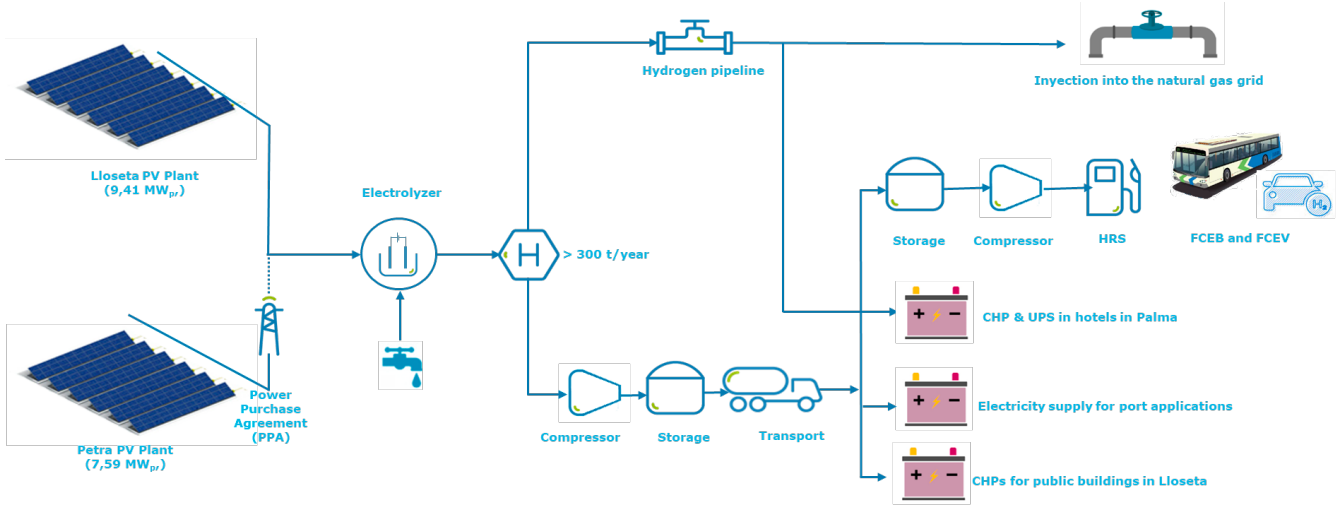
The initiative requires a total investment of around 50 million euros, including renewable electricity generation and equipment for green hydrogen end users.

The European Commission through the Fuel Cell and Hydrogen Joint Undertaking (FCH JU) funds the Green Hysland project with ten million euro to contribute to the development of the project between 2021 and 2025.

GREEN HYSLAND Project Consortium

Green Hysland is a partnership between the following organisations: Acciona, Ameland Municipality, AMHYD, Aragon Hydrogen Foundation, AREAM Madeira, Spanish Hydrogen Association (AeH2), Balearia, Calvera, CEA, National Centre for Hydrogen (CNH2), Cotenaval, DAFNI, EMEC, EMT Palma, Enagás, Energy Co-Operatives Ireland, Enercy, Fedarene, Gasnam, H2 Chile, HyCologne, HyEnergy Transstore, Instituto Balears de Energía, Lloseta Municipality, New Energy Coalition, NUI Galway, Ports de Balears, Redexis, Universitat Balears and Universidad de La Laguna Tenerife.

Figure 1: Green Hysland concept



H2PORTS project News

2nd H2PORTS Stakeholders Group Meeting

The 2nd H2PORTS Stakeholders Group Meeting will be held next 19 May in virtual format and will focus on the topic "H2 as a maritime fuel". In this session, which will be held from 16:00 to 18:00 hrs, we will discuss about aspects such as the fuels of the future for the maritime sector, the vision of a hydrogen producer, technologies of engines and fuels cells for vessels and finally experiences from real projects.

The H2PORTS stakeholder group is currently composed of more than 50 members including many port authorities and relevant entities related to the port-maritime and hydrogen sectors.

The buffer tank arrives to the CNH2 facilities

The buffer tank that will be part of the Hydrogen Refuelling Station of H2PORTS project has arrived to The CNH2 facilities. The 50 m3 tank, manufactured by Lapesa, is made of carbon steel P355N according to EN10028 and it has a capacity for 180 kg of #hydrogen at 40bar pressure.

The hydrogen Reach Stacker within the framework of the H2PORTS project is in full development at Hyster

Once fully developed, the Hyster Reach Stacker with a fuel cell is expected to offer comparable performance to a diesel truck in terms of capacity and lift and driving speeds, helping to support similar productivity levels.

Atena starts to work on the hydrogen Terminal Tractor

The hydrogen Terminal Tractor will be a retrofit from the diesel version that will contribute to the decarbonisation of the operations at the Port of Valencia.

H2PORTS at the Misión Cavendish Tour Centro Sur Event

On 12 January, Josep Sanz, coordinator of H2PORTS project, presented this initiative in the 2nd session of Misión Cavendish Tour Centro Sur, an event organised by Club de Innovación and H2 Chile to promote the economic introduction of green hydrogen in the regions of Maule, Ñuble, Bío Bío and La Araucanía (Chile).

H2Ports at Energyear H2 2021

On 22 April Raúl Cascajo, Head of Environmental Policy of Port Authority of Valencia, presented the project at the Case Studies and Real Experiences held as part of the Energyear H2 2021.

Shipping / Hydrogen International Events

2021

ESPO CONFERENCE REGATTA 2021

25-28 May

Valencia / Ghent / Oslo + online

https://www.espo-conference-regatta-2021.com/en

IAPH World Ports Conference

21-25 June

Antwerp, Belgium

http://www.iaphworldports.org/iaph-conference

TOC Europe

7-9 September

Rotterdam

https://www.tocevents-europe.com/en/Home.html

London International Shipping Week - LISW21

13-17 September

London, United Kingdom

https://londoninternationalshippingweek.com/

GreenPort Cruise & Congress

20-22 October

Piraeus, Greece

https://www.greenport.com/congress

Flame 2021

2-4 November

Amsterdam + online

https://informaconnect.com/flame-conference/

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