ISSN 2250-1967

MARINE ENGINEERS REVIEW INDIA

JOURNAL OF THE INSTITUTE OF MARINE ENGINEERS (INDIA)

Volume : 18 Issue : 9 August 2024 ₹ 90/-

Focussing on Fisherfolk

The Institute of Marine Engineers (India)

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

Tel: +91 – 8454847896/ 022-27711663
Email: training@imare.in. Website: https://imare.in/

REGISTRATION OPEN FOR Following DGS APPROVED COURSES

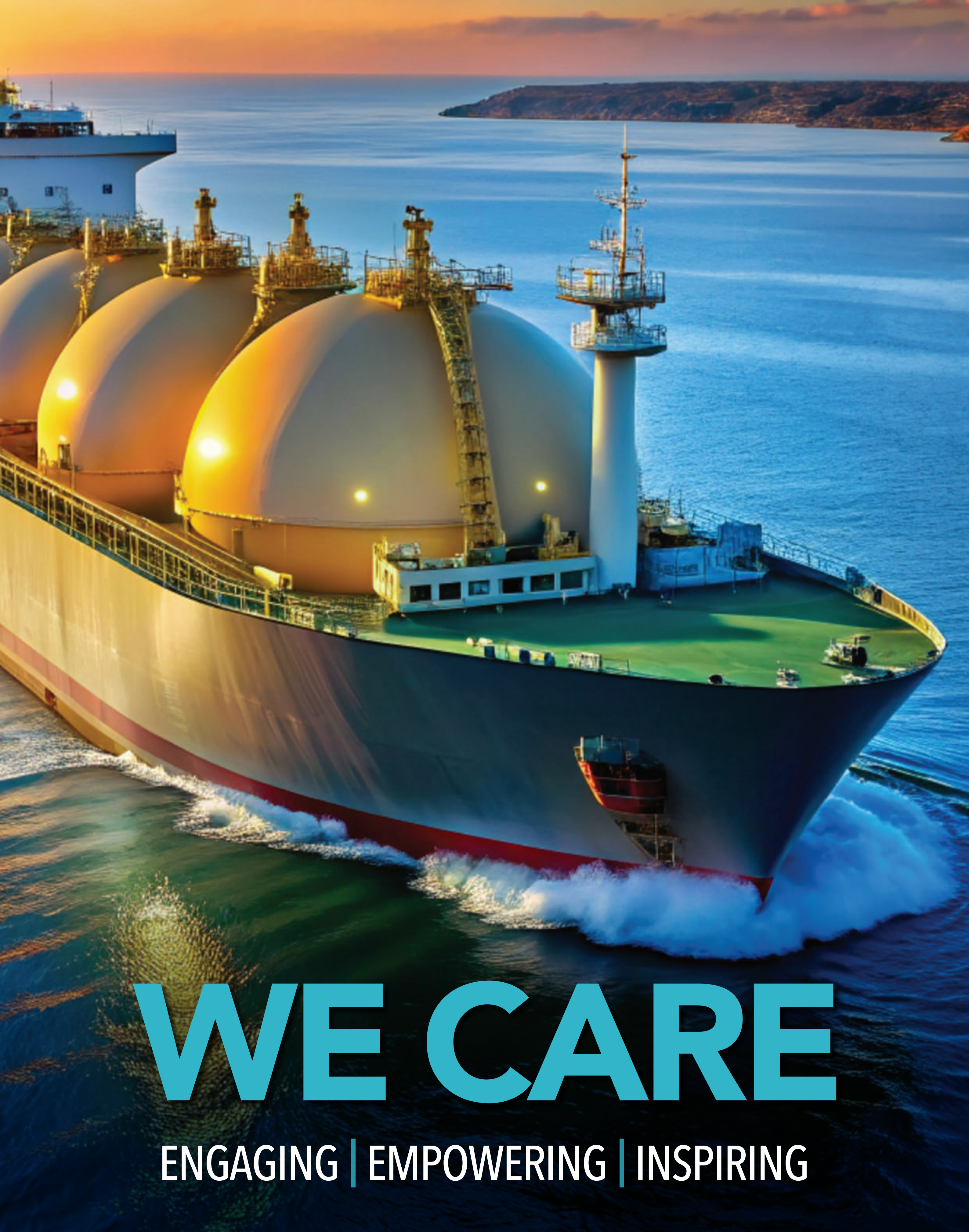
- Basic Training for Ships using Fuels covered within IGF code ***Course Id – 5311*** (OFFLINE) – (5 Days) - 05th August 2024/ 26th August 2024/ 02nd September 2024/ 10th September 2024
- Assessment, Examination and Certification of Seafarers ***Course Id – 1062*** (OFFLINE) – (12 Days) - 16th September 2024
- Advanced Training for Ships using Fuels covered within IGF code ***Course Id – 5312*** (OFFLINE) – (5 Days) - 20th August 2024/ 23rd September 2024
- MEO Cl. I (FG) : 2- months course (OFFLINE) - 02nd Sept 2024/ 01st Nov 2024 (followed by Simulator course) **Discount on combined bookings of Class I Course with Simulator**
- MEO CLASS III (NCV_CEO) Upto 3000kW – STCW 2010: 2 month course (OFFLINE) 2nd November 2024
- MEO Cl. III (NCV_SEO) Part-A - STCW 2010: 2-month course (OFFLINE) – 1st August 2024
- MEO Cl. III (NCV_SEO) Part-B - STCW 2010: 4-month course (OFFLINE) – 1st November 2024
- MEO Cl. IV (NCV) - STCW 2010 - 4 months course (OFFLINE) –
- MEO (CEO – NCV) BRIDGING COURSE: 15 Days (OFFLINE) – 16th AUGUST 2024/ 2nd September 2024/ 01st October 2024/ 16th December 2024
- MEO (NCV – SEO) BRIDGING COURSE: 1 Month (OFFLINE) – 01st August 2024/ 2nd January 2025
- MEO CL. II (FG): 4-month Course (OFFLINE) – 01st Aug 2024 / 02nd Sept 2024/ 01st Oct 2024 / 01st Nov 2024 / 01st Dec 2024 (Discount on combined bookings of Class II Courses with Simulator)
- REFRESHER & UPDATING TRAINING (RUT - 3 DAYS) COURSE FOR REVALIDATION OF COC FOR ALL ENGINEERS and ETOs (OFFLINE) – 7th August 2024/ 22nd August 2024
- ENGINE ROOM SIMULATOR MANAGEMENT LEVEL (3 DAYS) COURSE FOR MEO CLASS I (OFFLINE) – 29th August 2024/ 2nd Sep 2024/ 5th Sep 2024/ 29th Oct 2024/ 4th Nov 2024/ 7th Nov 2024/ 28th Dec 2024
- ENGINE ROOM SIMULATOR MANAGEMENT LEVEL (5 DAYS) COURSE FOR MEO CLASS II (OFFLINE) – 1st Aug 2024/ 27th Aug 2024/ 2nd Sep 2024/ 25th Sep 2024/ 1st Oct 2024/ 26th Oct 2024/ 1st Nov 2024/ 26th Nov 2024/ 2nd Dec 2024/ 26th Dec 2024
- ENGINE ROOM SIMULATOR OPERATIONAL LEVEL (3 DAYS) COURSE (OFFLINE) - 7th August 2024
- MEO Cl. IV(FG) non mandatory course (2months duration) – On request
- Familiarisation Training Course For Liquefied Natural Gas (LNG) Tanker Operations (Online) - On request

For Payment: Visit https://imeimum.marineims.com/course/register

For enquiries contact on training@imare.in

For registration of Courses, click on:
https://imeimum.marineims.com/course/register

Features: Experienced Faculty, Individual Attention



Setting the standard

manning.bom@angloeastern.com

ANGLO-EASTERN

World class support, anytime anywhere in the world

ClassNK is a global classification society, providing the highest quality survey and certification services through a network of over 130 exclusive surveyor offices across the world. Established over a century ago, our highly qualified surveyors are there to support your needs, when you need them. Learn more about our efforts to advance maritime safety and protect the marine environment at www.classnk.com

ClassNK CHARTING THE FUTURE

www.classnk.com

EDITORIAL

Anyone who lives within their means suffers from a lack of imagination
Oscar Wilde

Shipping has been in the news for more and less.

First is the Vadhvan Port approval. The estimated cost for the Port is ₹76000+ crores. A few of the fantastic features planned include a 20m deep berthing facilities which will be from almost 14+ Sq. Km. reclaimed land. The Port will accommodate container vessels (9 berths/1000m ea.), liquid cargoes, Ro-Ro vessels etc. This is a much needed space considering that the global trade has moved into boxes (about 15-17% of maritime trade is by containers). It is expected that this mega port will serve a vast hinterland by handling 20+million TEUs by 2030. The project will be enabled through a SPV and participation from JNPA and Maharashtra Maritime Board, while the policy drifts of allowing FDI etc., helping the cause.

To aid such projects and more, the policy revamp for ship leasing, ship building and repair is also on cards. Considering that the share of cargoes carried by Indian ships have dropped steeply and hovers at below 10% (<7% will be realistic), supportive financing models are imperative. While the posturing and assurance have stayed positive, the budget for shipping as a share of the overall spread has stayed at 0.05%. With mega projects like Vadhvan and the global trade demanding more gates on our coastlines, we won't need much imagining to push the outlays. The FM had stressed on utilising the apportioned funds completely. Guess the growing shipping can do that and seek more.

In this issue...

We focus on the fisher folk in this issue. The first article by Ca. Viswanathan et al., discusses the navigational capability of fishers. The sample population has been drawn from Tamil Nadu and from the surveys, the Authors put up a case for better training of the fisherfolk. The brighter side of this simplistic study is that it tries to look at the psychological aspects. Fisherfolk have traditionally handed down navigational skills and what could be the intent is to modernise and upskill. Whereas the knowledge of fishing, knowledge of mechanised boats etc., are more crucial from the subsistence and macro aspect of fishing industry. This is an easy read to get an insight into few aspects of fisherfolk and their vessels.

The second article focusses on the Schemes of GoI, particularly awareness of these amongst the fisherfolk; the challenges in implementation. Srikanth and Dr. Sekar had sampled the fisher population in the hamlets near to the University and carried out survey similar to the earlier Authors. The data and projections are all nominal sans any statistical analyses. The cursory study provides a few directions only, though such studies are needed for spreading awareness of schemes and benefits that are being meted out to coastal populations. Inclusion of female members in the study, reports from Fisheries University and wider sample population (sample is too less representing... >10 lakh fisherfolk of the State) would have helped the case better.

Following the fisherfolk talks, we turn to AI and ML. Ca. Anand Subramaniam and Tirth vakil take us through explaining the types of AI and ML and the merits of these while adopting to Maritime Education and Training. This is an easily digestible read.

We intend to bring on more articles related to AI and ML and this could be the pre-sequel.

Under Spanner in the Works column, Ramesh Vantaram presents an interesting case of azimuth thruster failure. This would be of immense interest to practicing marine engineers. I would invite a few discussion points on this repair incident.

MER Archives nests a Transaction on Steering Gears, proceeding on the IMCO's (now IMO) deliberations on steering capabilities, particularly on a single failure. The philosophy was that a single failure of the steering's pressure system must not render the system inoperative. The transaction discusses how the arrangements were optimised, especially for tankers, which is an engineering solution all of us would relish.

With golden hopes from Paris, here is the August issue of the MER...

Dr Rajoo Balaji
Honorary Editor


IMI
INTERNATIONAL MARITIME INSITITUTE
(An ISO 9001 : 2015 Certified Institution, Approved by
DG Shipping, Govt. of India) (Graded A1 Outstanding by IRS)
33
YEARS
IMI
INTERNATIONAL MARITIME INSTITUTE
INTERNATIONAL MARITIME INSTITUTE
PRE-SEA COURSES
*DNS
*GME
*GP RATING
*B.TECH
*ETO
*CCMC
POST-SEA COURSES
*BASIC & ADVANCED STCW
*BASIC & ADVANCED IGF
*MEO 1 & MEO 2
*RUCE & RTCD
*SIMULATOR COURSES
*VICT & AECS
For Course Bookings
scan the QR code
For Course Bookings:
+91 9650657755 | admissioncell@imi.edu.in | www.imi.edu.in

MARINE ENGINEERS REVIEW INDIA

JOURNAL OF THE INSTITUTE OF MARINE ENGINEERS (INDIA)

Administration Office
IMEI House
Plot No. 94, Sector - 19, Nerul,
Navi Mumbai 400 706.
Tel. : +91 22 2770 16 64
Fax : +91 22 2771 16 63
E-mail : editormer@imare.in
Website : https://imare.in/

Editor
Dr Rajoo Balaji

Editorial Board
Hrishikesh Narasimhan
Dr Sanjeet Kanungo
Chitta Ranjan Dash
Cmde (IN) Bhupesh Tater
Rashmi Tiwari *(Sub-editor)*

Disclaimer:
Papers and articles have been included in this Journal largely as submitted, with basic editing and formatting only, and without technical peer review. The Institute of Marine Engineers (India) does not take any responsibility whatsoever for any statements and claims made in these papers and articles for the quality, accuracy and validity of data presented or for any other contents. Inclusion of papers, articles, and advertisements does not constitute any form of endorsement whatsoever by The Institute of Marine Engineers (India).

Printed, Published and Edited by:
Dr Rajoo Balaji on behalf of The Institute of Marine Engineers (India). Published from 1012 Maker Chambers V, 221 Nariman Point, Mumbai - 400 021, printed by Corporate Prints, Shop No.1, Three Star Co-op. Hsg. Society, V.P Road, Pendse Nagar, Dombivli (E) - 421 201. District – Thane

Print Version: **Corporate Prints**

Typesetting & Web designed by:
Kryon publishing (P) Ltd.,
www.kryonpublishing.com

In This Issue

ARTICLES

COLUMNS

Cover Credits: **Kryon**

Join the HIMT Family

Applications Open For

FACULTY & INSTRUCTORS

LOCATION - HIMT College, Kalpakkam

Instructors

- Bosun/Petty officers/Chief petty officers and above from the seaman branch for Survival Technique course.
- Engine room Apprentice (ERA), Petty officer Mechanical Engineering (POME) and above, NBCD Instructor for fire fighting training.
- Life Guard for swimming pool.

Preference will be given to instructors already teaching PST, PSCRB, AFF, FPFF courses in DG Approved MTI's

Masters/Chief Engineers

- Tanker Experience.
- Prior Teaching Experience.
- Experience in Simulator Training.
- Chief Engineers competent to teach electrical topics.
- Willingness to take both Competency & Revalidation courses.
- Age below 55 years would be preferred.
- Masters/Chief Engineers with no teaching experience and above 55 years can also apply.

SALARY

As per Industry Standards

Interested applicants can send a mail to

careers@himtmarine.com

Quality Training | Commitment | Professionalism

An Empirical Investigation Into The Ocean Navigational Practices Of Tamil Nadu Deep-Sea Fishers

**S. Viswanathan,
Ashutosh Apandkar, K. Sivasami**

Abstract:- A total of 405 deep-sea fishers from Tamil Nadu, India, were selected from six fishing harbours located along the Coromandel, Arabian Sea, and Gulf of Mannar Coast and interviewed. The purpose of the interview was to evaluate their ocean navigational practices and determine their preparedness to transition from coastal fishing to deep-sea fishing. Through this study, the present navigational practices, fisher's psychology, and their demographic characteristics were analysed. The result revealed that many of the fishing harbours are being used for multi-day fishing activities, along with the fishers having sufficient psychological strength and navigational abilities, such as technical and non-technical skills for ocean navigation [1].

However, the results showed the lacuna in navigational knowledge, technical, non-technical skill, and procedure compliance among the fishers, and this led to many navigational-related accidents at sea [2]. This was due to the absence of structured training programs for the fishers and their poor awareness of navigational knowledge and procedure compliance. This has caused the fishing industry to lag in coping with the technological developments taking place in ocean navigation, adapting to the changing weather pattern due to global warming, and reducing navigational-related incidents involving fishing vessels.

Index items: - deep-sea fishers, navigational practices, ocean navigation, psychological factors, and structured training.

I. INTRODUCTION

The sea serves as a vital resource for a wide range of activities, including the transportation of commercial goods, offshore engineering projects, fishing, recreation, and water sports. Marine fishing is considered one of the most important activities due to its significant contributions to both the country's food supply and the livelihoods of fishermen. Marine fishers typically focus on coastal fishing, but some also venture into the high seas and participate in deep-sea fishing in the Indian Ocean [3]. Additionally, they serve as the first line of defence for the country against threats from the sea. Deep-sea fishing is carried out using various types of fishing vessels that are specifically designed to operate under the challenging open sea conditions. These crafts are built to ensure the safety of the crew and to optimise the efficiency of the fishing process. One of the functions performed by these vessels is navigation.

The International Maritime Organisation (IMO) governs maritime navigation under the International Regulations for Preventing Collision at Sea Convention (COLREG-1972). The maritime education and training is regulated and driven by the Standards of Training, Certification, and Watchkeeping (STCW). However, the Indian fishing industry lacks such a regulated mechanism. As a result, navigation on fishing vessels becomes disorganised and based on the fisher's personal experience, resulting in numerous navigational accidents documented in several reports [4].

Proficiency in navigational knowledge, abilities, and adherence to procedures is essential for ensuring the safety of fishing vessels during sea navigation. The lack of these capabilities results in navigational incidents specifically affecting these vessels. An in-depth examination of the navigational methods employed by fishermen might uncover the gaps in their knowledge and aid in identifying the appropriate steps to enhance the safety of their navigation at sea. This study aims to highlight the current level of navigational knowledge, abilities, and compliance with procedures among the fishermen of Tamil Nadu in ocean navigation and to provide strategies for improvement.

II. LITERATURE REVIEW

Ocean navigation is a primary function of vessels engaged in deep-sea fishing and the fishing vessels go beyond the sight of the land and engage in multi-day fishing. The ancient fishers were technically skilful in using the visual triangulation method of position fixing for coastal waters and used celestial objects [5,6], wind and wave direction to recognise time, direction and position at sea for ocean navigation. Nowadays, modern electronic navigational systems such as Global Navigational Satellite System (GNSS), Radio Direction and Ranging (RADAR), Automatic Identification System (AIS), Electronic Charts (ECs) and Echo sounders [7,8] are commonly used by fishers for navigation in coastal waters besides distant waters.

Vessel navigational calculations such as courses, distance and estimated time of arrival at a point are found by using GNSS, besides obtaining real-time positioning on the chart plotters. AIS is also being used for knowing the other vessel's information, the closest point of approach and time to the closest point of approach to avoid collision at sea [7]. Interpersonal skills (leadership, communication and teamwork) and cognitive skills (situational awareness, decision-making and work management) are the non-technical skills that influence a vessel's navigation and safe bridge watches at sea [1]. The vessel's navigators shall be trained, mentored and encouraged in non-technical skills for safe navigation of the vessels [9]. The majority of fishing vessel collision accidents involve merchant vessels as these vessels are huge and unable to detect the fishing vessels at far distances. Besides, the fishing vessel's crew is too involved in the fishing operation and no lookout is being kept during that time [2]. Thus, bridge activities such as poor lookouts and poor watch-keeping practices play a key role in fishing vessel accidents [10].

> "The ancient fishers were technically skilful in using the visual triangulation method of position fixing for coastal waters and used celestial objects [5,6], wind and wave direction to recognise time, direction and position at sea for ocean navigation"

The fishers of Tamilnadu develop skills from their own experience and their ancestors. Due to this, they could gain a high confidence level to use the craft even in rough weather conditions. Irrespective of their schooling, the fisher's children learn and are trained in basic skills at a very young age and develop fishing skills when practicing fishing at sea [11]. Accumulation of these skills from generation to generation and tough competition for survival with limited fisheries resources made them innovative to improvise in fishing in a continuous process [3]. Further, they could increase their skills in vessel operations to the extent of their exposure at sea. Thus, the skills of the fishers are geographically distributed and developed according to their area of operation.

III. MATERIALS AND METHODS

The study was conducted among the Tamilnadu fishers from the Coromandel Coast (Chennai, Nagapattinam and Cuddalore fishing harbours), Gulf of Mannar Coast (Tharuvaikulam fishing harbour) and Arabian Sea Coast (Thengappattinam and Colachel fishing harbours) covering 405 deep-sea fishers. Stratified random sampling was employed to select the fishing harbours and about 20% of the fishing vessels from each fishing harbours were selected for data collection.

A pre-tested structured interview schedule was utilised to collect data on demographic characteristics, psychological factors, navigational knowledge, skill and procedure compliance. And descriptive analysis was carried out to analyse these characteristics of the fishers. Demographic characteristics age of the fisher (X1), educational status (X2), experience at sea (X3), length of fishing vessel worked (X4), fishing distance (X5), duration of voyage (X6), training attended (X7) were kept as independent variables and navigational knowledge, navigational skill and navigational procedure compliance were kept as dependent variables and analysed by using regression analysis independently.

The navigation knowledge was assessed through 10 navigational-related questions. Each correct answer was given one mark and

ANGLO EASTERN
MARITIME TRAINING CENTRE

AEMTC MUMBAI : 401, Fourth Floor, Leela Business Park, Marol, Andheri-Kurla Road, Andheri (East), Mumbai-400 059.
T. +91 22 6720 5600 / 611 / 612 |
A.O.H. +91 8657408962 / +91 9820917656
aetr.bom@angloeastern.com
Capt. K. N. Deboo, Mr. Francis Akkara, Mr. Ivor Wilson

AEMTC DELHI : A-43, Ground Floor, Mohan Co-Operative Industrial Estate, Mathura Road, Delhi 110044.
T. +91 11 2642 6801 / 802 / 2647 2831 / 2647 1129
aetr.del@angloeastern.com
Capt. Prashant Gour, Ms. Sukhjeet Kaur

Anglo Eastern Maritime Training Centre | aemaritimetrg | For more details visit website: **www.maritimetraining.in**

For Pre Sea Training Courses kindly contact **Anglo-Eastern Maritime Academy** (A Division of Anglo-Eastern Institute) **DNS Course :** 011 68170837 | **GME / ETO Course :** 011 68170831 | aema.edu.in

MAN | PrimeServ

ME-C Control System Standard Operation
(OEM Approved Course)

August 2024: 05 - 09 | **September 2024: 09 - 13**

**For bookings: aetrbom@angloeastern.com
PrimeServ.academy-cph@man-es.com**

WIN GD
(OEM Approved Course)

Advanced Course X-DF Engines
August 2024: 20 - 24

UNIC - Controlled X Engines
September 2024: 16 - 20

For bookings: +91 22 67205611 / 12 / 18

WÄRTSILÄ

Wartsila RT Flex Engine
Conducted by Wartsila Switzerland
(OEM Approved Course)

August 2024 : 20 - 24
September 2024 : 09 - 13

D. G. Approved Courses

		August 2024	September 2024
1.	Engine Room Simulator - Management Level	05 - 09	09 - 13
2.	Engine Room Simulator - Operational Level	28 - 30	02 - 04, 15 - 16
3.	High Voltage Safety & Switch Gear - Management Level	-	23 - 27
4.	Refresher And Updating Training Course For All Engineers	28-30	23 - 25

Value Added Courses

		August 2024	September 2024
1.	Practical Marine Electrical (Basic) - Module 1	05 - 09, 20 - 24	02 - 06
2.	Practical Marine Electrical (Advance) - Module 2	12 - 14	02 - 04
3.	Electronics for Marine Engineers - Module 4	01 - 02, 28 - 29	05 - 06
4.	Instrumentation, Process Control & Programmable Logic Controllers - Module 5 & 6	05 - 09	09 - 13, 23 - 27
5.	Auxiliary Diesel Engine and Maintenance Course	05 - 09, 20 - 24	02 - 06, 09 - 13, 16 - 20, 23 - 27
6.	Bridge Manouervering & Engine Control - Management Level	12 - 14	16 - 18
7.	Hydraulics for Engineers - Basic	-	02 - 04
8.	Hydraulics for Engineers - Advanced	05 - 09	09 - 13
9.	Maritime Crew Resource Management (MCRM)- CAE Accredited	05 - 08, 20 - 23	02 - 05, 09 - 12, 16 - 19 30 - 04
10.	Machinery Maintenance - Skill Enhancement - Module 2	05 - 09	09 - 13
11.	Machinery Maintenance - Skill Enhancement - Module 3	05 - 08, 20 - 23	09 - 12, 23 - 26, 30 - 04
12.	Machinery Maintenance - Skill Enhancement - Module 4	20 - 22, 28 - 30	02 - 04, 16 - 18

VACANCY Faculty position | Training – Engineering

Qualifications and Experience

- Marine Engineer Officer Class 1 – COC from India / UK.
- With min. 1 year rank experience as Chief Engineer (Preference for experience on LNG/ LPG/ Tanker vessels).
- Experience in Ship operation, ship repair, teaching, auditing, inspections preferred.
- Training for Trainers and Assessors (TOTA) or Vertical Integration Course for Trainers (VICT).
- Other ISO / ISM / Technical Value-added courses.
- Excellent verbal and written communication skills.
- Should be interested in modern teaching methodologies.
- Candidate must have a passion for learning continuously and a desire to be in the teaching profession.
- Proficient in use of computers and savvy with use of various software.

For application along with your CV and/or queries with regards to the vacancy, kindly send it to AE-HR at talentsourcing@angloeastern.com / aemt.bom@angloeastern.com

1st in India and 2nd in the world to receive distinction by DNV SeaSkill Benchmarking

CERTIFIED MARITIME TRAINING PROVIDER DNV DNV-ST-0029

Psychological components such as innovativeness, self-confidence, scientific orientation, risk orientation, economic motivation and safety orientation are the factors that affect their psychological practices in carrying out vessel operations at sea

the average marks of all the respondents were calculated in percentage for finding knowledge level. Navigational skill was assessed for technical (vessel navigation skill and navigational equipment operation skill) and non-technical (cognitive skill and interpersonal skills) skills through 40 questions, 10 questions each, on an ordinal scale ranging from 1 to 4. The average of all the respondent's marks was converted to a percentage for each skill. Navigational procedure compliance was assessed through 10 questions pertaining to navigational regulation compliance and calculated on an ordinal scale ranging from 1 to 4 and the average of the entire respondent's marks was converted to percentage.

Psychological components such as innovativeness, self-confidence, scientific orientation, risk orientation, economic motivation and safety orientation are the factors that affect their psychological practices in carrying out vessel operations at sea. The indices were assessed through 5 questions each and each question was assigned with marks on an ordinal scale ranging from 1 to 3 and an average of all the respondent's marks was divided by 1.5 to get the indices. Further, the factors were named as low when the index value was less than Mean-SD, high when the index value was Mean + SD and medium when the index value was within and including Mean ± SD.

IV. FINDINGS AND ANALYSIS

A. Demographic Characteristics

Figure. 1 reveals that 58% of the respondents are in the age group 30-50 years. The fisher's population has remained nearly the same in this region since 2004 [3]. More than half of the respondents (55%) have not crossed the 8th standard, including 4% of them who have never gone to school. On the other hand, 11% have completed graduation. This poor education brings an inferiority complex within the fishing industry that the fishing industry is only suitable for poorly educated youngsters. Poor education was due to the respondent's early start of their career at a very early age, as evident through this study. Few of them had higher education as the schools were available nearby, and this education helped them in operating modern electronic equipment [3]. Further, youngsters and educated fishers are only able to know the weather data and analyse it for decision-making onboard [12]. 61% of the respondents have work experience of 10 – 30 years and this remained nearly the same for the last 30 years [3].

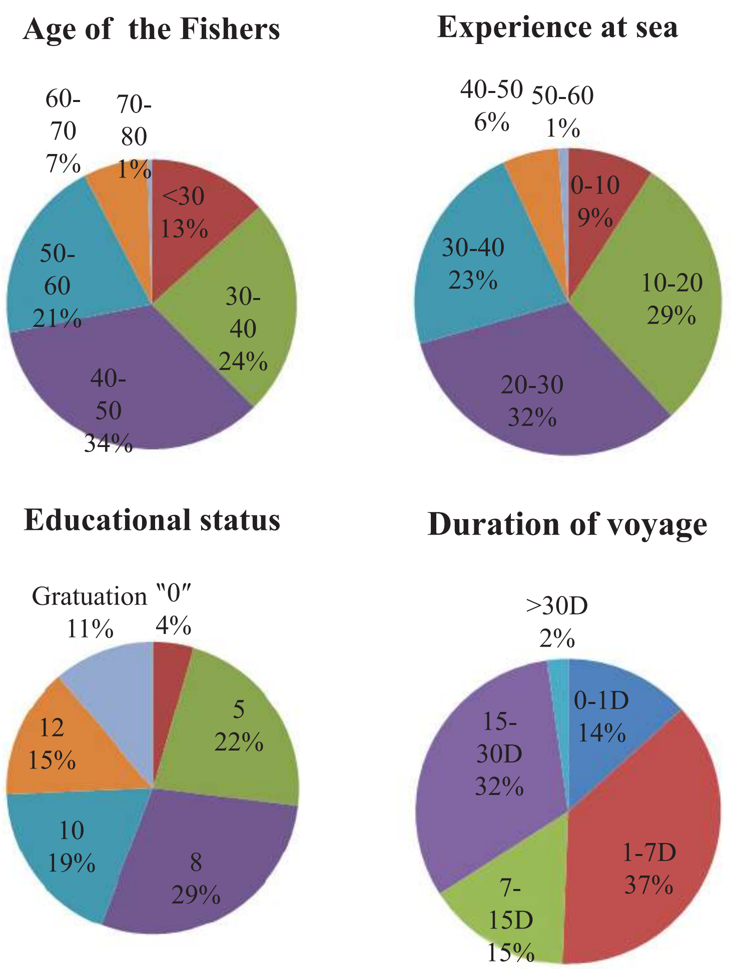


Figure 1. Demographic characteristics - age, experience, education and duration of the voyage of the respondents

Figure. 2 indicates that 94.8% of the respondents fish beyond territorial waters, and they are using fishing vessels of 50m or over (69.4%) in length. Due to their distant fishing operation, they stay at sea for up to 7 days (37%) and in some cases beyond 15 days (34%). Training attended by the respondents is very poor as 86.7% have never undergone any training related to their work.

B. Psychological factors

Figure. 3 reveals that the self-confidence index for the respondents is high (9.21) due to developing skills from their own experience and from their ancestors, and they are capable of handling different weather conditions at sea. Economic motivation (Index

THE INSTITUTE OF MARINE ENGINEERS (INDIA)

KOCHI BRANCH

In pursuit of excellence in Maritime Education & Training, we have been conducting the CoC preparatory courses for the past many years. And presently, also conducting the Refresher and Updating Training course (RUT) for engineers too.

We are in need of dedicated and motivated members with Chief Engineers experience, who can take over the responsibilities as Principal/ Course-in-charge. We are also looking for Full-time/ Visiting Faculty as well.

Principal, Course-in-charge

Qualification & Experience

- Certificate of Competency as MEO Class I (FG)
- TOTA / VICT course Certificate
- AECS certificate for Course-in-charge
- Minimum 3 years teaching experience in Competency courses (MEO Preparatory courses)

Full-time/ Visiting Faculty

Qualification & Experience

- Certificate of Competency as MEO Class I (FG) / Master (FG)
- TOTA / VICT course Certificate
- Some teaching experience in Competency courses (MEO Preparatory courses)

Qualified and eligible members may kindly contact the Institute at Kochi, for more details.

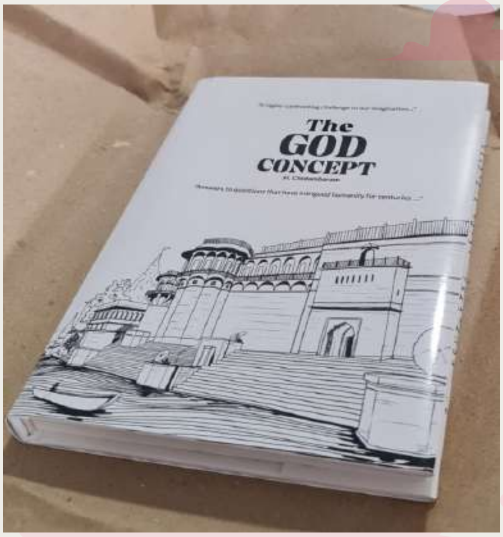
Email id: kochi@imare.in , Whatsapp number: 7025159111

The Institute of Marine Engineers (India), Kochi Branch

Kamalam Towers, Vyttila, Kochi, Kerala-682019

A book of absolute LOGIC upends our concept of God and His relationship with us.

YOUR GUIDE TO THE ULTIMATE TRUTH!



"It is you alone who has to become aware of the Ultimate Truth, to hear about it, to reflect on it ...., and implement it in your life!"

POWER YOUR WAY TO A LIFE WITHOUT MISERIES AND PAINS, ANXIETIES AND STRESSES...

"The God Concept" is NOT a book on any religion. It is as secular as, say, the Theory of Gravity, or our old beliefs of a flat earth!

This book is an English translation of a Malayalam tutorial on Sankaracharya's Manisha Panchakam by Swami Aseshananda of Chinmaya Mission, Palakkad

GAIN A DEEP UNDERSTANDING OF YOUR OWN SELF ...., AND THE UNIVERSE AROUND YOU.

Let LOGIC Lead your way to Faith ...!

Available in Amazon/Flipkart/Kindle

Place your order at:

www.genialsenior.com

Genial Senior

"Syndicated Articles, Topical Discussions, Publications"

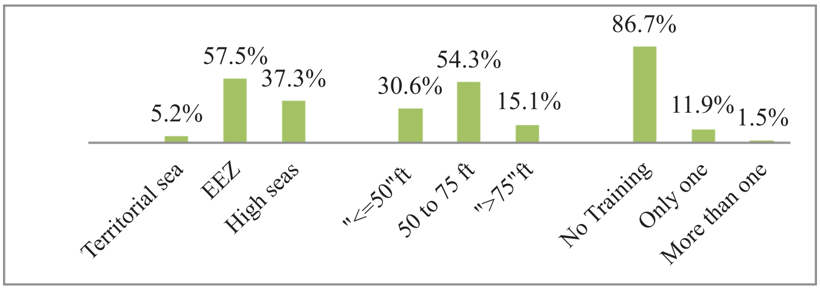


Figure 2. Demographic characteristics - fishing distance, length of the vessel and training attended by the respondents

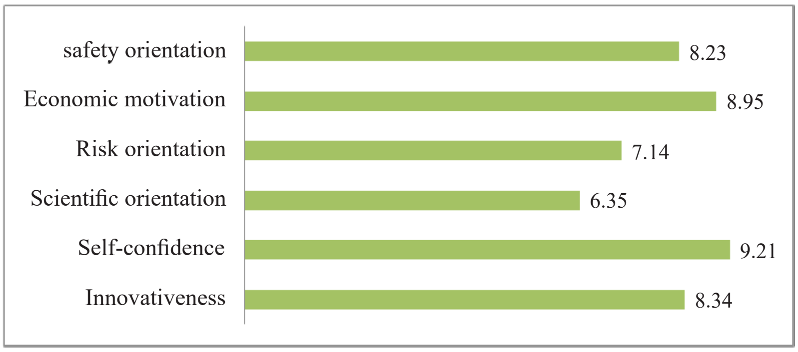


Figure 3. Psychological factors of the respondents

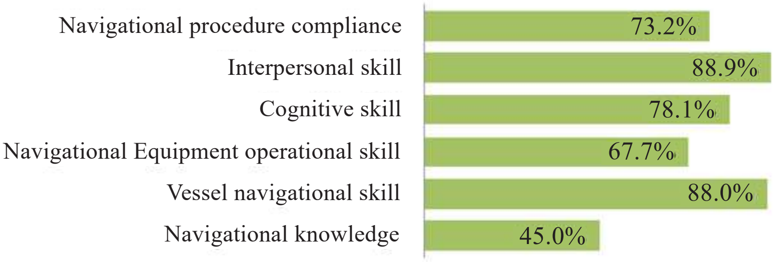


Figure 4. Navigational abilities of the respondents

value 8.95) is a factor that drives the fishing industry and directly related to innovativeness (index value 8.34) as the respondents are innovative enough to find a new way to increase the catch and reduce fishing net loss by fitting AIS in their nets (79.5%). Further, this technique was brought to the industry in their own efforts to avoid fishing net losses. On the other hand, their scientific orientation (index value 6.35) is low due to their poor educational level. Fishing is a risky job and fishers understand this (index value 7.14 - medium) and 82.5% of the respondents continue fishing even after their GPS (Global Positioning System) fails. However, only 10.9% continue fishing even after the weather warnings are issued. Safety orientation is medium (index value 8.23) and 99.5% of the respondents carry first aid equipment and engine spares on their vessels whereas only 79.3% of the respondents carry life-jackets for the entire crew onboard.

C. Navigational practices

Figure. 4 indicates that the overall knowledge of the respondents on navigation is below the mean (45.0%) due to their poor knowledge of collision regulation and lack of structured training. Only 5% gave the correct answer to questions on

HIMT Offshore

UK MCA Approved Courses Pilot Batch

Maritime & Coastguard Agency

Basic Training for Oil and Chemical Tanker Cargo Operations	20th Aug
Basic Training for Liquified Gas Tanker Cargo Operations	22nd Aug
Proficiency in Medical Care	21st Aug
High Voltage Training- Operational	4th Sept
High Voltage Training - Management	10th Sept
Basic Training for Service on Ships Using Fuels Covered within the IGF Code	19th Aug
Advanced Training for Service on Ships Using Fuels Coveredwithin the IGF Code	24th Aug

These courses are not approved by Director-General of Shipping, Mumbai.

98404 00000 | admin@himtoffshore.com

www.himtoffshore.com

their vessel related such as "What is the day signal for a vessel engaged in fishing?" However, 59.8% of them have correctly answered other vessel-related questions such as "What are the navigational light signals for a power-driven vessel?" The respondents could use the GPS (100%) and find the vessel's position and calculate the ETA (estimated time of Arrival) to the destination from GPS (80.5%) and thus making the vessel navigational skill (88.0%) high. However, the navigational equipment operational skill (67.7%) is lesser as much of the modern electronic equipment such as NaviC (86.2%), Barometer (61.5%), and Anemometer (58.8%), have never been seen by the respondents. This generally leads to poor onboard decision-making during rough weather conditions. Alternately, 79.5% and 96.0% of the respondents could operate AIS and VHF Radio respectively due to the regular use of these equipment for safe and efficient operation of the vessel. Cognitive skill (78.1%) of them is normally employed during navigation of the vessel and when fishing, the fishers are too busy on the fishing job rather than keeping a watch on the bridge, thus reducing the situational awareness capabilities of the fishers. It is further evident that 59.3% of them have never used binoculars for keeping a lookout, even though it could enhance the situational awareness capabilities of the fishing vessel. Interpersonal skill (88.9%) is high as it is being developed during their routine operation and has a direct influence on the safety and efficiency of the vessel. 92.6% of them appreciate their colleague for good work and 86.9% of the respondents share their mistakes with others so that it does not occur again. Navigational procedure compliance (73.2%) is above medium and 98.5% of the respondents could help the other fishers when they are in distress. However, only 25.2% of them could use the day signal for fishing vessels. This is due to a lack of navigational knowledge and poor vessel construction to display correct day and night signals.

Table 1 reveals that fisher's navigational knowledge has a significant positive correlation with educational status and experience at sea ($p<0.05$). However, age of the fishers does not have a significant correlation. Age of the fisher ($p<0.01$), educational status ($p<0.01$) and

Table 1. Correlation coefficient and navigational practices

Variable code	Correlation coefficient		
	Navigational Knowledge	Navigational skill	Navigational procedure compliance
X1	-0.023 NS	0.516**	0.269**
X2	0.045*	0.795**	0.462**
X3	0.032*	-0.119 NS	-0.028 NS
X4	0.006 NS	-0.027 NS	-0.080**
X5	0.000 NS	0.013**	0.002*
X6	-0.010 NS	-0.436**	-0.143**
X7	-0.045 NS	1.857 NS	-0.030 NS

* - significant at 5%, ** - Significant at 1%,
NS - Non significant

fishing distance($p<0.01$) have a positive significant correlation with navigational skills. However, the duration of voyage ($p<0.01$) has a significant negative correlation with navigational skills. Age of the fisher ($p<0.01$), educational status ($p<0.01$) and fishing distance ($p<0.05$) have significant positive correlations with procedure compliance, alternatively, length of fishing vessel worked ($p<0.01$) and duration of voyage ($p<0.01$) have significant negative correlation with procedure compliance. Further training attended does not have any significant correlation with the navigational abilities of the fishers. This may be due to inadequate training and the training given was unstructured and did not have any influence on navigational abilities.

This poor education brings an inferiority complex within the fishing industry that the fishing industry is only suitable for poorly educated youngsters

V. CONCLUSION

Distant fishing is inevitable as coastal fishing is not lucrative anymore due to poor catch. A paradigm-shift from coastal to deep-sea fishing is required in the fishing industry to continue to support the livelihood of the fishers. This can be achieved through raising vessel construction, vessel operations and abilities of the fishers to a new level on par with the international standard, besides removing the inferiority complex in the fishing industry as it is suitable only for under-educated children. Livelihood and economic motivations are the primary factors for the fishers to continue developing the required skills for deep-sea fishing. However, being away from family leads the fishers to problems such as

children's school education in family, poor safety and security at the fishing destination, lack of awareness of international rules and regulations and language hurdles [3]. The present navigational knowledge and skills are developed by themselves, and it is to the level of their exposure at sea working condition. As the age of the fishers, experience at sea and training could not mould their navigational skills and knowledge on par with the international standard, their compliance with the navigational rules and regulations and vessel construction to display proper day and night navigational signals at sea could not be enhanced as required.

Further training attended does not have any significant correlation with the navigational abilities of the fishers

Corrective measures after collision accidents involving fishing vessels are poor though their importance is very much addressed. This is because no formal training is established to improve the navigational knowledge and skills of the fishers. Poor vessel construction without a navigational mast led to poor navigational regulation compliance and led to much confusion at sea while navigating. Having inappropriate navigational light signals on these vessels (side lights with only 90 degrees arc of visibility and only a single all-round light in place of separate mast and stern light for a vessel of 12m and above) indicate that they are attempting to comply with regulations, however due to poor awareness on these regulations, they could not construct the vessels as required. Changing weather patterns and technological developments in the maritime field demand the fishers to adapt to a new way of vessel operations. Further, modern electronic equipment such as NavIC (Navigation in Indian Constellation) messaging services, Distress Alert transmitter (DAT) and GEMINI (GAGAN Enabled Mariner's Instrument for Navigation and Information) have been developed by the government to support in navigational decision-making of the fishers. However, it has not been utilised by the fishers and hence cannot improve the decision-making capabilities of the fishers at sea. Thus, the fishing vessels could not be upgraded to the requirements of the latest requirements and the fishers could not develop their navigational knowledge and skills as required for deep-sea fishing activities.

Specialised training is needed for fishers to develop leadership qualities and decision-making abilities, besides enhancing knowledge and skill [13].

In addition, developing non-technical skills and skills for handling modern electronic equipment shall also be considered [8]. Hence, structured training for fishers is strongly recommended to enhance ocean navigational abilities, and improve fishing vessel construction on par with the international standard with proper signal masts for displaying day and night signals.

[This paper was presented in IMU's MARPOL CC Conference/February 2024]

References

[1] Tavacioglu, "The non-technical skills of bridge officers on ship navigation: An assessment in terms of interpersonal skills," *Indian J. Sci. Technol.,* vol. 13, no. 46, pp. 4587–4594, 2020, [Online]. Available: https://www.indjst.org/

[2] J. Wang, A. Pillay, Y. S. Kwon, A. D. Wall, and C. G. Loughran, "An analysis of fishing vessel accidents," *Accid. Anal. Prev.*, vol. 37, no. 6, pp. 1019–1024, 2005, doi: 10.1016/j.aap.2005.05.005.

[3] T. D'Cruz, *Artisanal Deep-Sea Fishing in Kerala : Prospects and problems,* no. 74. 2004.

[4] MMSU, "Annual Report Annual Report," *Mares,* no. December, pp. 2–2, 2020, [Online]. Available: https://www.pvh.com/-/media/Files/pvh/investor-relations/PVH-Annual-Report-2020.pdf

[5] S. A. Aziz and S. Abdullah, "A Seafarer : a Study of Celestial Navigation As Depicted in Arena Wati ' S Selected Works," vol. 2, no. 3, pp. 52–64, 2013.

[6] C. Wu, "A Comparative Study of the Astronomical Navigation Between Ancient China and Pacific Austronesian," pp. 187–206, 2021, doi: 10.1007/978-981-16-4079-7_8.

[7] R. Jane, *Electronic navigation*, vol. 4, no. 1. 2016.

[8] V. Fernando and P. Da, "Designing for Safe Maritime Navigation Studying Control Processes for Bridge Teams Department of Mechanics and Maritime Sciences," 2018.

[9] OCIMF, "A Guide to best practices for assessment," *Ocean. 2019 MTS/IEEE Seattle, Ocean. 2019*, 2019, doi: 10.23919/OCEANS40490.2019.8962405.

[10] A. Moll, "2020 Marine Accident Recommendations and Statistics," *Mar. Accid. Investig. Branch*, 2021, [Online]. Available: https://www.gov.uk/government/publications/maib-annual-report-2020

[11] M. B. Gillette, M. Arias Schreiber, and N. Siegrist, "Sweden's good fishers: Skills and values in a transforming social-ecological field," *Swedish J. Anthropol.*, vol. 5, no. 1–2, 2022.

[12] M. S. Chakravarty, V. R. G, and P. R. C. Ganesh, "Sea safety on traditional fishing crafts along Andhra Pradesh coast," *Int. J. Fisheires Aquat. Stud.*, vol. 4, no. 3, pp. 209–214, 2016.

[13] L. W. Jodice, G. Sylvia, M. Harte, S. Hanna, and K. Stokes, "The Training Managers for 21st Century Fisheries Initiative: Summary and Recommendations from the Inaugural International Workshop," *Elev. Bienn. Conf. Int. Inst. Fish. Econ. Trade*, 2002.

About the author

Ca. S. Viswanathan is attached to IMU Chennai Campus as Associate Professor in the School of Nautical Studies.

Dr. Ashutosh Apandkar is the Principal of TS Rahaman.

Dr. K. Sivasami is attached to IMU Chennai Campus as Associate Professor & Head of the School of Marine Engineering and Technology.

Email: viswanathans@imu.ac.in

A Study on Government Initiatives for Fishermen: Challenges in Implementation

Srikkanth, M. Sekar

Abstract:- *Inland and marine Fisheries, remain a significant source of income, food, foreign exchange and employment in India. Fishing including aquaculture culture contributes a significant portion for the economic growth and GDP. The sector provides livelihood for, roughly around 16.25 million fishers. India plays an important role in fish exports, in 2021-22 India was ranked the third largest producer of fish, with the production touching 16.24 million tonnes. The fisheries sector has a share of about 6.7 percent of total agriculture GVA, with an annual average growth rate of 7 percent since 2016–17.*

This paper examines the challenges experienced in the implementation of government initiatives to the fisherman like PMMSY (Pradhan Mantri Matsya Sampada Yojana) which consist of sustainable development in fishing, infrastructure development, modernising fishing technology, crafting a market oriented approach etc. The objectives of the study is to analyse whether government initiatives are accessible to the fisherman and to find out exactly the challenges faced in implementation of government schemes. The scope of the study covers the coastal communities (fisherman) from Thiruvanmiyur to Muttukadu in Chennai and the challenges in implementing the government initiatives.

The researcher has circulated structured questionnaire and conduct unstructured interviews with the fishing community is quite easy with fisherman and also the most free-flowing. It gives better flexibility in gathering participants' responses in a better way and can really get crux of the matter which in turn can meet the research objectives. The researcher has used thematic analysis, and simple percentage analysis for the study. The conclusion of the study may bring out the challenges faced in implementation of government policies and initiatives.

Keywords:- *Fishery, youth, government schemes, implementation*

Introduction

Tamil Nadu is a state located in the southernmost part of the Indian subcontinent. The state has huge cultural references in Tamil literature with regard to marine fisheries (Neithal land) since ancient times. The costal length of Tamil Nadu is 1076 km along the Bay of Bengal and 41,412 sq.km of continental shelf area with an Exclusive Economic Zone (EEZ) of 1.9 lakh sq.km. It is projected that 10.5 lakh costal fishermen live in 608 fishing villages in 14 districts [1] of Tamil Nadu. Fisheries sector besides generating employment, significantly contributes to the state's economy.

It is projected that 10.5 lakh costal fishermen live in 608 fishing villages in 14 districts [1] of Tamil Nadu

Several schemes are being implemented by the Government of India and state governments for upskilling and imparting new skills amongst marine fishermen. These schemes are intended to improve the quality of life of the fishermen community as well as increase the quantity of fish caught by adopting environmentally friendly practices and necessary safety measures in reduced fishing time.

Literature Review

Promotion of deep-sea fishing, measures to promote mariculture, and vessel modernisation stood out as the most significant areas under support for fixed cost inputs. Support levels vary significantly by year, with the highest values from FY 2016 to FY 2019 being seen in Tamil Nadu and Maharashtra. Subsidised diesel comes under the category support for variable-cost input for fishing. The idea is that the support would tend to encourage more fishing[2].

Though fishermen possess traditional knowledge and wisdom in fishing, their education level is very critical. Capacity building for sustainable fishing is critical to achieve targets in capture fisheries of India especially at fishermen level [3].

Education and training shall develop environmental awareness among fisherfolks that eventually lead to solve problems in costal and marine fishing and promote sustainable fisheries and sustainable livelihoods[4].

Fishing by the young students affect academic achievement mostly to the male students [5].

The fishermen use not only money, boats and fish to support their livelihood but may also draw on their family labour, physical strength, educational and professional skills, political influence, the social services provided by the state, infrastructure funded by taxpayers, and a host of other assets that policy and management interventions potentially support, undermine and redistribute[6].

The government can monitor the activities of small-scale fishing vessel through the Vessel Monitoring System (VMS). The fishermen are willing to learn this new technology and install them in their boats for their safety. Most of the fishermen are aware of the government subsidy extended by the government and it plays an important role to install this system in their boats as it alleviates the financial burden in procuring those devices to an extent [7].

Modernisation of fishing crafts and gears have contributed in terms of good catch and reduced the fishing time significantly and also contributes nutrition security and income to the nation. The awareness with respect to responsible fishing is must to maintain the sustainability of the aquatic resources[8] .

Awareness on free training programme provided by the government amongst the youth is substantially low. The study found that lower economic status and illiteracy of parents put the youth on pathetic condition as it reflect directly on their development in the field of education and employment [9].

There is less takers of benefits by the fishermen form the government schemes that focuses on welfare and health of the fishermen [10].

Methodology

The study was carried out at Injambakkam village, South Chennai coast, and Kanathur village, South Chennai coast, Tamil Nadu. Descriptive survey method was used to collect the data from 29 respondents by using simple random sampling method. Qualitative and quantitative techniques were adopted to conduct the study. The study was conducted for the following objectives:

1. To Analyse whether government initiatives are accessible to the fisherman
2. To Study the challenges faced in implementation of government schemes.

Data Analysis, Finding and Discussions

Gender of the respondents:

The respondents were all male. During the informal interview, the respondents informed that normally women will not go for marine fishing, whereas they would engage in inland fishing.

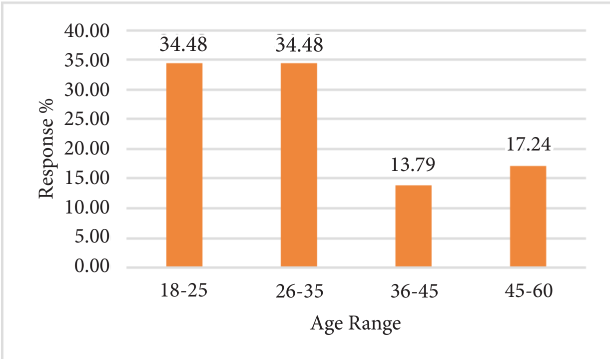


Figure 1. Age of the respondents

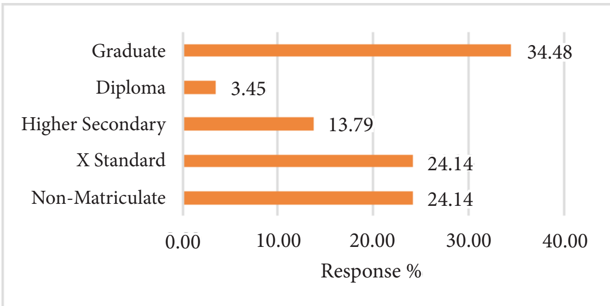


Figure 2. Level of Education

Findings from the **Figures 1 & 2:** Majority of the respondents were 35 years or less and 75% of the respondents were X standard and above. This shows that

THE MOST PROMISING MARITIME TRAINING INSTITUTE

THE INSTITUTE OF MARINE ENGINEERS (INDIA)

IMEI HOUSE, Plot No.94, Sector-19, Nerul, Navi Mumbai – 400 706

Email: training@imare.in Website: https://imare.in/

Phone no: +91 22 – 27711663 / 27701664, Mobile No: +91 8454847896

RANKED GRADE A1 (OUTSTANDING)

D. G. Shipping Approved Course

11 Days

AECS Course

Course Id - 1062

Assessment, Examination and Certification of Seafarers meets the guidelines provided in the IMO Model Course 3.12

Entry Criteria: Master (FG) / MEO Class I (FG) / GMDSS (GOC) / ETO COC Holder and TOTA / VICT Holder

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: 16th September 2024

Time: 9am - 5pm

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

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

For Registration:- CLICK HERE or click on - https://imeimum.marineims.com/course/register

FOR MORE INFORMATION, please email to training@imare.in or **contact on Mob: 8454847896 / Tel:-** 022 2770 1664 & 27711663

Or

Visit our Website: https://imare.in/

the sample population is mostly youth and may meet the criteria kept for availing training schemes.

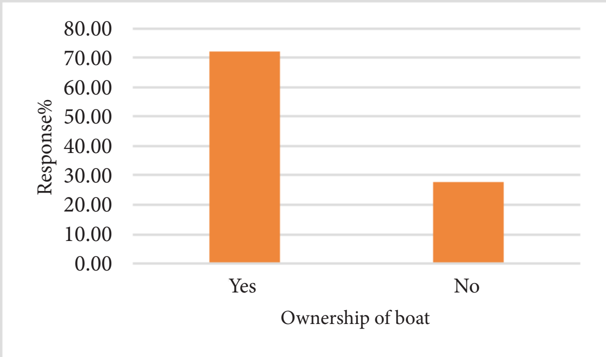


Figure 3. Ownership of boat

Findings from the above: Ownership of the boat may determine economic stability of the respondents. Majority of the respondents were owning boats and the others either hiring boats or work for others.

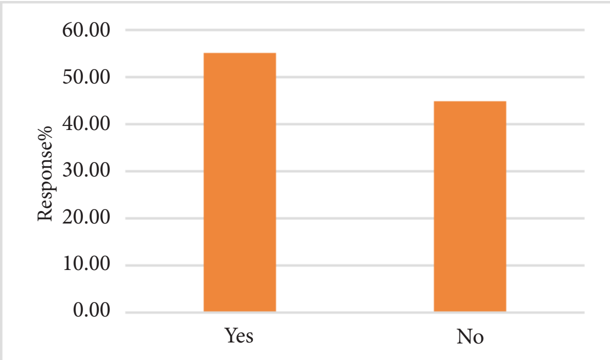


Figure 4. Employed in a fishing boat

Findings from the above: As regards employment of the respondents, most of the boat owners hire out their boats.

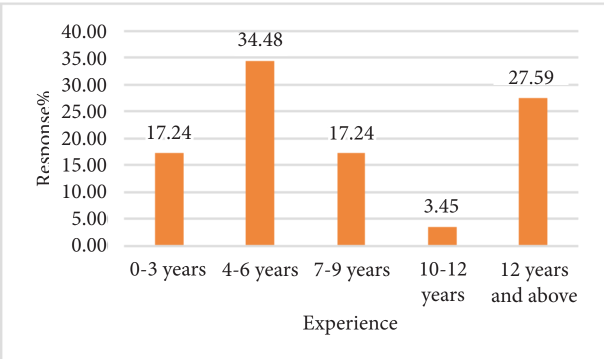


Figure 5. Experience of Marine Fishing

Findings from the above: Seventy-Three percentage of the respondents were having experience of marine fishing 12 years or less. It can be seen from the **Figures 1, 2 & 5** that the fisherfolks have begun their marine fishing career at very young age and the years of experience correlates with the age of the respondents.

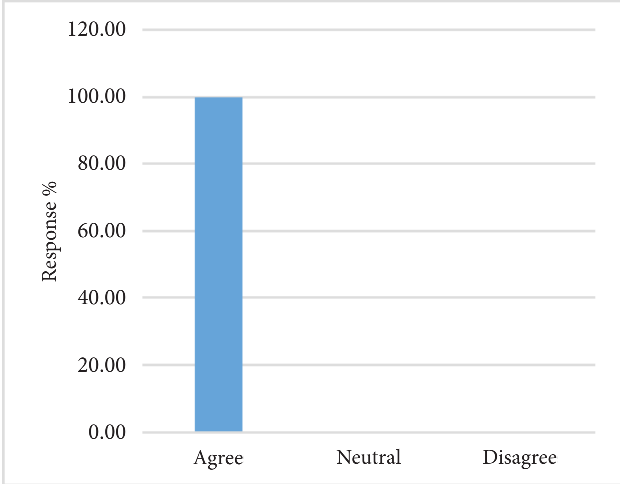


Figure 6. Your boats are using subsidised diesel facilities offered by Tamil Nadu State Apex Fisheries Co-operative Federation Limited (TAFCOFED)

Findings from the above: All the respondents were having awareness on subsidised diesel scheme of GoTN. During the informal interview, all the respondent stated that they are drawing subsidised diesel from the Neelankarai facility.

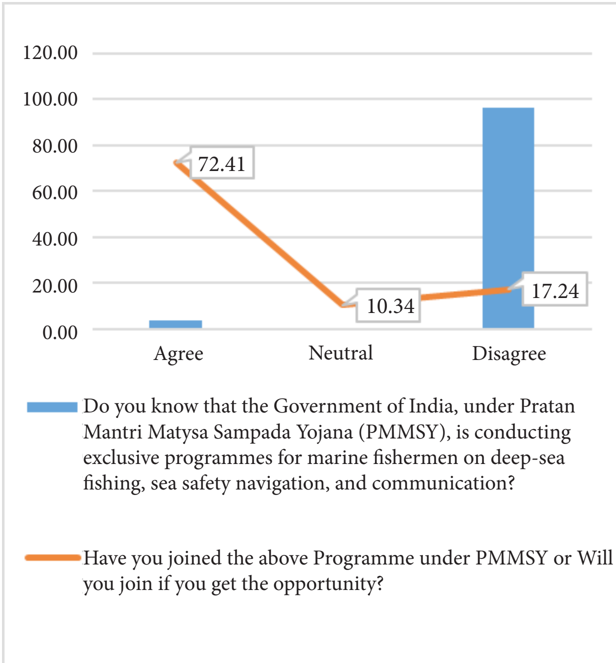


Figure 7. Awareness on GoI programmes for marine fishermen on deep-sea fishing, sea safety navigation, and communication

Findings from the above: Three percent of the respondents stated that they were aware of the scheme. Whereas, Ninety Seven percent of the respondents stated that they have no idea of the scheme. None of the respondents had undergone this training, however, Seventy Two percent of the respondent stated that they would undergo this training had we known.

THE INSTITUTE OF MARINE ENGINEERS (INDIA) MUMBAI BRANCH

&

VIKING MARITIME TRAINING INSTITUTE NAVI MUMBAI

VIKING MARITIME TRAINING INSITUTE

INSTRUMENTATION & AUTOMATION COURSE

Online and Offline
for Marine 3rd/Eng, 2nd/Eng, Ch/Eng & ETO.

Topics:-

- Intrumentation
- Process Control Engineering
- PLC / HMI
- Encoders, Proximity Sensors & Retentive Timers
- VFD
- Machine Communication
- PLC Based Boiler Firing Sequence Simulator
- Level and Flow Simulator

Offline Course :	Online Course:
Timing : 9 am to 5 pm daily (5 Days) Venue : Offline courses at VMTI, CBD Belapur, Navi Mumbai	Timing : 9 am to 5 pm daily (5 Days) Venue : Web Platform / Zoom

Contact Person for any queries:-
Ms. Anita Patill: +91-7350002757 , +91-9225516456
Ms. Neetha Nair: 91-9930977647
Email :training_mumbai@imare.in / mumbai@imare.in

Faculty Name : Mr. Kishore Khopkar , B.E.(Elect.)

Ex - Sr. Faculty for Marine Automation, Control Engineering and Electronics for Six Years at A.E.M.A., Karjat, and previous
30 Years of Sea and as Marine Superintendent Experience.

Registration Link : https://linktr.ee/imei.m

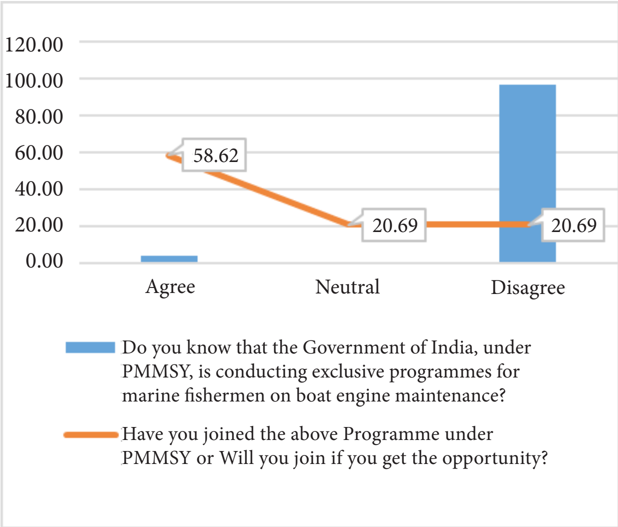


Figure 8. Awareness on GoI programmes for marine fishermen on boat engine maintenance

Findings from the above: Three percent of the respondents stated that they were aware of the scheme. Whereas, Ninety Seven percent of the respondents stated that they have no idea of the scheme. None of the respondents had undergone this training, however, Fifty Eight percent of the respondent stated that they would undergo this training had they known. It is also found that the interest in undergoing boat maintenance training is slightly less as it requires some technical knowledge.

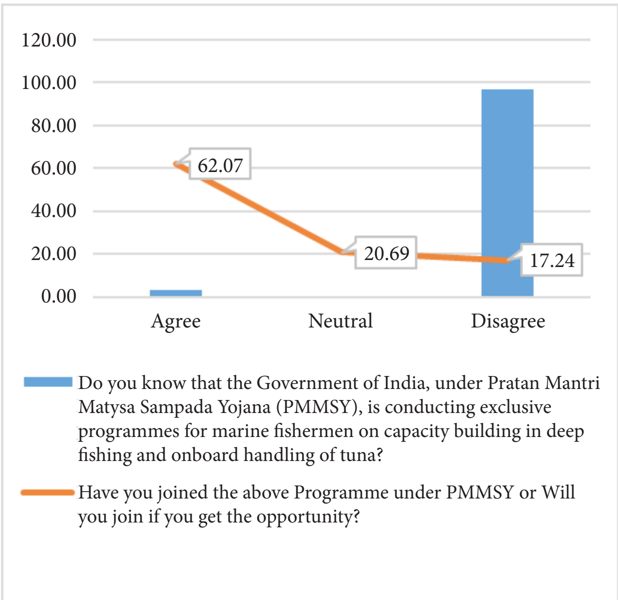


Figure 9. Awareness on programmes for marine fishermen on capacity building in deep fishing and onboard handling of tuna

Findings from the above: Three percent of the respondent stated that they were aware of the scheme. Whereas, Ninety Seven percent of the respondent stated that they have no idea of the scheme. No respondent had undergone this training, however, Sixty Two percent of the respondents stated that they would undergo this training had they known. The other did not show interest on deep sea fishing.

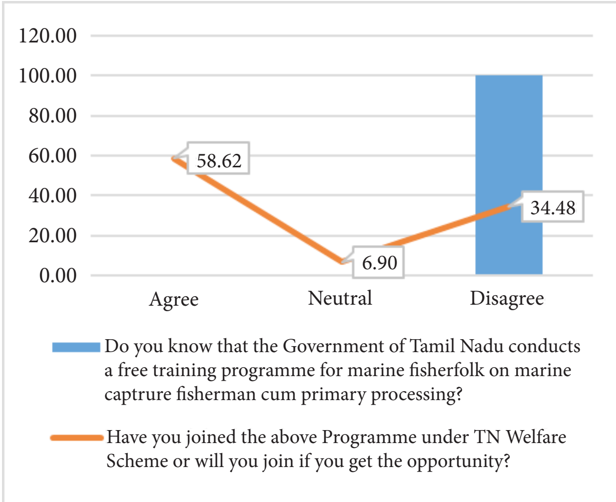


Figure 10. Awareness on GoTN programme for marine fisherfolk on marine capture cum primary processing

Findings from the above: None of the respondents were aware of the scheme. Fifty Eight percent of the respondents stated they would undergo this training had they known. As this training has classroom type of interaction and extend for a week, the respondents stated that they would be left with no business for a week if they go for this training.

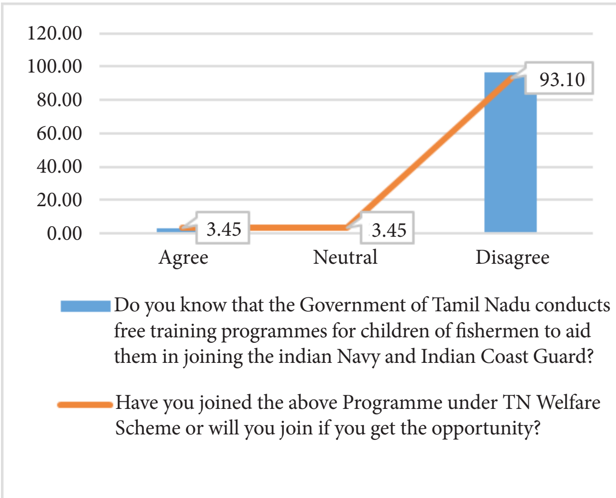


Figure 11. Awareness on GoTN programmes for children of fishermen to aid them in joining the Indian Navy and Indian Coast Guard

Findings from the above: Three percent of the respondents stated that they were aware of the scheme. Whereas, Ninety Seven percent of the respondents stated that they have no idea of the scheme. One of the respondents stated that he was trying to enrol himself for the training programme. Since joining Navy and Indian Coast Guard have age restriction, Ninety Three percent of the respondents stated that they won't join this programme.

Institute of Marine Engineers (India)

Kochi Branch

1st floor, Kamalam Towers48/200(B1), Narayananasan Road,
Vytilla, Kochi-682019

❖ TRAINING : Our Institute with Grade A1 (Outstanding) Certification offers the following DGS Approved courses

- MEO Class I Preparatory Course: 2 Months Duration
  - course scheduled based on demand
- MEO Class II Preparatory Course : 4 Months Duration
  - Admissions every month
- Refresher and Updating Training course for all Engineers
  - course scheduled based on demand

❖ OTHER ACTIVITIES :

- Organises Technical Meetings & Seminars for Mariner Engineers & seafarers.
- Facilitates joining the Institute as a Member of The Institute of Marine Engineers (India).
- **Benefits of membership**: Free access to campus library facilities and IMarEST UK Student membership, Fee discount for the courses conducted by us, Eligibility for scholarships, aid and research funding, publishing opportunities for original technical articles/research work & sponsors members for national & international seminars.
- Free advice on technical matters and opportunity to attend any specific session

Email us for Enquiries & Course booking at kochi@imare.in

Contact no. : +91- 7025159111

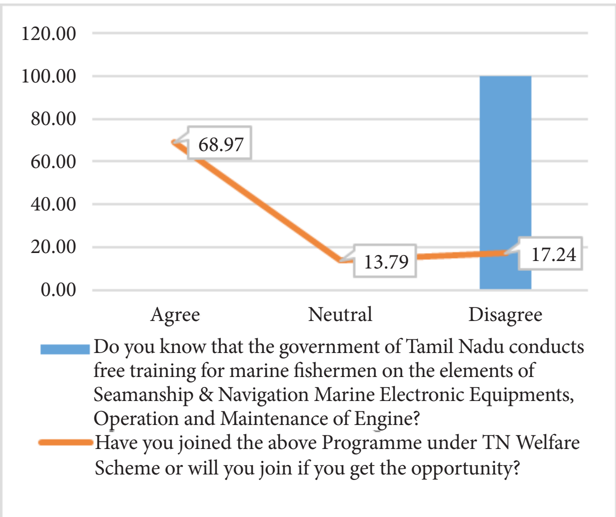


Figure 12. Awareness on GoTN programme for marine fishermen on the elements of Seamanship & Navigation Marine Electronic Equipment's, Operation and Maintenance of Engine

Findings from the above: None of the respondents were aware of the scheme. Sixty Nine percent of the respondents stated they would undergo this training had they known. Since the training requires some technical knowledge, Thirty Percent of the respondents did not show interest.

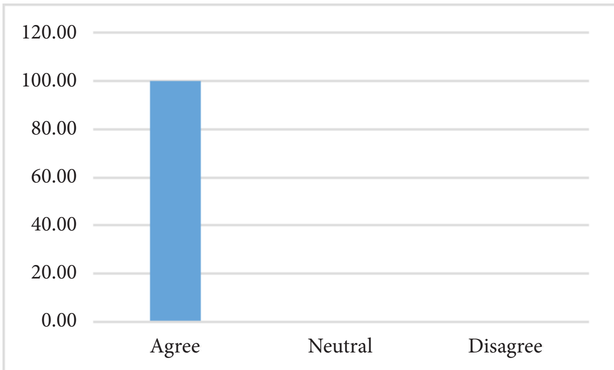


Figure 13. Your boats are fitted with Auto-Identification System-enabled GPS devices, which facilitate easy tracking and rescue in the event of technical snags in mid-sea?

THE MOST PROMISING MARITIME TRAINING INSTITUTE

THE INSTITUTE OF MARINE ENGINEERS (INDIA)

IMEI HOUSE, Plot No.94, Sector-19, Nerul, Navi Mumbai – 400 706

Email: training@imare.in Website: www.imare.in

Phone no: +91 22 – 27711663 / 27701664, Mobile No: +91 8454847896

RANKED GRADE A1 (OUTSTANDING)

D. G. Shipping Approved IGF Courses

★ Basic IGF
Course Id-5311

Basic Training for Ships using Fuels covered within

5 Days

★ Advanced IGF
Course Id-5312

Advanced Training for Ships using Fuels covered within IGF

5 Days

Course Dates:

Basic IGF: 05th August 2024/ 26th August 2024/ 02nd September 2024/ 10th September 2024

Advanced IGF: 20th August 2024/ 23rd September 2024

Time: 8:30am - 4:30pm

Registration Link: https://imeimum.marineims.com/course/register

MEO CL-I (FG)	2 months	02nd Sept 2024/ 02nd Nov 2024	Rs. 30000/-	CLICK HERE
MEO (CEO – NCV)	2 months	02nd November 2024	Rs. 30000/-	CLICK HERE
MEO CL-II (FG) - NEW	4 Months	01st Aug 2024 / 02nd Sept 2024/ 01st Oct 2024 / 02nd Nov 2024 / 01st Dec 2024	Rs. 40000/-	CLICK HERE
MEO (SEO – NCV) Part-A	2 months	1st August 2024	Rs. 28000/-	CLICK HERE
MEO (SEO – NCV) Part-B	4 Months	02nd Nov 2024	Rs. 40000/-	CLICK HERE
MEO. CL-IV NCV	4 Months	2nd January 2025	Rs. 36000/-	CLICK HERE
Diesel Engine Gas Combustion Simulator for MEO Class I	3 Days	29th August 2024/ 2nd September 2024/ 5th September 2024/ 29th October 2024/ 4th November 2024/ 7th November 2024/ 28th December 2024	Rs. 12000/-	CLICK HERE
Engine Room Simulator Management Level for MEO Class II	5 Days	27th Aug 2024/ 2nd Sep 2024/25th Sep 2024/ 1st Oct 2024/ 26th Oct 2024/ 1st Nov 2024/ 26th Nov 2024/ 2nd Dec 2024/ 26th Dec 2024	Rs.14000/-	CLICK HERE
Engine Room Simulator Operational Level for MEO Class IV	3 Days	7th August 2024	Rs. 7500/-	CLICK HERE
Refresher Updating Training Course for all Engineers (RUCE)	3 Days	7th August 2024/ 22nd August 2024	Rs. 7000/-	CLICK HERE
Basic Training for Ships using Fuels covered within IGF code Course	5 Days	22nd July 2024/ 05th August 2024/ 26th August 2024/ 02nd September 2024/ 10th September 2024	Rs. 15500/-	CLICK HERE
Advanced Trg. for Ships using Fuels covered within IGF code	5 Days	20th August 2024/ 23rd September 2024	Rs. 21500/-	CLICK HERE
Assessment, Examination and Certification of Seafarers	10 Days	16th September	Rs. 15500/-	CLICK HERE

Findings from the above: All the respondents were aware of the GPS devices. The respondents stated that their boats either fitted with GPS devices or use GPS app in mobiles for the same.

Recommendations and Conclusion

Creating awareness about the government scheme amongst the fishermen is the way forward. The following recommendations can be made to increase the awareness of the government schemes:

1. Bill boards may be placed at the fuel station where the fuel subsidy is being given, and the scheme details may be displayed.
2. Further, Fisheries depart-ment may prepare a yearly or half-yearly training calendar and the details may be disseminated through flyers.
3. Most of the coastal fishermen are sailing on registered and licensed boats. Details of the schemes may be sent to their registered mobile numbers as a WhatsApp message in both English and the local language.
4. Government and private schools located in the fishing hamlets may be informed to display the schemes regarding skill development, and awareness programs may be conducted.
5. At present, the training programmes are being conducted in Chennai; steps may be taken by the government to extend them to all the coastal districts.
6. Fishermen find it difficult to commute to the training centre; steps may be taken by the training institute to plan for TA and DA. Further, hostel facilities may be explored.
7. The association for fishers may arrange road show to populate the schemes rolled out by the government.

The number of beneficiaries' slots available for the free training of each programme ranges from 20 to 50, and the number of batches per year is in the range of 5 to

THE MOST PROMISING
MARITIME TRAINING INSTITUTE

RANKED GRADE A1
(OUTSTANDING)

D. G. Shipping
Approved Course

Basic Training for Liquefied Gas Tanker Cargo Operations (GASCO)

Commencing soon

Course Id – 5121
05 Days

COURSE FEE
RS. 6500/-

Click Here to Book Now

For any queries:

training@imare.in 022 2770 1664 & 27711663

8454847896

IMEI HOUSE, Plot No.94, Sec-19, Nerul, Navi Mumbai – 400 706

Visit: https://imare.in/

50, or on a request basis. This shows that the number of beneficiaries for the free training programmes would be less than 2000 per year in Tamil Nadu. The central and state governments may take the necessary action to increase the batches over the year. By and large the fishers are not getting enough information about the government schemes to the fullest extent.

It is found that the young fishermen are ready to enrol themselves in the training programmes offered at no cost by both the central government and the state government, though they were not initially aware of the schemes. This study has limitations as the primary respondents are from only two villages and the respondents are less than thirty.

[This paper was presented in IMU's MARPOL CC Conference/February 2024]

References

[1] Handbook on Fisheries Statistics 2022.

[2] S. Sharma, C. Bellmann, C. Beaton, and A. Pant, Supporting Marine Fishing Sustainably: A review of central and state government support for marine fisheries in India GSI REPORT, 2021. [Online]. Available: www.iisd.org/gsi

[3] D. A. Ramesh and N. K. Karthi, Studies on education and skill development of coastal fishing community for sustainable livelihood, in *Sustainable Development through Education*, 2017, pp. 146–160. [Online]. Available: https://www.researchgate.net/publication/321347791

[4] M. Sangaralingam, Role of education and awareness in empowering coastal communities for the conservation and sustainable use of fishery, natural and marine resources, 2010.

[5] S. Das and J. Das, Characterizing the educational status of students from the fishermen families at Fraserganj Coastal Village, Indian Sundarbans, *Pramana Research Journal*, vol. 11, no. 9, pp. 1–17, 2021, [Online]. Available: https://www.researchgate.net/publication/354323239

[6] E. H. Allison and B. Horemans, Putting the principles of the Sustainable Livelihoods Approach into fisheries development policy and practice, *Mar Policy*, vol. 30, no. 6, pp. 757–766, Nov. 2006, doi: 10.1016/J.MARPOL.2006.02.001.

[7] S. B. Raghu and D. Ancy, A Case Study Analysis of VMS and Its Implementations in Small Scale Fisheries, 2022. [Online]. Available: http://ymerdigital.com

[8] S. Kaur and S. N. Datta, IMPROVISING INDIAN FISHING TECHNOLOGY : MODERNIZATION, IMPACTS AND STRATEGIES FOR SUSTAINABLE FISHERIES, *Article in Journal of Experimental Zoology*, vol. 24, no. 2, pp. 1071–1076, 2021, [Online]. Available: https://www.researchgate.net/publication/353862537

[9] J Lakshmi, K B Inian, and K Sathyamurthi, EDUCATIONAL AND EMPLOYMENT PROBLEMS OF YOUTH AMONG FISHERMAN COMMUNITY AT THIRUVOTRIYUR KUPPAM, CHENNAI, TAMIL NADU, pp. 190–197, 2023, [Online]. Available: https://www.researchgate.net/publication/373076223

[10] S Jayaselvi, AN ECONOMIC AND HEALTH STATUS OF FISHERMEN IN TIRUCHENDUR, *Shanlax International Journal of Arts, Science & Humanities*, vol. 4, no. 1, pp. 35–52, 2016.

About the author

E. Srikanth is attached to the Indian Maritime Unviersity as an Assistant Registrar. Currently, he is pursuing his research.

Email: esrikkanth@imu.ac.in

Dr. M. Sekar is attached to IMU Chennai Campus as an Assistant Professor in the School of Maritime Management.

Artificial Intelligence & Machine Learning In Maritime Training & Education – The Way Forward

Anand Subramanian, Tirth Vakil

Abstract: Artificial Intelligence (AI) and Machine Learning (ML) are two related fields of computer science that aim to create systems that can perform tasks that normally require human intelligence, such as reasoning, learning, decision making, and problem solving. AI and ML have been applied to various domains, including the maritime industry, where they offer potential benefits for improving efficiency, safety, sustainability, and competitiveness.

This paper discusses the application of AI & ML specifically in Maritime Education & Training sector.

India is a power house in Information Technology sector. We can develop the required AI / ML software, Simulators, AR / VR graphics under Make-In-India and Atma Nirbhar Bharat initiatives.

This will put India back in forefront of Maritime Training.

Keywords: Maritime Training & Education; AI & ML; Safety of Life.

Narrow AI refers to systems that can perform specific tasks or functions, such as speech recognition, image analysis, or game playing. General AI refers to systems that can perform any intellectual task that a human can do, such as understanding natural language, reasoning, or creativity

1. WHAT ARE AI AND ML?

Artificial Intelligence or AI is a broad term that encompasses different types of systems that can mimic or augment human intelligence. AI systems can be classified into two categories: Narrow AI and General AI. Narrow AI refers to systems that can perform specific tasks or functions, such as speech recognition, image analysis, or game playing.

General AI refers to systems that can perform any intellectual task that a human can do, such as understanding natural language, reasoning, or creativity. General AI is still a hypothetical concept that has not been achieved yet.

Machine Learning or ML is a subfield of AI that focuses on creating systems that can learn from data and experience, without being explicitly programmed. ML systems use algorithms and statistical models to identify patterns and make predictions based on the input data. ML systems can be divided into three types: supervised learning, unsupervised learning, and reinforcement learning. Supervised learning refers to systems that learn from labelled data, such as images with captions or texts with categories. Unsupervised learning refers to systems that learn from unlabelled data, such as images without captions or texts without categories. Reinforcement learning refers to systems that learn from their own actions and feedback, such as a robot that learns to navigate an environment.

ML systems can be divided into three types: supervised learning, unsupervised learning, and reinforcement learning

2. HOW ARE AI AND ML USED IN THE MARITIME INDUSTRY?

AI and ML have been used in various aspects of the maritime industry, such as navigation, communication, operation, maintenance, security, logistics, and management.

Some examples of AI and ML applications in the maritime industry are:

a. Autonomous ships: These are ships that can operate without human intervention or with minimal human supervision. Autonomous ships use sensors, cameras, radars, GPS, and other devices to collect data about their surroundings and use AI and ML algorithms to process the data and make decisions. Autonomous ships can improve safety, efficiency, fuel consumption, and environmental impact of maritime transportation.

b. Collision avoidance: This is a system that helps ships avoid collisions with other vessels or obstacles by using AI and ML techniques to analyse the data from the Automatic Identification System (AIS), radar, sonar, and other sources. Collision avoidance systems can alert the crew or take control of the ship in case of emergency situations.

c. Predictive maintenance: This is a system that monitors the condition of the ship's equipment and components and uses AI and ML methods to predict failures or malfunctions before they occur. Predictive maintenance systems can reduce downtime, repair costs, accidents, and environmental damage.

d. Maritime security: This is a system that uses AI and ML tools to detect and prevent threats such as piracy, terrorism, smuggling, or cyber-attacks. Maritime security systems can use image recognition, natural language processing, anomaly detection, or facial recognition to identify suspicious activities or persons and alert the authorities or take countermeasures.

e. Maritime logistics: This is a system that uses AI and ML techniques to optimise the planning, scheduling, routing, loading, unloading operations etc.

AI & ML use has not been harnessed as yet in Maritime Education and Training.

Artificial intelligence (AI) and Machine Learning (ML) are two of the most promising technologies that have the potential to transform various sectors, including maritime education and training. This article will explore the pros and cons of using AI and ML in maritime training, and discuss some of the challenges and opportunities that lie ahead.

Figure 1. VR Set for Training (AI Generated)

3. USE CASE OF AI & ML IN MARITIME EDUCATION & TRAINING

AI and ML are branches of computer science that aim to create systems that can perform tasks that normally require human intelligence, such as perception, reasoning, decision making, learning, and adaptation.

AI and ML can be applied to various aspects of maritime cadets training, such as:

a. Simulation and Virtual Reality: AI and ML can enhance the realism and interactivity of simulators and virtual reality environments, which can provide cadets with immersive and realistic scenarios for learning and practicing various skills, such as navigation, communication, collision avoidance, emergency response, etc. AI and ML can also enable adaptive learning, where the system can adjust the level of difficulty and feedback according to the cadet's performance and progress.

For example, the Maritime AI-NAV Project is developing an AI-based navigation simulator that can generate realistic maritime traffic scenarios and provide personalised feedback to the cadets.

b. Data analysis and feedback: AI and ML can help collect, analyse, and interpret large amounts of data from various sources, such as sensors, cameras, GPS, etc., which can provide cadets with valuable insights and feedback on their performance, strengths, weaknesses, areas for improvement, etc. AI and ML can also help identify patterns, trends, anomalies, risks, and opportunities in the data, which can help cadets improve their situational awareness and decision making.

For example, the Maritime Data Science Project is using ML to analyse data from various sensors on board ships to detect faults, optimise fuel consumption, predict maintenance needs, etc.

c. Personalisation and customisation: AI and ML can help tailor the training content and methods to the individual needs, preferences, goals, and learning styles of each cadet. AI and ML can also help create personalised learning paths and schedules for each cadet, which can optimise their learning outcomes and efficiency.

For example, the Maritime Adaptive Learning Project is using AI to create adaptive learning modules that can

THE INSTITUTE OF MARINE ENGINEERS (INDIA)
MUMBAI BRANCH

Hydraulics Workshop – Skill Upgradation Course (Online)

for Marine Engineers, Electro Techno Officers & Superintendents

Faculty Name : Mr. Pravin R Marathe, Ex- Chief Engineer (MEO Class I)

OBJECTIVES:-

- To understand Principle of operation of various hydraulic equipments suchs as pumps, control valves and actuators.
- To understand the symbolic representation of various hydraulic equipments so as to read and analyse the hydraulic circuit diagrams.
- To know the correct dismantling and assembly procedure for various hydraulic equipments.
- To understand safe operation and trouble shooting of hydraulic systems.

Venue : Web Platform / Zoom

Time: 0900 hrs to 1700 hrs

Fees :
Members - Rs. 11,800/- (Inclusive of GST)
(IMEI, CMMI and INA Members)

Non Members - Rs. 14,160/- (Inclusive of GST)

MORE INFORMATION

Ms. Anita Patill: +91-7350002757 , +91-9225516456
Ms. Neetha Nair: 91-9930977647

www.linktr.ee/imei.m

training_mumbai@imare.in /
mumbai@imare.in

adapt to the cadet's prior knowledge, learning pace, and feedback.

d. Collaboration and communication: AI and ML can facilitate collaboration and communication among cadets, instructors, mentors, peers, etc., through various platforms and tools, such as catboats, voice assistants, social media, etc.

AI and ML can also help create a supportive and engaging learning community, where cadets can share their experiences, challenges, solutions, feedback, etc.

Figure 2. Gamification Scoreboard (AI Generated)

For example, the Maritime Chatbot Project is developing a conversational agent that can answer questions, provide guidance, and offer encouragement to the cadets.

4. WHAT ARE THE LATEST AI / ML TOOLS FOR TRAINING MARITIME CADETS IN TRAINING INSTITUTES.

a. Adaptive Learning: Adaptive learning is a method of delivering personalised and optimised learning experiences to each learner, based on their individual needs, preferences, and performance. Adaptive learning systems use AI and ML algorithms to analyse the learner's data, such as their prior knowledge, learning goals, progress, feedback, and behaviour, and then adjust the content, pace, difficulty, and sequence of the learning materials accordingly. This way, adaptive learning can provide a tailored and engaging learning experience for each maritime cadet, while also reducing the cognitive load and enhancing the retention and transfer of knowledge.

b. Virtual Reality (VR): VR is a technology that creates an immersive and realistic simulation of a three-dimensional environment, where the learner can interact with various elements using a headset and controllers. VR can be used to create realistic scenarios and environments that are relevant to the maritime industry, such as ship navigation, engine room operation, cargo handling, emergency response, etc. VR can provide a safe and cost-effective way for maritime cadets to practice their skills and gain hands-on experience in various situations, without the risks and limitations of real-world training.

c. Gamification: Gamification is a technique that applies game elements and mechanics, such as points, badges, levels, leader boards, challenges, etc., to non-game contexts, such as education and training. Gamification can increase the motivation, engagement, and enjoyment of learners by making the learning process more fun and rewarding. Gamification can also foster a sense of competition and collaboration among learners, as well as provide feedback and recognition for their achievements. Gamification can be applied to various aspects of maritime training, such as quizzes, simulations, assignments, etc., to make them more interactive and appealing for maritime cadets.

Gamification can be applied to various aspects of maritime training, such as quizzes, simulations, assignments, etc., to make them more interactive and appealing for maritime cadets

By using these tools, maritime educators can create more effective and efficient learning experiences for their students, while also preparing them for the challenges and opportunities of the maritime industry in the digital age.

5. USE OF AI / ML BY MARINE SHIP OWNERS FOR TRAINING MARITIME CADETS ONBOARD & ADMINISTRATION FOR ASSESSING THEIR PERFORMANCE:

AI and ML are powerful tools that can enhance the training of maritime cadets onboard ships. AI and ML can help ship owners to design personalised and adaptive learning programs, monitor the progress and performance of the cadets, provide feedback and guidance, and assess the competencies and skills of the cadets. AI and ML can also enable the use of immersive technologies, such as virtual reality (VR) and augmented reality (AR), to create realistic and engaging simulations of various scenarios and tasks that the cadets may encounter in their future careers. By using AI and ML, ship owners can improve the quality and efficiency of the training, reduce the costs and risks, and prepare the cadets for the challenges and opportunities of the maritime industry.

AI and ML can help maritime administrations to design and implement objective, fair, and reliable assessment methods that can measure the knowledge, skills, and attitudes of maritime cadets. For example, AI and ML can be used to create adaptive and personalised tests that can adjust the difficulty and content of the questions based on the cadet's responses and learning progress. AI and ML can also be used to analyse the data collected from the tests, such as the response time, accuracy, confidence level, and feedback of the cadets, to generate insights and recommendations for improving their learning outcomes.

Moreover, AI and ML can help maritime administrations to monitor and evaluate the practical training and on-board experience of maritime cadets, which are essential for developing their professional competencies and readiness for the real-world challenges. For instance, AI and ML can be used to create realistic and immersive simulations that can mimic the scenarios and situations that cadets may encounter at sea, such as navigation, communication, emergency management, teamwork, etc. AI and ML can also be used to track and record the performance and behaviour of cadets during the simulations, such as their actions, decisions, reactions, interactions, etc., to provide feedback and guidance for enhancing their skills and confidence.

By using AI and ML, maritime administrations can ensure that the cadets are well-prepared and qualified for their future careers in the maritime sector.

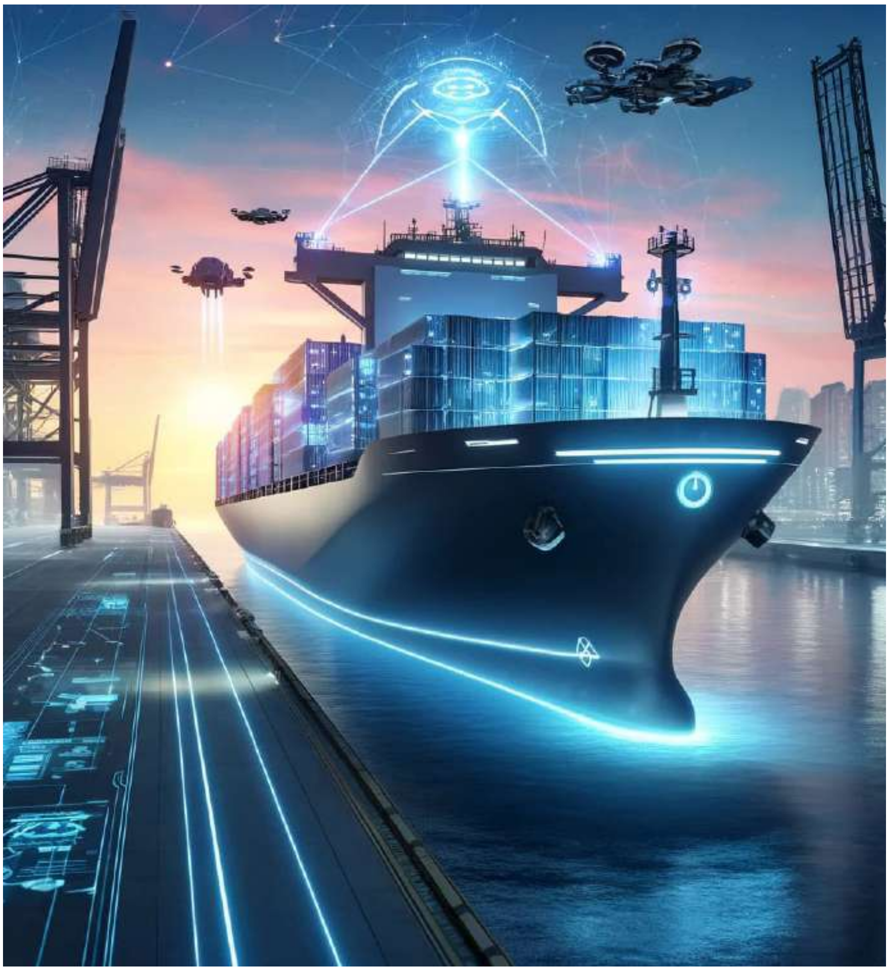
> **AI and ML can also be used to analyse the data collected from the tests, such as the response time, accuracy, confidence level, and feedback of the cadets, to generate insights and recommendations for improving their learning outcomes**

6. USE OF AI / ML IN WORKSHOP & LAB TRAINING:

AI and ML can help cadets learn from data, simulations, feedback, and scenarios that are relevant to their field of study. Some examples of how AI and ML can be used for maritime training are:

a. Data analysis: Cadets can use AI and ML tools to collect, process, and visualise data from various sources, such as sensors, cameras, radars, sonars, and satellites. This can help them understand the patterns, trends, and anomalies in the maritime environment and make informed decisions.

b. Simulation: Cadets can use AI and ML to create realistic and immersive simulations of maritime operations, such as navigation, manoeuvring, communication, collision avoidance, and emergency response. This can help them practice their skills, test their knowledge, and improve their performance in a safe and controlled environment.



How to prevent or mitigate the potential biases, errors, harms, abuses, etc., that may arise from the use or misuse of AI and ML?

How to balance the human-machine interaction and collaboration in a way that respects the dignity, autonomy, and agency of both parties?

b. Technical challenges: AI and ML face various technical challenges that need to be overcome before achieving their full potential in maritime cadets training.

For example, how to ensure the quality, reliability, accuracy, robustness, scalability, etc., of the data and systems used in AI and ML?

How to deal with the uncertainty, complexity, dynamism, and diversity of the maritime domain and scenarios?

How to integrate AI and ML with other technologies and systems in a seamless and interoperable way?

c. Human factors: AI and ML also depend on various human factors that need to be considered when using them in maritime cadets training.

For example, how to design, develop, implement, evaluate, and improve the AI and ML systems in a user-cantered and participatory way?

How to ensure the usability, accessibility, affordability, acceptability, etc., of the AI and ML systems for the cadets, instructors, mentors, peers, etc.?

How to foster the skills, knowledge, attitudes, values, etc., that are needed for effective use of AI and ML?

AI and ML are powerful technologies that can offer many benefits for maritime cadets training. However, they also pose some challenges and risks that need to be carefully considered and addressed. Therefore, it is important to adopt a balanced and responsible approach when using AI and ML in maritime cadets training.

c. Feedback: Cadets can use AI and ML to receive personalised and adaptive feedback from instructors, mentors, peers, and systems. This can help them identify their strengths, weaknesses, gaps, and errors in their learning process and improve their competence and confidence.

d. Scenarios: Cadets can use AI and ML to generate and explore various scenarios of maritime situations, such as weather conditions, traffic patterns, hazards, threats, and incidents. This can help them develop their critical thinking, problem-solving, creativity, and teamwork skills.

7. DRAWBACKS AND LIMITATIONS IN USE OF AI / ML FOR MARITIME TRAINING:

Artificial intelligence (AI) and machine learning (ML) are powerful tools that can enhance the Maritime training. However, AI and ML also have some drawbacks and limitations that need to be considered when using them in maritime cadets training.

Some of these are:

a. Ethical and social issues: AI and ML raise various ethical and social issues that need to be addressed before deploying them in maritime cadets training. For example, how to ensure the privacy, security, transparency, accountability, fairness, trustworthiness, etc., of the data and systems used in AI and ML?

8. MISUSE OF AI & ML IN EXAMS AND ASSESSMENT:

AI & ML can pose some challenges and risks, especially when they are used in exams. Some of the ways that AI and ML can be misused in exams are:

a. Ethics: Educators and developers should adhere to ethical principles and standards when designing, implementing, and evaluating AI and ML systems for exams. For example, they should ensure that the systems are fair, transparent, accountable, and respectful of human dignity and rights.

THE MOST PROMISING
MARITIME TRAINING INSTITUTE

RANKED GRADE A1
(OUTSTANDING)

D. G. Shipping
Approved Course

Advanced Training for Chemical Tanker Cargo Operations (CHEMCO)

Commencing soon

10 Days

COURSE FEE
RS. 9900/-

Click Here to Book Now

For any queries:

training@imare.in 022 2770 1664 & 27711663

8454847896

IMEI HOUSE, Plot No.94, Sec-19, Nerul,
Navi Mumbai – 400 706

Visit: https://imare.in/

b. Education: Students and teachers should be aware of the potential benefits and risks of AI and ML for exams. For example, they should learn how to use the systems responsibly, critically, and creatively. They should also learn how to protect their privacy and security online.

c. Regulation: Policymakers and regulators should establish and enforce laws and policies that govern the use of AI and ML for exams. For example, they should define the scope, purpose, and limits of the systems. They should also monitor and audit the systems for compliance and quality.

9. CONCLUSION

Artificial Intelligence & Machine Learning has a lot of potential in being used as a potent tool in Maritime Education & Training. It makes intensive use of technology which is readily available but it requires Maritime educators to adapt the technology to the special needs of Maritime Training. All those involved in Maritime training – Administration, Training Institute and Trainers – should be well aware of the potential benefits of AI & ML. They should also be careful that this technology is not misused. India is a power house in IT & ITES sector. We can develop the required AI / ML software, Simulators, AR / VR graphics under Make-In-India and Atma Nirbhar Bharat initiatives.

This will put India back in forefront of Maritime Training.

[This paper was presented in the GLOMARS 2024 Conference in March 2024]

References

[1]. AI & ML : https://ai.engineering.columbia.edu/ai-vs-machine-learning/
[2]. Use of AI & ML In Maritime Sphere: https://nexoode.com/blog/posts/ai-in-maritime-artificial-intelligence-solutions-in-the-shipping-sector/
[3]. Maritime AI Nav Project: https://maritimeai.wordpress.com/
[4]. Maritime Science Data Project: https://marine-digital.com/article_data_analytics_in_maritime
[5]. Maritime Adaptive Learning Project: https://nordicroads.com/eu-project-on-ai-and-machine-learning/
[6]. Maritime Chatbot : https://navguidesolutions.com/custom-maritime-ai-chatbot/
[7]. VR, AR & MR https://www.intel.com/content/www/us/en/tech-tips-and-tricks/virtual-reality-vs-augmented-reality.html
[8]. Gamification of Learning: Kapp, Karl (2012). The Gamification of Learning and Instruction: Game-based Methods and Strategies for Training and Education. Pfeiffer. ISBN 978-1118096345.

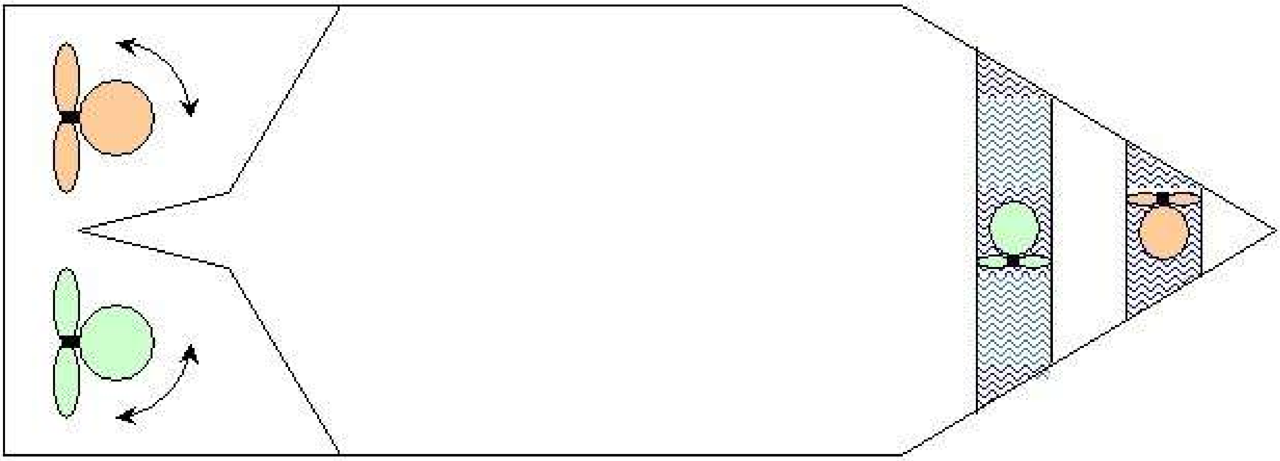
About the author

Ca. Anand Subramanian joined sea in 1995 and sailed on various kinds of ships, and became Captain in 2007. His sea career spans about 23 years with 12 years as Master. Since 2018 has been with HIMT Pre-sea College. Presently he is serving as Principal of HIMT College.

Email: principal@himtcollege.com

Tirth S Vakil is currently working as an Operations Manager at HIMT College. He holds a MSc in Maritime Affairs and specialisation in Maritime Education and Training from the World Maritime University Malmo, Sweden.

Failure of Azimuth Thruster



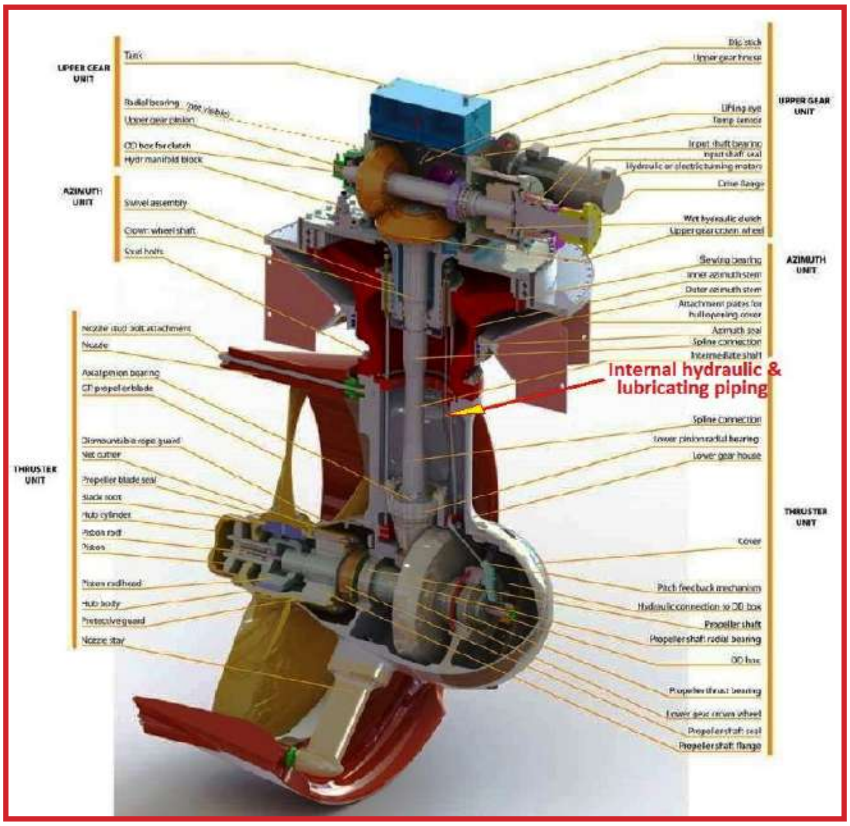
Ramesh Vantaram

Summary

The following Incident Report pertains to an Azimuth Thruster installed on an Offshore Supply vessel that failed whilst the vessel was in the offshore field. This is a classic case of Single Point of Failure (SPOF) that occurred while the vessel was in operation. Fortunately, the OSV was not in the 500-metre zone of the offshore installation. Immediately after the incident occurred the OEMs were contacted, but their Representative could not attend the vessel due to some other commitments. Owners therefore decided to address the problem independently. After a process of elimination, it was concluded that the issue was with the Azimuth Thruster. During the repair it was found that the torque pin had sheared off and had to be replaced. The simple solution would have been to replace the sheared torque pin with a replica. However this was not an option as the system would once again plunge the system into a SPOF mode.

Owners obviously did not have the wherewithal to delving into any kind of detailed design calculations with regard to the torque transmission load. The torque pin was not only replaced but also redundancy factor was included. Instead of a single 5mm diameter torque pin, 6 Nos. of 16.5 mm diameter torque pins were introduced. Looks like an over-kill, but it was better to err on the side of caution! The vessel underwent the necessary repair/modification and was put back into service. There was no problem encountered over the next 6 months when the vessel was dry-docked for the Statutory Docking Survey.

Based on Owner's feedback, the Maker went back to the drawing board and reviewed the design. They came up with a design modification what they called a Swivel Assembly Upgrade. They had incorporated 3 torque pins of 10mm diameter! Adequate redundancy was provided. The torque transmission sequence was retained as the initial design. The new assembly was installed during the next dry-docking at their cost.



NOMENCLATURE

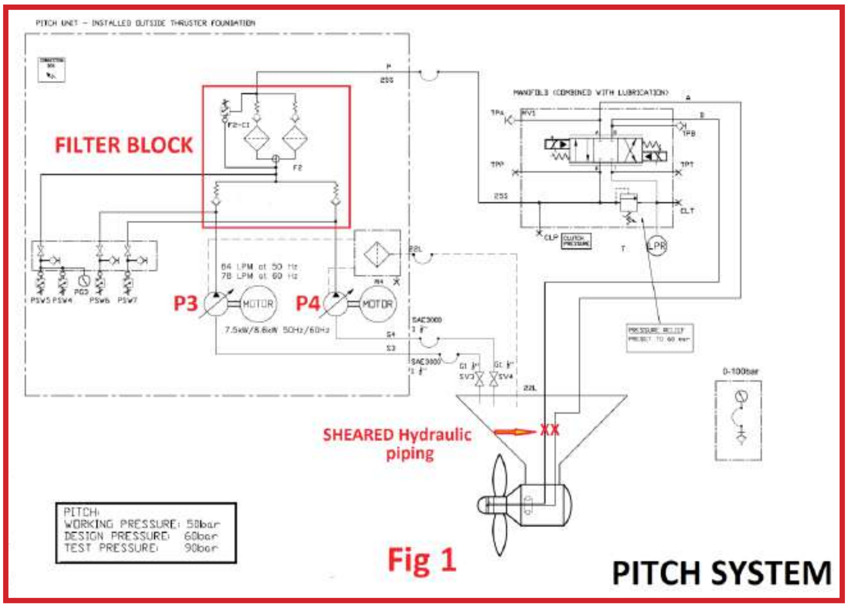


Fig 1

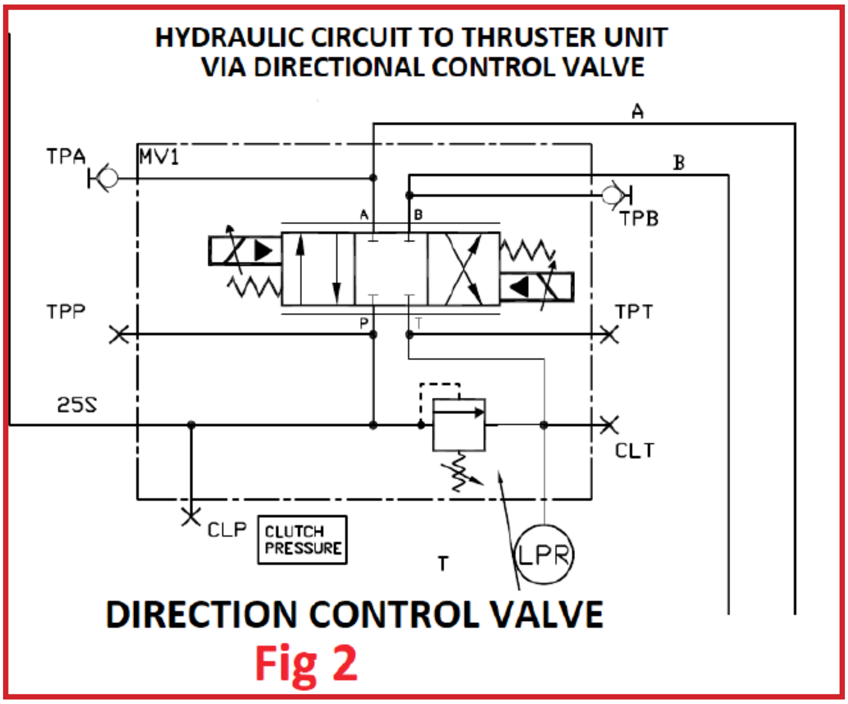


Fig 2

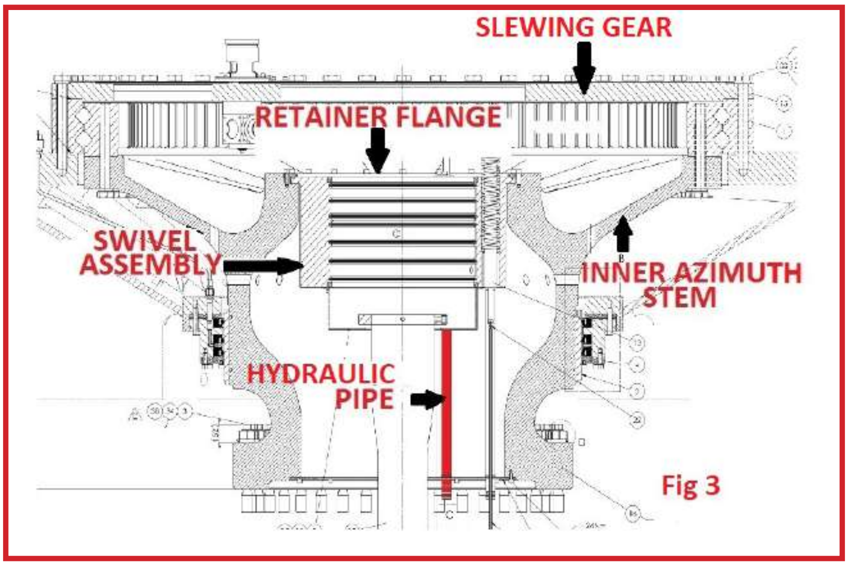


Fig 3

Azimuth Steering System Failure:

Overview

On 23rd May 2015, the vessel reported that the DP system alarm "AZIMUTH PORT/STBD PREDICTION ALARM" and until such time as the alarm was not acknowledged the Azimuth Thruster was getting locked. When Kongsberg, providers of the Dynamic Positioning System was informed, they tried some "remote" trouble shooting with no remedy. Finally they concluded that since the alarms were reported in both the DP Mode and the Independent Joy Stick (IJS) Mode, the problem would most likely be with the Azimuth feedback signal from the Thruster unit to DP/ IJS. What was perceived to be a DP related problem, turned out to be a Thruster related issue.

Port Thruster

When the pitch control Pumps P3 and P4 were operated, neither of the pumps was able to deliver the pressure. It was suspected that there could be some blockage in the system (valves, filters, pipelines). When no blocks were found in the piping etc, it was assumed that the filter block could be having an internal blockage. The Thruster OEM recommended replacing the Filter Block Assembly.

A new Filter Block was ordered and when this was fitted and tried out there was no improvement. At this time the OEM technician attended on board. The pressures were recorded at the various locations on the proportional directional control valve. The pressures recorded on the return lines were almost zero and so it was suspected that there was heavy leakage down-stream of the direction control valve

Thereafter the whole unit was dismantled and it was found that the torque pin had sheared and all 5 hydraulic pipes that convey hydraulic oil to and from the pitch activating pistons, in the hub assembly had sheared off. The root cause was identified as failure of

The Institute of Marine Engineers (India)

Promoting Knowledge - Building Relationships

IME(I) - iConnect

Mobile App for Effective Communication Within the IME(I)

Broadcasting events and/or announcements to the members (e.g. AGM or Technical Seminar Notices, etc.) with provision for RSVP response

Connect with current members of the Governing Council

Know the current members of Sub Committees

Search for birthdays of members in your branch

Easy search for IME(I) Members by Name, Branch / Chapter, Grade or Membership Number

Know the current office bearers of your Branch or Chapter

Read the names of all the past Presidents of IME(I)

Read the monthly technical journal Marine Engineers Review (India) & IME(I) monthly eMagazine iMélange

How Secure Is The Data In IME(I)-iConnect ?

IME(I)-iConnect respects the privacy of every member and takes utmost care to protect it. The data is highly secure and the app can only be enabled on a phone by a registered member user. Whilst downloading you will be sent a one time password on your registered mobile number, which would then enable you to download the members data on your phone. This ensures access to only respective member using their valid mobile number.

Steps To Download The App

Step 1: To Download the Mobile App on Your Mobile
Click on the link: https://onelink.to/6xzk2d

Step 2: Install the App on Your Mobile
Depending on your OS, you will be directed to either the Google Play Store or the Apple App Store. Tap the "Install" button to download and install the IME(I)-iConnect Mobile App.

Step 3: Enter Your Mobile Number
Once the app has been installed on your Mobile, open it and you'll be prompted to enter your mobile number. Please enter the registered mobile number associated with your IME(I) Membership account.

Step 4: Receive OTP
After entering your mobile number, you will receive a One-Time Password (OTP) via SMS and your registered eMail. Please enter the OTP received in SMS or eMail in the app to verify your identity.

Step 5: Access IME(I)-iConnect Mobile App
Once you have successfully entered the OTP, you will have access to the IME(I)-iConnect Mobile App.

Making Changes In Your Profile

It is probable that you may wish to update your data in the app once you download it. This can be done by a "Change Request" - a feature that is available within the app itself. You may also enable / disable personal details e.g. your phone no. & email id.

Click here to change your profile

Click here to refresh & get the latest updates

IN CASE OF ANY PROBLEM ENCOUNTERED WHILE INSTALLATION, kindly contact Ms. V. G. Geeta at membership@imare.in

THE INSTITUTE OF MARINE ENGINEERS (INDIA)

"IME(I) House", Plot No. 94, Sector 19, Nerul, Navi Mumbai - 400 706, Tel.: +91 22 2770 1664 / Fax : +91 22 2771 1663

Email: administration@imare, in / accounts@imare.in, membership@imare.in / training@imare.in

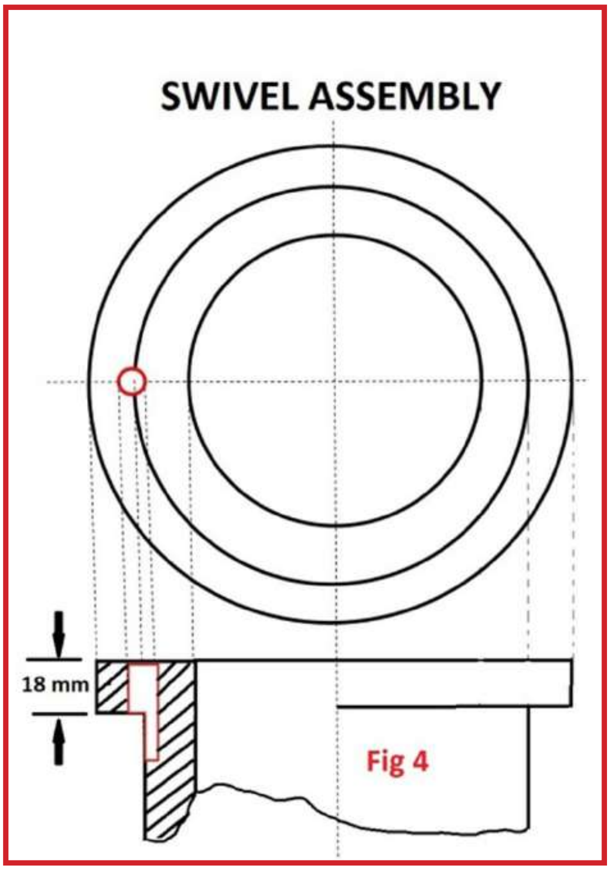
the locking arrangement causing a relative movement between the Inner Azimuth Stem and the Swivel Assembly, the later houses the 5 hydraulic pipes. Under normal operation the Inner Azimuth Stem and Swivel Assembly act as one unit and rotate together.

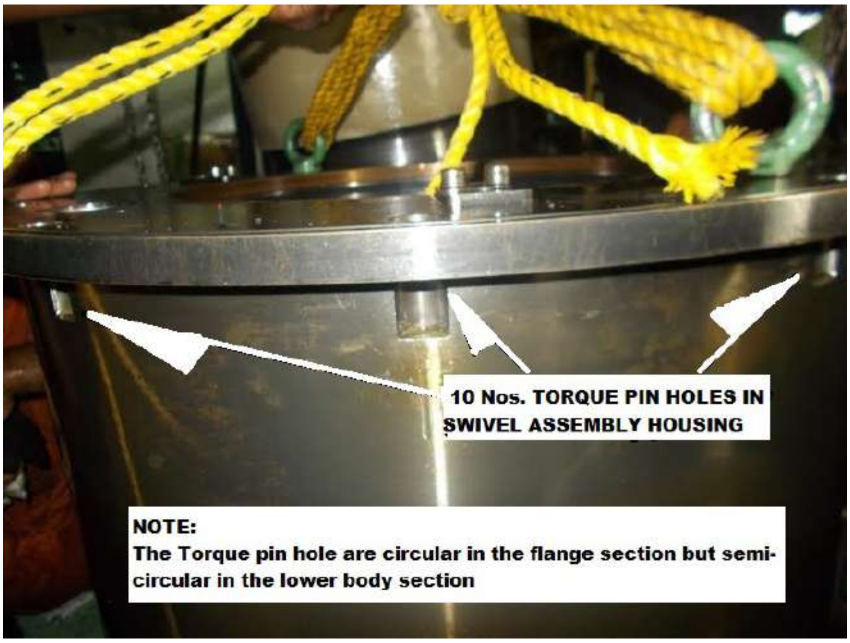
FAILURE ANALYSIS:

To understand the incident better, it would be pertinent to trace the whole slewing sequence. The slewing motors rotate the slewing gear. The slewing gear is bolted to the top flange of the Inner Azimuth Stem. Within the Inner Azimuth Stem there is a Swivel Assembly that houses 5 hydraulic pipes. The function of these pipes is to convey oil to and from the pitch activation piston that is located in the hub. The supply of oil is as per the path set by the direction control valve. The slewing motion (rotation) of the inner azimuth stem has to be transmitted to the swivel assembly. This process is facilitated by a torque pin.

One half of the torque pin fits in the inner azimuth stem, while the other half fits in the swivel assembly. By this arrangement, the torque pin effectively locks of these two components. This was the SPOF in the system. Failure of this pin would result in relative motion between the Inner Azimuth Ring and the Swivel assembly which is not permissible.

In the case in point, there was a failure of the torque pin causing the relative motion of the two components. While the Inner Azimuth Stem slewed along with the slewing motors, the swivel assembly remained stationery. This resulted in the 5 hydraulic pipes housed within the swivel assembly to shear off. Thus when hydraulic oil was directed to any side of the hub cylinder, the oil simply did not reach the intended location rather it leaked off from the sheared hydraulic pipes which explained the low oil pressure recorded at the directional valve block. Since the hydraulic pipes were routed within the Thruster assembly, there was no

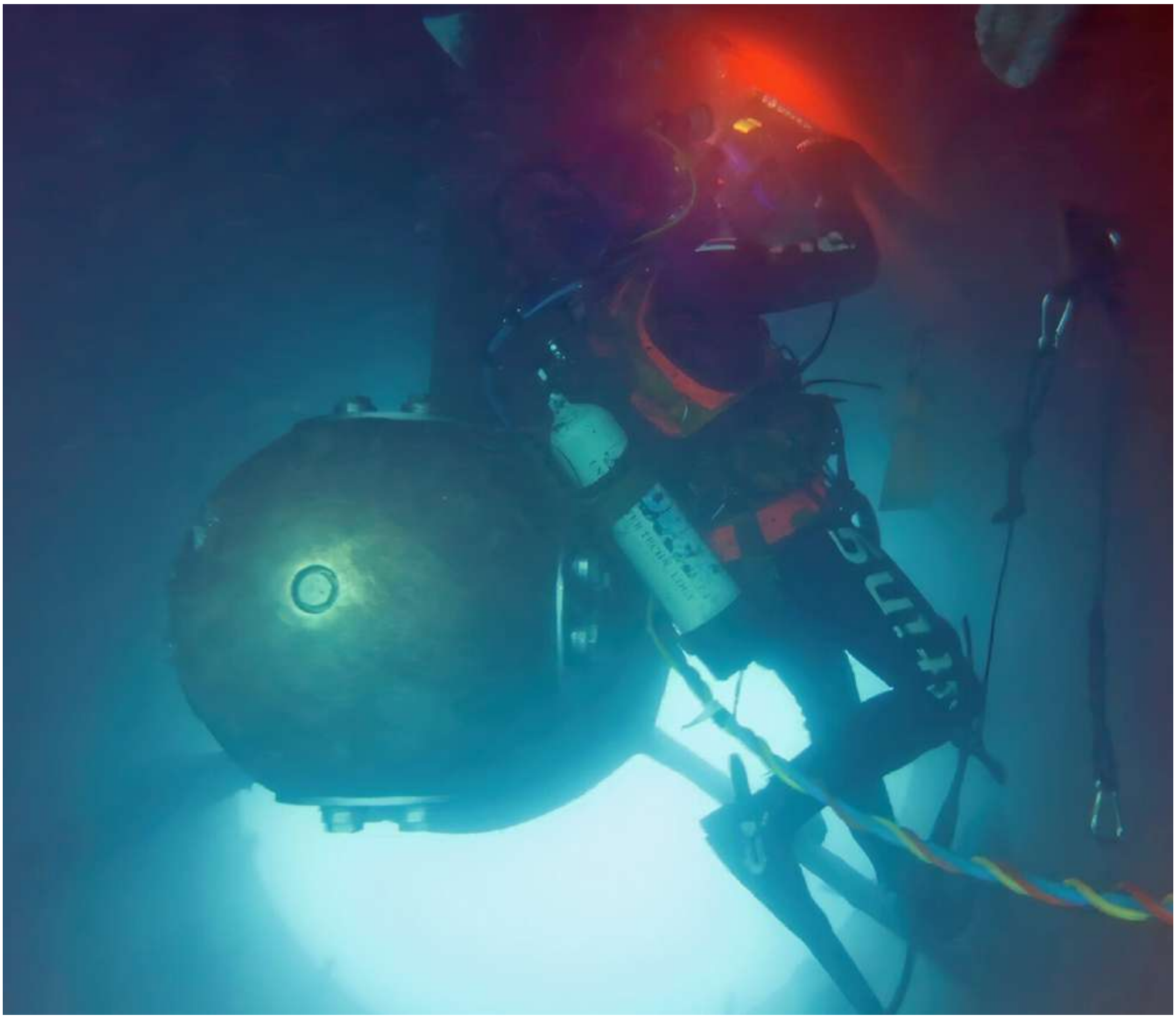




visible leakage as well as no loss of hydraulic oil. The level in the hydraulic header tank remained constant.

LOCKING ARRANGEMENT

It would be interesting to reflect upon the locking arrangement swivel assembly and the Inner Azimuth stem by means of the torque pin. The swivel assembly is cylindrical in shape having a flange at the top end. The swivel assembly has 10 Nos. axial bores of 5mm diameter. The PCD of the bores is same as the outer diameter of the lower section. One of these 10 bores



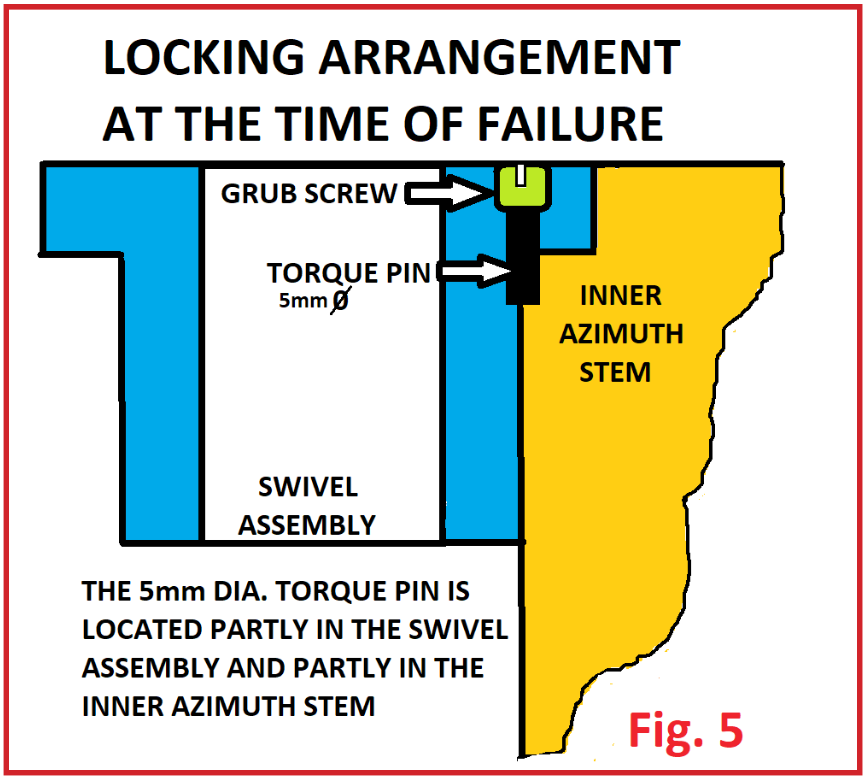


Fig. 5

was used to house the Torque pin. As mentioned earlier, this was the SPOF of the system.

In plan-view, the bore in the flange section is circular whereas in the lower section it is a semi circular. Refer the sketch and photograph (**Figure 4**). The corresponding semi-cylindrical holes is in the inner azimuth stem, thus, the torque pin would efficiently lock the two components together.

At the time of failure, the swivel assembly and the inner azimuth stem were locked together with just **ONE torque pin, of 5mm diameter!** This 5mm diameter torque pin was to transmit the entire torque exerted by the slewing motors. The 5mm torque pin was inserted from the top and held in place by a grub screw. Refer to the **Figure 5.**

It is still not understood why the flange had 10 bores, and when there


WORLD MARITIME TECHNOLOGY CONFERENCE
Chennai, India 2024
GLOBAL SHIPPING – A BATTLE FOR SURVIVAL
OR A TORCH BEARER OF HOPE ?
Knowledge & Technology Partner
IRCLASS
Indian Register of shipping
Platinum Sponsor DNV
December 4 - 6, 2024
The Leela Palace, Chennai
INSTITUTE OF MARINE ENGINEERS
INDIA
WORLD MARITIME TECHNOLOGY CONFERENCE
CHENNAI , INDIA 2024

"You Get to Make Your Own Choices, but You Do Not Get to Choose Your Consequences"

"It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair, we had everything before us, we had nothing before us, ..."

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.

Is it the first choice industry for an entrepreneur? For the hopeless romantics, it is!

We would like stakeholders in the industry to come forward to make a case for Shipping. We invite you to Chennai and fearlessly present views to make the industry safe, environment friendly and investor supportive. In Chennai, one of India's largest cities and its cultural capital, you would find the rhythm and the beat to speak your mind, with an unwavering conviction and unfounded joy.

On behalf of the Organising Committee and The Institute of Marine Engineers (India), Chennai Branch, we extend a warm invitation to you and your organisation to actively participate and support the three day event, between December 4-6, 2024 in Chennai. We provide you in attachment, a copy of the canvas, and we hope to engage you in cool pre-winter periods in India.

World Maritime Technology Conference (WMTC - 2024)

"GLOBAL SHIPPING – A BATTLE FOR SURVIVAL OR A TORCHBEARER OF HOPE"?
{AMIDST TECHNOLOGY, REGULATIONS, GEO-POLITICS & CLIMATE CHANGE}

Is Shipping a good story? Let us debate.

Looking forward to meeting you in Chennai
On behalf of the Organising Committee, WMTC 2024

Hrishikesh Narasimhan
Convenor

C V Subba Rao
Chairman

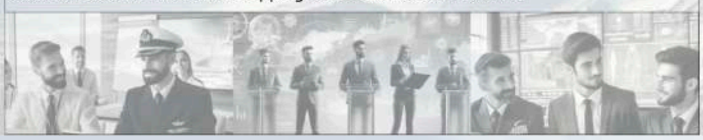
SPONSORSHIP OPPORTUNITIES

Sponsorships	Qty	Indian Co'S INR + GST	Overseas Co'S USD	Free Delegates	Feature Slot
SPONSORSHIP					
Knowledge & Technology Partner	1	33.6 Lakhs	42000	12	Strategic Forum Address - Plenary
Platinum Sponsor	1	24 Lakhs	30000	12	Key Note Speaker 1- Plenary
Gold Sponsor	1	19.5 Lakhs	24000	9	Key Note Speaker 2- Plenary
Silver Sponsor	1	15 Lakhs	18000	6	Key Note Speaker - Papers Panellist - Plenary
Bronze Sponsor	3	10.5 Lakhs	12600	3	Anchor – Plenary Panel Discussion (2) Key Note + Panellist - in Sessions (1)
Associate Sponsor	12	3.6 Lakhs	4500	1	Key Note Session or Panellist
Inaugural Dinner	1	10.5 Lakhs	12600	3	Panellist - Plenary
Conference Lunches	3	4.2 Lakhs	5100	1	Key Note (3) Paper Session
Closing Dinner	1	10.5 Lakhs	12600	3	Panellist - Plenary
Conference Bags (420)	1	4.2 Lakhs	5100	1	
Lanyards (420)	1	1.95 Lakhs	2040	0	
EXHIBITION STALLS					
Exhibition (Stall Size A)	6	3 Lakhs	3600		Stall – Deluxe Location
Exhibition (Stall Size B)	18	2.4 Lakhs	3000		Stall – Standard Location
DELEGATE FEE					
Member-IMEI, CMMI, ICS	90	4500	150		Conference Material + All Dining
Non Member	60	6000	195		Conference Material + All Dining
Students	90	960	60		Conference Material + Day Dining Only
MARINERS NITE					
Mariners Nite	96	1500			Free for Delegates
SOUVENIR ADVERTISEMENTS					
Front Cover	1	3.6 Lakhs	4500		
Front Inside	1	2.4 Lakhs	3000		
Back Cover	1	1.95 Lakhs	2400		
Inside Back Cover	1	1.5 Lakhs	1950		
Colour Full Page	60	42000	510		
Black & White Full Page	24	24000	300		

PAPERS

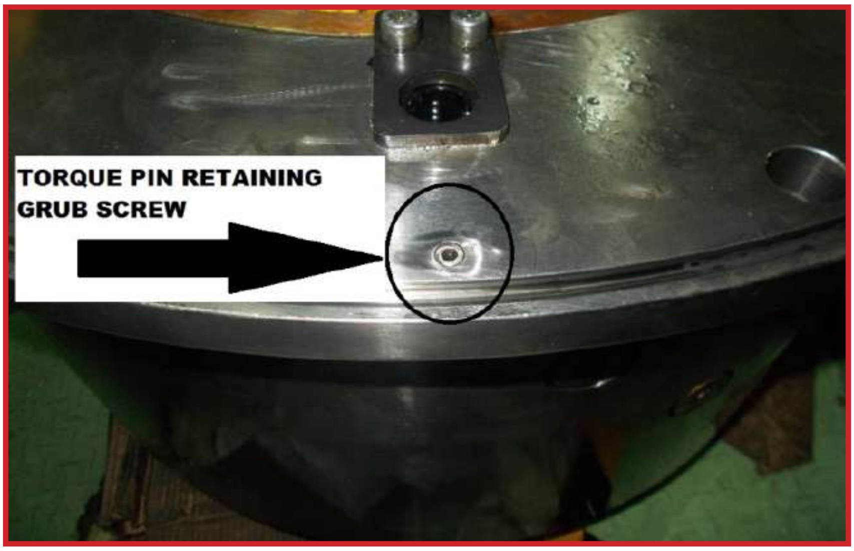
Papers are invited from Financial Institutions, Business Managers, Ship Owners and Managers, Shipping Associations, Regulatory Institutions, Classification Societies, Analysts, Brokerage Houses, Academic Institutions, Shipbuilding & Repair Yards, Professional Bodies, Engineers, Designers, Manufacturers, Students, Researchers, Recyclers, Salvors, Adjudicators etc.

- **Navigating the Future** - Blockchain, AI, Data Analytics and Digital Transformation
- **Managing and Hedging Risk** - Asset, Cargo and Currency
- **Ship Building and Repairs** - Can India grab a share of the market?
- **Shipping Markets** - Can we predict the future?
- **Marine Money** - Do Banks believe in Shipping? - The Basel and The Poseidon Narrative
- **Duty of Care** - Safety Management and Crew Welfare
- **Reforming (or Romancing) the Future** - Is Education the same as Schooling?
- **Classification Society** - A voice of Influence or just an IMO ally?
- **The Bugle of Geo Politics** - Sounds of the 21st Century for Shipping
- **Sustainable development** - Is it only about climate change?
- **Powering Academic Research** - Hulls, Propulsion Equipment, Vibration & Underwater Noise
- **The Connectivity Conundrum** - Linking Rivers, Ports and Railways
- **Advancements in Product Technologies** - Fuel Lubricants, Paints, Chemicals & others
- **Cost Leadership in Maintenance**
- **Managing Learning** - What can Shipping learn from other Industries?



were 10 bores, why only 1 torque pin was provided. Was it supposed to be a weak-link? Not really, because of the fact that the modified design that was installed in the subsequent dry dock included 3 torque pins of 10mm diameter. An increase of 1200%! See calculation in the box below.

Original Design:
Shear load on each Torque Pin = Shear load / Shear Strength of Material X $\pi/4$ $(5)^2$
Modified Design:
Shear load on each Torque Pin = Shear load / Shear Strength of Material X $\pi/4$ $(10)^2$ X 3
It is assumed that the material remains unchanged



The Torque Transmission chain was as follows:

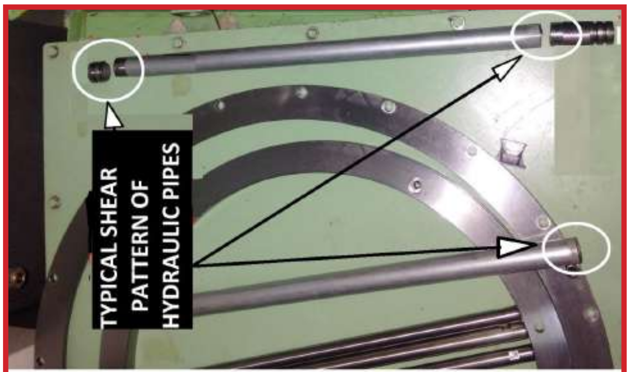
Slewing Motors to Slewing Ring to inner Azimuth stem, via bolts; to the Swivel Assembly via single torque pin

Due to the shearing of the torque pin, the lower side of then flange was badly "scored" and the torque pin bore in the inner azimuth stem assembly and swivel assembly sustained damage, as can be seen in the photographs. More importantly this resulted in a relative motion between to two components thus shearing the 5 hydraulic pipes.

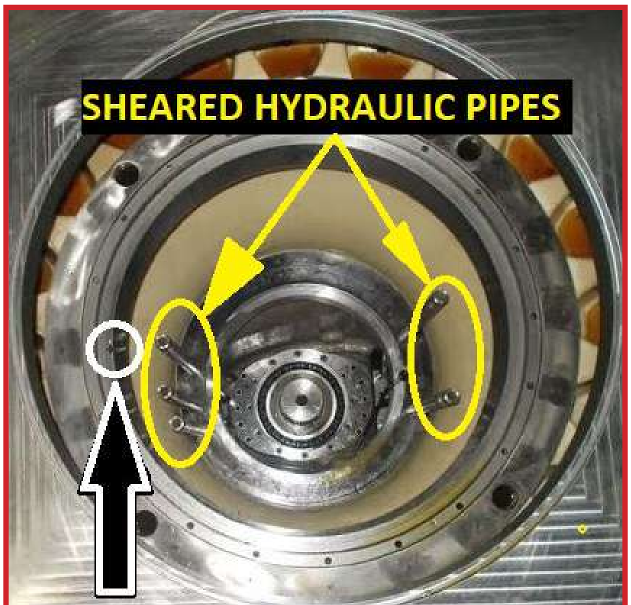
The repair was carried out in-situ and the ORIGINAL locking arrangement as discussed above in paragraph titled LOCKING ARRANGEMENT was not replicated, instead locking arrangement was modified as detailed below.

OWNER'S MODIFIED LOCKING ARRANGEMENT:

To ensure that the torque is effectively transmitted from the inner azimuth stem to the swivel assembly, 6 torque pins of 16.5 mm diameter and 19.5 mm length were provided in the modified assembly. Further the newly made bores of 17mm diameter, were restricted only to the through-thickness of the flanged portion of the swivel assembly. The flanged section was 18mm thick.



All 5 Nos. Hydraulic pipes sheared off at both ends

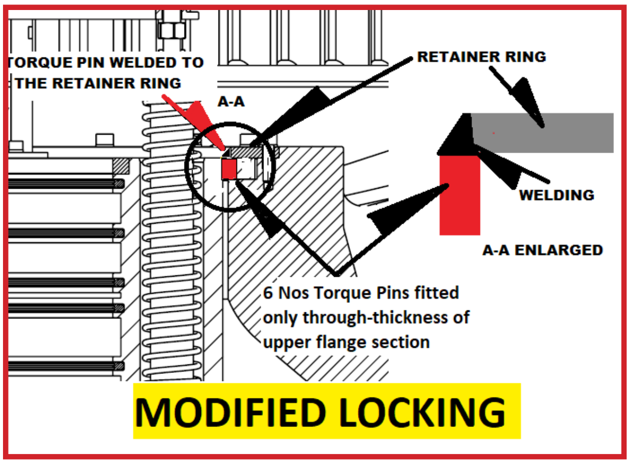


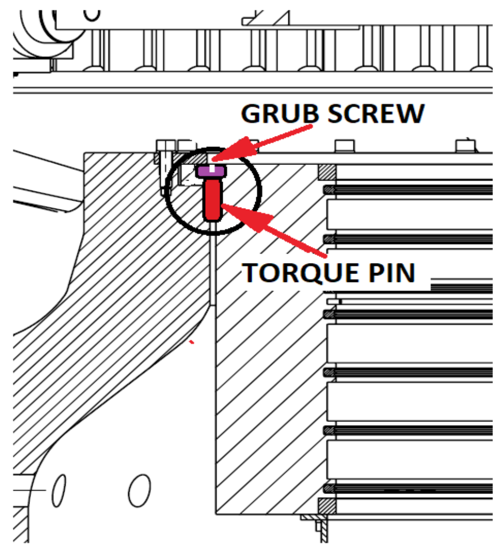
DAMAGED TORQUE PIN HOLE IN INNER AZIMUTH STEM

In plan-view, the bore in the flange section is circular whereas in the lower section it is a semi circlular

Modified Torque Transmission chain:

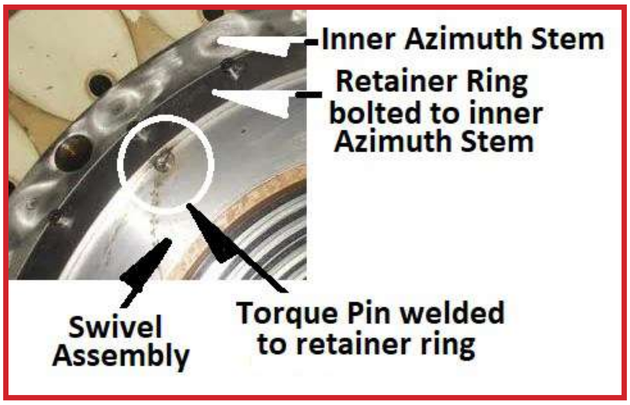
Slewing Motors to Slewing ring via Bolts to Inner Azimuth Stem via bolts to Retainer Ring via fillet weld to 6 Nos. Torque Pins to Swivel Assembly. Note that the transmission chain is different to what was originally provided.





Torque pin is partly in the inner Azimuth Ring and partly in the Swivel Assembly.

ORIGINAL DESIGN



After fitting the torque pins in the swivel assembly, the retaining ring was place over the torque pins and secured to the inner azimuth stem with Allen bolts. The torque pins were then tack welded to the retaining ring. Thus the torque would get transmitted from the inner azimuth stem to the retaining ring and then on to the torque pins and finally to the swivel assembly

The sheared hydraulic pipes, 5 in all, were locally procured and machined to house the "O" Rings. Prior to assembly the pipes were hydrostatically tested to 100 bars and found satisfactory. System was tried out and found satisfactory.

The sketches and illustrations are Not to Scale and have been made for ease of understanding and explanation.

About the author

Ramesh Vantaram is an alumnus of D.M.E.T. (1974-1978). The sea career started with The Shipping Corporation of India. After obtaining MEO Cl II certificate, he served with Hongkong-Borneo Shipping Company. After obtaining MEO Cl I certificate in 1983, he served with Anglo Eastern Management Services until 1987. Thereafter he was associated for 3 years with an FAO (UN) regional Project known as The Bay of Bengal Program. The objective of the project was to provide fisher-folk with a viable alternative to Outboard Motors on their FRP boats. The work-scope involved Prototype testing of power tiller engines and multiple propulsion systems.

He worked with Lloyd's Register of Shipping from April 1992 to June 2005 at Chennai, Ahmedabad and Marmagoa. Just before and soon after his stint with LRS, he served as Chief Engineer, with South India Shipping Company and United Ocean Ship Management Co.

In 2008, he joined Great Offshore as Head of Quality, Health Safety and Environment, in charge of the Company's International Safety Management and Integrated Management System Certification processes.

In 2014, he moved to Ocean Sparkle Limited as Senior Vice President and served as Regional Head of North West Region. In 2018, took over as Head of Quality in charge of the Company's Integrated Management System and Certification.

In February 2022, he retired from Ocean Sparkle Limited and took up part-time teaching. Currently he is a visiting faculty at the Institute of Marine Engineers (India) at Navi Mumbai. He regularly writes technical articles especially for student readers in iMélange.

Email: ramesh.vantaram@gmail.com

MASSA Maritime Academy, Chennai
(A Unit of Maritime Training and Research Foundation)
GRADE A1 (OUTSTANDING)
E-mail – mmachennai@massa.in.net
Website - https://massa-academy-chennai.com/
Creating Learning Experiences

COURSES OFFERED

DG SHIPPING APPROVED COURSES

Competency Courses
Simulator Courses
Modular Courses

VALUE ADDED COURSES

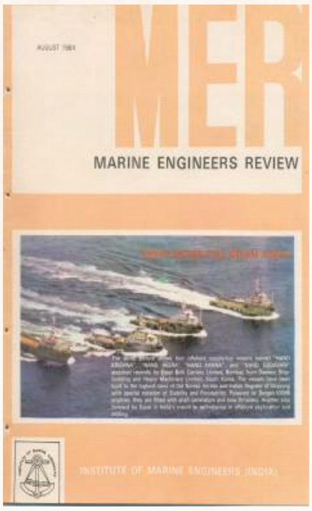
Academy Courses
DNV Certified Courses

MASSA BOARD
Chairman, MASSA: Capt Girish Phadnis ,
Chairman, MTRF : Capt S Jahagirdar,
Chairman, Gov. Council: Mr Deepu Kishinchandani
CEO: Capt Shiv Halbe

In Service of Seafarers

https://massa-academy-chennai.com/

Going Astern into MER Archives…



The Editorial captures few suggestions from a recently-concluded conference on Marine Bunkering organised buy Institute of Petroleum in London. The poor quality of fuel, the knowledge of personnel handling the responsibility etc., are the focal areas of concern. While fixing bunker suppliers, at least 5 enquiries must be made and if the Company cannot handle more than it should join with other Companies for the bunker purchase or engage a broker. A Consortium of Companies, particularly for bunker purchases is also proposed. MER would welcome some discussions from Superintendents and marine engineers who have been handling the business of bunker supplies.

The 'Opinion' highlights North Sea Offshore opportunities and how British firms are missing out on them (In Indian shores this is a familiar story). The issue carries an article on the North Sea Offshore Opportunities.

Another interesting article is on technologies for extracting smaller quantities of oils from smaller fields. BP's SWOPS (Single Well Oil Production System) is focussed upon. Marine personnel engaged in offshore operation will certainly find this interesting.

Discussions on RoVs, Tension leg platforms, all pertaining to offshore platforms, follow.

The 'History' column captures the times of the 'first operational aircraft carrier', HMS Furious.

The Transaction section has 'Steering Gear: New Concepts and Requirements' by J. Cowley. Most of the marine engineers would have immersed themselves in the 'Running & Maintenance of marine Machinery' and Cowley would be familiar. The interesting part of the discourse is the single failure criterion, which made a big difference to steering systems. The redundancies required and the optimised options/combinations were a matter of intrigue for the marine engineers. All the Regulations are also projected.

The cherries on top of the icing are the discussions at the end of the Transaction (*Amoco Cadiz* disaster drives a good part). This is a very interesting read.

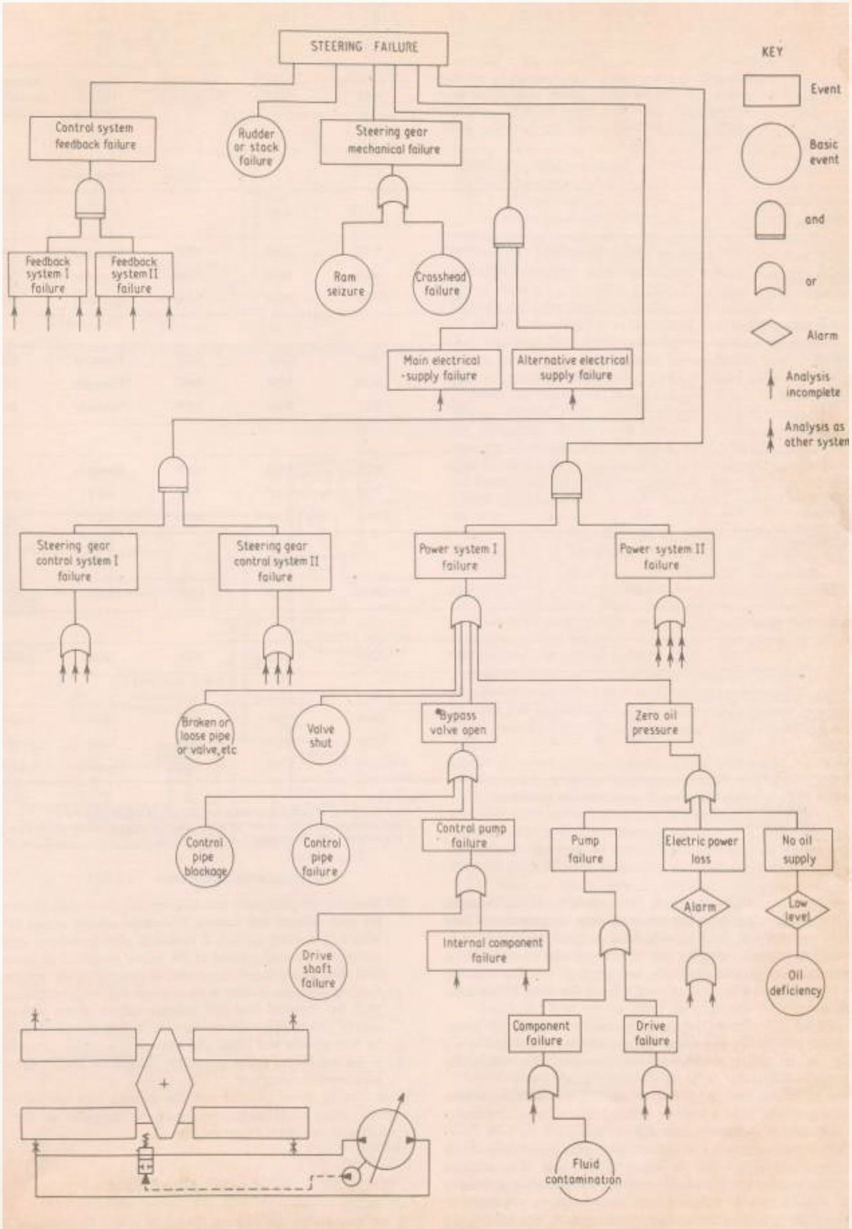


FIG 14 Fault tree analysis of four-ram steering gear with separate and independent power actuating systems

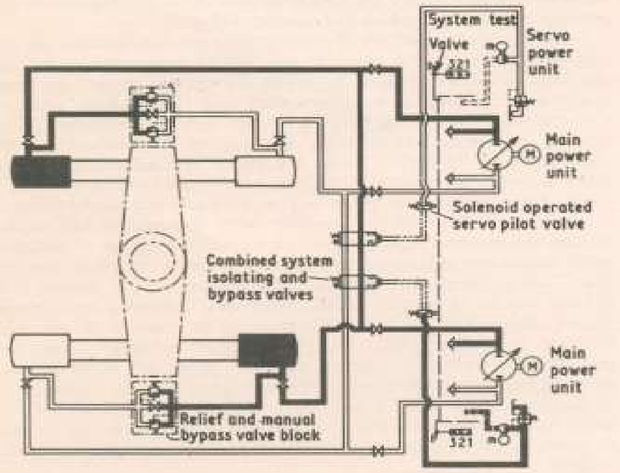
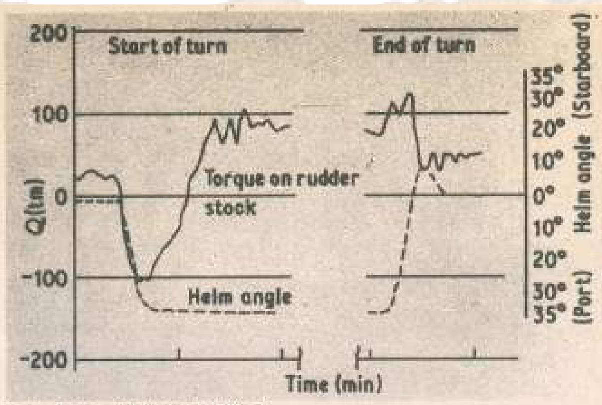
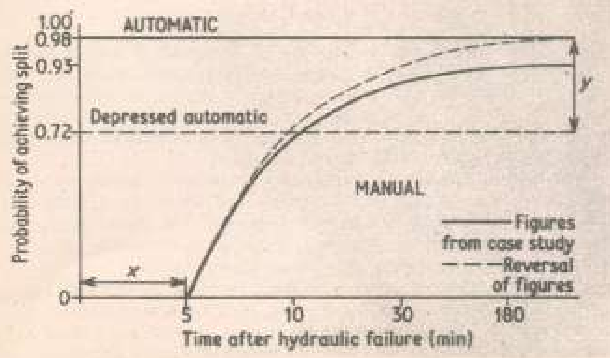


FIG 18 Automatic split system



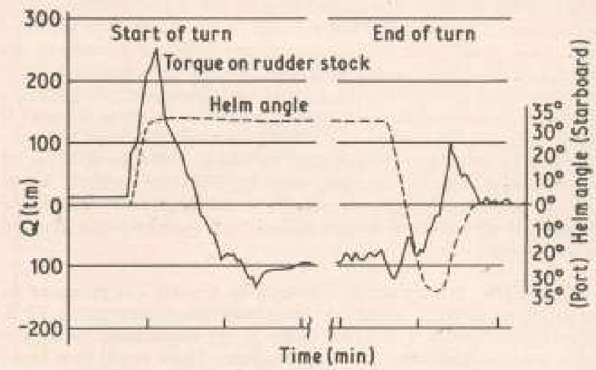
Two-pintle rudder; source Ref. 2

FIG 26 Torque transmitted to rudder stock on a 240 000 tdwt fully-laden tanker during full-speed turn to port



The quick action of the automatic system is the predominant factor in achieving better overall ship safety

FIG 19 Automatic vs. manual split system



Two-pintle rudder; source Ref. 2

FIG 27 Torque transmitted to rudder stock on a 240 000 tdwt fully-laden tanker during full-speed turn to starboard

Table VI: Relationship between predicted and actual failure rate

EQUIPMENT	FAILURE RATES (FAULTS/YEAR) *Predicted*	*Actual*
Pneumatic transmitting flowmeter	0.58	0.6
Pressure switch	0.13	0.14
Oxygen analyser	3.3	2.5
Pneumatic valve	0.19	0.25
Temperature trip amplifier	2.8	2.6
Criticality monitor	0.38	0.34
Pulse amplifier	3.4	5
Pulse discriminator	6.1	7.1
Gamma monitor	1.28	0.85

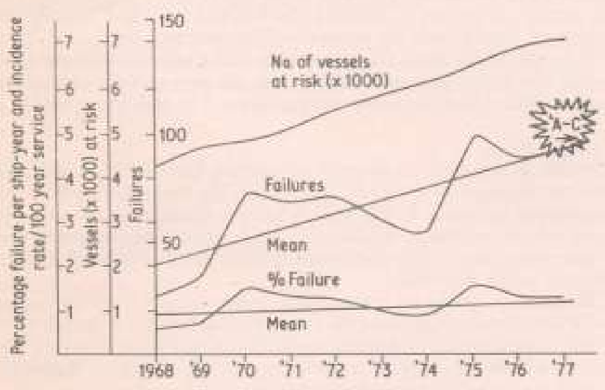


FIG 20 Steering gear defects 1968–1977

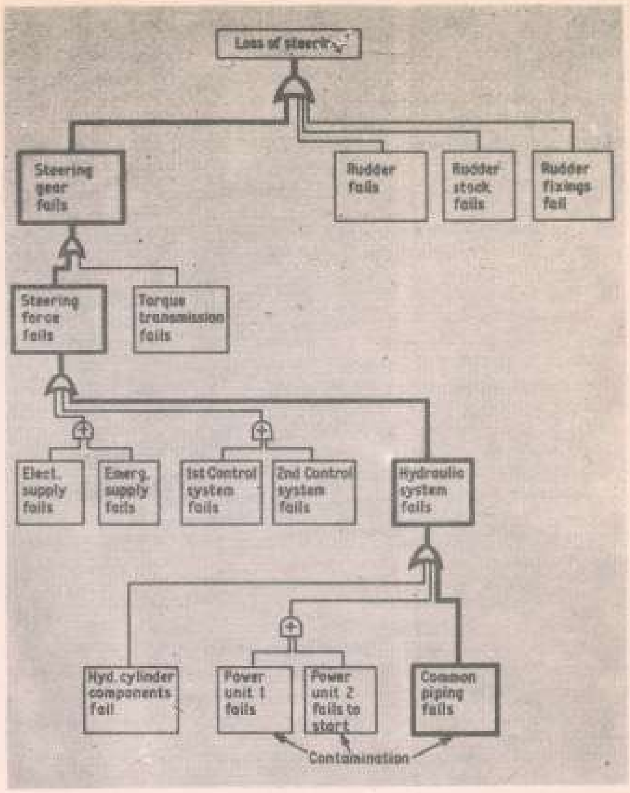


FIG 21 Fault tree analysis

We invite observations, discussion threads from readers, taking cues from these sepia-soaked MER pages. – Hon.Ed.

Join the India's Largest Association for Marine Engineers

BENEFITS OF MEMBERSHIP

- Develop professional competency on a continuous basis.
- Receive monthly technical journal free of cost.
- Access Institute's website for relevant technical and social information.
- Get special discount on Institute Publications, attendance fees at technical seminars and conferences.
- Use the opportunity to interact and network with senior marine engineering professionals, academics, administrators and business leaders.
- Receive information about marine technical events worldwide.

ABBREVIATED TITLES AND DESCRIPTION OF MEMBERSHIP

Each Corporate and Non-Corporate Member of the Institute may use the title of the grade to which he belongs or the abbreviation thereof, as provided by these Articles and shall use no other title or abbreviation to describe his relation to the Institute.

Each member of the Institute is entitled to describe himself as follows

Fellow	F. I. Mar. E (I)	Graduate	G. I. Mar. E (I)
Member	M. I. Mar. E (I)	Student	S. I. Mar. E (I)
Associate Member	A. M. I. Mar. E (I)	Subscriber	S. M. I. Mar. E (I)
Associate	A. I. Mar. E (I)		

OUR BRANCHES & CHAPTERS ARE AT

- Chennai
- Chandigarh
- Delhi
- Goa
- Gujarat
- Hyderabad
- Kolkata
- Karnataka
- Kochi
- Mumbai
- Navi Mumbai
- Patna
- Pune
- Visakhapatnam
- Rajasthan

And many more branches being launched soon.

BECOME A MEMBER NOW

https://sites.google.com/view/member-imei/home

For any clarification/support, please mail us at **membership@imare.in**

Institute of Marine Engineers (India)

visit us: https://imare.in/

"Reg. No. MCS/090/2018-20"
RNI No. MAHENG/2006/19917
W.P.P. Licence No.:
MR/Tech/WPP-336/ South/2018-20

IME(I) House, Nerul, Navi Mumbai