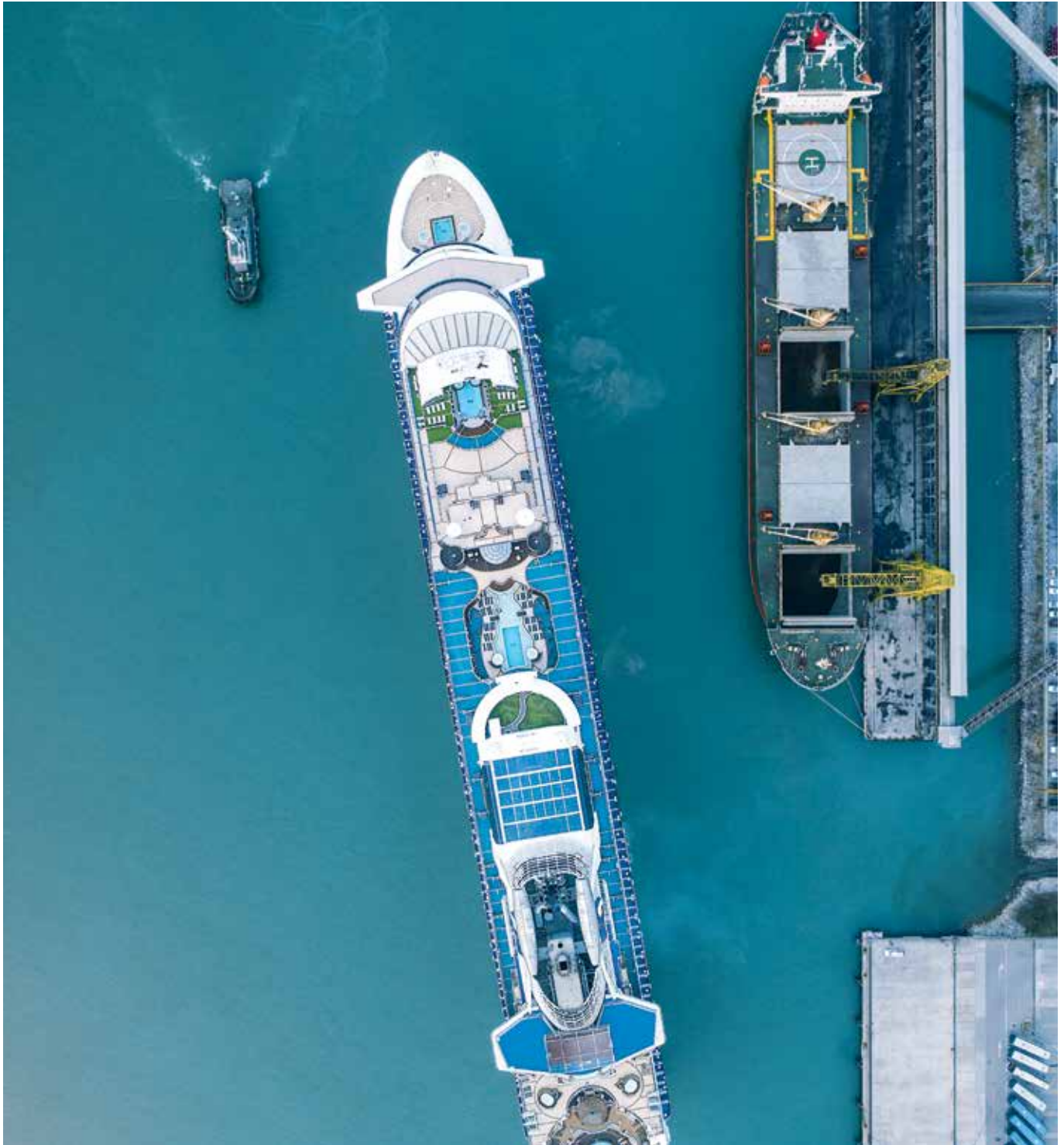


SEAVIEW



RINA MAGAZINE - MERCHANT & CRUISE EDITION



COPING WITH COVID
strategy & solutions

GETTING SMART
the digital revolution

SUSTAINABILTY FIRST
rules & developments

Welcome to the latest issue of Sea View, RINA's dedicated magazine for the merchant and cruise shipping market. In this issue, we look at the longer term implications of Covid-19, and how technology and digitalisation are set to become crucial to business even after the pandemic. We ask if remote surveys could replace traditional shipboard visits, and can biosafety systems minimise the impact of future viral outbreaks. Meanwhile, can data analysis help owners improve their strategic decision making?

Key industry figures such as George Procopiou, founder of Dynacom Tankers and Dynagas, and George Pateras, President of the Hellenic Chamber of Shipping, share their views on how shipping can cope with the challenges of Covid-19 and develop a new framework to thrive. Meanwhile, the Liberian International Ship & Corporate Registry addresses the importance of technology, while China Merchants Group talks about the future for Chinese cruise shipbuilding.

Finally, we report on new regulatory requirements relating to ship stability and hazardous materials, as well as the potential for bio-LNG as a fuel, and the rise of expediting services to keep shipping projects on time and budget.

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Signs of recovery

The Covid-19 pandemic has had a strong impact on the shipping market: in the immediate term, we have seen a decline in demand for seaborne transport, a drop in orders for new buildings, a frozen cruise ship sector, and some difficult conditions for the ro-ro passenger market.

But despite the disruption from the virus, the shipping market has proved remarkably resilient. Ultimately, world seaborne trade dropped by less than 4% during 2020, while demand is expected to grow by nearly 5% in 2021, potentially rising above pre-Covid levels.

The greatest increase is expected to come in the oil, products and gas sectors, although improvements are starting to filter through in all markets. It appears that the worst impact of Covid-19 may have passed for shipping, and quicker than initially expected. At the same time, the pandemic has accelerated some important trends. In particular, it has hastened the digitalisation of shipping and the 'remotisation' of survey activity, complementing the traditional method of shipboard visits.

Technology is playing an increasingly important role. RINA recently installed a pioneering Fleet Operation Centre (FOC) at its Greek headquarters in Piraeus comprising a data monitoring and analysis platform which will extract value and business insight from ship data, helping shipowners make better strategic decisions.

Meanwhile, video technology is offering surveyors the chance to inspect ships at a distance, as well as train staff remotely. RINA is also using wearable devices such as 'smart helmets' to enable people on board to interact with people ashore. Meantime, solutions have also been developed to

combat the risk of virus infections on board. RINA has developed a goal-based class notation BIOSAFE SHIP, the first additional class notation devoted to this matter and the Biosafe Ship Notation and Biosafety Trust Certification, the first system certification to mitigate the spread of infections in public places. These provide reassurance that the highest health and safety standards have been followed.

Amid the disruption from Covid-19, some other important issues affecting ship operations received less attention. The introduction of the obligatory onboard IHM inventory meant thousands of existing ships had to cope with this new regulation (see article on HazMat) and will now have to maintain and update this documentation through their operational lives.

Going forward, shipping's energy transition will undoubtedly be the main topic affecting the industry. The goal is to identify and implement the best approach for shipowners and operators, which both meets the 2030 target set by IMO and offers the best solution in technical and economic terms, and recent developments in the industry including the Energy Efficiency Existing Ship Index (EEXI) and Carbon Intensity Indicators (CII) will help push this forward.

Indeed, the forthcoming energy revolution partly explains last year's decline in ordering activity, as many owners chose to wait before committing to new vessels at a time of rapidly changing technology. It is an exciting time for the industry, which is going full speed ahead to develop tomorrow's fuel sources, despite the additional challenges created by the pandemic.

Giosuè Vezzuto,
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Living in uncertain times

Interview with **George Procopiou**, Founder of Sea Traders SA, Dynacom Tankers Management Ltd, and Dynagas Ltd



We live in difficult and strange times where there is effectively no 'present'. It is difficult to make predictions. Much depends on the eventual vaccine or treatment discovery. After 9 months, we are more experienced in dealing with pandemic related problems. We have faced anomalies with crew changes, inspections, and entering ports. Despite this difficult time, we took delivery of two vessels.

The uncertain times we are going through present both threats and opportunities. Container trading volumes have increased because of e-commerce for example.

The tanker industry had a pleasant surprise, as the competition between the oil producing states and companies paired with the drop of demand, created a need for transport and storage. This resulted in very high rates for a period, which now have dropped again considerably. It is uncertain what will happen tomorrow.

It is my belief that the discrepancies between the production and the budgets of the oil producers and nations create unwanted frictions and eventually oil production will increase. I believe that oil is overpriced and I expect that its price will adjust downwards.

Natural Gas is the big competitor. To put things into perspective, for an equivalent energy content the price of LNG is almost half the price of oil. Either the gas price has to go up or the oil price to go down.

My feeling is that the oil price will go down as the production of gas is increasing everywhere in the world, with many new installations.

A very important question for the

industry is: what is the fuel of the future? This is another mystery. We hear about ammonia, hydrogen, batteries, some sort of combination but, I do believe that for the time being oil is the dominant fuel and it will remain so.

LNG is the second best alternative, especially for fixed trading routes.

The trends in the shipping industry always seem to centre around environmental issues which we take very seriously. We have to protect the environment in a realistic manner. However, the desirable and the doable are far apart. We have to proceed with the doable and not the desirable.

We should envision the desirable, but we have to be realistic and to focus on what is actually doable when making regulations or issuing rules. For the time being, the most effective and doable way of reducing greenhouse gas emissions is the reduction of speed.

By reducing speed, you have a huge reduction in fuel consumption and therefore, emissions of SOx, NOx, CO2, and particulates. I can understand the need for sensitive cargo to be transported at higher speeds. However it is hard to understand why finished goods like TVs and dishwashers need to be transported in container ships running at a speed of 20-23 knots when two container ships operating at 11 knots consume on aggregate less than half the fuel consumed by one container ship operating at 23 knots.

Why should iron ore, crude oil, grains, coal, alumina etc. need to be transported by vessels built according to designs optimized to operate at a speed of 15 knots and create twice the pollution compared to the aggregate pollution created if the same



transportation work was carried out at a speed of 10 knots (this, also accounting for the 1.5 additional vessel needed!).

I don't believe in scrubbers and polluting the sea instead of going through the natural cycle. I don't blame my colleagues who have installed scrubbers. They made a financial bet. As you hedge on various currencies, they have hedged the differential of the price of low sulphur content VLSFO and high sulphur content HSFO.

This bet was initially seen as favourable because of the price differential at \$350 per ton. In reality, this differential is close to \$50 as I predicted and will soon be reversed. The high sulphur HSFO will be more expensive than the low sulphur VLSFO. This will happen because the 95% of the volume that is traded is on vessels that consume low sulphur fuel rather than high sulphur fuel and thus, the suppliers and refineries will keep catering to the 95% and not to the 5%.

Additionally, I believe that it is the governments' obligation to ban the production of high sulphur fuel as they did with gasoline a few years ago. This would be an obvious solution, as ships are not refineries nor is it the truck drivers' (ship owners') obligation to improve their engines and do things that are not their business. The IMO has to set the permissible emission levels per tonne mile of cargo transported for the various types of vessels.

The engine builders and shipyards should be the parties with the responsibility to meet the new

standards, coming up with new ship designs, more efficient engines with lower installed horsepower, and hull forms and propellers optimized for lower speeds in order to drastically reduce their fuel consumption rather than forcing ship owners to adopt doubtful methods in order to comply in an unrealistic time frame.

I hope that at the end of the day, major stakeholders could show the IMO the obvious, which they pretend not to see. I don't believe we will see ammonia fuelled ships - at least not in my and my daughters' lifetimes - and we don't believe in hydrogen or battery ships either. Their wide adoption in the near future is fiction, in the sphere of the desirable and not the doable.

Environmental regulations should focus on the doable and realistic. The fiasco of water ballast treatment or scrubbers should never be repeated. Now, they are talking about scrapping scrubbers only 9 months after having them installed! This entails a huge waste of energy and additional creation of pollution all over the place, without any results.

I would suggest to the classification societies and owners to focus on the doable and to take the necessary measures where we can, when we order a new ship.

If you were to ask me what ship to order tomorrow, I don't know. This partly why the shipyards currently have no business. That may be good news for us as an owner, but it is not good for humanity. We will see the pendulum swing from one extreme to the other

and back again.


Shipping is a global business; we go wherever transportation is needed. Exporting nations are located in the Far East and importing nations are mostly in the West but, depending on the kind of export, this trend is reversing. There are energy related cargoes like coal, crude oil, fuel oil, clean petroleum products, LNG, LPG, then minerals, grains, steel products, containers, which are in need of transportation all over the world.

In terms of classification, RINA is becoming an increasingly important society and, as Greeks and Italians are always very close, we believe there will be more opportunities where RINA's expertise and capabilities that can be used. Dynacom is satisfied with, and continuously increasing, its collaboration with RINA.

“We have to proceed with the doable and not the desirable”

BIOGRAPHY

Mr. George Procopiou is the founder of Sea Traders SA, Dynacom Tankers Management Ltd, and Dynagas Ltd. Holding a degree in civil engineering from the National Technical University of Athens, Mr. Procopiou has managed over the years a shipping fleet in excess of 500 vessels since first entering the shipping business in 1971 by purchasing one third of a vessel. He has served as Chairman of the North of England P&I Association and is currently Chairman of the Hellenic Committee of Bureau Veritas, Chairman of CCS Mediterranean Committee, as well as a member of the Greek committees of DNV GL, Lloyd's Register, ABS and RINA.

 www.dynacomtm.com
www.dynagas.com



Courtesy of LISCR

Finding solutions in a Covid world

Interview with
Alfonso Castellero,
 COO of the Liberian
 International Ship &
 Corporate Registry
 (LISCR)



For Flag State administrations, it is all about speed of response and quality of service. Whatever the global emergency, we have to keep the ships running so that shipowners can keep trading without interruption.

Covid-19 has changed everything. This has highlighted the limitations of companies across the globe. This is especially true for Flag States when the reliance on a global network has become so vital. Flag States need to have a coordinated network of global representation, with clear autonomy for those offices so that they can provide the best, fastest, and most cost-effective service locally whenever it is needed.

We had already identified this trend before Covid-19, but the pandemic has confirmed it. Thankfully we had a fully integrated network of 28 global offices in place, and each one was able to support the other as and when needed.

Decentralisation means that in an emergency you can move quickly to Plan B, or to Plan C. We lived this first hand, and it has been a validation of this model we have employed.

Decentralisation also requires investment in technology. In fact, this may be one area where Covid-19 ushers in positive change: shipping can sometimes be slow to change its culture, but Covid-19 has shown that investing in technology in shipping is an undeniable reality.

Remote surveys have been one of the most visible new technologies used during the pandemic. One of the reasons we have seen greater take-up is that Port State Control has shifted its outlook. Previously, both shipowners and Port State Control were reluctant to give up physical surveys, but with the pandemic their approach has changed.

In our case, RINA played a key role. LISCR trialled several different software packages and platforms and found theirs to be the best. We suspect that once the pandemic retreats, there will be a return to physical surveys, but within 5-10 years we expect remote surveys to dominate. In the interim, the industry will gain more experience and be able to compare the results of physical and remote surveys, giving stakeholders more confidence.

There are still some restrictions and limitations: noise and a lack of internet coverage can still prevent remote surveys in certain areas of some ships. So, remote surveying will require a commitment from shipowners to ensure there is connectivity in all parts of a ship, which will of course require investment. But I truly believe in 5-10 years remote surveys could become the norm.

Another technology we are promoting is LISCR's Dynamic Detention Prevention application. This is an automated Port State Control (PSC) risk assessment system that focuses on preparedness before Liberian vessels enter into port, allowing owners and operators to ensure they are in compliance, and prepared for port state control boarding.

The system calculates and assigns a PSC boarding risk category to all 4,500+ Liberian-flagged vessels, which allows us to focus our efforts on vessels that are more likely to have a PSC boarding, detention, or deficiency. The score for each vessel adjusts in real time based on the port which the vessel is entering. For instance, a vessel may be categorized as low risk for boarding in Singapore, while the same vessel may be high risk for boarding in Houston. We are the only Flag State administration to offer such a product, which is free of charge, and believe it is a true game-changer.

The advent of Covid-19 has been,

commercially-speaking, challenging for the Flag State administrations.

Shipowners need everything done 'yesterday', and all parties are constantly having to adapt to restrictions, requirements, and other Covid-related hurdles on a daily basis. It is Flag State's responsibility to intervene to maintain safety so that the ship can sail. For example, if a crew member falls sick and has to go ashore, we will work with the owners to see if the vessel can be exempt from waiting for that crew member to be returned to the vessel, enabling the ship to sail.

Another example would be if a piece of equipment malfunctions onboard and the new parts do not arrive because of Covid-related delays. We will check if the equipment is vital for safe navigation, and if the vessel can move safely to be repaired.

It is particularly challenging because the usual maritime authorities are not always in charge. For example, it may be the customs authorities, who are not shipping specialists and may make proposals that are not always adapted for shipping.

However, we are able to manage the situation by having top quality technical knowledge in-house. That means former Port State Control or Classification Society surveyors, or former masters. You also need the best technology, and the best service – we are always striving to meet clients' needs. This overlapping of the

right people with the right technology has been the key to success for us.

It is in times like this that you see the value of Flag State administrations and Classification Societies. After all, anything that happens on board is our responsibility. We are prepared to meet these challenges, because we have the expertise to find common sense and practical solutions.

“Covid-19 has shown that investing in technology in shipping is an undeniable reality”

BIOGRAPHY

Alfonso Castillero is the Chief Operating Officer of the Liberian International Ship & Corporate Registry (LISCR), the US-based manager of the Liberian Registry.

He has more than 20 years' experience in international maritime shipping regulation and operations. He served onboard tankers and container vessels, and worked for many years at the Panama Maritime Authority, rising through the ranks to become the head of the Panama Registry.

As the head of the largest ship registry in the world, Alfonso introduced numerous changes such as the ratification of several IMO conventions and a change of vision, which led the Registry back to the Paris MoU's white-list in only 2 years. Today, as the COO of the Liberian Registry, Alfonso drives the development of the Registry's new, strategic markets and strengthens Liberia's global presence and reputation as the world's most innovative and successful ship registry. It is the fastest growing registry in the world.



The opening of the Liberian Registry's new office in Imabari, Japan (Photo courtesy of LISCR)

Looking forward



Courtesy of Hellenic Chamber of Shipping

Interview with
George D. Pateras,
Deputy Chairman,
Contships Management,
and Chairman of the
Hellenic Chamber of
Shipping



The effects of Covid-19 will eventually pass and trade patterns affected by the pandemic will normalise. This may happen sooner than we expect, provided a medical solution is developed.

However, what may take longer to resolve is the long-term stigma created by the disregard shown to seamen by so many nations as a result of the pandemic. The decision by many countries to ignore seamen's rights by abandoning them without developing reasonable repatriation arrangements for them - men and women who transport almost 90% of world trade – the impact of this will take time to heal.

These problems of crew repatriation are still an issue.

Looking further ahead, the normalisation of trade and the easing of tariff disputes also pose some problems. These are of real concern to those shipping companies aiming to provide a consistent and reliable service to customers, as well as those who want to expand in their sector of the market.

Future environmental policy also poses some challenges. Inevitably, environmental issues are going to increase, requiring the development of new solutions. However, regulations will eventually become extremely challenging to comply with until a more reasonable approach is adopted.

Our industry produces less than 3% of harmful emissions worldwide, yet spends a disproportionately large amount of time and money on implementing preventative measures.

Geopolitics has raised its ugly head and this always has an adverse effect on trade in the short term. This is a problem that we have learned to accept and ostensibly adapt our businesses to survive the impact of geopolitical issues.

Indeed, our industry thrives on the stability of trade, and a consistency in regulations. When the goal posts keep shifting unilaterally, and superfluous regulations are introduced this gives unfair advantage to the unscrupulous.

On an individual country basis, I think the countries that will succeed the

most going forward will be those that master the infrastructural challenges. Globalization has reduced the regional effect on trade and shipping, such that today infrastructure has become the governing factor.

Countries that develop more reliable infrastructure and can handle the greatest through-puts will benefit in the long run. The African continent has great potential for growth as they realise the enormity of their natural resources and wealth.

At the Hellenic Chamber of Shipping, we have three main projects underway: the up-grade of the Naval Academies throughout Greece, the renewal of the country's ferryboat fleet, and of course the growth of the Greek Flag fleet. I would like to see these three projects through to fruition before my tenure expires.

The Hellenic Chamber of Shipping is the institutional advisor to the Greek Government, and in this regard is involved in all aspects of shipping; from the largest tanker to ferryboats, tugs, fishing boats and right down to the smallest private yachts.

The Chamber has been in existence since 1936, and plays a range of roles, from offering opinion on draft legislation proposed by government departments, to proposing measures for the protection and welfare of seafarers, to conducting arbitration on maritime disputes.

We also carry out research and studies on shipping related matters, follow

developments in international maritime legislation, and offer expert advice on specialised shipping issues.

As with many people in shipping, I love my job. It is a job that never ends, and brings the excitement of problem solving, together with the satisfaction of resolving issues. This is enhanced by the open-mindedness of people in our industry.

I have a long personal history with RINA as I sat on the board of the society's first Greek Technical Committee. I have seen the society develop and grow, and emerge stronger in the international market.

RINA has the great advantage of a close relationship with shipowners, plus a willingness to listen and adapt - always the basis for success.

“Our industry thrives on trade stability and consistency in regulations”

BIOGRAPHY

George D. Pateras is the Deputy Chairman of Contships Management Inc, and since 2016 the Chairman of the Hellenic Chamber of Shipping. He studied Engineering and Economics and holds a BSc in Marine Engineering from Newcastle University, an MS in Marine Engineering and Naval Architecture from MIT and a PhD from Plymouth University. He is a Board member of the Hellenic War Risks Association and the Bahamas Shipowners Association, Chairman of the Hellenic Shipping War Risks Insurance S.A., Vice Chairman, NATO, PBOS now TG(OS) (2000-) and permanent advisor (AMSCC) of the Hellenic Ministry of Defense. Dr. Pateras has also served as the Chairman of the Bahamas Shipowners' Association (2011- 2015) and as a Board member of the Hellenic Seamen's Pension Fund (1984-1993), Olympic Aviation (1991-1993), the Hellenic Chamber of Shipping (1986-2015), the Union of Greek Shipowners (1983-2004), HELMEPA (1996-1998), the BSA representative on International Chamber of Shipping (2011- 2015) and Managing Director of Aegeus Shipping S.A. (1981- 2018).

 www.nee.gr



Courtesy of Hellenic Chamber of Shipping

Building on China's cruise potential

China Merchants Cruise Shipbuilding (CMCS) mainly concentrates on the Asian and Chinese cruise markets. There were 2.3 million cruise passengers from China in 2018, and another 1.9 million from the rest of Asia.

The potential in China, in particular, is huge. There are approximately 120 million people in the country with an annual income of \$50,000 or more, and the cruise penetration is less than 1% of the population, far below the 3.6% seen in the US.

When it comes to 'Chinese style' cruises, there are two aspects where operators look to customise facilities: service and interior design.

In terms of service, passengers from China have their preferred foods, service style, daily habits and activities. Many ships now offer tailored services such as: Chinese food and drink, souvenirs, activities such as Mahjong, square dancing and Karaoke. It is important that companies fully respect the needs of Chinese passengers.

There is also the design element. These days we offer a modern aesthetic style, which has replaced features such as a traditional style temple or palace on a ship's hull. But we expect to see more Chinese-style public areas, offering a modern translation of traditional Chinese architectural design. We are happy to see some of our potential clients already offering such designs.

Ships must also be designed with the sea conditions and port facilities in mind. In China most voyages have a duration of around 5-7 days and many ports require vessels to reserve customs clearance, meaning ships must arrive on schedule. As a result, ships must sometimes run at a speed of more than 18 knots to make up time, which must be considered in the concept design phase.

There is also potential in the fact that Chinese cruising is not yet subdivided into the segments that we see in Europe and the US, for example, small luxury cruise ships, dedicated voyages for older citizens, and long duration voyages.

Interview with
Zhengjun Tian,
Director of Cruise
Projects for China
Merchants Industry
Holdings



Courtesy of China Merchants Industry Holdings



Courtesy of China Merchants Industry Holdings

At CMCS, which was founded in 2017, we are working towards establishing a leading position in the small cruise vessel market, and then step-by-step entering the large cruise market.

At our Haimen shipyard near Nantong, we are building a series of 6 cruise expedition ships for US-based SunStone, and delivered the first ship in August 2019. We have had very good feedback on the vessel quality and design.

Our parent company, China Merchants Group, has a wider strategic plan to develop cruise line operations in Asia, Chinese cruise terminals, plus newbuilding and repair. It is discussing potential strategic cooperation with several cruise lines.

We at CMCS meanwhile are following a development path of "from small to large, from easy to difficult". We aim to start with high-end inland river cruise ships, polar cruises, cruise ferries, small and medium-sized cruise ships, and simultaneously develop the manufacturing supporting chain.

We are building a new weather independent dock, and facilities with advanced and intelligent manufacturing. The group has the Sci-tech Innovation Platform, Cruise Research Institute in Shanghai and Cruise Ship Technical Center in Haimen. It also owns overseas

technical sub-centers including Deltamarin Ship Design and CMIT Europe for interior design.

We believe the cruise ship building industry in Asia currently faces three main challenges: technical risk, supply chain risk, and marketing demand risk.

Construction of cruise ships above 100,000 gt remains a new area for Chinese yards, and we still have gaps in ship design, manufacturing, interior workmanship, quality control etc. We are gradually overcoming this with the aforementioned strategic plan.

Supply chain risk is another big topic. European shipyards can generally obtain 80% or more of the materials, equipment and systems in their local areas, while importing means risk in time control and stock availability.

We are currently building a cruise industry park near our yard, offering plants and factory space for potential contractors with experience, while local government is offering beneficial tax policies.

Finally, market demand risk is clearly currently dominated by the Covid-19 outbreak. Incidents onboard cruise ships in early 2020 impacted confidence, and as a result we have some concerns about ordering volume in the next 2-3 years. We expect it could take between 1-3 years

to recover from the full impact of Covid-19.

Ideally, the cruise ship is something that brings the passenger happiness. The most important elements for shipbuilding are delivery time, and that passengers are satisfied with the ship and the product. Cruise ships are a resort, a travel destination in their own right, and we are part of the travel business rather than the transport industry.

“The cruise potential in China is huge”

BIOGRAPHY

Zhengjun Tian is the Director of Cruise Projects at Hong Kong-based China Merchants Industry Holdings Co. Ltd, where he is responsible for the marketing and sales of cruise projects, including newbuilding and renovation. He is also responsible for China Merchants' Cruise Research Institute's passenger ship technical center.

Zhengjun is a naval architect, having graduated from Shanghai JiaoTong University in 1991. Prior to joining China Merchants, he spent 7 years as a surveyor for China Classification Society, and 12 years at AVIC shipyards where he was responsible for special project development, ship design and project management. He also spent 10 years advising European shipowners on newbuilding site project management.

Zhengjun is a specialist in chemical and LNG carrying/ fueled ships, as well as Cruise and Passenger ships. He is a serving member of RINA's China Technical Committee.

 www.cmindustry.com.hk

Minerva adopts digital approach

Classification societies have a key role to play in shipping's transformation to a digital industry. The need for digital tools stretches far beyond engine performance, covering all elements of the industry.

Leading Greek ship management company Minerva Marine has become the latest to embrace a digital approach to operations, adopting RINACube, the open platform for digitally augmented services developed by RINA.

RINACube is designed to integrate data from various sources, using machine-learning driven analytics to create unique business insights and help companies take intelligent decisions based on real-time data-driven evidence.

The platform is capable of extracting value from your business data to optimize processes and performance, and is suitable for all companies regardless of size or sector.

All of the RINACube applications are based on the digitization of physical assets: the operating and performance data is extracted with the aim of

digitally providing both traditional and emerging new services.

As part of Minerva's digital vision, the company will deploy the platform on its entire fleet. The data collection and analytics generated will enable the company to manage its operations in a more planned and cost-effective way, while also meeting transparency and compliance requirements.

Among the elements monitored are: energy efficiency, environmental protection and procedure, audit inefficiencies (with alerts), fleet operation optimization, safety, compliance, and overall ship supervision.

In short, it gives the operator an integrated overview of their shipping business, and takes a holistic approach to the fleet's performance.

Meanwhile, RINACube also uses the aforementioned information and capabilities to empower both onshore and seagoing personnel to make the best real-time decisions related specifically to the voyage.

This monitoring of the ship's operation is facilitated by data retrieval and

the establishment of KPIs. The platform then provides assistance to improve performance where needed. RINACube is a custom-made service that recognizes the needs of each individual ship operator.

RINACube highlights RINA's capacity and willingness to meet shipping industry needs. With almost two centuries of history, RINA has embraced the demands of the new digitalization era, recognizing that the classification societies have a core role to play in this transformational journey. Digitalizing the shipping industry is a long and demanding process. It involves not only a natural evolution in the business model, but also the development of a new working 'culture' involving the whole supply chain, right through from suppliers to vessel operators. In doing so, it will enable companies to take informed strategic decisions for their assets.

Operators will be able to fully optimize the control of their fleets, utilizing the insights that this digital transformation promises to bring.

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SOLAS 2020: A revolution in design

The new damage stability requirements included in the 2020 SOLAS amendments represent a significant improvement in ship design.

In fact, the required subdivision index R for new passenger ships (i.e. contracted on or after 1 January 2020) no longer depends on the ship's length but solely on the number of persons onboard, and without a distinction between the number of persons for which lifeboats are provided (N1) and those permitted to be carried in excess (N2).

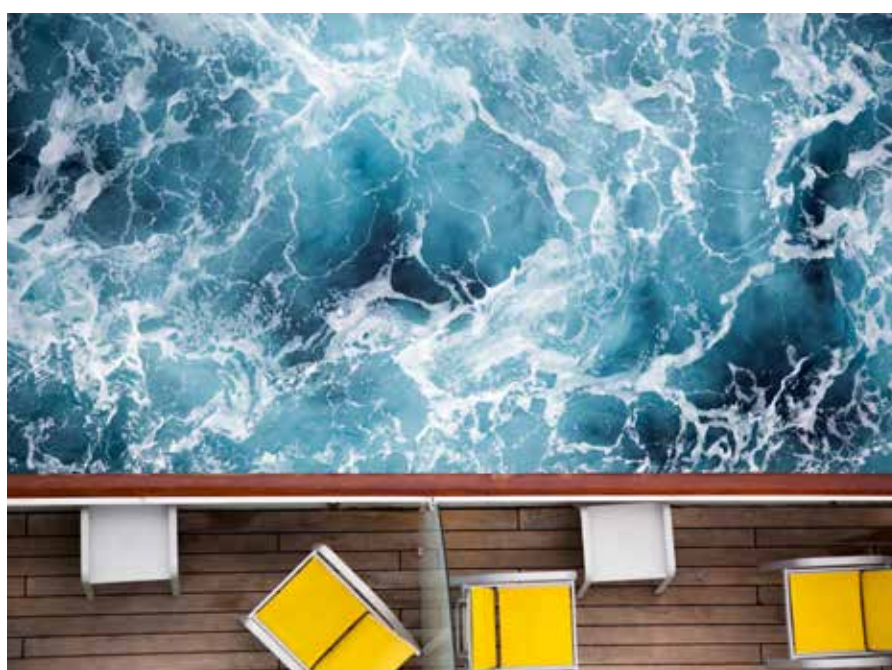
The index R is constant for passenger ships with less than 400 persons onboard. Meanwhile, for ro-ro passenger ships, the factor representing the probability of survival after compartment flooding in the final equilibrium stage of flooding (s_{final}) is stricter than for other ship types (i.e. $TGZ_{max}=20$ and $TRange=20^\circ$).

The 2020 SOLAS amendments also forbid new passenger ships from sailing with any watertight door continuously open. Meanwhile, it is now a requirement for some existing passenger ships (i.e. those of 120m in length and above, or having at least 3 main vertical zones, and constructed before 1 January 2014) to have either an onboard stability computer or a shore-based support to provide the master with operational information for safe return to port after a flooding casualty. This is required not later than the first renewal survey after 1 January 2025.

According to analysis carried out by RINA, the 2020 SOLAS amendments will significantly impact the design of new ships. In particular, for small cruise ships carrying fewer than 400

persons, a significant increase in ship size (i.e. higher freeboard and larger breath) may be necessary to meet the

including: appraisal of damage stability calculations and plans based on a proven expertise achieved over many



required index R. This index becomes the determining criterion, with a higher value being constant for ships with fewer than 400 persons onboard, irrespective of ship length.

For large cruise ships, a reduction of 5-6% in capacity is anticipated due to the potential required changes in the ship's subdivision.

For ro-ro passenger ships, the expected impact on design is due not only to the stricter index R but also to the new calculation of the s-factor, which may cause a reduction in the attained index (i.e. 2-10% depending on the size of the ship).

In order to comply with these new challenging requirements, RINA offers a number of services to clients,

years, especially for ro-ro passenger ships and cruise vessels; approval and testing of on-board stability computers; and technical advisory - when the shore-based support option is chosen - using the long experience gained from offering this type of service to more than 450 vessels (including passenger and merchant ships).

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Ensuring bio safety in the COVID era

In these troubled times, when the shipping sector is grappling with the effects of COVID-19, organizations are taking action to protect the safety of their employees and to strengthen the trust of all their stakeholders. Companies are keen to demonstrate that the highest health and safety standards have been applied - both on board ship and across the organisation itself.

RINA has been an early leader in developing a dedicated service to deal with this new scenario, creating a special additional class notation for companies. This notation is focused both on procedures to mitigate the bio risk and also hardware solutions and new technologies which can be applied on board.

Called BIOSAFE SHIP, this is a goal-based notation with a holistic and flexible approach to achieving the goal of bio safety. This approach, rather than a prescriptive one, gives shipowners and shipyards the freedom to select those systems, components and operative procedures that they deem to be most appropriate.

As a result, the BIOSAFE SHIP additional class notation is based on a BIOSAFE Index. This classes the various solutions that can be installed on board according to ten main categories. Under each category, a range of different options are available, and each solution is assigned a value to calculate the overall BIOSAFE index based on its effectiveness.

There are many new successful technologies available on the market to deal with COVID-19 and other infections that are currently in use ashore and in hospitals. These new technologies are now being introduced into the marine sector. RINA is able

to test these technologies and assess their effectiveness on board, and their subsequent eligibility in the evaluation of the ship's BIOSAFE index.

Furthermore, when systems and components have been recognized as capable of improving a ship's infection resilience, RINA may issue, upon request of the applicant, a statement on the properties of the system or component in respect of recognized standards or showing a validation test campaign.

The BIOSAFE SHIP additional class notation is granted to all types of newbuildings and ships in service where a significant investment has been made in systems, components and operative procedures in order to control and prevent outbreaks of onboard infection.

Special criteria are available for cruise ships and ro-ro passenger ships with sleeping facilities, as well as passenger ships and ro-ro passenger ships on

short sea trades, plus cargo ships.

A Certificate of Compliance can be issued to ships whether or not they are classed with the Society.

In conclusion, the BIOSAFE SHIP Additional Class Notation is the perfect solution for both newbuildings and ships in service, whether in the design or operation phase, to ensure the highest bio safety standards and a minimum risk of infection and, in turn, business disruption.

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Keeping crowded areas safe

One of the many issues the Covid-19 pandemic has highlighted is the lack of voluntary standards for the prevention and control of infection, particularly in non-healthcare sectors.

Indeed, the presence of such a management system could have avoided the spread of infection in some organizations, as well as some of the tragic implications that followed.

As a result, RINA has developed a ground-breaking new management system certificate which can be implemented in practically any organization.

RINA's new Biosafety Trust Certification provides requirements to manage the risk of spreading epidemics in crowded places such as accommodation facilities (hotels, congress centers, cruise ships), entertainment and sporting venues (restaurants, theaters, gyms, museums, swimming pools), healthcare structures like retirement and care homes, and public transport.

Its main objective is to prevent and mitigate the spread of infection, and is equally applicable to players in the transport and tourism sectors. This could include ship owners, ship builders, parts manufacturers, etc.

Certification is based on the ISO's systematic approach to management systems, combined with the principles of organizational behaviour management (OBM).

Human behaviour plays a fundamental role in the success of health safety management systems. OBM is a science-based discipline that aims to explain, predict and control human behaviour.



In this regard, the scheme provides ad hoc training courses on strict compliance with hygiene rules, the application of the management system in specific contexts, and staff awareness at an individual level.

Compliance is verified by RINA through documentary audit and audits at the organisation's sites. The certificate has a three-year validity and includes periodic supervision.

Each business sector carries different infection risks, with varying severities. The requirements for each sector are based on analysis of the best practices for the prevention and control of infection in that specific sector.

Upon completion of a successful certification process, the organization obtains a "Biosafety Trust" certificate, which also entitles the company to display a logo affirming the same.

Those organizations that implement the system will be able to reassure users and customers that they are following the highest health and safety

standards thanks to a combination of ISO standards, science-based knowledge on the spread of infections, and the lessons learned by frontline professionals during the current epidemic.

In creating such a system, RINA aims to assist the industry's in its economic recovery. Meanwhile, certified organizations will be able to reassure their clients and staff that the highest standards of infection prevention and control are being implemented.

Such guarantees will ensure trust in the service by users, clients and employees alike.

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Digitalization key to the future

At RINA, we are committed to being frontrunners rather than followers. We want to drive change, and be at the forefront of new developments. Nowhere is this more important than in technology.

Digitalization is a key element of the new technology being developed to make clients' business even more efficient, productive and seamless.

Our aim is twofold: create new digital services and products for customers, improving efficiency and economy; and to streamline our own internal processes so that we can meet the needs of clients more quickly and effectively.

RINA started this process 15 years' ago but Covid-19 has accelerated the drive: without digital technology, business interruption would have been considerably worse.

RINA now has a complete portfolio of digital products and services. The first digitalization was adopted in the early 2000s when the full regulatory rules and framework were placed online. The ability to access class rules anytime, anywhere, became crucial in the Covid-19 pandemic. Ship drawings and documents have also been available in digital form for many years.

Recently, we have seen this digital evolution take a new step, with electronic certificates. It is now simple to send the certificates resulting from surveys without reassessing the ship, while testing equipment certificates can be provided to Makers in a digital format. Furthermore, the certificate is easy to share with others and authenticate, providing added assurance.

Remote surveys have also come

to the fore. At their most basic remote surveys offer the video technology to inspect the ship at a distance. However, they offer much more: the possibility to interact and communicate so that the surveyor can 'direct' the survey from a remote location. RINA has collaborated with a VR specialist to create a dedicated 'video helmet', enabling the wearer to transmit images, but also to see and read instructions from ashore.

Attention is also being given to the day-to-day operation of the ship. RINA's Optimum technology monitors and enhances the performance of the ship, including fuel consumption, equipment performance and routing. By creating a baseline performance measure, it can indicate if the ship is performing well or not. Further, by using A.I. the software can be trained to predict the behaviour of the ship according to load, draft and weather conditions.

Meanwhile electronic logbooks not only reduce paperwork and provide a digital record, but also guide the user

to follow correct procedure by alerting him or her to potential mistakes – a real management system.

All of these digital services can be accessed and controlled centrally using RINA's electronic platform, CUBE.

RINA is working continually to develop the most secure cyber protection measures to protect these new digital tools.

Going forward, blockchain transactions and autonomous ships are arguably the next frontier of the digital revolution, although ironically the latter may be more restrained by the lack of a regulatory framework than technological limits.

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Virtual Reality training for crews

For many years, Virtual Reality (VR) was only available to train the likes of pilots and astronauts. The sheer cost and complexities of the technology made it inaccessible to most industries. Over the last 10 years, however, VR equipment has become more affordable, portable and useable. In addition, technological advancements in 3D software and 360° filming equipment have enabled developers to bring VR into the area of competence training.

VR has already proven itself to be an invaluable tool in maritime training.

The competency profile of an individual crew member is comprised of a combination of knowledge, skills and experience. Modern control systems and autonomous shipping modules are causing massive disruption to these profiles. So what if the knowledge, skills and experience of a crew member no longer match the requirements onboard a vessel?

VR has been especially useful for the maritime industry as it has faced crew

supply challenges, brought about by rapid developments in shipping technology.

Imagine that a shipping fleet requires its maintenance staff to be trained to operate new engine room equipment, but that the vessels in question are rarely moored. This makes on board training difficult. In addition to the geographic challenges, the costs associated with getting maintenance crews on board threaten to spiral out of control.

This is where training within a virtual environment, one that can be delivered at any location, makes strong sense. Further, if you combine this with the capacity to update and expand the learning experience as needs evolve, VR is a practical, cost effective and sustainable learning solution.

Putting on a VR headset, you find yourself inside the digital twin of an engine room. You're in control. Using intuitive controls, the user is able to move around the space, interact with the environment and receive

physical feedback through the hand controllers.

Throughout the virtual experience, useful information is delivered, quite literally, to your fingertips. Intelligent sound design adds to the sensory immersion of the experience, helping to guide your line of sight toward areas that may need special attention, such as a hissing gas leak or a loose nut rattling on a bolt.

In the virtual space, you are free from risk and can learn from your mistakes without posing a risk to others. It allows the user to gain knowledge, master skills and become familiar with working environments - all in one training experience. A high-fidelity digital twin, combined with the open world interactive nature of Virtual Reality, lends itself to better situational training.

Put very simply, people learn best by doing.

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This image taken from a VR training experience developed for the Ministry of Defence by RINA Digital

New rules for HazMat inventories

RINA Consulting is currently providing support to shipowners and shipmanagers worldwide on the maintenance of the Inventory of Hazardous Material (IHM) after a key deadline at the end of last year.

According to the EU Ship Recycling Regulation (n° 1257/2013) (SRR), which entered into force on 30th December 2013, all existing ships must hold an IHM onboard after 31 December 2020. Newbuildings were already obliged to have an IHM.

The regulations are similar to those contained in the Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships (the Hong Kong Convention) which was adopted in 2009, but has not yet entered in force.

The main aim of the above rules is to prevent, reduce or eliminate adverse effects on human health and the environment as a result of the recycling of vessels.

Both rules require, as a first step, the preparation of an IHM. The EU

Regulation applies to ships of 500 GT and above, on international voyages, and which fly the flag of an EU Member State or the flag of a third country calling at a port or anchorage of an EU Member State. The EU regulation requires, with respect to the Hong Kong convention, two additional materials to be listed in the inventory.

The preparation of the IHM is to be carried out by Hazardous Material Experts according to IMO Guidelines, and the IHM must be specific to each ship. It is to be verified either by the Flag Administration or a Recognised Organisation authorised by it.

The inventory of hazardous materials consists of three parts:

- Part I: A list of hazardous materials contained in the structure or equipment of the ship, their location and approximate quantities;
- Part II: A list of the operationally generated waste present on board
- Part III: A list of the stores present on board.

Part I is mandatory for new and existing ships, while Part II and Part III must be prepared prior to the vessel's recycling.

RINA Consulting supported marine customers in the IHM Part I preparation through the following steps:

- Collection and assessment of necessary information;
- Preparation of the visual/sampling check plan (VSCP);
- On board visual check and sampling of suspect materials;
- Laboratory analysis;
- Development of the Part I of the IHM.

Part I of the IHM shall be properly maintained and updated throughout the operational life of the ship, taking into account new installations that contain hazardous materials and any relevant changes to the structure and equipment of the ship.

RINA Consulting has developed a dedicated online tool to help customers manage all the required information needed for the IHM Update. Furthermore, Hazmat Material Experts are on hand to support customers in both the IHM Update and the preparation of Parts II & III, when needed.

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Remote surveys keep the ship running

Remote surveys have attracted considerable attention during the Covid-19 pandemic, but there are many more advantages to this technique apart from simply avoiding physical contact.

RINA has worked closely with shipping company Vroon Offshore Services over the past year on a number of remote surveys. One significant element which has come to light is how remote surveys can dramatically reduce the impact of machinery failure.

During a year-long trial period in which twelve surveys were carried out on the Vroon Offshore fleet, the company recorded a significant reduction in machinery failure and an improvement in business continuity.

In one case, a gearbox failure on the firefighting pump of the anchor handling tug supply (AHTS) vessel VOS Triton threatened to halt operations. However, using software developed by RINA for remote surveys, engineers were able to give clearance for the vessel to continue operating while replacement parts were sourced.

This provided two extra weeks of service before the vessel had to enter port for repairs, which were then also supervised remotely, reducing downtime and averting possible off-hire. The remote survey was achieved with just a conventional smart phone and special software protocols developed by RINA.

Ship availability was also maximised in an incident involving Vroon Offshore's VOS Aphrodite, which was on standby awaiting compliance to the INF code. With Flag administration approval, RINA performed a remote survey and an e-certificate was successfully issued.

Vroon's Italian-flagged offshore fleet has now obtained RINA's pioneering "Remote" notation, enabling the

satisfaction and higher revenues. RINA is committed to offering integrated services across the offshore



operator to perform periodical class surveys remotely and taking its classification process to the 'next digital level'.

"One of the key tasks of any ship operator is ensuring its vessels are kept fully classed and certified. To guarantee this, we need to overcome movement-limitations in order to keep operating our assets as usual", commented Cristiano Vattuone, Manager Ship Management at Genoa-based Vroon Offshore Services.

To comply with the notation, Vroon's Information and Communication Technology (ICT) team arranged an on-board 'connectivity kit' to ensure flawless 4G wireless connection in all areas on board the ship. For shipowners, a small investment like this can translate to huge savings, operational continuity, better charterer

industry, a factor which was shown by another project involving the two companies this year.

Vroon Offshore successfully installed a RINA-approved marine-certified telescopic mobile crane onboard its AHTS VOS Champagne.

The challenging project – which covered engineering, procurement, construction and installation – involved safely securing the equipment on deck while complying with all class-stability requirements. Particular attention was paid to its utilisation in severe weather/sea conditions.

After completion of the two-month installation process, all equipment was tested and certified by RINA, and the crane went operational in July.

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The road towards net zero solutions



Shipping is clearly entering a path towards decarbonisation, which has become a demanding reality and not a noble dream, and we are deeply involved across all markets with the goal of giving confidence to decarbonisation solutions and guaranteeing ROI for each stakeholder through our role of industry chain facilitator and integrator. Ships and ports can play a major role in the global spread of new solutions for decarbonisation and with energy efficiency, new energy vectors and carbon capture already on the table, some have already been addressed and others are in progress. MEPC 75 adopted amendments to Marpol Annex VI on the energy efficiency of existing ships and introduced the EEXI and CII's, which complement the requirements for new building ships through EEDI.

Hydrogen is a valuable energy vector for storing intermittent renewable energy to be transferred to sectors

unable to reduce their CO₂ emissions in meaningful and practical ways. As a fuel, it is a promising option due to its carbon-free content, wide flammability limits and fast flame speeds. It's extreme resistance to knocking and high auto ignition temperature makes it an excellent choice for spark ignition (Otto) engines with increased compression ratios. It also has very low ignition energy in air and a very high diffusion coefficient, with a homogeneous hydrogen-air mixture being formed more readily than with other conventional fuels. This results in very high burning velocity, about six times higher than of ordinary HC fuels.

On the contrary, methane (LNG) has very slow burning velocity, leading to disadvantages in the Otto cycle such as low thermal efficiency, large cycle-by-cycle variation, and poor lean-burn capability, all of which decrease engine power output and increase fuel consumption. The addition of premixed hydrogen

increases the degree of constant volume combustion, resulting in faster and more complete combustion, with reduced cyclic variations. A fuel mixture of 20% H₂ +80% NG yields higher thermal efficiency and less THC emissions (=methane slip) than if running only on pure NG.

The ultimate goal of hydrogen economy is to replace fossil fuels with clean burning hydrogen, and NG is the best route to ensuring its smooth introduction into the fuel mix for the transportation and energy sectors without requiring breakthrough changes in available engine technology. The progressive addition of hydrogen to NG supports and future proofs the adoption of NG as a marine fuel today, meaning natural gas is not a bridge fuel, but the starting point on the road to a future fuel. RINA acted as consultant on a prime example project aimed at improving the environmental sustainability of marine vessels: ZEUS – Fincantieri's Zero Emission Ultimate Ship, a first-of-its-kind experimental vessel with a 130-kilowatt fuel cell facility, powered by approximately 50 pounds of hydrogen contained in 8 metal hydride cylinders.

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Bio-LNG: a stepping stone to 2050

With IMO's goal to cut greenhouse gas emissions by at least 50% by 2050, environmental issues are currently top of the agenda.

But let us shift our perspective for a moment: instead of cleaning polluting fuels, why not produce green and sustainable replacement fuels for the future, as part of a wider environmentally-focused business transformation?

Biogas upgrading and biomethane liquefaction technologies allow this paradigm shift: transforming waste into Bio-LNG - a viable fuel for land and sea transport - represents a true example of the circular economy.

Ecospray Technologies is committed to helping clients manage their environmental footprint effectively through the development of sustainable solutions, with a focus on efficient engineering and reliable performance.

We have a shared goal to work with shipowners to upgrade the shipping fleet, and are working on a daily basis to create tailor-made technological solutions through dedicated continuous research & development.

Ecospray Technologies, which was founded in 2005, is part of the Carnival Group and is globally recognized as a leading manufacturer of marine exhaust gas cleaning systems.

We are perhaps less known for our commitment and contribution in the field of renewable energy.

Substantial R&D investments have led to the development of solutions to treat gas and water emissions. For those considering LNG as marine fuel, they have also led to a range of new services along the entire supply chain, including the in situ production and supply of green fuel and sustainable energy.

LNG and Bio-LNG trends are now irreversible: biomethane is globally acknowledged as a key source of clean, safe and cost-efficient fuel, and aligns perfectly with the growing need to boost the circular economy including all the supply chain stakeholders.

Ecospray recognized early on the importance of Bio-LNG as a key element in the sustainability and mobility challenge. Since 2014, we have been working on a process to upgrade biogas from multiple sources

to biomethane, as well as on its liquefaction to Bio-LNG as marine fuel.

The technology developed is efficient and suitable for micro application (1 ton/day), but also scalable for larger productions (50 tons/day and above), producing minimal emissions and a zero-carbon footprint.

Going beyond the field of Bio-LNG towards other methods of decarbonization, we are also developing systems to achieve carbon capture, sequestration and storage. Further, we are carrying out research on the development of technologies to clean the ocean of microplastics and heavy metals.

In light of the challenging IMO target on the reduction of greenhouse gas emissions by 2050, research, innovation and collaboration will be vital tools in the marine marketplace. Together with RINA, Ecospray is committed to actively driving this environmental transformation, accompanying shipowners on their journey towards 2050.

MAURIZIO ARCHETTI

Maurizio Archetti was born in Genoa and is the co-founder of Ecospray Technologies, an engineering company that specializes in the design and production of air and gas cleaning and cooling systems. He is currently President and Chief Scientist of the company. After studying mechanical engineering, Maurizio began his professional career in 1989 at the FIAT Research Centre. He has over twenty-five years' experience in environmental business, specifically in Air Pollution Control systems for both industrial and marine applications.



Expediting service and quality



Expediting services are becoming increasingly important in the shipping industry as shipbuilding projects become ever larger and more complex. The concept ensures goods and services are delivered to the right location on the appointed date and to the right standard, saving significant time and money for the client.

In June, RINA signed a landmark deal with the Shanghai Waigaoqiao Shipyard (SWS) which is building two 5,246 passenger cruise ships for CSSC Carnival Cruise Shipping, a joint venture between the Carnival group and China State Shipbuilding Corporation (CSSC). An option has also been signed for a potential four additional ships.

As well as being a groundbreaking project – it is the first Chinese cruise newbuilding project of this size – it is also the first time the shipbuilding industry in China has contracted for expediting services.

Discussions between RINA's expediting experts and SWS started in 2019 involving RINA Marine China and RINA's Energy teams in both China and Europe. A series of talks and teleconferences led to the creation of a detailed, tailor-made expediting plan.

RINA will provide vendor inspection, field expediting, and desk expediting based on the plan, which has also been adapted in the meantime to respond to the new demands imposed by Covid-19.

Further, RINA helped SWS create a Desk expediting team, comprised of two local representatives and one overseas, who will take responsibility for the monitoring of the contract execution. The team will follow project status at all times, and plan for any necessary field expediting by European vendors.

The project promises to be a fascinating experience: not only is this

the first large cruiseship newbuilding project ever to take place in China, but more than 90% of the equipment and products will be sourced from Europe. This will create significant expediting challenges, while the expediting team will also have to manage the differences between Chinese working practices and European working practices.

The Covid-19 pandemic adds a further layer of complexity to the project. This promises to create more delivery challenges, and could make the delivery schedule unusually unpredictable.

In its discussions with SWS, RINA spent a significant amount of time presenting the different types of expediting services, and the company's strengths in these areas. Overall, the contract will be an excellent project reference for RINA's expediting service and its utility in the cruise industry.

Meanwhile, we strongly believe RINA's professional support will greatly assist in the timely delivery of the project.

Indeed, delays caused by late delivery, or inferior quality, can have multiple negative impacts on shipbuilding projects: increased expenses, reputational damage, unsatisfied clients, and even in some cases, the loss of a project.

Instead, expediting services can remove a large part of this uncertainty, making sure that the required goods arrive at the appointed date in the agreed quality at the agreed location.

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RINA's state-of-the-art operation centre

As part of RINA's exciting digitalization strategy, the company recently installed a pioneering Fleet Operation Centre (FOC) at its Greek headquarters in Piraeus.

This platform provides a powerful tool to extract value and business insight from ship data, in turn supporting strategic decisions for shipowner operations.

State-of-the-art electronics and IT systems have been used to realize the Operation Centre: 12 video screens

across a 7-meter long wall allow dedicated experts to analyse and share information (drawings, real-time streaming, etc), either on site or remotely at other locations.

Meanwhile, the Center makes it possible to integrate, in real time and on a single platform, all ship records and certificates, ship plans, manuals and calculations of RINA's member vessels, together with all performance data generated by these vessels.

It also brings together relevant third-party external data, such as Port State

Control statistics, navigational alerts, meteo-marine information, information on piracy and emission control areas, and availability of service suppliers.

Ship performance monitoring is completed by optimization analytics, based on both historical data and AI-powered predictions.

The Centre is part of efforts to create innovative new work tools for clients that enhance efficiency and performance. It is the first created by RINA and will be replicated in strategic locations worldwide.

Among the additional services that can be provided to clients are:

- Remote surveys and monitoring will be supported by the FOC, while new digital classification tools such as the Inspection Master will be at the core of operations.
- The FOC also opens up the possibility to monitor and train surveyors using real cases, or through Virtual Reality scenarios.
- Emergency Response Service in cases of severe damages, etc. can also be followed up from RINA experts through the FOC.

The Fleet Operation Centre represents the future of fleet monitoring, and builds on existing RINA digital software such as RINACube Optimum. RINA will offer 24/7 support through the platform, and future services will be built around the Centre.

Through the platform, the expert surveying team can react to all ship requirements, both expected and unexpected, to achieve complete performance optimisation, reducing both down-time and operating costs for clients.



RINA's ground breaking Fleet Operation Centre (FOC)



Photo is taken from the preliminary study by the RINA Brand Image & Design team

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RINA Corporate Image®