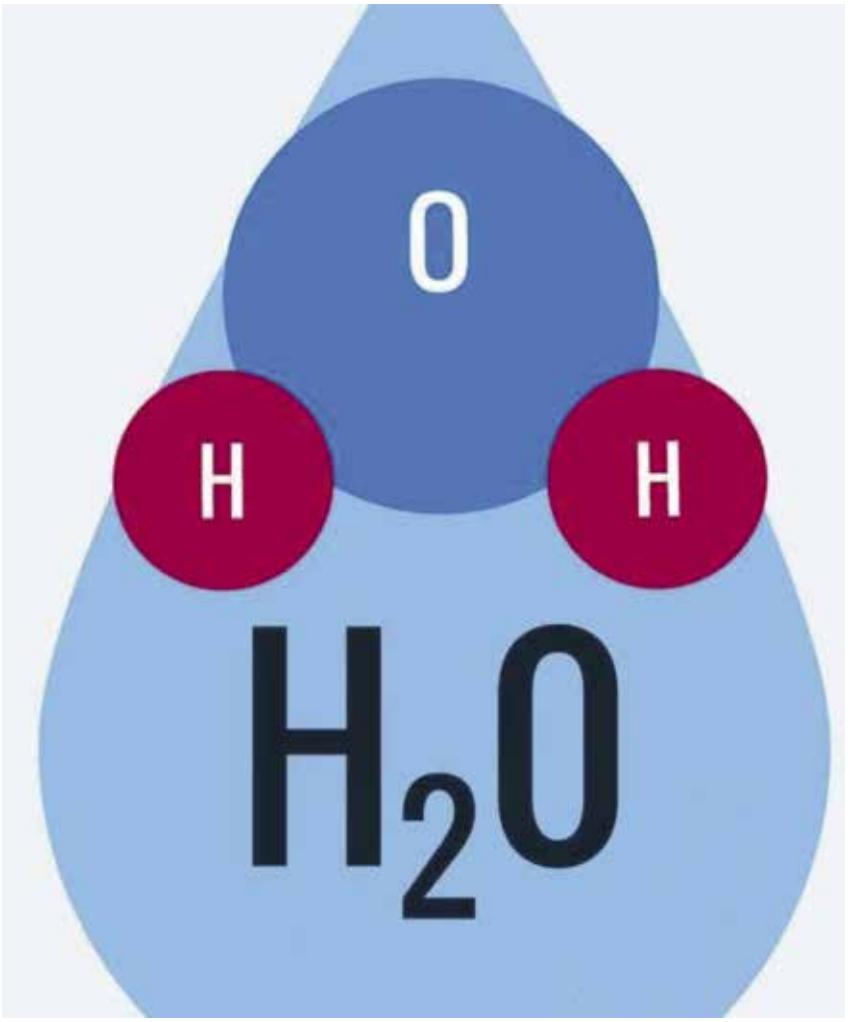
OCMI-OTG and SAPIO flag hydrogen as lead sustainability player

The GMP&A editorial team recently spoke to Anna Marigo, Business Development Manager at SAPIO and Michele Gusti, OCMI-OTG Group Chairman - all to learn more about their ongoing project to promote a more sustainable use of energy in machines for glass making.

GLASS MACHINERY PLANTS & ACCESSORIES (GMP&A):

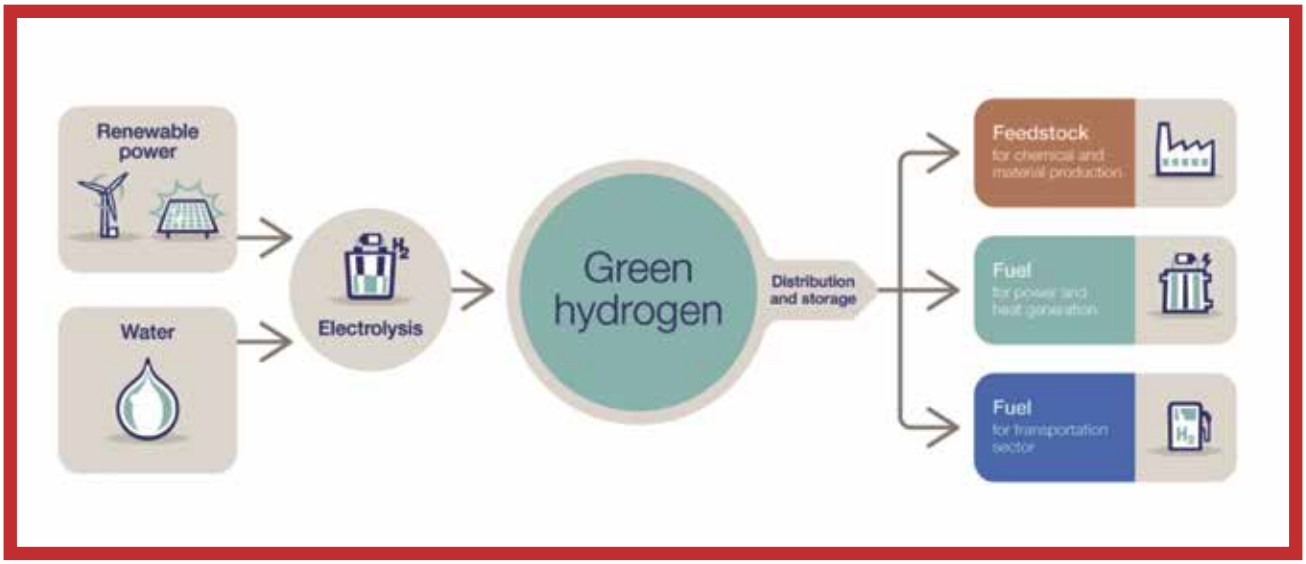
Anna, tell us something about Sapio and about why hydrogen is so central to your business.

AM: As an independent company that produces technical gases, Sapio has always been in the hydrogen business. Yesterday we celebrated our centenary. These past hundred years have consistently seen hydrogen being very much a part of our history. Right from the outset we started producing it in significant quantities. Now looking ahead, the coming years will bring new developments for hydrogen, If it's a ten to fifteen percent blend most likely they can all remain the same. That's a very challenging new market. To enter this market it's important that the assets which enable hydrogen use are designed to work with it, i.e.: it has to be ensured that future boilers can burn hydrogen instead of methane. In our case, therefore, glass furnaces will use hydrogen instead of methane, and so on. To achieve this, those assets need to be modified - given that they were made to consume methane and not hydrogen. If it's a ten to fifteen percent blend most likely they can all remain the sameBut when you have to boost that level to reach 100 percent hydrogen then you must redesign the glassmaking assets to ensure they can offer the same performance.



GMP&A: Where's the conversation around green hydrogen going today and how has hydrogen become so important to today's challenge to take CO2 emissions out of the energy equation?

AM: To answer your question I must begin by saying that to create this new market, hydrogen must become the fuel that replaces methane. Here the starting molecule is water - a molecule comprising an oxygen atom with two hydrogen atoms attached. Note that when I recombine the two hydrogen atoms to make our H2 hydrogen molecule then I leave an oxygen molecule behind - not a carbon molecule, as would have been the case with methane. So, starting from water in this way, you have no CO2 emissions in the hydrogen production process. The problem lies here: much energy must be consumed to detach the hydrogen from the oxygen molecule before combining them together to make the hydrogen molecule. Today 40 percent of the electricity comes from a gas turbine plant. It's important that the electric current I use for my electrolysis should be electricity from a primary renewable source that comes either from the wind, the sun, hydroelectric power, etc. Such primary forms of energy need to be converted into electrical energy by using wind turbines, photovoltaic panels, and so on. It's electricity that makes the electrolysis reaction which breaks the water molecule and produces the hydrogen molecule in its entire supply chain without releasing CO2 into the atmosphere - and it can be used to substitute methane. Now to substitute the methane I first need to make changes to my assets to ensure they perform well - still doing the work optimally as if they were operating on methane. Here we have to work on the nozzles, on the geometry of the burners, etc. That's because hydrogen and methane are indeed two fuels but they're very different. What's evident is that they exhibit differences in combustion with oxygen. Another detail here is that the flame is transparent in hydrogen but not in methane. That can have repercussions when I make a radiative heat transfer. As the flame is shorter, I now have to heat more by convection. I must consider that I have a shorter flame. The



calorific value is also different ent. In terms of volume, hydrogen has a calorific value three times lower than methane. As such, it's a molecule that can take the place of methane, yes, but it displays different chemical forms - which means it also has a different behaviour. Consequently, the asset that will have to burn this hydrogen will have to be modified. The OCMI-OTG case comes into play here, since the group produces machines that are used to form glass. A methane-fueled flame is produced that then melts glass rods. These get processed, following which a vial comes out. That machine has been modified to ensure it can work completely free of methane and be one hundred percent powered by hydrogen combustion. In this way we have a vial formation that displays the same characteristics and quality - and the degree of defectiveness is reduced when compared to methane combustion. The machine can thus shift from methane to hydrogen. When deciding to transfer to hydrogen the customer will have conversion kits to be able to use one fuel rather than the other. We've offered our support with the hydrogen and gas distribution system - the whole phase that concerns the burner, combustion, etc. Now OCMI-OTG has done the fine-tuning and indeed the machine works very well running on hydrogen.

GMP&A: Michele, what is OCMI-OTG's part in this project?

MG: We commenced this joint research a year and a half ago in order to identify the best way to power the machines we make. Mind

that we have about 1500 lines on the market - a significant amount all over the world. We're aware that there's a strong need out there for our customers to try to reduce energy costs in production. Here's why we started with a study that could offer us some way of getting hydrogen. We first rented some generators to conduct tests and also perform cost studies. These hydrogen generators are a fairly refined product by now. However, frankly that conflicts with our goal, which is to give our machines a way of working with something cheaper. Many years ago I went to Denmark to see the very first wind generators - all distant relatives of the ones we have now, which had a very modest production capacity back then. Not only. They had no way of transmitting the electricity. They generated the wind from a distance, though we're talking here of transmission of an electric current through an electric cable that died after just 200 metres. By contrast, wind farms today can generate megawatts of electrical power and supply it over significant distances. So the wind generator is an important means of having clean hydrogen. Sapio is a large company that has signed very noteworthy contracts that include important contacts, for example with Enel in Sicily, in order to be able to take hydrogen from their wind farm.

GMP&A: Anna, tell us about Sapio's current projects with hydrogen.

AM: Well, we have the construction of three hydrogen valleys in the pipeline - one of which is in Mantua. The other two centralised production centres aren't yet at an advanced stage though we're finalising them. In Mantua we already have a steam reforming plant that we are going to expand with an electrolysis plant where the hydrogen produced will be green. In our steam reforming plant we capture the CO2 and we sell it on the food market.

GMP&A: Michele, what are your considerations about the project's progress so far?

MG: To date, the project has given an exceptional result at experimental level. On the other hand, we do clash with different interlocutors. Large multinationals already have a hydrogen plant installed in their factories. So let's say it's already easy to make a mix of hydrogen and oxygen or gas -or anything else- to take forward production with slightly minor modifications of the machines. The real problem arises when the user of our machinery is a medium-small company that's perhaps poorly-equipped, given that the hydrogen destined for its factory requires significant investment in safety. That explains something about the situation. We arrived at a time when the machines were already on the market. If we're talking about the supply of cylinders with plant engineering that's well done then we're already producing plants that can bring hydrogen to our machines. The truth is that today is the worst moment to make certain considerations because the cost of gas has risen tenfold. Also, there's the war and so on.

GMP&A: Anna, can you speak to your own take on the project's progress?

AM: What we can say from our technical point of view is that the combustion has improved with hydrogen, with excellent metrics and an elevated quality of the final product, i.e. the vial is identical, if not improved, with hydrogen combustion as opposed to methane combustion. No defects or worsening has been introduced.

GMP&A: And which is Sapio's contribution to the mix?

AM: In order to power these machines with hydrogen, what a company like Sapio can do is produce and transport the gas needed by the customer in cylinders or bundles where the hydrogen requirement is compatible with such transport. So, if the customer's needs are compatible with transport by trucks then we'll transport the gas by truck. If, instead, the demand is greater because we're maybe talking about a glass factory oven or a steel mill oven (with quantities no longer compatible with a back and forth of trucks) then our business model can also add onsite plants for hydrogen production - obviously always with electrolysis and renewable electric power and so connected to renewable energy and 'on-demand' hydrogen production for customers. Such is our business model for all gases - nitrogen included.

GMP&A: Michele, any comments on project financing?

MG: At the moment studies on hydrogen are generally sponsored by individual states. In our case Europe takes care of them, which allows us to break-even with costs for where

hydrogen finds itself today. Indeed we also participated in a European study to create a glassworks powered by hydrogen. As soon as our client shared the project idea on the net, hundreds of others tried it too with the result that Europe suddenly said: "Guys, we can't finance hundreds of the same initiatives. Try to pool resources among yourselves to come up with some sustainable economic plan and we will finance it." That marks a very important step. But in the meantime, here is Sapio and we continue to do our job to try to convert everything that's mixed to take hydrogen forward. I am personally very optimistic.

GMP&A: Anna, can you speak to Europe's part in the hydrogen question?

AM: Hydrogen is one of the ways identified by Europe to decarbonise. We have the entire roadmap for hydrogen articulated by the European Union and the European stock exchange provides the financing to develop the hydrogen sector. If we need to arrive at zero emissions by 2050 then fossil methane can no longer be burned. That necessitates finding an alternative that doesn't contain carbon.

GMP&A: Michele, can you report any numbers yet?

MG: We've just installed a line that's in its start-up phase at one of our customers - a large multinational that had the hydrogen plant already installed onsite. So we're already taking production forward with hydrogen. We don't have any pertinent statistical data yet to hand. However, given that we already have burner consumption data as well as maintenance needs and production quality information, we hope to be able to publish something within two to three months - which will certainly show a very positive result.

GMP&A: Finally, Anna, how does the whole project tie into your company's core values?

AM: The Green Deal anticipates a complete abatement of carbon emissions by 2050. With its 'fit for 55' project it also has a milestone set for 2030, which seeks to push for the halving of emissions. Here the European roadmap is quite precise. Europe has dictated the timeline but it has also given us the tools to propose one of the decarbonisation levers, which is hydrogen (and there are others as well) - even to start projects that use hydrogen in these sectors. Obviously, when we can, we move internally to apply for funding because it's the best means to start projects today in ways that are also economically sustainable. This is how we're interpreting the European mandate to meet our commitments to the environment. We as Sapio believe in hydrogen and sustainability, which is why we're moving forward with all we believe to be our strength in setting out upon this path. ■