

SINGAPORE maritimeweek[®] 2022



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THE NUTGRAF
CAPTURING THE ESSENCE



Charting Three Ways To Transformation

Derek Wong
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Singapore will soon be part of a landmark framework for reducing greenhouse gas (GHG) emissions from shipping, along with the United States, Japan, Germany, France, and the United Kingdom.

Minister for Transport and Minister-in-charge of Trade Relations S Iswaran announced the move to join 22 other signatory states of the Clydebank Declaration for Green Shipping Corridors in his opening address yesterday at the 16th edition of Singapore Maritime Week (SMW).

"At the plurilateral level, we support initiatives among like-minded partners that seek to galvanise action towards more ambitious outcomes," he said.

The Declaration was launched at last November's United Nations Framework Convention on Climate Change's 26th Conference of Parties (COP26). It aims to establish green shipping corridors between ports by deploying zero-emission vessel technologies and alternative fuels.

Mr Iswaran named such collaborations, along with innovation and talent development, as the three key elements for transformation in the sector, the theme of this year's SMW. Besides coping with supply chain disruption wrought by the pandemic and geopolitical developments, the industry must also adapt to challenges such as carbon emissions and manpower constraints, he noted.

To solve complex issues such as decarbonisation, a "whole-of-industry" approach is required, he said in his address to more than 900 delegates and experts attending the Opening Ceremony.

Besides international cooperation between governments through instruments such as the Declaration and the International Maritime Organization, company-led initiatives are also key to the sustainability drive. This is taking place in the development of alternative-fuel ships, for example.

Singapore is at the heart of such partnerships, having established a Maritime International Advisory Panel for global perspectives on key trends shaping the maritime industry. The group comprises 12 global business leaders from companies such as shipping giant Maersk, Boston Consulting Group, and ING Bank.



S Iswaran, Minister for Transport and Minister-in-charge of Trade Relations, speaking at the Singapore Maritime Week 2022.

"Decarbonisation is but one of the myriad challenges that lie ahead," said Mr Iswaran. "We need our combined capabilities, across nations and importantly, from both public and private sectors, to chart a path forward for the maritime sector."

Besides collaboration across boundaries, he also highlighted the need for innovation to transform and elevate the industry.

Singapore is a forerunner in this space, positioning itself as an innovation hub through events such as the Smart Port Challenge 2021, which drew over 150 start-ups worldwide to address industry challenges.

The Republic's innovation drive is also spearheaded by Tuas Port, which is expected to be the world's largest fully automated container terminal when completed in the 2040s, featuring technology such as video analytics.

"It will deliver a quantum change in efficiency and sustainability," said Mr Iswaran of the port.

Finally, a strong maritime workforce should underpin the sector's transformation, noted the minister.

To attract top talent, Singapore launched a skills development scheme last month for local seafarers called Sail Milestone Achievement Programme. This is alongside initiatives such as Career Conversion Programmes for mid-career switchers joining the sector.

Developing adaptable and competent maritime workers will pave the way for a similarly robust sector.

"To ensure (the maritime industry's) reliability, resilience and readiness for the future, (it) must transform, and embody the essential elements of continuous innovation, boundaryless collaboration and strong talent development," said Mr Iswaran. "This endeavour requires partnership across nations and between the public and private sectors, for which the Singapore Maritime Week can serve as a valuable platform." ■

Deputy Prime Minister and Coordinating Minister for Economic Policies, Singapore, Mr Heng Swee Keat delivering the keynote address titled 'Riding out storms and seeking new opportunities - The maritime sector in a time of change'.

Refreshed Blueprint To Transform Singapore's Sea Transport Sector By 2050 Unveiled

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Singapore will embark on a renewed push to transform its sea transport sector, anchored on a strategic plan that will generate 1,000 new jobs by 2025.

The refreshed Sea Transport Industry Transformation Map (ITM) will also future-proof Tuas Port to become the world's largest fully automated container terminal port as well as expand the international maritime centre ecosystem in Singapore.

The blueprint "sets out the collective course for the next few years with an emphasis on innovation, human capital development, and resilience," said Singapore's Deputy Prime Minister and Coordinating Minister for Economic Policies Heng Swee Keat yesterday.

Mr Heng, who delivered the announcement in his keynote Singapore Maritime Lecture, noted that this approach of bringing together stakeholders in the maritime community has made good progress in the past five years, boosting productivity, jobs, and strengthening linkages and synergies across the economy.

First launched in 2018 by the Maritime and Port Authority of Singapore (MPA) in partnership with the industry, unions, and other government agencies, the Sea Transport ITM lays out strategies to grow sector's value-add by S\$2 billion, or an average rate of 2 to 3 per cent annually, between 2020 and 2025.

The latest refresh aims to help the sector address the challenges from the COVID-19 pandemic and shifts in global supply chains, and to seize new opportunities.

To grow the innovation ecosystem, for instance, the sector aims to attract over S\$25 million of venture capital investments into PIER71™ start-ups and to grow the number of MarineTech start-ups supported by MPA from the current 30 to 150. PIER71™, or Port Innovation Ecosystem Reimagined @ BLOCK71, is a joint initiative between MPA and NUS Enterprise to accelerate industry-wide innovation for the port and maritime industry.

And as the sector undergoes restructuring, new roles requiring skills in data analytics, data science, Internet of Things engineering, software engineering, and sustainability management will grow, while support will be provided for workers to upgrade their skills as existing roles evolve.

These initiatives, said Mr Heng, form part of Singapore's contributions to the global industry's transformation efforts.

Speaking to more than 900 onsite and virtual participants attending the hybrid event at Marina Bay Sands, he singled out three key areas that the industry must focus on as it moves into the future.

The first is continuous maritime investment. Noting that global container shipping rates rose more than four times in 2021 from pre-COVID-19 levels, against a record high in global trade, Mr Heng pointed out that persistently high rates will dampen trade and undermine the lifeblood of the global economy.

"It is inherently difficult to eliminate economic cycles of all forms, including the shipping cycle. But we can moderate the cycle, by having greater awareness of this risk, and working together to adopt a discipline of measured and continuous investment," he said.

At the same time, disruptions like COVID-19 have affected the industry. The reliability of vessels arriving at ports on time has more than halved to an average of around 35 per cent in 2021, from around 78 per cent before the pandemic.

Digitalisation will serve as a major enabler in optimising the flow of goods and the industry's capacity to adapt to evolving circumstances, Mr Heng said. The OCEANS-X API (Application Programming Interface) marketplace, also announced yesterday, is the latest in Singapore's digitalisation efforts. The platform will facilitate data exchange between industry players to scale digitalisation more easily and quickly.

The industry must also "make a decisive green transition" as it nears the International Maritime Or-

ganization's target to halve absolute greenhouse gas emissions by 2050, from 2008 levels, he said.

In 2017, Singapore launched the world's first national standard for Liquefied Natural Gas (LNG) bunkering. It continues to drive innovation in sustainability with research and development in new technologies as well as in green financing.

Mr Heng acknowledged that the maritime industry has been operating in choppy seas – "with one storm receding behind us, and a new one clouding the horizon", in reference to the COVID-19 pandemic and the Russian invasion of Ukraine respectively.

But one reason to be optimistic is that "the fundamentals of the shipping industry remain strong", he said. "We must make the best use of this strength to transform, if we are to realise the (sector's) growth potential."

In a fireside chat with Singapore Maritime Foundation Chairman Hor Weng Yew, also Managing Director and Chief Executive Officer of global maritime logistics solutions provider Pacific Carriers, Mr Heng noted that the industry must expect to see crises and disruptions as a "recurring feature of the global economy".

"The need for us to be prepared for crises and to build resilience into our system is going to be very important," he said.

Yet, despite a landscape that is filled with more risks and uncertainty than before, Mr Heng remains optimistic of global growth.

"Countries need to have this belief that economic competition is not a zero-sum game. In fact, it spurs greater improvement. For countries to benefit from this integration, you need to restructure the economy."

"That's why this theme of transformation is important. We need to learn how to use resources much more efficiently, in particular, resources with constraints," he said, adding that collaboration will hold the key to solving these common problems. ■

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From left: Jeremy Nixon, Global Chief Executive Officer, Ocean Network Express; Andreas Sohmén-Pao, Chairman, BW Group (Singapore); Rashpal Bhatti, Vice President, Maritime and Supply Chain Excellence, BHP; and Aw Kah Peng, Chairman, Shell Companies in Singapore.

It's Time To Get Real: How To Steer Shipping's Net Zero Vision Into Reality

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The goals have been set, deadlines established, and ambitions cast. But the hard truth is this: to achieve net zero shipping, the industry must first face harsh realities.

"What we've done really well in the past couple of years is (setting) aspirations," said Andreas Sohmén-Pao, Chairman of shipping company BW Group (Singapore). "Aspirations are so important in setting the direction of where we want to go. But you cannot solve a problem if you don't know or are unwilling to face what the reality is."

Speaking at the SMW Leaders' Perspectives panel discussion yesterday, he cited the stark challenges confronting the industry as it embarks on decarbonisation – from the availability and costs of alternative fuels, to the time required for technology to mature, to gaps in infrastructure.

The maritime community is racing to meet the International Maritime Organization's 2050 target for global shipping to halve greenhouse gas (GHG) emissions, compared to 2008 levels.

"Energy is becoming more expensive, minerals and metals are getting more expensive...Free trade is not quite as easy as it used to be. We have to be realistic," said Mr Sohmén-Pao.

Compared with gas, for instance, he noted that wind energy production requires four times the capital expenditure, while producing solar photovoltaic cells requires five times the amount of minerals and materials.

Echoing this sentiment, Jeremy Nixon, Global Chief Executive Officer of container shipping line Ocean Network Express, said that putting decarbonisation into action requires navigating "practical realities" – specifically the availability of green fuel when greener ships emerge from the production lines in a few years.

He worked out the numbers: if there are 100,000 vessels, each with a working lifetime of 25 years, the industry will need to replace 4 per cent, or 4,000 vessels, of its total fleet with green ships every year to meet its decarbonisation targets.

Noting that green fuels such as methanol, hydrogen, and ammonia, are not yet available at scale, he said: "The reality is we are going to need market-based measures and incentives to accelerate the availability of that green fuel."

A bunker levy, he added, could be used as a tool to support and offset the costs of ships running on green fuel.

FROM NUDGE TO PUSH

Tackling the financial part of the decarbonisation equation will be key, according to speakers on the high-level panel moderated by Rashpal Bhatti, Vice President, Maritime and Supply Chain Excellence at resources company BHP.

What works is that more banks are offering sustainability-linked loans to incentivise green shipping operations, noted Stephen Fewster, Global Head for Shipping Finance at ING Bank (UK).

To take this further, he suggested allocating risks to parties that are best able to take them, adding that bank regulators, for instance, could help to lower capital ratings for green assets. Mr Fewster was responding to a question by Mr Sohmén-Pao on how finance players can "move the needle" in bringing riskier – but potentially more rewarding – projects to life, given that sustainability-linked loans may be merely seen as "a nudge" in decarbonisation efforts.

"The technological risks should go to the shipyards and engine manufacturers, (as) there has got to be some kind of performance guarantee," he proposed. "The operating risks should lie with the shipowners.

They have to demonstrate they are able to operate the ships with this new technology. And the banks take the credit risks."

Another way to boost financing for sustainability efforts could lie in the redesigning of ships, as ships are currently built to last 25 years – which makes it difficult to swap ageing components.

"We need to build more modular ships where we can swap parts in and out easily – plug and play. If we can do that, we can develop financing around that," he said.

DIVERSITY OF OPTIONS

For Aw Kah Peng, Chairman of energy giant Shell Companies in Singapore, it is heartening that concrete decarbonisation actions are being taken to pave the way for progress.

Shell has already halved its crude processing capacity in Singapore, and the group has also built infrastructure globally to enable Liquefied Natural Gas (LNG) bunkering, which cuts GHG emissions by a quarter – opening up more possibilities to alternative fuels like bio or synthetic LNG.

Perhaps instead of looking for a single pathway or the perfect fuel of the future, the question to ask, she said, should be: what different pathways can the industry explore?

"The energy security debate that is now raging is telling us we need a diversity of options. You need to have the agility and the willingness and the capacity to build multiple pathways," she said. ■

What Next For Shipping After A Watershed 18 Months?



Rahul Kapoor

When the pandemic struck in early 2020, the industry was expected to be severely hit – as was the case in every previous recession. The debt levels were high, profitability over the last decade was dismal, and demand was expected to fall off a cliff.

Yet, the industry has emerged stronger, partly because it was much better positioned going into the pandemic. In years preceding COVID-19, competition was becoming less intense due to consolidation. The fight for market share had already taken a backseat and years of losses had forced carriers to search for profitability.

The past 18 months has seen the container shipping industry's fortunes turn on its head. Demand started normalising and pricing power, which had long been elusive, came back ferociously. Demand destruction was short-lived; recovery was swift and exceeded expectations as the United States government stimulus drove consumer spending.

The result: a year of massive profits that wiped out decades of losses. But what's next?

DEMAND EXPLOSION

Both ocean and landside supply chains were unprepared for such a significant demand explosion in such a short burst. To put it in perspective, we witnessed a very significant increase in spending on goods in the US. Since early 2020, at the height of pandemic, consumer spend on goods has jumped by close to 50 per cent.

This is similar to what happened after the Global Financial Crisis, except that this time it took just 18 months. This meant that decades of demand was packed into one short period. The supply-side bottlenecks were not only being caused by COVID-19 restrictions but also because of surging demand.

It was a perfect storm as significant active capacity shortage across the supply chains came in the face of an extremely strong demand environment.

Over the last two decades, global supply chains embraced the just-in-time approach, one that proved resilient and predictable in a normal demand environment.

But we also witnessed a significant rise in supply chain concentration risks. With the pandemic, integrated global supply chains faced their toughest test yet and the evidence suggests the global trading system was severely stressed. Distress was accentuated by congestion, land-side restrictions, and equipment imbalances which persist today, almost two years since the pandemic began.

Our data suggests that congestion continues to plague global container ports with only minor signs of abating. Delays continue causing frustration for shippers and other stakeholders in the global economy and is slowing the pace of the general trade recovery.

DEMAND SHOULD EASE UP

The only way out for supply chain stress is when demand starts to taper off. There are early signs that this is happening with US disposable income moving below trend after two rounds of massive stimulus.

This should provide some relief and help bring down goods spending and ease demand growth in 2022. We believe container freight rates peaked in 2021 and are expected to face correction in the coming years.

Rates will stay elevated compared with pre-pandemic levels but decline meaningfully from the heady levels seen in 2021. In our earlier stated view, the era of cheap ocean shipping is certainly behind us.

INDUSTRY TO EMERGE IN NEW AVATAR

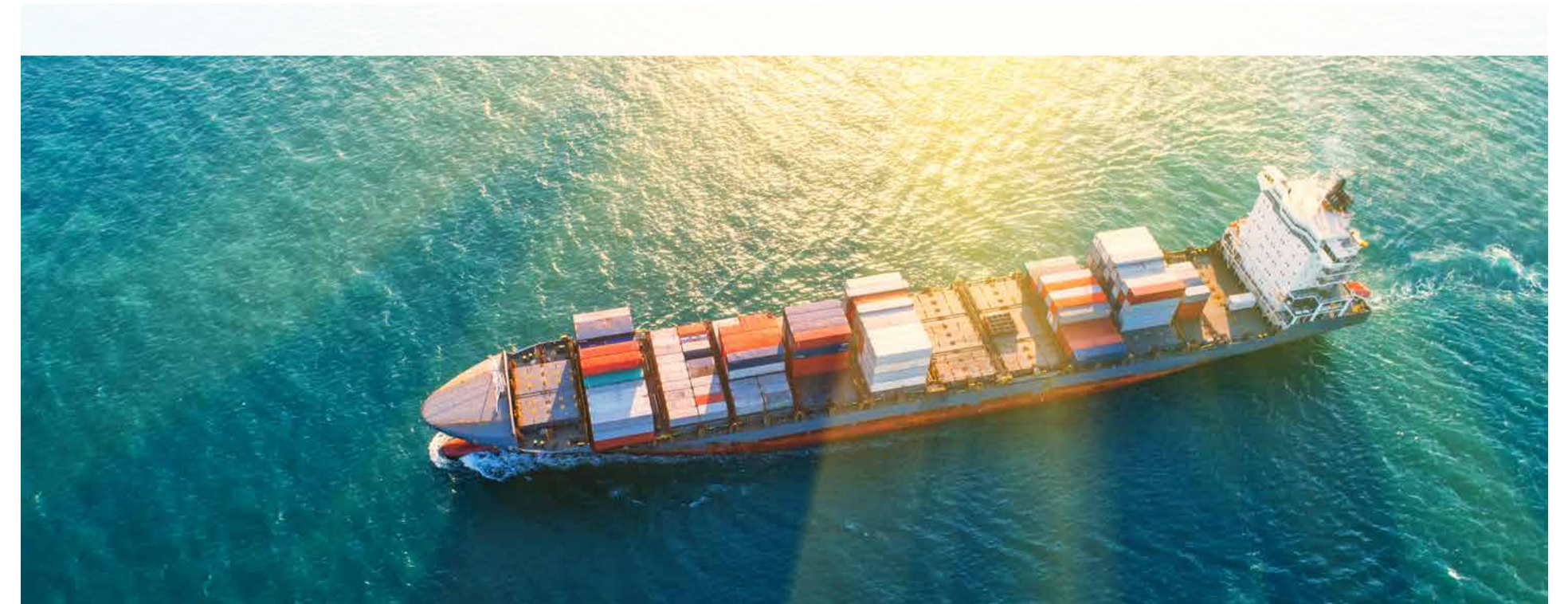
Container shipping is a low-margin business and barring some spurts of abnormal profitability, the industry has mostly struggled to make decent operating margins and cover its cost of capital for a sustained period of time.

Since the Global Financial Crisis, the industry has suffered multiple bankruptcies and has lost billions of dollars annually. Container shipping industry on a whole is expected to make over US\$200 billion in operating profits in 2021 to 2022, wiping out decades of losses.

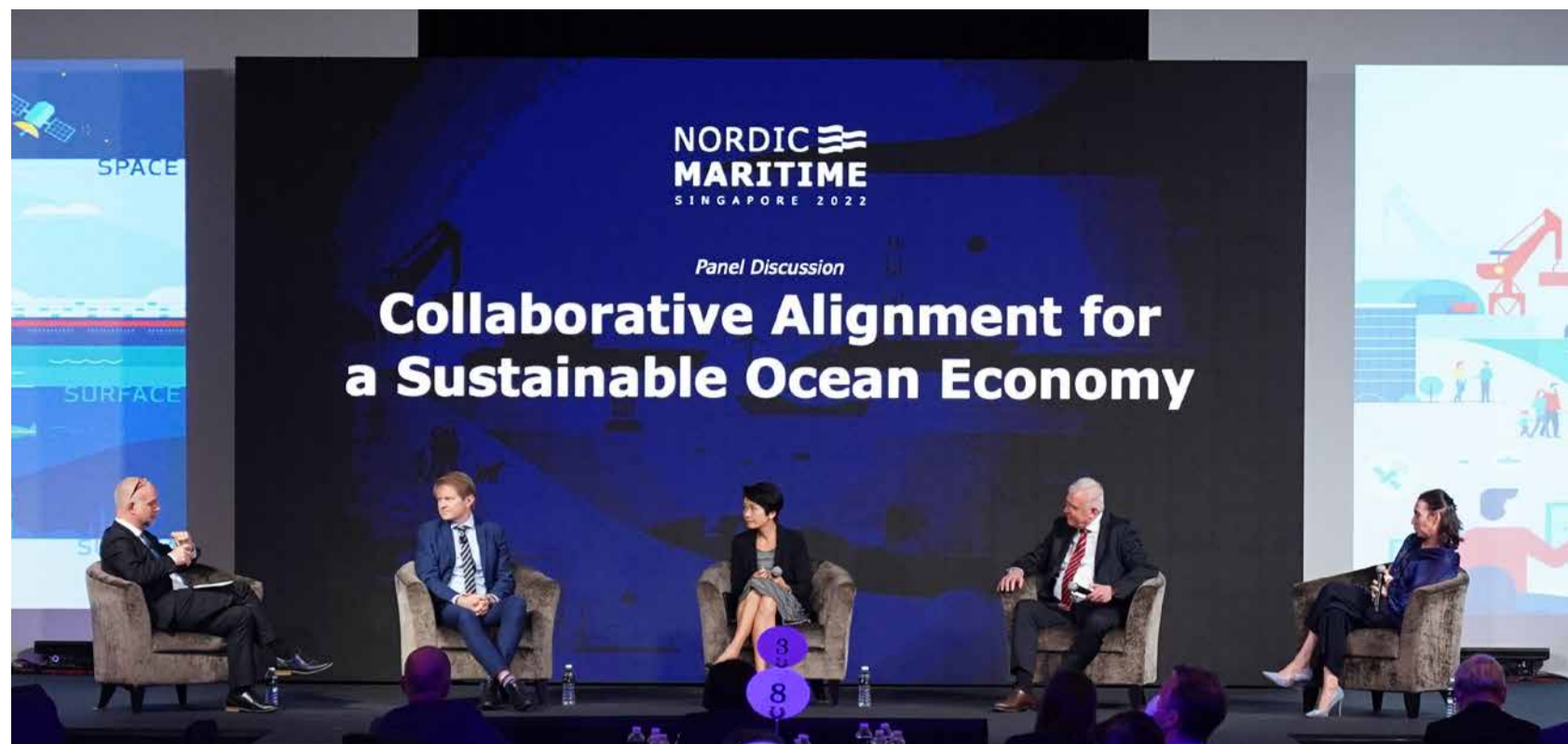
This is a welcome turn of events for the industry, and we believe the windfall will see container shipping companies emerge in new forms. They will spend big on technology, while non-shipping assets will accelerate multifold.

All this will provide the industry with a stronger balance sheet to fund efforts aimed at decarbonisation, the industry's biggest challenge as it strives to get to net zero emissions. ■

A thought leader in market analysis forecasting, shipping economics, and commodity market developments, the author is the Maritime & Trade Global Head of Commodity Analytics & Research for S&P Global, based in Singapore.



From left: Mikael Lind, Senior Strategic Research Advisor, Research Institutes of Sweden; Bo Cerup-Simonsen, Chief Executive Officer, Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping; Lynn Loo, Chief Executive Officer, Global Centre for Maritime Decarbonisation; Esa Lindqvist, Chief Advisor, Maritime and Ports, Business Finland; Cristina Saenz de Santa Maria, Regional Manager, Region South East Asia, Pacific & India, DNV Singapore, at Nordic Maritime 2022.



Decarbonisation Needs A Private-Public Partnership Power-Up

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The road to decarbonisation cannot be undertaken by a single entity alone. With time running out, the shipping industry must use this window of opportunity to pool resources and advance the transition towards a greener ocean economy.

Key to this effort is a collaboration between the private and public sector, where sharing information can build momentum in developing different pathways for zero emissions, panellists at the Nordic Maritime 2022 said yesterday. The discussion focused on creating a sustainable maritime industry, particularly between Nordic countries and Singapore.

"Singapore seeks to continue to play the role as a facilitator to build partnerships for an inclusive transition to cleaner fuel," said Guest-of-

"We don't believe there's a silver bullet, so we need to test and pilot and try to scale many technologies and fuels at the same time."

Cristina Saenz de Santa Maria
Regional Manager, Region South East Asia, Pacific & India, DNV Singapore

Honour Quah Ley Hoon, Chief Executive of Maritime and Port Authority of Singapore.

As an intertwined ecosystem, the lack of coordination has a knock-on effect on the environment. When ships find themselves waiting for as long as weeks to enter ports, for instance, they consume excessive fuel and produce significantly more emissions.

Nordic countries, in this case, support global alignment to preserve the planet.

"When I talk about collaboration, it's not a naive understanding that collaboration will solve everything – it's really about figuring out where do we collaborate in the ecosystem, where can we truly make a difference by collaborating and creating confidence and standards," said Bo Cerup-Simonsen, Chief Executive Officer of Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping, a non-profit research organisation focused on maritime climate goals.

One way this partnership between stakeholders can work is through digitalisation. The sheer amount of data collected from connected devices provides a clearer big picture for shipowners to make more informed decisions.

Better yet, this joint endeavour should be extended to adjacent sectors such as fuel and energy producers, or aviation, said Lynn Loo, Chief Executive Officer of non-profit organisation Global Centre for Maritime Decarbonisation (GCMD).

"It's really important to bring them on board because they can give us insight on the supply chain, on infrastructure buildout," she noted. "There may be opportunities for us to work together to avoid duplication of effort."

But regulations are necessary to drive decarbonisation, the panellists agreed. For example, if countries aim to be net zero by 2050, the foun-

dations to scale a new system comprising energy-efficient technology – from carbon pricing to technical standards for fuel specifications – must be laid by 2030.

This will level the playing field and outline global goals to ensure everyone chips in. More importantly, implementing safety guidelines helps to minimise risks when testing alternative fuels.

Panellists also agreed that the world cannot wait for bodies like the International Maritime Organization (IMO) to get this going. While there is consensus that the IMO should regulate efforts in the long run, the industry should support first movers through investments, for instance.

While the world is not yet moving in unison, some frontrunners with the impetus are already getting started, which is the boost the industry needs.

And as more projects materialise, shipping cannot wait for a single solution to succeed. A multi-pronged approach is the quickest way to find viable alternatives, given the lack of time.

"We don't believe there's a silver bullet, so we need to test and pilot and try to scale many technologies and fuels at the same time," said Cristina Saenz de Santa Maria, Regional Manager, Region South East Asia, Pacific & India of classification society DNV Singapore. "Otherwise we will lag behind."

The event was rounded off by the signing of a three-year Memorandum of Understanding (MOU) between Research Institutes of Sweden (RISE) and the Singapore Maritime Institute (SMI) to complement the ongoing collaborative efforts between the Nordic countries and Singapore. The MOU will cover four broad areas: maritime informatics, supply chain innovation and efficiency, decarbonisation and sustainability, and safety and security. ■

An Ocean Of Possibilities For Digitalisation Of Maritime, Says Technology Expert



Codi Loh

Digitalisation will have a big role to play as the maritime industry evolves over the next few years, especially in the areas of sustainability and operational efficiency.

But even as companies embrace the power of technology, they need to be careful about the risks it brings, said Anders Bryhni, Vice President and Head of Digital Ocean Applications at software and digital solution specialist Kongsberg Digital.

Mr Bryhni was speaking at a Maritime Software Developers Live TV panel on Maritime Software Development Landscape and Trends, as part of the Singapore Maritime Week. The event focused on the maritime software development market and had speakers tackle a range of different topics, from Application Programming Interfaces (API) to the Internet of Things (IoT).

In his session, Mr Bryhni identified four key trends that would shape the maritime industry: the environment, fuel transition, digitalisation, and remote and autonomous technology.

"Digitalisation is certainly a big thing in the maritime industry. There are a lot of opportunities that are coming with new technologies like remote and autonomous technology," said Mr Bryhni.

"We are very used to a very digital world, but how this hits the shipping market is not always so easy to get a grip on."

He also noted that while there was growing excitement over machine learning and artificial intelligence, he believes the better approach is to use technology to address specific challenges. For instance, he said that insights gathered through location analytics that combine voyages with transport data can make the flow and traffic of trade more efficient.

Likewise, companies should also be circumspect about the power of autonomous ships, he said.

"Crucial areas to consider are how it can help vessels avoid collisions and make smart decisions in constricted waters and challenging spaces. Specific use cases should also be considered, such as for relatively short trips and repeated voyages," he said.

In addition, autonomous ship technology could be applied to fleet management, such as the de-

velopment of remote operation centres for fleets of vessels. They would act as centralised locations with easy access to competent personnel that would make serving and operating a large fleet more efficient.

However, he also warned that digitalisation could be a double-edged sword, especially when it comes to issues of cybersecurity.

"We need to build systems that are resilient, that are built with a lot of security in mind. There are so many aspects of building a good security culture, like people, organisations, and processes. It is so important to have cybersecurity in mind and look into it," said Mr Bryhni.

Lastly, where sustainability is concerned, digitalisation can play a big part in accelerating the change, he added. This is especially the case in how the ships of the future are built and how the new technologies are incorporated.

"The software developer market in the maritime industry is a broad market. It is a race with a lot of horses," said Mr Bryhni.

"There are so many places that you can join to make a difference. I am really positive and intrigued by this ocean of possibilities." ■

"We are very used to a very digital world, but how this hits the shipping market is not always so easy to get a grip on."

Anders Bryhni
Vice President & Head of Digital Ocean Applications, Kongsberg Digital

TODAY'S HIGHLIGHTS

Tue
April 5

MarineTech Conference

9am - 4.30pm
Hybrid (Marina Bay Sands, Level 4, Orchid Ballroom)

The MarineTech Conference features global leaders of industry and influencers who will speak on trending and important technology topics concerning the global maritime port and adjacent industries.

MarineTech Exhibition

9am - 5pm
Marina Bay Sands, Level 4, Melati Ballroom

Marine Money Singapore Ship Finance Forum

12pm - 5pm
Hybrid (St. Regis, John Jacob Ballroom)

ReCAAP ISC Piracy and Sea Robbery Conference 2022

2pm - 4pm
Virtual
Distinguished speakers from international organisations, regional coordination and information sharing centres, and shipping companies will be discussing the situation of maritime piracy and sea robbery in Asia and in Africa.

Baltic Freight and Commodity Forum – Dry Bulk

4pm - 5.30pm
Virtual
Get the latest updates on the Baltic services and hear from leading market experts on the dynamics and market outlook of the dry bulk freight and commodities markets.



Does Ammonia Hold The Keys To A Green Shipping Future?

THE SPARK - FROM FERTILISER TO FUEL

Justin Kor
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It is foul-smelling and typically used to grow crops. But could ammonia also power shipping's green drive?

Already, this colourless compound is making the transition from farmland fertiliser to green fuel, as the maritime sector embarks on a course to decarbonise and decouple from its reliance on carbon-heavy fossil fuels.

Currently, it is estimated that international shipping accounts for about 3 per cent of global greenhouse gas emissions. A large container ship can emit more than 5,000 tons of carbon dioxide in a single long-haul journey. That is the equivalent to an entire year's emissions from over a thousand cars.

In light of the climate crisis, the International Maritime Organization has set out an ambitious target to halve international shipping's greenhouse gas emissions by 2050.

As a zero-carbon energy resource, using ammonia as marine fuel can help the sector achieve this goal. "The climate possibilities for ammonia as fuel are an appealing option to slash emissions from transport such as long-haul shipping and aviation," noted European Energy Research Alliance president Nils Rokke in a *Forbes* article.

And maritime players are aware of this, with a handful of projects to build ammonia-fuelled vessels now popping up in shipyards.

For example, the Castor Initiative, a global alliance set up in January 2020 is looking to develop an ammonia-fuelled tanker by 2025. The partners are: MISC, Lloyd's Register (LR), Samsung Heavy Industries, MAN Energy Solutions, the Maritime and Port Authority of Singapore (MPA), Yara International, and Jurong Port.

In January this year, shipping company Avin International also took delivery of the Kriti Fu-

ture, the world's first ammonia fuel-ready ship. "This vessel represents a milestone in the development of the maritime industry and a step forward in the readiness to utilise alternative fuels," noted maritime classification society American Bureau of Shipping during the launch.

A recent survey by Lloyd's List showed that ammonia is expected to make up 7 per cent of all shipping fuel by 2030, and 20 per cent by 2050. As eco-friendly vessels begin to set sail, ammonia will be pivotal to fulfilling the industry's green goals.

COMPACT AND CONVENIENT

Its green attributes aside, ammonia brings about two other notable benefits as a shipping fuel.

First, it packs energy on a level that alternative fuels like hydrogen cannot match. With an energy density that is 1.5 times that of hydrogen, ammonia's compact nature means that it requires less storage space – a valuable commodity onboard cargo ships. This makes it more cost-efficient as a fuel source.

Second, ammonia is also comparatively low maintenance. For instance, hydrogen requires costly, sophisticated cooling equipment like high-pressure tanks to be stored in liquid form before it can be used as fuel. Ammonia, on the other hand, requires significantly less cooling to be stored as a liquid. It is also less flammable, posing less of a fire risk than Liquefied Natural Gas (LNG).

But the biggest benefit is that ammonia can be produced in potentially unlimited amounts, noted a 2020 report by Hafnia Tankers.

"Green ammonia is produced entirely from renewable electricity, water, and air. Unlike sustainable carbon-based fuels, green ammonia feedstocks are unlimited," it said.

A FUEL FACELIFT

But it is not all smooth-sailing – harnessing ammonia also has its challenges.

For starters, the compound is toxic and corrosive. The slightest leak or spill could be disastrous. "Handling ammonia onboard ships will require a complete new set of skills and safety procedures," noted Charles Haskell, LR's Decarbonisation Programme Manager in an article for the maritime classification society.

Its hazardous nature also means there needs to be a change in public perception for ammonia to be accepted as fuel. Currently, port authorities and regulators remain wary about ammonia bunkering.

Lastly, there needs to be an overhaul of the supply chain. A 2021 article in engineering magazine *IEEE Spectrum* noted that "boosting fuel supplies and building fuel-distribution infrastructure are the biggest challenges to ammonia-powered shipping".

"There will be a substantial need for additional flexible and scalable infrastructure," stated Stian T Magnusson, Chief Innovation Officer at Norwegian energy firm ECONNECT Energy, in an article for the company. Considerable investment will be required.

Perhaps the answer then lies in diversification. "As mandatory carbon dioxide regulation increases in strength, it is clear no single fuel will solve all of shipping's zero carbon needs," noted Mr Haskell. "In the future, ship owners will equip vessels for the fuel most appropriate to a ship's type, route and cargo."

Alongside the less onerous LNG acting as a transition fuel, ammonia is likely to play a key role in cleaning up the industry. With such solutions in sight, the future of maritime remains bright. ■