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Hydrogen is the Ideal Zero-Emissions Fuel

Bishal Das -B.Tech-IV

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The maritime industry is at a crossroads. It has reached a point in its history where it has to pick the right path to meet its decarbonization targets. Specifically, the International Maritime Organization's (IMO) climate strategy has set out to reduce the total greenhouse gas emissions by at least 50% by 2050. Nevertheless, the shipping world is yet to carve out the strategy on how to achieve that.

To propel the industry into the future, a large burden has fallen on the engineers and the role of technology in coming up with ingenious solutions to cut emissions, redesign ships and help the industry reinvent itself.

However, the key factor in making the giant leap toward a less polluted future is zero-emission fuels.

World Maritime News spoke with Traver Kennedy, Chairman and CEO of Joi Scientific, on the potential of hydrogen to be the fuel of the future. Joi Scientific, headquartered at the Kennedy Space Center in Florida, is leading the development in efficient extraction technology to produce hydrogen energy from water.

"The commitment of the IMO to cut the shipping sector's overall CO2 output by 50 percent by 2050 is a vital step to bring the maritime industry in line with the Paris Climate Agreement. For these commitments to be met, it is imperative that the maritime industry look at alternatives to fossil fuels for both propulsion and auxiliary power. While batteries may make sense in some very small craft and nuclear has a role in the very largest, neither is practical for the vast majority of maritime vessels," Kennedy said.

Hydrogen has a major role to play in the sector's reduction of CO2 emissions and the elimination of sulphur and heavy metals from maritime activities. By weight, hydrogen is a highly energy dense fuel that is entirely clean – with the only by-product being water. It is also highly adaptable; the same source of hydrogen can be used in fuel cells for auxiliary power in addition to internal combustion engines, burners, and turbines for propulsion.

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Students of Krishnammal Ramasubbaiyar School Visit to RLINS

Mr.M.Subramanian, Advisor - Technical Addresses the students and parents visiting the campus.

Mr.M.Subramanian, Advisor - Technical interacts with the audience and explains the facilities available in RLINS and job opportunities for the marine engineers.

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"Vessels reliant on heavy fuel oil today should look to switch directly to hydrogen rather than just adapting to compliant low-sulphur bunker oil. The environmental forces are clearly there to render major fuel source changes in the maritime industry, and hydrogen looks to be a big winner."

Could hydrogen be the zero-emissions fuel the shipping industry strives for?

Kennedy believes hydrogen is the ideal zero-emissions fuel as the product of its combustion is only water vapor. As explained, hydrogen is already fueling various modalities in California, Japan and across Europe—including autos, buses, trains, and aircraft—but its adoption in the marine environment has been slower to date.

Over the recent period there have been some projects exploring hydrogen as marine fuel in the passenger shipping industry, mostly ferries. Most notably, in September last year cruise ship owner Viking Cruises unveiled plans for a liquid hydrogen-fueled cruise ship, and earlier this year Ferguson Marine announced its plans on developing the world's first renewables-powered hydrogen ferry – HySeas III.

However, it appears that the technology is still in its infancy.

Hydrogen has to be kept at minus 253 degrees to prevent it from evaporating

"It is, indeed, early days but the early trials have been very promising. One of the reasons that ferries have been targeted for hydrogen trials is because they travel to the same ports of call over and over. This is critical, as it allows ferries to load hydrogen when they dock," Kennedy said.

One of the key drawbacks in greater uptake of the technology are challenges related to storage and supply because hydrogen has to be kept at minus 253 degrees to prevent it from evaporating.

Keeping hydrogen in a liquid form through cooling and pressurization is both technically challenging and also expensive as the cooling alone uses up 18% of the available fuel.

"Storage has been one of the most difficult challenges in the broad adoption of hydrogen as a clean fuel. The small atomic size of hydrogen means that highly specialized materials have to be used to contain the molecules, and the low inter-molecular attraction means that the element has a low liquification point," Kennedy said.

"In practice, three approaches have been used to store hydrogen: cryogenics where the liquid hydrogen is kept at -253 0 C, pressurization of hydrogen gas, and containment or loading of hydrogen in metal hydrides or other molecular solid structure. All suffer major drawbacks. The need to keep liquid hydrogen at such low temperatures means that around 18% of the hydrogen is used just to provide the cooling. Gaseous pressurization requires triple-layer carbon fiber reinforced tanks that are bulky and expensive. While metal hydrides and other containment solids are often difficult and dangerous materials to work with."

There are three means of using hydrogen for production: the direct combustion in an engine to drive the propellers directly or a diesel-electric drive train, the combustion to power a steam turbine, and the use of a fuel cell. All have been successfully tested, and all have proponents who preach their virtues, Kennedy pointed out.

"For larger vessels," Kennedy continues," the most suitable combination of technologies today would be a steam turbine for propulsion, a large-scale hydrogen engine, and a fuel cell for auxiliary power (so the turbines and engines do not need to be turning when the vessel is stationary)."

But there is rapid development occurring in the fuel cell sector, he added.

"It is quite possible that in the future this will become a standard for propulsion as well in a fuel cell electric or hybrid electric drive."

Commenting on whether combustion engines powered by hydrogen are a better solution than batteries or fuel cells, Kennedy said different methods have different advantages.

"A fuel cell on a luxury yacht would be quieter; but an internal combustion engine might be more efficient and lower cost; and a turbine generator may prove to be more reliable with longer life and less maintenance required."

In conclusion, Kennedy forecasts that many vessels will wind up using a combination of different hydrogen-powered technologies with batteries alongside as an energy buffer.

What is the key concept behind Hydrogen 2.0 technology, and could it work on bigger ships?

Joi Scientific has discovered a new method to produce hydrogen, called Hydrogen 2.0, that is on-demand,

eliminating the storage problem. Namely, hydrogen is generated directly from seawater as needed. It is extracted at room temperature and without pressure. What is more, there is no need for shore-based infrastructure required because the hydrogen is generated on-board.

"Since the fuel-stock for the on-demand production of our hydrogen system is from untreated seawater, maritime applications are an ideal starting point for bringing Hydrogen 2.0 technology to market," he pointed out.

"What will make the most impact is a low-cost source of hydrogen where no storage is required. We believe that Joi Scientific has an answer to that."

At the end of September, Joi Scientific announced that it had signed its first license agreement for its Hydrogen 2.0 production technology with MarineMax, the world's largest boat and yacht retailer.

The license agreement grants MarineMax the exclusive rights to develop, manufacture, and sell propulsion and auxiliary boat power systems capable of running on hydrogen using Joi Scientific's technology.

"Together with MarineMax we will work with co-development partners across the industry to bring hydrogen-based energy solutions to leading vendors in the marine industry," Kennedy pointed out, adding that the advantage of Hydrogen 2.0 technology is that it is a modular system.

"Units can be scaled to the amount of energy required by each vessel's design and application. As a result, we intend to apply it in ships of all sizes and tonnage. Hydrogen system components can be used in multiples to provide a volume of hydrogen gas required for various applications throughout the ship, whether propulsion, auxiliary or shore power.

"For large ships, the design and packaging of the components can be sized for peak energy utilization or can be sized to generate a continuous flow of hydrogen in which storage of hydrogen or electric power can be done during the cruise. In this manner, the stored energy can be used during times when acceleration is required. We realize that this approach appears to be counterintuitive. But think about it: your energy on-board is already topped up when you arrive in port rather than the other way around. There is no reason why the biggest oil tankers cannot be hydrogen-powered in the future, although that might be a little ironic."

Next steps and goals for the future

As explained, the key focus now is on the productization of the Hydrogen 2.0. Now that the company has proven the system works, the goal is to fit it on board boats and ships in cooperation with MarineMax.

"We will be working closely together with a growing number of co-development partners to deliver the first boats and ships with on-board Hydrogen 2.0 generation capability.

"In terms of our plans for the future, we envision a wide range of marine applications from small to medium to large. Boats and vessels are just the beginning. We already have seen interest in a variety of other applications—from offshore electrical and clean water generation to improving and decarbonizing power for fish farms.

"There will be an evolution of uses for Hydrogen 2.0 technology with the ultimate goal of getting to full large-scale propulsion. First uses may be with small outboard engines and auxiliary power. The auxiliary power units can be used to generate heat, cooling, electricity, or water when at anchor or on-the-go without noise or emissions," he concluded.

Interview by Jasmina Ovcina Mandra
Courtesy: world maritime news

How Smart are Your Ships?

Hemant Attreya - B.Tech-III

Becoming "smart" in the shipping industry has been a hot topic over the recent period as the rise of technology promises to unlock numerous benefits, ranging from cost cutting to improved productivity and effectiveness.

Smart containers, smart ships, smart ports are the buzzwords being repeated everyday. But the question is: how to make a smart decision when choosing the right technological solution for one's fleet or business operation?

Image Courtesy: ABS

To help answer that question, the American Bureau of Shipping (ABS) has issued Guidance Notes on Smart Function Implementation to help owners use technology to achieve their operational targets.

Smart technology is aimed at helping collect, process, and perform advanced data analytics, in order to allow the people using that technology to make more informed decisions.

Derek Novak, Senior Vice President, Engineering and Technology, ABS

Commenting on the launching of the guidance, ***Derek Novak, Senior Vice President, Engineering and Technology, ABS***, told World Maritime News that the key goal was to recognize "that the industry is embarking on a journey towards smart functionality, with more smart equipment and systems being installed on vessels every day."

The drivers from the industry that prompted drafting of the notes are twofold, according to Novak.

"Owners and operators want guidance to enable them to truly take advantage of the technology on their vessels to improve operational performance, asset maintenance, or to have a less intrusive class experience. The drivers from the equipment manufacturers, who are putting their products on board the vessels, are that they want recognition from class that allows for owners and operators to easily realize the benefits of the technology that they have placed on their assets," he said.

"If you are building ships or buying modern second-hand tonnage, then ABS can look at what you have on board and help you take advantage of that equipment

A big part of that is being able to adopt technology and have confidence in what it can do for you. It's not expensive, certainly not to get started and this kind of technology is increasingly going to be found on ships coming out of yard as standard equipment."

Hence, smart functionality is not intended only for the big players. According to Novak, it's more about the mindset of taking the technology you may already have and work out how to make that technology fit your goals.

Main Concerns of Owners and Operators

For some owners, the use of new technology can be overwhelming and they don't know where to get started, Novak continues.

"We have seen a spectrum within the industry and there are many owners who are interested in using technology to their advantage and are trying to figure out how to get smart functions on board.

"The process to implement these technologies needs to be flexible to allow for further advances, but to get the process started we suggest that the owners have a specific goal in mind, for example to improve operational efficiency, to make surveys less intrusive, or to improve performance of the asset overall.

"We work with owners through a process one step at a time to leverage the technology; that's our unique approach. What we provide is a well-designed framework that will let them set and achieve their goals.

The idea of the guidance is to take owners to a place where they can leverage technology today to meet the defined goals of their business

In addition to setting the goal you want to achieve and choosing the right equipment to do so, there are potential downsides to improper implementation of the technology. Basically, there is a risk that an owner will not get the benefit out of the technology they have bought.

"It can happen, especially where systems are very complex. The main reason why we see this issue is companies not understanding what they want the technology to do for them; they do not have a goal in place. As we've said, just paying for technology is not going to help, when what they really need is a plan.

"Nobody puts digital technology on a ship just because it's interesting; we're not in an environment where owners have that luxury. If one buys equipment with state-of-the-art technology they should expect to have it work in their favor. For us it's a process of helping owners to set a goal, to use the technology to achieve that specific goal."

Is the Industry Ready to Embrace Smart Shipping?

Novak believes that a considerable portion of the industry is ready to embrace smart shipping and for some straightforward reasons.

"We are living in an era of increasingly demanding regulation and that is driving the collection and reporting of data that has a 'smart' element. Secondly, the industry increasingly understands how to use technology to find value and benefit to their operations, so they are moving in the right direction," he pointed out.

Over time, as the benefits of the technology become embedded, Novak believes flag states and regulators may recognize that having this information available could provide some equivalency to the way that requirements are being fulfilled now.

"There will be early adopters who get in there first and pick up the opportunity more rapidly but in the long-term, smart functionality is a philosophy the industry will squarely get behind," he added.

As explained, smart functionality is part of the industry's journey to autonomy.

"Years ago most vessels were pretty basic in terms of data technology and humans made a majority of the decisions," he said.

"Now we're at the stage of collecting and analyzing data so that humans can make better decisions: that's 'smart'. If you look at the world we are heading towards, the next step is semi-autonomous where the machines can take decisions with humans providing oversight and intervention."

The last step is full autonomy, and for that, "we are going to need a lot more information about operations and maintenance," according to Novak.

"To get down that path, you really need to take that step fully into smart before you can truly go towards autonomy."

Can BigData Live Up to the Hype Seen Over the Recent Period?

"For us, avoiding the hype and gaining the benefit of big data is all about focusing on what you need to know. You can collect data from many different locations but it's the value it provides and the information it delivers that contributes to better decisions," Novak said.

"If you don't understand why you're looking into operational data then yes, it could be a lot of hype. If you want certain questions answered and you want data to help you with those goals, that's when big data can be a huge asset.

"Let's not forget we are in the era of IMO 2020 and looking ahead to the IMO's requirements for carbon emissions reductions after 2030 and 2050. We are going to need to collect and analyse a lot of data – much more than we have now – on vessel operations if we are going to be able to meet a challenge on that scale."

Interview by
Jasmina Ovcina Mandra
courtesy : world maritime news

Live Life Your Style

Anjali Tibrewal - B.Tech- II YEAR

Hey there! Everyone has his/her own style to live, but unfortunately very few are aware, rest just follow others - by this you can consider it as it's their style but in depth it's not.

See every person in this earth has an individuality but for some it takes very long time to recognize while others grasp it early. When you know your uniqueness, you will be on the top of the world, it does not mean that you will become a dominating person or like that but it will give an inner peace and then you can say that, yes I have got something that's unique, "I am not a copy cat".

In the marine field, we have to learn everything, so why not we learn ourselves first. Everyone has a style of living, or may have thought of it so, then why to follow others style. You may say people change or living thing change, but actually we should first ourselves change in our life. Why don't we smile in difficult situations and say bring it on, it will not help you to come out of that situation but will give you strength to face it. By the way it's my style, so find yours.

Lastly, I want to say, don't take it personal, I am just a beginner, just tried to give my best shot.

"BE FREE, BE YOU, JUST WEAR YOUR OWN BRAND"

Placement Details of Cadets From BS Marine Engineering & ETO -2018

R.L. Institute of Nautical Sciences made commendable achievements in the academic year 2018 by bringing coveted placement offers to the deserving and meritorious cadets who have successfully completed their degrees and Certification courses. All the cadets have attended off-campus recruitment programmes conducted at Chennai to short list the probable candidates to be placed in their shipping companies.

RLINS will also take concerted efforts continuously in future for getting suitable placement opportunities for the meritorious cadets.

I. WALLEM SHIP MANAGEMENT (INDIA) PVT. LTD.

ETO Cadets of February -2018 batch of RLINS were successfully placed in Wallem Ship Management (India) Pvt. Ltd.

VINOTH KUMAR K
(2018FRLETO020)

MOTA RAM JAKHAR
(2018FRLETO010)

SMATAV SHARMA
(2018FRLETO018)

II. WALLEM SHIP MANAGEMENT (INDIA) PVT. LTD.

BS. Marine Engineering Cadets of RLINS Graduated in July-2018 were successfully placed in Wallem Ship Management (India) Pvt. Ltd.

PRINCE JUNEJA
(201438RL012)

VIKRAMAN R
(201438RL015)

AMAN AWASTHI BHAGAVAN
(201438RL003)

MADALA SHANKAR
(201438RL008)

III. MSC CREWING SERVICES PVT. LTD., INDIA

BS Marine Engineering Cadets of RLINS Graduated in July-2018 were successfully placed in MSC CREWING SERVICES PVT. LTD., INDIA

MANOJ RAGHAV A M
(201438RL009)

SALAI GOPALAKRISHNAN S
(201438RL012)

Congratulations to Budding Marine Engineers

Vasudevan's Son Marriage at Trichy

Newly Married couple Chi. Prahalad and Sow. Nivethitha with (L-R) Mrs. & Mr. Prabhakar, Mr. Bhaskar Agnihotri , Principal , Mrs. & Mr. Vasudevan Mrs. & Mr. M.Subramanian , Advisor-Technical , Mrs. & Mr.J.Krishnamoorthy Executive Assistant, Mr. Uma Mahesswaran, Senior Faculty.