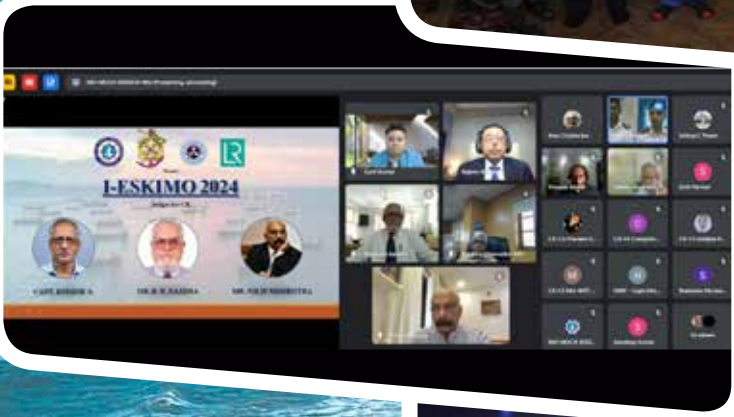
iMélange

November 2024



Monthly Magazine of The Institute of Marine Engineers (India)

The Institute of Marine Engineers (India)

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Administration Office:
IMEI House
Plot No. 94, Sector -19, Nerul,
Navi Mumbai 400 706.
Tel. : +91 22 2770 1664
Fax : +91 22 2771 1663
E-mail: editornewsletter@imare.in
Website: www.imare.in

Editor: **Sunil Kumar**

Editorial Board:
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Edited and Published by:
Sunil Kumar on behalf of
The Institute of Marine Engineers (India).
Published from 1012,
Maker Chambers V,
221 Nariman Point,
Mumbai - 400021.

Printed by:
Corporate Prints
Shop No.1, Three Star Co-op. Hsg. Society, V.P Road, Pendse Nagar,
Dombivli (E) - 421 201.
District - Thane

Design and Layout:
Kryon Publishing Services (P) Ltd.,
www.kryonpublishing.com

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ANGLO-EASTERN

From the Editor's Desk

Dear Esteemed Readers,

November brings a season of reflection and renewed commitment to the shared aspirations of the maritime community. This edition of **iMélange** captures the pulse of innovation, collaboration and inspiration that continues to propel our industry forward.

A significant highlight is the recent Seminar on MEPC 82 Outcomes, jointly hosted by DG Shipping and IME(I) Mumbai Branch. This event underscored India's firm commitment to sustainable shipping, shedding light on actionable strategies to meet the challenges of a changing global landscape. It stands as a proof to how collective efforts can steer our industry toward greener horizons.

The **Maritime SheEO Conference 2024** further celebrated the spirit of leadership, diversity and inclusion. Through thought-provoking discussions and inspiring stories, it echoed the importance of creating a maritime sector where every voice is heard, and every talent is nurtured. Such initiatives lay the foundation for a resilient and inclusive future.

Our **Fresh Features** section introduces *The Hood: Uniting the Maritime World Through Connection and Community,* a thought-provoking piece highlighting the bonds that unite us across oceans. Complementing this is *Dance of Chaos,* an intriguing exploration of the philosophical question: "If the universe is the answer, what is the question?"

Creativity finds its voice in poetry as well. *!!* inspires courage and determination, while ये जीवन है एक अप्रत्याशित माया जाल captures the enigmatic beauty of life's unpredictability. Both promise to strike a chord with your emotions.

Turning to technical reflections, the first part of *Chilling Insights* explores the indispensable role of shipboard refrigeration in ensuring the success of long voyages. This deep dive into an essential maritime facet emphasizes the intricate balance of science and practicality that defines our operations.

Lastly, as the maritime community geared up for **I-ESKIMO 2024**, the shared learning and collaboration grew. Such events remind us of the collective strength we bring to the table.

I invite you, dear readers, to immerse yourselves in this diverse array of narratives and insights. Let's continue to celebrate our shared journey while shaping a promising future. As always, your thoughts and feedback are invaluable – do share them with us at editornewsletter@imare.in by 7th December 2024.

SUNIL KUMAR
Honorary Editor – iMélange

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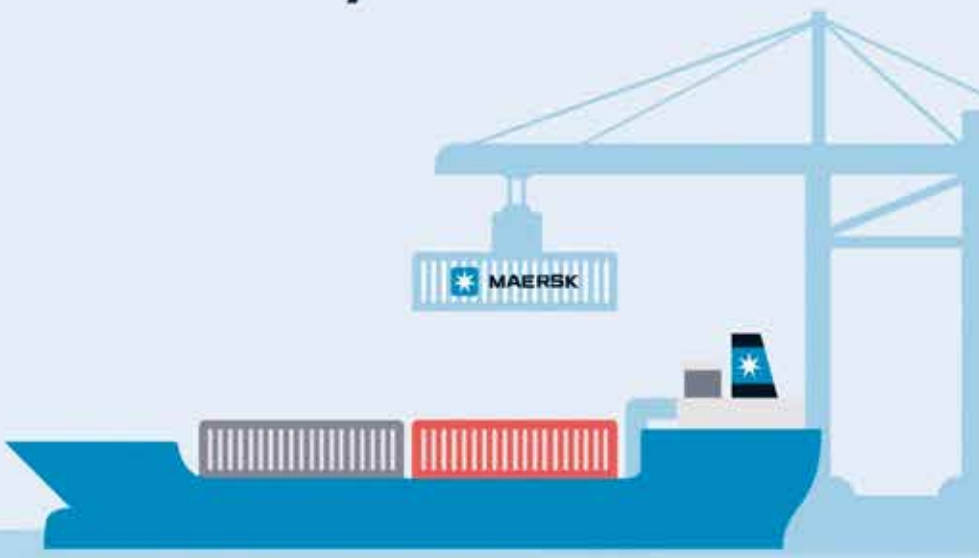

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DG Shipping and IME(I) Mumbai Branch Host Seminar on MEPC 82 Outcomes, Highlighting India's Commitment to Sustainable Shipping

The Directorate General of Shipping (DG Shipping), in collaboration with the Institute of Marine Engineers (India) organized a comprehensive seminar on the outcomes of the 82nd Marine Environment Protection Committee (MEPC) meeting at IMO, London. This seminar was held at the Indian Register of Shipping (IRS) Head Office in Powai, Mumbai, this event gathered India's leading maritime professionals and policymakers to discuss the latest international regulations and technologies for reducing greenhouse gas emissions, enhancing maritime safety, and protecting the ocean environment.

The event began with a welcome address by **Shri David Birwadkar**, Chairman of IME(I) Mumbai Branch. Chief Guest, **Shri Shyam Jagannathan**, IAS, Director General of Shipping, addressed the gathering, underscoring India's proactive stance in aligning with global maritime sustainability goals. Guests of Honour included **Shri Ajithkumar Sukumaran,** Chief Surveyor-cum-Addl. DG (Engg.), Directorate General of Shipping and **Shri PK Mishra**, Managing Director of Indian Register of Shipping (IRS), who emphasised the industry's collective responsibility in transitioning towards eco-friendly practices.

Shri Vikrant Rai, Principal Officer of the Mercantile Marine Department (MMD) Kolkata, led India's delegation to MEPC 82 and delivered the keynote address. He detailed India's contributions to the committee's extensive agenda, which included ambitious greenhouse gas (GHG) reduction strategies, lifecycle assessments of marine fuelsand energy efficiency measures. Other members of India's delegation present at the seminar included **Shri Rajeev Nayyer, Shri Mudit Mehrotra, Shri B. Venkat, Shri Devrup Kabi, Shri J. Senthil Kumar** and **Shri Mahesh Subramanian** each of whom led discussions on specialized topics.

Shri Shobhit Kapoor, Head of the Technical Sub-Committee, served as the moderator, guiding the discussions and providing insights into the regulatory and technical aspects of the MEPC 82 outcomes.

The seminar covered the following critical outcomes from MEPC 82:

1. Reduction of GHG Emissions: Shri Vikrant Rai, alongside Shri Rajeev Nayyer and Shri Mudit Mehrotra, highlighted MEPC's evolving GHG reduction strategy. India supported the adoption of a flexible GHG Fuel Intensity (GFI) standard and promoted sustainable fuel initiatives.
2. Short-Term GHG Reduction Measures: Shri B. Venkat presented on the Carbon Intensity Indicator (CII) and other short-term measures, focusing on compliance challenges and the benefits of enhanced data granularity.
3. Air Pollution Prevention: Presentations by Shri Devrup Kabi and Shri J. Senthil Kumar detailed the designation of new Emission Control Areas (ECAs) in the Canadian Arctic and Norwegian Sea, aiming to reduce air pollutants like sulphur and nitrogen oxides.
4. Ballast Water Management: Shri Rajeev Nayyer and Shri Mahesh Subramanian shared India's insights on ballast water management, including updated guidelines to prevent the spread of harmful aquatic organisms, with a special focus on handling challenging water quality conditions.
5. Compliance with Basel Convention: Shri J. Senthil Kumar discussed India's initiatives in ship recycling, aligning with both the Hong Kong and Basel Conventions, ensuring that India's shipbreaking industry meets international environmental standards.

Participants engaged in a Q&A session, where they explored practical challenges in adapting to MEPC's new regulatory standards and discussed strategies for enhancing India's role in maritime environmental governance. The event concluded with a vote of thanks by **Ms. Sonali Banerjee**.

The Institute of Marine Engineers (India) is committed to advancing the maritime engineering profession in India. Through seminars, workshops and advocacy, IME(I) supports India's maritime community in meeting the global industry's evolving demands.

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Maritime SheEO Conference 2024: Celebrating Leadership, Diversity and Inclusion

The Maritime SheEO Conference 2024, hosted at Taj Santacruz, Mumbai on 15th November 2024, brought together over 300 in-person and 1,500 online participants globally. Held on Gurunanak Jayanti, the conference underscored the pivotal role of leadership in promoting diversity and inclusion within the maritime industry.

Key Highlights

Centered on leadership's influence on diversity, the event addressed themes such as "Measuring Diversity and Closing the Pay Gap" and "Empowering Women Leaders and the BBNJ Agreement." The launch of the "Inclusion of Women in the Sri Lankan Maritime Industry - A 2025 Study" was a notable milestone, alongside sessions on "Navigating the Future: Technology & Innovation" and "Supporting Wellbeing: From Sea to Shore."

Notable Speakers

Prominent speakers included **Mr. Arsenio Dominguez**, Secretary-General of the International Maritime Organization (IMO), **Ms. Monica Nagelgaard**, Consul General at the Royal Norwegian Consulate General in Mumbai and **Dr. Malini Shankar (IAS, Retd.)**, Vice Chancellor of the Indian Maritime University. Industry insights were also shared by **Mr. Guy Platten**, Secretary-General at the International Chamber of Shipping, **Ms. Nathalie De Jaeger**, Head of the Strategic Department, DG Shipping (Belgium) and **Mr. Max Meija**, President of the World Maritime University.

Category	Award	Recipient
Individual Awards	SheEO to Watch Out For	Parnita Rasal (Anglo-Eastern)
		Amal Albawardi (National Center for Environmental Compliance, KSA)
	SheEO Leader of The Year	Anisha Ramakrishnan (Transworld Group)
		Akanksha Batura Pai (Sinoda Shipping Agency)
	Champion of Diversity	Tevita Misdali Robanakadavu (Fiji National University)
	SheEO Entrepreneur of the Year	Zoe Upson (FACT - Freight and Commodity Talent)
	Lifetime Achievement Award	Dr. Malini V. Shankar, IAS (Retd.) (Indian Maritime University)
	SheEO Seafarer Rising Star Award	3/O Shraddha Vishwakarma (Exmar)
		Amilia Busby (CEMEX UK)
Company Awards	Seafarer Diversity Champion	Priyanka Gupta (Anglo-Eastern)
	Inclusive Faculty Excellence Award	Dr. (Mrs.) Sheeja Janardhanan (Indian Maritime University)
	Best Practices in Diversity	Maersk India
	Best Practices in Sustainability	Transworld Group
	Seafarer Workplace Diversity Award	Seaspan India
	Diversified Maritime Education Award	T S Rahaman & Centrum Marine
	Media Company of the Year	Bhandarkar Publications

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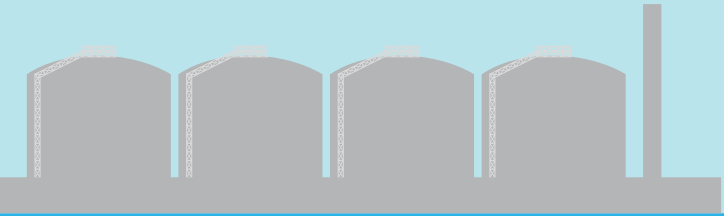

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Glimpses of the Event


INTERVIEWER

I-ESKIMO 2024

The Indian Maritime University (IMU) conducted the Fourth IMO Mock Session, I-ESKIMO 2024, with the Grand Finale on 16 November 2024. The First edition of this competition was held in 2021, with all the six Campuses of IMU participating. It was an unqualified and resounding success. In the year 2022 the Competition was expanded to include the Affiliated Institutes of IMU. This event is organized in line with the country's identified requirements for training the future leaders of Maritime India, particularly in matters related to the International Maritime Organization (IMO).I-Eskimo 2024 was conducted by the Indian Maritime University in association with DMET - MERI Alumni, Institute of Marine Engineers (India), CMMI & Lloyds Register of Shipping.

The objective of the competition is to ensure that future leaders of Maritime India are exposed to the art, philosophy and science of regulations development at the International Maritime Organization (IMO), so as to be able to grasp and appreciate the regulatory framework they will be exposed to in the Shipping Industry. It is also conducted as a value addition to the academic pursuits of the students and scholars, as also contributing to honing the cognitive and communication skills of the participants.

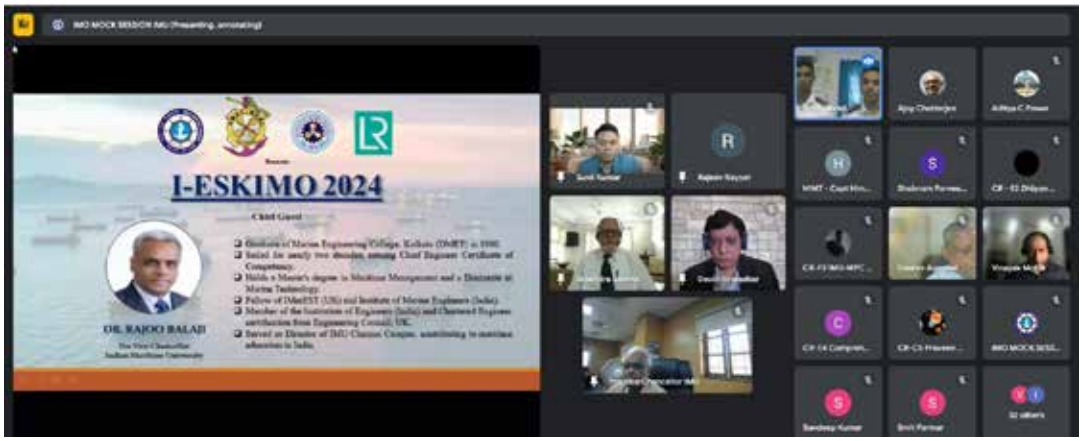
The event was specially curated by Shri Rajeev Nayyer, President, IME(I) and an Industry veteran, who has been part of the Indian delegation at the IMO on numerous occasions.

It was conducted for four topical and critical subjects:

- **CR - Comprehensive review of STCW convention**
- **IB - Interplay Between Conventions**
- **CC - Carbon Capture and its Applications**
- **WP - Wind Propulsion**

Seven eminent veterans of the industry constituted the panel of Judges, lending an aura of dignity to the event. The Judges were:

- **Dr B K Saxena**
- **Capt Kishore Sundaresan**
- **Shri Dilip Mehrotra,**
- **Shri Achintya B Dutta,**
- **Shri Ajoy Chatterjee**
- **Shri N. Girish**
- **Shri S.M. Rai**



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JUDGES PANEL:

	TOPICS AND PANEL JUDGES			
	CARBON CAPTURE	STCW CONVENTION	INTERPLAY BETWEEN CONVENTION	WIND PROPULSION
1	Mr. A.B. Dutta	Dr. B. K. Saxena	Mr. Dilip Mehrotra	Mr. N. Girish
2	Mr. N. Girish	Mr. Dilip Mehrotra	Mr. A.B. Dutta	Mr. Ajoy Chatterjee
3	Mr. Ajoy Chatterjee	Capt. Kishore S.	Dr. B. K. Saxena	Mr. S.M. Rai

The participants greatly benefitted from the guidance and mentorship by the galaxy of Industry experts who were roped in for the competition. The Guides were :-

- Mr. Anil Kumar Korupoju, Sr. Surveyor, IRS
- Mr. Arun Shankar V, Sr. Surveyor, IRS
- Capt. Porus Dalal, Shipvet
- Capt Gajanan Karanjikar, Managing Director– Cordelia Marine Services, UAE
- Mr. David Birwadkar, Vice President (Head – Fleet Management) GEIMS
- Capt. M.C. Yadav, Director Marine Education & Training, FOSMA
- Mr. Hemadri Ray
- Mr. J. Dasgupta
- Mr. Kunal Sharma, Surveyor, IRS
- Mr. L.P. Tripathy
- Mr. Mohan S Pal, Director (METC), IME(I)
- Capt. Vinayak Mohala, Head-Cadet Recruitment and Competency Management, Anglo-Eastern Maritime Training Centre, New Delhi
- Mr. Ritesh Kaushik, Chief Engr. & Maritime lawyer
- Mr Rajesh Kasaragod, IME(I)
- Mr. Sanjiv Ogale, IME(I)

- Mr. S. Sanatani
- Dr Sheeja J, Associate Prof & HOD, SNAOE, IMU Vizag
- Mr. Siddhesh Prabhu, Senior Surveyor, IRS
- Mr. Mahesh S
- Capt. Subroto Khan, Principal, GEIMS
- Mr. Sunil Kumar, CTO & Head-T&A, GEIMS
- Capt Sureen Narang
- Mr. Tarique Mulla, IMEI
- Mr. Venkat B
- Capt. Ashok Kumar Singh, Principal Surveyor, IRS
- Capt. Harish Khatri
- Mr. C.P.K. Kashyap, Executive Director, The Sanmar Group
- Mr. Ranajitsinh C Patil, Principal Surveyor
- Cdr. Sandeep Kumar (Retd.)
- Mr. Shammy K., Sr. Principal Surveyor, IRS
- Mr. Rakesh Roy, COO, Vedam Design & Technical Consultancy Pvt. Ltd
- Cdr Bharatkumar Unercat
- Mr. Devrup Kabi, Principal Engineer, IRS
- Mr. H.V. Ramesh, Principal Surveyor, IRS
- Mr. Shrikant Aradhey
- Capt. Vinayak Mahola, IMO(UN) Goodwill Maritime Ambassador

Out of 140 registered teams of IMU campuses & IMU Affiliated Institutes; 96 teams submitted final papers. 47 teams qualified for semifinal rounds and began the battle for victory.

Further, 4 teams from Carbon Capture, 4 teams from STCW Convention, 4 teams from Wind Propulsion and 3 teams from Interplay Between Conventions made it to the Finals.

The Finals were conducted on 16 November 2024 in virtual mode. Dr. (Mrs.) Malini V Shankar (IAS Retd.) Vice Chancellor at Indian Maritime University, was the Chief Guest. In her Welcome Address, Dr.(Mrs.) Malini V Shankar, Vice Chancellor Indian Maritime University, brought out that India was rightly again focusing its attention on the Maritime Sector, the roadmaps for which were being laid out in the Maritime India Vision 2030 and Maritime Amritkaal 2047. The onus was on all maritime professionals, and the youth of today, to ensure that India's future Maritime leaders were capable of getting the developed nations to pay heed to the needs and requirements of developing and under developed nations in matters maritime.

In her address, Dr Malini Shankar lauded the standard of the competition, stating that after seeing the finalists in action, she was confident that the future of the Indian Shipping industry was in good hands. She emphasized that given the uncertainty in the industry with respect to technological advancements, it was imperative that fresh and innovative ideas kept coming to the fore, and events of this nature were the best opportunities for this. She thanked the IMEI, DMECA,CMMI & Lloyds for supporting the competition.

The detailed results are tabulated below:

	Winner	1st Runner Up	2nd Runner Up
CR			
Team	B3	E4	C1
Institute	**IMU Mumbai Port Campus**	**Anglo Eastern Maritime Academy**	**IMU Kolkata Campus**
Member	Isha Sakshi	Chaitanya Salunke	Aman Somra
Member	Kashish Sharma	Gurcharan Singh	Atharva Tripathi
Member	Junaid Ansari	Ujjwal Parashar	
Member	Piyush Singh	Md Asad Shaikh	
Guide	Capt. Vinayak Mahola Capt. Harish Khatri	Capt. Vinayak Mahola Capt. Harish Khatri	Shri Mohan Singh Pal
Campus Co-ordinator	Shri Hare Ram Hare	Shri Anil Sharma	Dr. Pradeep Raja C
IB			
Team	C3	B3	D1
Institute	**Anglo Eastern Maritime Academy**	**IMU Navi Mumbai Campus**	**IMU Kolkata Campus**
Member	Joshua Antonio Gomes	Gaurav Butola	Mohd Emaad Khan
Member	Lakshya Bevli	Chowdhury	Nitish Pandey
Member	SubbaiahAllarandaAppaiah	Soumyajeet	Pranav Amit Prasad
Member		Sirajuddin SK	Viraj Paragbhai Trivedi
Guide	Cdr. Sandeep kumar retd. Mr. Shammy K	Cdr. Sandeep Kumar retd.: Mr. Shammy K	Shri C.P.K. Kashyap Shri. Ranajitsinh C Patil
Campus Co-Ordinator	Shri Anil Sharma	Capt. Giby John	Dr. Pradeep Raja C
CC			
Team	A10	C2	E1
Institute	**Samundra Institute of Maritime Studies**	**IMU Kolkata**	**IMU Kolkata**
Member	Aniruddh Anilkumar Achary	Isham Ahmed	Shwet Ranjan
Member		Divya Swaraj Jayswal	Shubham Kumar
Member		Safal Das	Shivam Kumar
Member		Mirza Dia Ferdousi	
Guide	Dr. Nanaware S D	Dr. Pradeep Raja C	Dr Pradeep Raja C
Campus Co-ordinator	Shri S. Sanatani, Shri Tarique Mulla	Mr Anil Kumar Korupoju Capt Gajanan	Mr Anil Kumar Korupoju Capt Gajanan
WP			
Team	A8	D4	E6
Institute	**IMU Vizag**	**IMI Noida**	**IMU Kochi**
Member	Sagnik Sarkar	Mohammad Masroof Khan	Amrutha Santhosh
Member	Aditya Ghosh	Barosiya Denis Girishbhai	PalaashKatochh
Member	Jamson Saikia	Daniel Jose J	Lini C L
Member	Subhrajyoti Sarkar	Daniel Jose J	
Guide	Shri H.V.Ramesh Dr.Sheeja.J	Shri Mahesh S	Shri L.P.Tripathy Shri Ritesh Kaushik
Camous Co-ordinator	Dr. P Sirisha	Shri Ankush Sharma	Shri Shabnam Parveen

- Prizes & Rolling trophies have been sponsored by DMET MERI Ex-Cadets Association (DMECA), Mumbai Branch of IME(I), Lloyds Register of Shipping and Company of Master Mariners of India (CMMI).

The collaboration between so many stakeholders of the Indian shipping industry to contribute to the endeavours and activities of the IMU indeed augurs well for the future of Maritime India.

The Hood: Uniting the Maritime World Through Connection and Community

The maritime industry stands on the brink of a transformative era in connectivity with the launch of *The Hood*, a groundbreaking social platform aimed at bringing together seafarers, their families, and maritime professionals into a thriving, inclusive community.

The Hood goes beyond being a networking tool—it's a space for building genuine connections where members of the maritime industry can support and empower each other. Inspired by concepts like "sisterhood" and "brotherhood," *The Hood* embodies a spirit of family and shared support. It allows users to explore job opportunities, chat with colleagues, and share ideas and experiences seamlessly, no matter their location.

The idea for *The Hood* began six years ago with Josephine Le, Founder and Managing Director, when she entered the maritime sector and recognized its distinctiveness. Witnessing the challenges of life at sea, especially the isolation faced during long periods away from home, Ms. Le identified the need for a platform where maritime professionals could connect and support one another. Following in-depth research into the unique needs of the industry, she brought her vision to life with a platform designed to tackle these challenges head-on.

"When I first joined the industry, I felt an immediate sense of community but also noticed the isolation many seafarers face and outdated recruitment methods," said Josephine Le, Founder and Managing Director of *The Hood*. "*The Hood* was created to foster connection and reliability. In the ever-changing chaos of today's social media landscape, it speaks to our innate desire for authentic relationships and how digital anchors can become the foundation for real communities."

"Our mission is simple but impactful: to create a space where strangers become family and every member feels supported and empowered. Whether you're new to the industry or have years of experience at sea, *The Hood* is here to help you connect, share and belong."

Serving all corners of the maritime world, *The Hood* provides tailored spaces for various professionals. Engineers can exchange technical knowledge in dedicated groups, deck officers can discuss navigation and regulation and cadets can connect with mentors. This personalized approach ensures maritime professionals of all levels find camaraderie and support within the platform.

Balancing simplicity for those less tech-savvy with advanced features for seasoned users, *The Hood* offers the younger generation a modern social media tool while creating value through industry expertise by engaging experienced professionals.

The platform introduces features like dual social/professional profiles, a free Career Hub for users, secure document storage and sharing, online centers for wellbeing support, e-learning opportunities, industry news, and a soon-to-launch e-shop. These resources address the unique needs of the maritime community.

The Hood isn't just a platform for work—it's a space to build an enduring community within the maritime sector. As it continues to expand with new features, it remains committed to its mission of uniting and uplifting the industry, fostering meaningful connections among maritime professionals, their families and seafarers.

Source: The Hood

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★ Course Id - 5122

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Entry Criteria:

A Seafarer should hold minimum a Certificate of Proficiency as Rating in charge of a Navigational /engineering watch or Completed sea time required for appearing for a Certificate of Competency Examination.

Officers are required to hold a Certificate of Competency and a Certificate of Proficiency for Basic Training for Liquefied Gas Tanker Cargo Operations and at least three months of approved sea going service on Liquefied Gas Tankers within the last sixty months on liquefied gas tankers, or at least one Month of approved onboard training on Liquefied Gas Tankers in a Supernumerary capacity, which includes at least three loading and three Unloading operations and is documented in an approved training record book as specified in section B-V/1 of the STCW Code.

Course Date: Commencing Soon

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This Course ensures that the Core publications namely, the STCW Convention and the Code and the Quality Management System is familiarized and well understood by the trainee.

This Course also covers the techniques of assessment and developing written tests and conduct of oral and practical assessments

Assessment, Examination and Certification of Seafarers

Dates: 13th – 23rd January 2025 / 17th – 27th March 2025

Time: 9 am - 5 pm

Course Fee: Rs.15500/- (per participant inclusive of Taxes)

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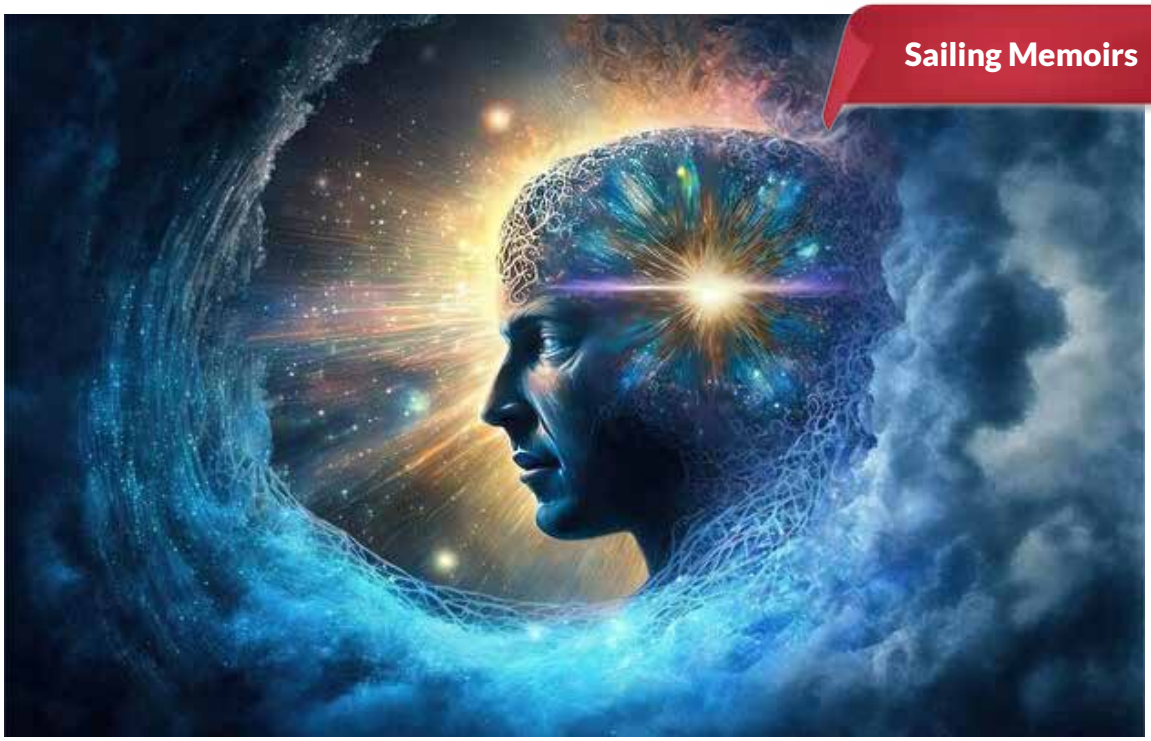
If Universe is the Answer, What is the Question?

Sailing Memoirs



Universe is chaos. Ultimate, unbridled, unhinged chaos. Galaxies chewing each other out, Blackholes swallowing Star Systems and other Galaxies in entirety, leaving them in eternal state of suspended animation at the point of Singularity. Large Stars collapsing unto themselves and exploding into spectacular Supernova deaths. Meteors raining death and destruction on planets. Here on Earth, predatory birds, animals, fish hunting down and eating other animals even while they are alive. Snatching them from their environment and asphyxiating the life out of them. Even predatory plant species choking out others, at scale. Inside Earth's core, angry molten lava swirling, seeking any weakness in the Earth's crust to burst out via Volcanoes, raining furious death and destruction. Then there are Storms, Earthquakes and other natural disaster happening regularly. There is utter chaos. It is a perpetual never ceasing Tandav, a violent dance of death and destruction unleashed on beings and non-beings alike, at staggering unimaginable scale.

Universe is also in ultimate fine-tuned Order. Precise laws controlling the perpetual movement of Stars in Galaxies, of Planets in Solar Systems. Round and round they go in perfectly crafted orbits owing to specific gravitational and other forces. The minutest change in those forces would collapse the entire Universe. Animals, plants being born following precise behaviour of sub cellular structures. Blood flowing in our veins at precise rate, hundreds of billions of animal hearts beating at precise rates for the organism to survive, procreate, live and feel the Universe it is part of. All of it has to be calibrated to perfection for it to "be", for anything to exist. Each of the billions of brains need to be fed with specific molecules of glucose carried by oxygenated blood in those finest of fine capillaries, through the entire life-span of the organism. Slightest disturbance in the system and there is no life. Everything existing in perfect balance, harmony and order, interdependent on everything else. Any significant changes and it will all fall apart, whether it is the Solar System, Earth's Ecosystem or our Biological Systems. So, the Universe is perfect and precise "Order". That's what it is. A brilliantly regulated and choreographed dance of balance and Order.

Universe is Love. God's love pulsating through the heart of every atom as evidenced by the motions of the electrons, the energy and charges of each Quark, holding together every particle and by extension structure in the Universe. In living beings, it is showcased through a mother's love in the heart of every mother of each of the millions of species and billions of organisms, small or large. It is evidenced in the love between two beings of a species, male and female, that hunger to come together physically, emotionally and psychologically to procreate. It is pure unadulterated, abundant love.

So, the Universe is Chaos, Order, Destruction, Love, Beauty and Ugliness of gigantic, Universe size proportions.

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06 Days

★Course Id - 5111

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Entry Criteria: Any seafarer who has successfully completed approved Basic Safety Training Course as per STCW Section A-VI/1, para 2,3, Tables A-VI/1-1, A-VI/1-2, A – VI/1-3, A-VI/1-4

This course is principally intended for candidates for certification for basic training for oil and Chemical tanker cargo operations as specified in section A-V/1-1 para 1 of the STCW Code as amended.

On successful completion of this course, candidates will be qualified in accordance with regulation Section A-VI/1 of the STCW code for Seafarers, 1978 as amended and will be eligible to carry out the assigned specific duties and responsibilities related to cargo or cargo equipment on Oil and Chemical Tankers

VENUE:- IMEI HOUSE, Plot No.94, Sector-19, Nerul, Navi Mumbai-400706

Course Date: 2nd – 7th December 2024/ 16th December 2024

For Registration: CLICK HERE

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Wait, which is it?

Actually, that may not be such an important question after-all.

A more pertinent question may be, who or what are we? Are we any or all of these? Are we carrying in our heart, chaos, order, pain, love, beauty, ugliness? It may be that the Universe might merely be acting as a mirror. The grandest, vastest illusion to give evidence of who "We Are" at this point in the evolution of our being, reflecting where exactly our Consciousness sits at this precise time.

For most of us, we may be a mash up, with bit of this and a bit of that. And "our" Universe reflects that. For some it might be leaning more into love and kindness, for others pain and destruction.

So, if Universe is the answer, what is the question you ask. The question simply is, who are we? That's the only pertinent question of our existence. That is the most elemental, most foundational, most primal question of all.

If we pay attention we would notice that every nuance, every property of the Universe exists in exact mapping to our senses. If we switch off the senses one by one, all properties of the Universe, of size scale, colour, sound, taste and feel disappear. What is left is an inert, colourless, tasteless, lifeless sterile blob that we may still be aware of, due to our consciousness, but no more.

Try it. No senses left, what is the nature of the Universe now? Can't have colour, can't have sound, can't have texture, can't have size... since all are observed due to our five senses, don't they? Now if we do not draw upon the Universe from our memory, which was available to us only through our senses, what is the nature of it? A giant blob of something of unqualified character. Neti, Neti, not this, not this!

So, do we exist because the Universe does or Universe exists, in the way we perceive it, because we do? Can the answer to whether one is in a dream be ever known by the dreamer? Perhaps not. But what shapes the nature of the dream has to sprout from within the dreamer. Does it not?

The Universe does indeed answer "the" question of who we are, by mirroring us, pixel by pixel, grain by grain, feeling by feeling. So even those of us who do not give in to reflection, can see. In their life, their thoughts, in their emotions and actions, is the Universe that exists - for them. That they have created. They are the authors of it. Universe merely answers by manifesting externally, what we have created internally, in our minds and hearts.

Aham Brahmasmi!! they say.

I am Brahm, the Creater, the Nurturer, The Destroyer!!

The Universe was indeed in Krishna's mouth now, was it not!!

– Atul Singh, Marine Engineer

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Ex - Sr. Faculty for Marine Automation, Control Engineering and Electronics for Six Years at A.E.M.A., Karjat, and previous
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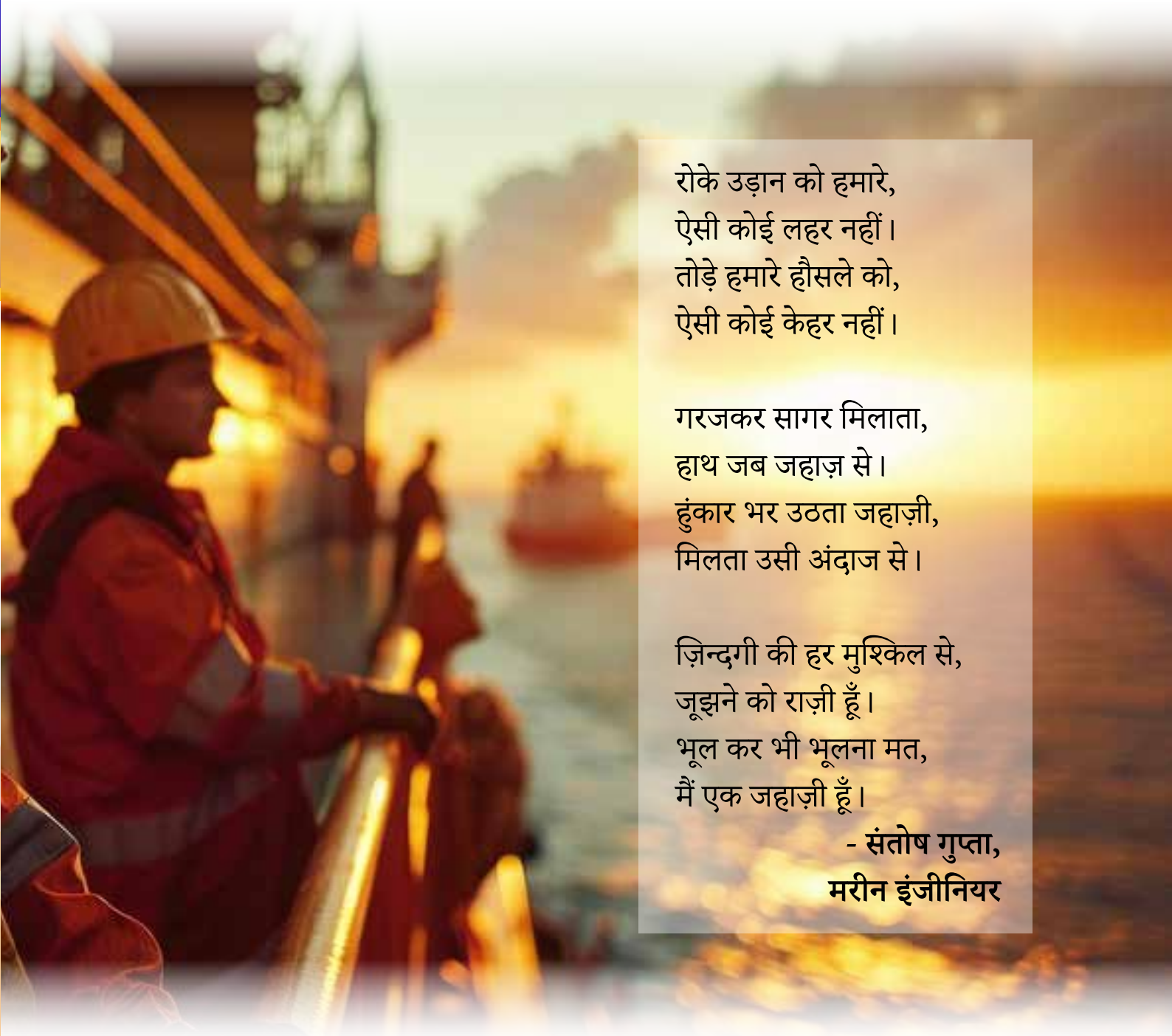
Poem

हौसला !!



रोके उड़ान को हमारे,
ऐसी कोई लहर नहीं।
तोड़े हमारे हौसले को,
ऐसी कोई केहर नहीं।

गरजकर सागर मिलाता,
हाथ जब जहाज़ से।
हुंकार भर उठता जहाज़ी,
मिलता उसी अंदाज से।

ज़िन्दगी की हर मुश्किल से,
जूझने को राज़ी हूँ।
भूल कर भी भूलना मत,
मैं एक जहाज़ी हूँ।

- संतोष गुप्ता,
मरीन इंजीनियर

Errata: In the October 2024 issue of our magazine, an error occurred on page 38 regarding the authorship of the poem titled "जीवंत- जहाज़ी- जीवन !!". The poem was mistakenly credited, but we wish to clarify that the correct author is **Shri Santosh Gupta, Fellow, IME(I)**. We thank him for his exceptional work and contributions to our magazine.

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- To know the correct dismantling and assembly procedure for various hydraulic equipments.
- To understand safe operation and trouble shooting of hydraulic systems.

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Poem

ये जीवन हैं एक अप्रत्याशित माया जाल

शब्दों से बुना जाल , अल्फ़ाज़ों में लिपटी मशाल
आज के दौर में यही इंसानियत का चर्चित निहाल
चले गये वह फ़रिश्ते जिन्हें गर्व से कहते, माँ के लाल
जिन्होंने अपने सिवा सिर्फ़, अपनों का रखा ख़याल
आज के दौर में बहुत से शख़्सियत मशहूर हैं और बेमिसाल
वक़्त नहीं उनके पास अपनों के संग , बहाने लाख और सोच विक़राल
जीवन में अक्सर हम सभी करते हैं एक दूसरे का इस्तेमाल
अनिवार्य अथवा लाचार हैं हालत के हाथों मजबूर और बेहाल
सदियों से सुनकर उपनिषद् से प्रचलित बिखरें मिसाल,
आज उन कहानियों पर अमल करने वाले की सूची हैं अकाल
अकस्मात् हम सब एक ही थाली में छटे बटे परोस हुए गुलाल
विचारों में बेद, कर्मों से विविधता, राह में बटके हुए गोपाल
इस संसार में झूझतें बने शिकार, सोचे में मानसिकता का अस्पताल
एक रोज़ सभी का निष्कर्ष होगा, चाहे मिश्रा , तिवारी , गुप्ता हो या अग्रवाल
जो बिन सोचे इंतज़ार की कड़ियाँ गिन रहे , जब कि सामने हैं त्रिकाल,
आजकल जिनके सपने जन्नत में हूर से मिलने का बना हैं इंद्रजाल
इस सोच में डूबे अज्ञानी, इन्हें बक्श दो मेरे भगवान जो हैं आदीकाल
काम में मशरूफ हर किसी को ये सलाह दूँगा , बनो हृदय से विशाल
आज और इस पल के लिये जियो मेरे लाल, कल हैं अप्रत्याशित जंझाल

- पी लक्ष्मण, मरीन इंजीनियर

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3. Engine Room Simulator - Operational Level	11 - 13, 25 - 27	09 - 11
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2. Practical Marine Electrical (Advance) - Module 2	11 - 13, 25 - 27	09 - 11, 24 - 27
3. Electronics for Marine Engineers - Module 4	14 - 15, 28 - 29	12 - 13, 30 - 31
4. Instrumentation, Process Control & Programmable Logic Controllers - Module 5 & 6	04 - 08, 18 - 22	02 - 06, 16 - 20
5. Auxiliary Diesel Engine and Maintenance Course	04 - 08, 11 - 15, 18 - 22 25 - 29	02 - 06, 09 - 13, 16 - 20
6. Bridge Manouervering & Engine Control - Management Level	11 - 13	23 - 26
7. Bridge Manouervering & Engine Control - Operational Level	28 - 29	12 - 13
8. Hydraulics for Engineers - Basic	25 - 27	09 - 11
9. Hydraulics for Engineers - Advanced	04 - 08, 18 - 22	16 - 20
10. Maritime Crew Resource Management (MCRM) - CAE Accredited	11 - 14, 25 - 28	02 - 05, 09 - 12, 23 - 27, 30 - 03
11. Machinery Maintenance - Skill Enhancement - Module 2	04 - 08, 18 - 22	02 - 06, 16 - 20
12. Machinery Maintenance - Skill Enhancement - Module 3	04 - 07, 25 - 28	02 - 05, 09 - 12, 23 - 27, 30 - 03
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Chilling Insights: The Essential Role of Shipboard Refrigeration for Long Voyages (Part I)

Sometimes it is necessary for us to reflect on where we were, where we are and where we are going. This article explores some of the aspects of refrigeration.

The cold rooms on board a ship are the main sustenance islands for unspoilt provisions of vegetables, meat, fish, dairy products etc. for long voyages. Present day practice is to stock up on long lasting provisions in the cheapest ports and pick up fresh provisions - vegetables, fruits, meat, fish, eggs etc. - at intermediate ports. So, an efficient 'fridge cooling system is needed to preserve the items, with rooms set at different temperatures.

During sailing ship days, there was no electricity nor any refrigeration available on board to preserve food. The sailors of those days used a variety of methods to keep their provisions from rotting, at least tried to stem the rot for as long as possible. That they failed more times than succeeded is now history, given the very long voyages of months, the scurvy attacks on sailors, the delirium that sometimes comes with not eating fresh produce for long periods and the problems that are associated with eating rotting meat.

Their forays into uncharted islands to store themselves up with fresh produce, fresh game and fresh water are the stories of legends, especially when they met the residents of settlements, sometimes friendly, sometimes hostile.

To preserve their food when they left their home port, 'Google' tells me that **Sailors preserved food on ships using a variety of methods, including:**

Salting

Meat was stored in barrels of salt and brine to dehydrate bacteria and prevent it from growing. One early method of salting was corning, where large grains of salt were rubbed into the meat. Salted meat was often called "junk" or "salt horse".

Pickling

Fruit and vegetables were stored in sealed containers of acidic liquids like vinegar or sour whey to prevent bacteria from growing.

Storing in barrels

Food was stored in wooden barrels or casks.

Selecting long-lasting foods

Ships carried foods that could last a long time, such as biscuits, dried beans, salted beef, flour, raisins, rice, hard cheeses and molasses.

Food on ships could quickly spoil and become infested with pests like weevils, maggots, cockroaches and rat droppings.

Semi-perishables were stored in a cool, dry, dark place, and their other foods were either canned, jarred, bottled, salted, smoked, fermented or dehydrated.

The advent of ice factories ashore gave a fillip to the preservation process, by increasing the life of perishables during the voyages.

Of course, the catchment of fresh sea food while at sea, gave a boost to the health, culinary and gastronomic morale on board.

The words 'victuals' (pronounced 'vittles') and 'victualling' (pronounced 'vittualling' are, even now, a part and parcel of maritime lexicon. The word "victuals" comes from the Late Latin plural noun victualia, which means - surprise, surprise - "provisions".

It is known that, as early as 1560, sailors were given their 'victualling allowance' or rations of "biscuits, beer, salted beef, fish, butter, and cheese and by 1588 they had added bacon and peas to the menu".

The modern seafarer is very well aware of the word 'victualling', as 'victualling allowance' is part of the lexicon of contracts signed between Ship Owners and Seafarers' Unions. Strict orders were given by the Ship Owner or Manager to the Master of each vessel that he is not to exceed a certain amount per day per seaman. At the far end of my sailing days, this allowance amounted to (about) US$ 9 per person per day.

For a long period of time, this 'victualling amount' given to each member of the crew was sacrosanct, beyond the clutches of the Owner or Management Company. What to do with the amount - in terms of buying provisions for the ship - was the exclusive preserve of the Master and Chief Steward on board. But, in recent years, this monies has been usurped by some unscrupulous Management Company higher ups, flying flags of convenience, to the detriment of quality of food on board.

The Master's power and prerogatives have been trampled upon a hundred times over, in order to line their own pockets.

Of course, even with a Master having exclusive rights to the allowance, it is not unheard of to see a few Masters dipping their hands into the till and making off with a good bit of money, thereby hitting the very stomachs of the sailors they are to feed and protect.

With mechanised machinery came refrigerated machinery. Surprisingly, various refrigerated systems were introduced more to carry carcasses of meat rather than preserving the food for the seafarer - as early as the 1870s.

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1876 - The ship 'Eboe' had a methyl-ether refrigerating plant.

1879 on 'Bell Coleman' Dense Air Machine became a popular refrigerating plant.

1890 - **The J & E Hall company installed the first marine CO2 refrigerator system on the Nelson Line ship Highland Chief. (I still remember my first ship in 1970 - it had a J&E Hall R-22 'Fridge Compressor).**

1929 - The entire 'fridge scenario changed. Till then, most domestic 'fridges (used at home) were using toxic gases, either ammonia (NH3), methyl chloride (CH3Cl) or Sulphur Dioxide (SO2) as refrigerants. During that decade, several fatalities had occurred to the general public due to inhalation of leaked, toxic, gases and there was a hue and cry. Some of the top companies of that period, Frigidaire, Du Pont and General Motors came together to research this. In 1928, two scientists developed a compound gas which they called ***Freon.***

Freon represents several *Chlorofluorocarbons (CFCs)*

"Freon represents several different chlorofluorocarbons, or CFCs, which are used in commerce and industry. They are a group of organic compounds containing the elements carbon and fluorine and, in many cases, chlorine and hydrogen. CFCs are colorless, odorless, nonflammable, noncorrosive gases or liquids and highly stable compounds that were used as propellants in spray cans and in refrigeration units. They are several organic compounds composed of carbon, fluorine, chlorine, and hydrogen. CFCs are manufactured under the trade name ***Freon***."

The Fridge and Cooling Industry merrily settled itself to using CFCs as refrigerants.

40 to 50 years later, scientists - this time chemists - Mario Molina and Sherwood Rowland (1974) found and proved that the CFCs were the direct cause of ***depletion of the ozone layer***, which alerted all scientific bodies and the UN. In 1995, Rowland, Molina, and atmospheric chemist Paul J. Crutzen shared the Nobel Prize in Chemistry for their work.

The ozone layer protects the Earth from the sun's harmful UV-B radiation. The discovery of the ozone hole also showed how quickly human activity can negatively impact the planet.

"Sherwood Rowland and Mario J. Molina discovered that chlorofluorocarbons (CFCs) could deplete Earth's atmospheric ozone layer, which blocks the sun's damaging ultraviolet rays. When the scientists reported their findings in 1974, CFCs were widely used as refrigerant gases and as propellants in aerosol sprays."

From Wikipedia: "**Ozone depletion** consists of two related events observed since the late 1970s: a steady lowering of about four percent in the total amount of ozone in Earth's atmosphere, and a much larger springtime decrease in stratospheric ozone (the ozone layer) around Earth's polar regions. The latter phenomenon is referred to as the ozone hole. There are also springtime polar tropospheric ozone depletion events in addition to these stratospheric events.

The main causes of ozone depletion and the ozone hole are manufactured chemicals, especially manufactured halocarbon refrigerants, solvents, propellants, and foam-blowing agents (chlorofluorocarbons (CFCs), HCFCs, halons), referred to as ***Ozone Depleting Substances (ODS)***. These compounds are transported into the stratosphere by turbulent mixing after being emitted from the surface, mixing much faster than the molecules can settle. Once in the stratosphere, they release atoms from the halogen group through photodissociation, which catalyze the breakdown of ozone (O_3) into oxygen (O_2). Both types of ozone depletion were observed to increase as emissions of halocarbons increased.

Increased cancer risks and other negative effects were predicted with the ozone depletion and the entry of more concentrated UV radiation through the ozone hole created by CFC emissions".

The medical fraternity predicted an increase of skin cancer, sun burn, blindness, cataracts, as well as being harmful to plants and animals.

The long and the short of it - Ozone provides the shield needed for humans. CFCs destroy the ozone, hence has to go.

The **Montreal Protocol on Substances That Deplete the Ozone Layer** is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion. It was agreed on 16 September 1987, and entered into force on 1 January 1989. Since then, it has undergone nine revisions, last in 2016. Even then, the ozone depletion due to the ozone home in the North Pole is calculated to regain its 1980 levels only by about 2040, whereas the ozone hole over the Antarctica is expected to reach those levels only by 2066.

In actuality, this signing of the Montreal Protocol in 1987 and its strict implementation in 1989 is one of those rare occasions when the world, in unison, agreed on quickly acting before more damage can be done to an already vulnerable and susceptible environment.

It is necessary to now go into more details of the Montreal Protocol, as it affected our lifestyle, our working lifestyle as well as our living lifestyle.

Some examples of Ozone Depleting Substances (ODS) include:

- Chlorofluorocarbons (CFCs) - used mainly as refrigerants
- Halons - used as Fire Retardants, suppressors and extinguishers
- Carbon tetrachloride (CCl4) - used in products such as metal degreasers, insecticides, aerosol propellants, solvents on rubber and chemical industry
- Methyl chloroform (CH3CCl3) - was developed as a replacement for halogenated solvents such as tetrachloroethene. It was being used in solvents, degreasers, dry cleaning, correction fluid thinner etc.

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- Hydrobromofluorocarbons (HBFCs) - primarily used as fire suppressants
- Hydrochlorofluorocarbons (HCFCs) - used as refrigerants, insulating foams, aerosol propellants
- Methyl bromide (CH3Br) - used as a refrigerant, fumigant, in pharmaceutical industry, degreasing wool, extracting oil from seeds, fire extinguishing, as an aesthetic in dentistry
- Bromochloromethane (CH2BrCl) - used as a fire extinguishing fluid in aircrafts and in portable fire extinguishers

From the above list of items that have been branded as Ozone Depleting Substances and its uses, one can calculate the impact of banning these substances would have on multiple industries. The larger corporations will cope with the cost of finding safe alternatives. It is the small time industrialist who will find it difficult to change.

For that reason, the Montreal and Kyoto Protocols have a clause wherein closure dates are different for advanced nations and developing nations.

ODS are stable in the troposphere, but break down in the stratosphere when exposed to intense ultraviolet light.

Two very important measures need to be understood in conjunction with the Montreal Protocol and the Kyoto Protocol.

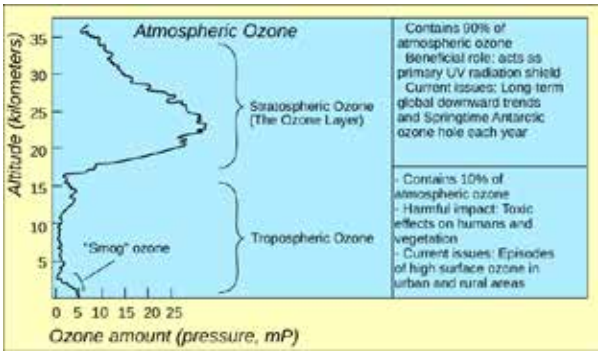
The Montreal Protocol sets standards to measure Ozone Depleting Potential (ODP). The higher the ODP, the greater the potential to destroy the Ozone layer.

The Kyoto Protocol sets standards to measure Global Warming Potential (GWP). It is used as a measure of how much a greenhouse gas traps heat in the atmosphere over a period of time. It's used to compare the climate impact of different greenhouse gases. GWP is calculated by comparing the heat-trapping ability of a gas to carbon dioxide, which is given a GWP of 1. For example, if a gas has a GWP of 28, it's 28 times more potent than carbon dioxide.

The operative words, acronyms, in today's world of climatic and environmental consciousness and in adhering to the protocols, are ***ODS, ODP and GWP.***

Humanity has, by now, become accustomed to refrigerated foods. So, what is the alternative to CFCs?

There emerged two alternatives.



The distribution of atmospheric ozone in partial pressure as a function of altitude (Wikipedia)

Hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs) are two chemical classes that are used as alternatives to chlorofluorocarbons (CFCs).

Here also there was a catch.

HCFCs contain small amounts of chlorine and have a lower Ozone Depletion potential. So, a compromise was reached. As a temporary measure, HCFCs can be used. The more advanced countries are mandated to cease using HCFCs by 2030 and the less advanced countries by 2040.

HFCs - One of the most widely-used replacements for CFCs is a chemically-similar group called HFCs (Hydro-Fluoro-Carbons). These compounds contain hydrogen atoms rather than chlorine, and are often marketed as 'environmentally-friendly' due to their negligible contribution to ozone layer depletion.

Controversially, although HFCs do not contain chlorine and do not contribute to ozone depletion in the stratosphere, some of the HFCs contribute to the green house gases that form part of the much touted 'global warming'.

Evidence of Global Warming was picturised in FB as under:

The Kyoto Protocol has emphasised a reduction in the use of those HFCs.

Carbon Dioxide CO2 is also an alternative.

The common refrigerants used today are

R 134a and R 32 (HFCs)

R 407c - a blend of R 134a, R 125 and R 32

R 410a - A refrigerant with good thermodynamic properties and higher energy efficiency than R-22

R 454b - A blend of R-32 and R-1234yf, with a lower global warming potential (GWP) than previous refrigerants.

This begs the question - are HFCs and HCFCs as efficient, less efficient or more efficient than CFCs when used in the refrigeration cycle?

HFCs and HCFCs are more efficient than CFCs for refrigeration on board because they are more thermodynamically efficient and have a lower ozone depletion potential (ODP) and global warming potential:

HFCs

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Charles Dickens comes to our minds as we reflect upon the state of shipping today. Juxtaposed between Trade Wars, Galloping Technology, Regulatory Challenges and Climate Change issues, we could be looking like a deer caught in the headlights, unable to comprehend where our future lies.

The Lehman Brothers crisis of September 15, 2008, now close to 15 years ago; yet we have not been able to overcome its impact, just as we have never been able to avoid the odd bout of flu every winter, and of course the Covid-19. There has been a continuous stream of regulations, in the wake of galloping technology, escalating political gamesmanship across nations, and also with safety management continuing to be an issue, duty of care towards crew remains questionable.

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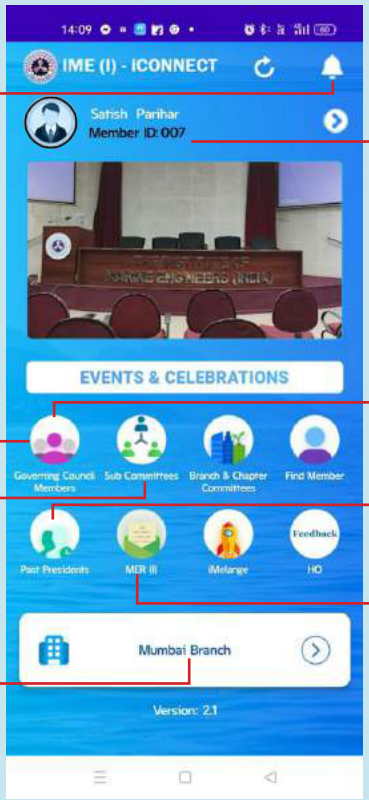

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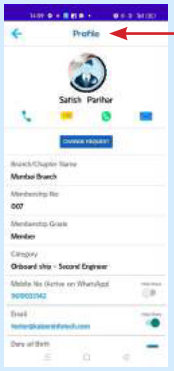

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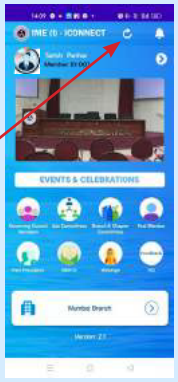

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HFCs have excellent thermodynamic properties, which means they can absorb and release heat efficiently. This results in better energy efficiency and, although the gas itself is costly, it lowers operating costs.

HCFCs

HCFCs contain hydrogen, which makes them less stable than CFCs and more easily broken down in the atmosphere. This results in a lower ODP and Global Warming Potential than CFCs.

CFCs

CFCs were inexpensive to mass-produce and performed similarly to the natural refrigerants they replaced. However, they contribute to the destruction of stratospheric ozone.

AMMONIA

Ammonia is another alternative to CFCs and HCFCs. It has a low price per kg, low specific weight, and a low indirect CO2 footprint. However, it is poisonous when accumulated in high concentrations, has a distinctive smell, and is lighter than air.

So, in fact, the refrigerant gases in use today are more expensive but more sustainable - as far as earth is concerned.

While ***Global Warming Potential*** and ***Green House Gases*** are intimately linked, there are many sceptics who retort that GWP and Green House Gases are the playthings of the rich, the more advanced countries. They opine that the imposition of the cost of the tools needed for such environmental control are, mostly, manufactured in the advanced nations and are being deliberately foisted on the less developed countries, more as a money making scheme than an environmental improvement. Those countries have usurped the Kyoto Protocol and taken the amendments hostage to the detriment of the poorer countries. There are numerous controversies that need to be sorted out, that need to be bolstered by scientific facts.

On the other hand, the Montreal Protocol on ODS has seen quick - or as quick as they possibly can - implementation of the clauses and later amendments, because all member countries immediately recognised the potential for disaster if the world did not pay heed to the widening of the ozone hole in the stratosphere. Even with quick implementation and all the nation states co-operating, the damage to ozone layer is such that, to even regain the 1980 status, the earliest predicted year is 2040 over the North Pole and 2060 or thereabouts over the South Pole. To regain 1920 status will, likely, take till the end of the century, were we to continue to pay the price till then and lay emphasis on the cautionary measures now in place.

One of the beneficial fallouts of the implementation of the ***ISO (International Organisation for Standardization)*** clauses is that each industry started policing itself to improve standards, to improve quality, whether in the product or in the service and improve the quality of its qualified work force by systematised training and certification. (As far as the Marine Industry is concerned ***STCW (Standards of Training, Certification and Watch Keeping)*** is a prime example.

Similarly, the Refrigeration Industry has taken upon itself the task of regulating the Industry, researching, setting standards and policing itself with the mandatory audits by an outside, qualified, source, much akin to the Classification Societies of the Marine Industry.

Quite a bit of the material that I present below has been quelled from ***"Danfoss"*** website, as they seem to have a very resonant way of bringing to light the mysteries behind ODS and GWP.

One of the (newly) qualifying ISO Standards that the Refrigeration Industry has set upon itself is ***ISO 5149-1:2014*** for Refrigerating Systems and Heat Pumps. It is likely to be enacted soon.

"ISO 5149-1:2014 specifies the requirements for the safety of persons and property, provides guidance for the protection of the environment, and establishes procedures for the operation, maintenance, and repair of refrigerating systems and the recovery of refrigerants.

ISO 5149-1:2014 specifies the classification and selection criteria applicable to the refrigerating systems and heat pumps. These classification and selection criteria are used in ISO 5149-2, ISO 5149-3, and ISO 5149-4.

ISO 5149-1:2014 applies to: a) refrigerating systems, stationary or mobile, of all sizes including heat pumps; b) secondary cooling or heating systems; c) the location of the refrigerating systems; and d) replaced parts and added components after adoption of this part of ISO 5149 if they are not identical in function and in the capacity."

There are several other statutes, which I will not go into - this being the primary one. Of course, being ten years old, several amendments have come into play, the essence is in 5149-1.

The ***ISO / DIS 5149-1*** is presently under development and will entirely replace 5149-1:2014 shortly. This includes several sustainable development goals.

What did ISO 5149-1:2014 achieve or propose to achieve? Introduction of refrigerant gases that

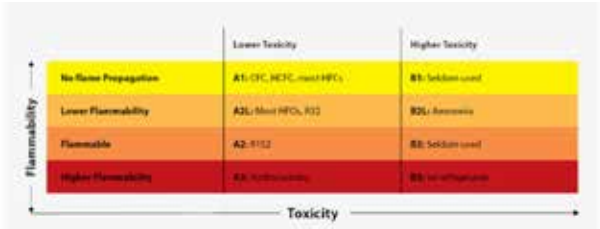
Are Non Toxic - achieved after 1929 itself, with the introduction of Freon family of gases.

Are Non flammable or Mildly flammable (without posing any risks)

Is not of the family of gases that are Ozone Depleting Substances (Montreal Protocol)

Is not of the family of gases that have Global warming Potential.

Refrigerants were classed under the following headings:



COURTESY: DANFOSS

Non-toxic and mildly flammable, A2L refrigerants are gaining traction as a relatively easy way to further reduce Global Warming Potential (GWP).

With the cooling industry successfully phasing down the use of higher GWP refrigerants, countless applications are now benefiting from refrigerants that are kinder to the environment. Now, the next step is to go further, and achieve ultra-low GWP.

Natural refrigerants like R290 and CO2 are being used for a wide range of applications. But for installers looking for a cost-effective option that maintains a conventional system design, A2L refrigerants are an excellent choice—offering a GWP saving of 90% and more.

Most of the refrigerants that has come into use recently have the A2L Classification, meaning 'mildly flammable'.

'Mildly Flammable' means A2L refrigerants need at least 1,000 times more energy to ignite than most A3-class flammable refrigerants.

It means that A2L refrigerants are unlikely to ignite from a discarded cigarette or a space heater. Even naked flames struggle to ignite A2L refrigerants under test conditions.

What's more, the "L" means they have a low burning velocity. So, even in the event of ignition, the flame will likely burn slowly and self-extinguish

Refrigerants need a certain concentration in air to generate a flammable mixture. The lowest flammable concentration is the lower flammability limit (LFL).

For A2L refrigerants, the LFL is greater than 100g/m3; typically, it's above 300g/m3.

A2L has lower flammability and toxicity compared to other classifications—making it the second safest refrigerant category.

A - Non Toxic

2 - Flammable

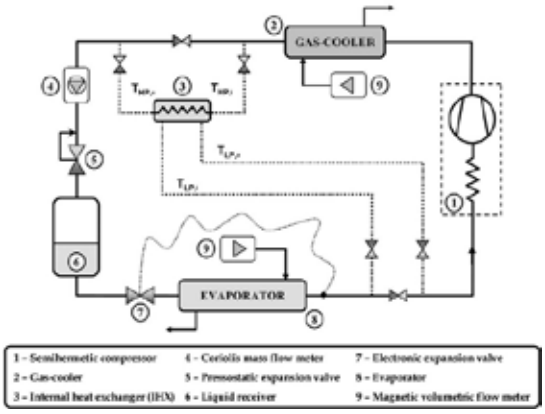
L - Low Burning Velocity

The primary benefit is on the GWP level. When compared to a popular refrigerant like R134a, an A2L refrigerant like the R1234yf offers up to 99% reduction in GWP. The very low or ultra-low GWP level makes A2Ls an attractive choice as regulations tighten further. They are also relatively easy to use.

The disadvantage is that they cannot be used in a retrofit. The whole plant will need to be renewed, making it the ideal choice for new buildings.

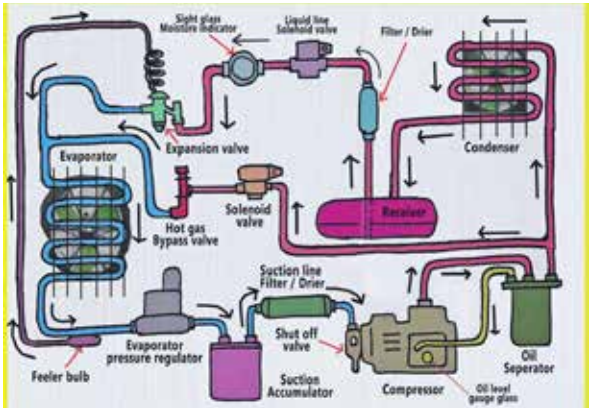
A2L refrigerants offer better performance and efficiency than many A1 and natural refrigerants—making them a versatile choice when used with the correct components and pipe sizes.

Blend refrigerants combining hydrofluorocarbons and hydrocarbons are good substitutes to decrease the flammability of hydrocarbons while reducing the global warming potential of hydrofluorocarbons. Four hydrofluorocarbon/hydrocarbon blends (R134a/R290, R134a/R600, R134a/R600a, and R134a/R1270)



Typical Schematic Diagram of Plant using HFCs

Below is a typical base layout of an older type refrigeration system. I am of the opinion that the same principles will apply to the newer gases. What will, likely, be different are the pressures and temperatures at each point in the system.



About the Author

Mr. A. Ranganathan, 1970 batch of DMET, now retired worked in Sisco and Barber SM. Of the 38 years at sea, 28 where as Chief Engineer, served on Car Carriers, Container Vessels, Bulk Carriers, MPCs and Self Unloaders. After leaving sea, he has been a Consultant and Vessel Manager with Maersk USA for 6 years.

E-Mail: ranganathan.blog@gmail.com

The Institute of Marine Engineers (India)

CONTACT DETAILS

For General Queries:
(Except Courses, TAR Book, Membership and MER / iMélange):
The Institute of Marine Engineers (India) "IMEI House"
Plot No. 94, Sector-19, Nerul, Navi Mumbai – 400706, India
Phone: +91 22 2770 1664, +91 22 2770 6749
E-mail: hgs@imare.in

For Training/Admission:
Training Programmes:
The Institute of Marine Engineers(India) "IMEI House "
Plot No. 94, Sector-19, Nerul, Navi Mumbai – 400 706, India.
Phone: 022 – 27711663 / 27701664
Mobile No.: +91 – 9967875995 | E-mail: training@imare.in

For Membership Queries:
The Institute of Marine Engineers(India) "IMEI House"
Plot No. 94, Sector-19, Nerul,
Navi Mumbai – 400 706, India
Phone: +91 22 2770 1664, +91 22 2770 6749
E-mail: membership@imare.in

Send your Articles to:
The Institute of Marine Engineers(India) "IMEI House"
Plot No. 94, Sector-19, Nerul,
Navi Mumbai – 400 706, India
Tel.: +91 22 2770 1664 | Fax: +91 22 2771 1663
E-mail: editormer@imare.in

For iMélange Queries and Articles:
The Institute of Marine Engineers(India) "IMEI House"
Plot No. 94, Sector-19, Nerul,
Navi Mumbai – 400 706, India
Tel.: +91 22 2770 1664
E-mail: editornewsletter@imare.in / subeditor@imare.in

IME(I) House, Nerul, Navi Mumbai