The IIRE Journal of Maritime Research and Development (IJMRD) provides a forum for critical reviews and research findings that underpin scientific foundations of all decisions. Selection of articles for publication in the IJMRD is completely merit based and articles are published only if favorable review and approval is received from a referee.

The concepts, views, expressions and examples in the published articles of IJMRD are those of the authors and not necessarily of the journal. The responsibility for the content of the articles remains exclusively with the author(s) concerned.

The Publishing team of IIRE does not necessarily subscribe to views expressed in the articles published under its banner. IIRE as the publisher disclaims any liability to any party for any loss, damage, or disruption caused by errors or omissions, whether such errors or omissions result from negligence, accident, or any other cause.

The copyright of the articles published under IIRE in its Journal of Maritime Research and Development (IJMRD) rests with the author(s) concerned, who may be contacted for any clarifications and/or reproduction rights.

ISSN: 2456-7035

Published by:

ISF INSTITUTE OF RESEARCH AND EDUCATION (IIRE)
410, Gemstar Commercial Complex, Ramchandra Lane Ext, Kachpada, Off Link Road, Malad (W), Mumbai 400 064, India.
Website: www.iire.in, www.inner-search.org, www.isfgroup.in

Link of Publication: - http://iire.in/ojs/index.php/IJMRD

Place of Publication: - Mumbai
Maritime sector has always been influencing the global economy. Shipping facilitates the bulk transportation of raw material, oil and gas products, food and manufactured goods across international borders. Shipping is truly global in nature and it can easily be said that without shipping, the intercontinental trade of commodities would come to a standstill.

Recognizing the importance of research in various aspects of maritime and logistic sector, IIRE through its Journal of Maritime Research and Development (IJMRD) encourages research work and provides a platform for publication of articles, manuscripts, technical notes, papers, etc. on a wide range of relevant topics listed below:

- Development in Shipping
- Ship Operations and Management
- Risk Assessment and Risk Management in Maritime Sector
- Maritime Safety and Environmental Protection
- Technological Developments
- Maritime Education
- Human Resource in Maritime Sector
- Trade Liberalization and Shipping
- Freight Rates Fluctuations and Forecasting
- Commodity Markets and Shipping
- Shipping Investment and Finance
- Maritime Logistics
- Multimodal Transport
- Inland Waterways Transport
- Maritime Statistics
- Port Management, Port Pricing and Privatization
- Economic and Environmental Impact of Shipping and Ports
- Other Current Topics of Interest in Shipping
CARGO HANDLING ON BOARD CHEMICAL TANKERS: EFFECT ON SEAFARERS - AN EMPIRICAL STUDY.

Sajith Babu

Abstract

Increasing trends in accidents/ incidents on board Chemical tankers are a rising concern for the entire Chemical seaborne trade. IMO through its comprehensive International Conventions and Codes have provided an international standard for the safe carriage of chemical cargoes. Most of the shipping accidents are caused by human error. Even when the ISM code helps in establishing a safety culture, it is never fully attained unless the seafarer’s on-board work hand in hand with their respective shipping company or managers. Shipping companies finally ends up paying a heavy price due to the poor decision making of seafarer’s, which may directly or indirectly lead to a maritime casualty. It is highly common that seafarers working onboard chemical tankers will be carrying cargoes which they have never heard of or carried in the past. Even then, the seafarers are required to carry out all operations onboard very professionally and safely without compromising on the local and international rules and regulations. A thorough understanding of safety and health hazards and also about the emergency procedures is vital to all crew members directly involved with the operational part of the cargo carriage. This paper is based on an empirical study of day-to-day operations on board ships with the help of questionnaires and how seafarers can be practically guided on chemical tankers to safely handle cargo operations. The relationship between crew knowledge gained through studies and their work efficiency on board chemical tankers needs to be assessed. Valuable inputs from this study will turn out to be effective for various training techniques being developed. In future, advanced training tools using machine learning will be developed using the various end results from this study.

Key words: Chemical tanker, Incidents, Maritime casualty, Training.

1. INTRODUCTION:

Chemical tanker as the name suggests is a specialized type of tanker ship used for the transportation of petrochemical cargoes in bulk (Akyuz and Celik, 2015). As per Annex II of the International Convention for the prevention of pollution by ships (MARPOL, 1973/78), chemical tanker is a ship constructed, equipped or adapted for carrying in bulk liquid products as listed in Chapter 17 of the International Bulk Chemical Code. The design and equipment of chemical tankers are such that it can be used for shipment of a wide range of products simultaneously in the same voyage. Apart from oil tankers and gas tankers, chemical tankers are built to carry multiple cargoes with varying characteristics and hazards at the same time. Capability of handling multiple cargoes adds to the complex nature of construction of these kinds of ships. The smaller size of ships, presence of numerous numbers of tanks which usually ranges between 10-50, individual submersible pumps for all tanks, cargo heating arrangements, tank cleaning hoses and portable tank cleaning machines, nitrogen generators, gas freeing blowers, cargo hoses and reducers of various sizes are unavoidable sights onboard a chemical tanker. These ships are also stronger and stable compared to other ships due to the segregation.
capability and the number of tank divisions which are created to carry various parcels together (CDI, 2013). Chemical cargoes on board chemical tankers are usually transported in small parcels, since most of the cargo receivers require lesser quantities as compared to the transportation of crude oil or clean petroleum products. Thus, various parcels of chemical cargoes are normally carried in the same vessel without the risk of mixing. These tankers are also called as parcel tankers.

Even though there are several rules and regulations laid down by regulatory bodies of maritime industry, maritime casualties have not reduced due to human error (Noroozi et al., 2014). Due to increased shipping activities worldwide, high level of safety performance is required to counter human error which can even lead to loss of life, harm to marine environment and also equipment’s on-board ships (UNCTAD, 2015). Recent research studies indicate that risk management plays a pivotal role in minimizing human error occurrence. Proactive solutions used by a number of safety practitioners have led to the introduction of various risk-based approaches (Hameed et al., 2016; Akyuz and Celik, 2015, 2016; Prasad and Gaikwad, 2015).

2. LEGAL FRAMEWORK AND LITERATURE REVIEW:

International conventions and codes framed by the International Maritime Organization - IMO, govern the operation of chemical tankers. SOLAS Chapter VII- Carriage of dangerous goods and MARPOL Annex II- Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk, are the two major Conventions which require chemical tanker ships to comply with the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk - IBC Code. The IBC code helps by providing international standards required by ships for safe carriage by sea, of the various chemicals and liquid substances as per Chapter 17 and 18 of the code (IBC Code, 2016). The IBC code assigns one of the ship types to each chemical tanker, taking into account the degree of the hazards of the products carried by the respective ships. The products normally possess one or more hazardous properties which includes flammability, toxicity, reactivity, corrosivity and other environmental hazards.

Unlike conventional tankers, chemical tankers are classified into 3 different types. Classification has been done based on cargo to be carried and structural requirements needed
to sustain and survive damage. IBC code clearly indicates that ships subject to the code shall be designed to the following standards as per the type of ship:

Type I: Chemical tanker ships which are built mainly to transport specialized and sophisticated products under chapter 17 of IBC code, and which possess very severe environmental and safety hazards and require maximum preventive measures to avoid an escape of such cargo. These ships are assumed to sustain even if damage occurs anywhere in its entire length (IBC Code, 2016).

Type II: Chemical tankers intended to transport products under chapter 17, which possess appreciably severe environmental and safety hazards and require significant preventive measures to avoid an escape of such cargo are called Type II ships (IBC Code, 2016).

Type III: Chemical tankers which can transport products under chapter 17 which possess sufficiently severe safety and environmental hazards and a moderate degree of containment is required to increase survival chances in a damaged condition (IBC Code, 2016).

![Tank configuration as per IBC Code](image)

It can be clearly stated from the above classification that Type I chemical tankers are those intended to carry products which can present maximum hazard, followed by Type II and then Type III ships which carry products of lesser hazards (Figure 1).
The IBC Code mentions that any cargo offered for bulk shipment should be indicated in the shipping documents by the product name under which it is listed in Chapter 17 or 18 of the code or the latest edition of MEPC.2/Circular or under which it has been provisionally assessed. The importance of MSDS - Material safety data sheets, and its availability to all concerned for the safe carriage of the cargo must be strictly followed. MSDS normally gives a full description of the physical and chemical properties, emergency procedures in case of fire, spillage, personnel contact, first aid measures and ecological effects.

Shipboard Occupational Health and Safety Programme – SOHSP, should have active involvement of people involved at all levels like Master, Officers and Engineers on board, crew and even the office person in charge (MSC-MEPC.2/Circ.3, 2006). Shipboard and shore side employees should be involved in developing, implementing, evaluating and modifying the SOHSP. Both should work together to achieve occupational health and safety goals. Systems for detecting, reporting and correcting non-conformities should be present in the programme. Standard Operating procedure framed by the company gives a benchmark to the personnel actually involved in the operations.

There are four main groups of liquid chemicals transported by sea: organic chemicals, inorganic chemicals, vegetable/animal oils and fats, and molasses (Hammer, 2013). Chemicals like methanol, ethanol, xylenes, toluene and glycols form part of the organic chemicals group. Chemicals like sulphuric acid, nitric acid, caustic soda and phosphoric acid are classified as inorganic chemicals. As per research carried by Drewery research consultants in 2008, 48% of chemical seaborne trade consisted of organic chemicals, 17.5% of inorganic chemicals and 26.8% included vegetable and animal oils and fats which included palm oil, soya bean oil, sunflower oil and rapeseed oil. Molasses shipments are comparatively small and involve transportation of molasses cane, base oils and molasses beat sugar. Chemical tankers which are normally called as oil/ chemical carrier also carries oil and petroleum products like jet fuel, naphtha, gasoline, gasoil, lube oil and various other lube oil additives. The number and variety of unconventional liquid cargoes being transported in bulk by water continues to steadily increase. The transportation of bulk chemicals by sea not only requires purpose-built ships and equipment, but also seafarers who have received specialist training, both theoretical and practical, in order to understand the properties of various chemicals and the potential hazards involved in cargo operations (ICS, 2004). SWOT analysis methodology has also been used to assess the safe carriage of liquid chemicals by tanker ships (Arslan and Er, 2008). It is highly
common that seafarers working onboard chemical tankers will be carrying cargoes which they have never heard of or carried in the past. Even then, the seafarers are required to carry out all operations onboard very professionally and safely without compromising on the local and international rules and regulations.

3. VARIOUS PROPERTIES OF CHEMICAL CARGO CARRIED ON SHIPS:

Prior loading chemical cargoes onboard ships, MSDS sheets must be referred to and properly studied well in advance to get a thorough idea about the various chemical properties of the same. Some of them are:

3.1. Flammability:

The flammability limit of a cargo is defined as the range of concentration of flammable vapor which can lead to an explosion upon ignition. Flammable vapors are normally defined as % by volume in air. LEL (lower explosive limit) forms the bottom of the range below which there is insufficient vapors to support combustion and UEL (upper explosive limit) forms the upper limit above which there is insufficient air to support combustion (IMDG code, 2018).

3.2. Toxicity:

Toxicity is a property of a chemical which causes harm to living organisms and can eventually lead to serious injury or death. Depending on the nature of the product, toxicity can be defined as chemical, biological or physical. Toxic cargoes are clearly identified in IBC code chapter 17 under column-k. Oral toxicity (swallowing), dermal toxicity (absorption through skin, eyes and mucous membranes) and inhalation toxicity (inhaling toxic vapors) are three major means of toxic exposure onboard ships (IMDG code, 2018).

3.3. Reactivity:

Even though most of the chemicals carried on board ships are chemically stable, there are some which require certain precautions to be taken so that they remain in a stable condition. Some of the reactive chemicals are inherently unstable and some react in a dangerous manner when in contact with air, water or other materials (IBC code, 2016). Reactive and unreactive group
of chemicals can be easily referred to from USCG compatibility chart. According to USCG, a mixture of two chemicals is considered hazardous and incompatible when, under specified test conditions, the temperature rise of the mixture exceeds 25°C or a gas is produced as a result of the reaction.

3.4. Static accumulator cargoes:

Liquid chemical cargoes having a conductivity reading of less than 50pS per meter are considered as nonconductive cargoes. Accumulation of an electric charge is very significant in these kinds of cargoes and special measures must be taken so as to mitigate the effects of static electricity. Static sparking can occur during loading, unloading, steaming, gas freeing, cargo tank cleaning, sampling/gauging and even during adding of cargo inhibitors (IBC code, 2016).

3.5. Corrosivity:

These are chemical properties of a substance which tends to destroy human tissues on contact. Acids and alkalis are the most common corrosive products which can cause severe burns in a very short exposure time. Some are corrosive when in contact with water while others are corrosive when in contact with moist air (IBC code, 2016).

4. EMPERICAL STUDY:

Shipboard hierarchy has been found out to be the major reason behind most of the accidents in the marine industry (Fortland, 2004). In every accident, an act or omission by a human being plays some role or the other. Personnel at the management level should be well aware of the procedures to be followed and should guide others in the process. Incidents onboard chemical tankers are at times very serious and even leading to death due to the hazardous nature of cargo carried on board. The hazardous characteristics of cargo carried on chemical tankers makes them potential risk for human life and marine environment (Akyuz and Celik, 2015). IMO with their recent amendments in SOLAS have introduced mandatory requirements for operations including tank cleaning and inserting. Even though a lot of rules and regulations are in place, the results of the study have given many insights to the real time activities on board chemical tanker ships.
For the purpose of the study, seafarers on board ship has been classified as per Table 1.

Table 1: Classification of crew- Rank wise.

<table>
<thead>
<tr>
<th>Senior Officer</th>
<th>Master, Chief Officer.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junior Officer</td>
<td>Second Officer, Third Officer, Trainee Officer.</td>
</tr>
<tr>
<td>Crew</td>
<td>Bosun, Pump man, Able body seaman, Ordinary seaman.</td>
</tr>
</tbody>
</table>

The following areas of interests have been shortlisted from questionnaires answered by seafarers at various ranks (Figure2) working on chemical tankers and who were playing an active and direct role in the cargo operations of the ship. The study was mainly concentrated on seafarers working onboard chemical tankers. For the purpose of getting more accurate results only seafarers working on deck department, from deck officers to deck crew were included. A total of 38 senior officers, 60 junior officers and 120 crew members were included in this study. The survey was conducted on ships of a reputed shipping company whose fleet comprises of more than 25 ships of IMO Type II and III sailing worldwide. From the questionnaire four major areas are addressed in this study:

1) Minor incidents involving contact with cargo  
2) Use of personal gas meters  
3) Understanding of MSDS  
4) Training on board ships

![Participant - Ranking](image)

Figure 2: Category of crew included in the study.
5. RESULTS OF THE STUDY:

5.1. Minor incidents involving contact with cargo:

During cargo operations on board ships, there are a lot of instances where crew get exposed to the cargo if not properly dealt with. For the purpose of this study, minor incidents have been categorized as those in which crew members have experienced small leakages or spills on board the ship which were of negligible nature and well within the TLV - threshold limit value, range of that particular cargo.

Figure 3 indicates the percentage of crew members who have been accidentally in contact with cargoes due to various reasons. First part of the graph represents crew members who were involved in accidental contact with cargo. Situations involve loading, discharging, tank cleaning, hose connection, hose disconnection, cargo sampling, tank mop/ dry and even cofferdam purging.

![Minor Incidents - Contact with Cargo](image)

Figure 3: Minor incidents- contact with cargo.

Second part of the graph represents crew members who have actually experienced leakages at manifold during various stages of cargo operations. Cargo manifolds of a tanker are a major area which is most susceptible for leakages due to the fact that they are opened up every time for connecting and disconnecting the shore connections at port facilities.
5.2. Use of personal gas meters:

Personal gas meters are to be used by ship’s crew working on deck, so that they are not exposed to the cargo vapors which can be harmful for human life. Personal gas meters have alarms set at points which can alert the crew in case of a presence of specific vapors and even when the work must be stopped prior to exceeding TLV limits. Hence proper and timely use of personal gas meters should be done by the crew to prevent being exposed to harmful vapors. Figure 4 indicates the results of the study, in which use of personal gas meters for cargo operations and tank cleaning operations have been separately carried out.

It can be clearly noted that seafarers who have used gas meters during cargo operations have not used the same during tank cleaning operations. The above-mentioned fact can be directly related to the rules and regulations, ships must strictly comply when at port.

![Operational Safety: Use of Gas Meter](image)

**Figure 4:** Use of personal gas meters.

While ships are alongside at berth, the terminal authorities also monitor the personal protective equipments being used by the ship crew. This in turn has led to following the rules strictly while at port. Tank cleaning operations on the other hand are done normally out at sea and hence there are no other third parties involved in monitoring the operations on board the ship.
20% of the seafarers also states that they had asked for gas meters during cargo operations but were not given the same by person in charge. 10% seafarers experienced the same during tank cleaning operations.

5.3. Understanding of MSDS:

Material safety data sheets (MSDS) give a detailed safety data overview of the cargo being dealt with. These sheets should be available with every person dealing with the cargo be it a shipper, charterer, receiver, port facility and also the ship crew. Information on the MSDS sheets is of vital importance as it helps in the diagnosis and treatment of a casualty when a chemical exposure has occurred (ICS, 2004). Proper understanding of MSDS sheets are required for safely handling the cargo throughout the voyage. Figure 5 clearly indicates the level of importance seafarers give in understanding MSDS. These sheets give several important information pertaining to first aid measures, exposure controls, personal protection, chemical properties and even toxicological information. Cargo to be loaded can be refused by the vessel, in case sufficient information necessary for the safe transportation of the cargo is not available (IBC Code, 2016). MSDS also contain contact details of shippers who have a wider knowledge of dealing with medical emergencies for that particular cargo.

![Graph showing understanding of MSDS](image)

**Figure 5: Understanding of MSDS.**

Results show that 54% seafarers were of the opinion that, not all times they tried to read and understand the MSDS prior loading a new cargo. While 27% seafarers tried to read and
Understand the data sheets whenever a new cargo was being loaded, 19% seafarers read the MSDS only when they get time. This clearly indicates that many seafarers directly dealing with cargo operations are still not aware of the information they can gain from these MSDS.

### 5.4. Training on board ships:

Training onboard ships are an integral part of improving seafarer efficiency. Effective training and protection programs do not stop after the initial training. Success of the trainings must be evaluated and refresher trainings are to be offered on both a routine and as-needed basis (MSC-MEPC.2/Circ.3, 2006). Specialized theoretical and practical training for every cargo being carried gives the seafarers better understanding of the unique characteristics and be aware of the potential hazards involved while handling them. Computer based training (CBT) programs are readily available on all ships which gives the seafarer a lot of awareness. Apart from this, practical training onboard ships by senior officers helps in giving a much clearer picture to the crew members who are involved in cargo operations. Awareness of the consequences helps in taking precautionary measures at the right time.

![Figure 6: Interest taken by senior staff in training seafarers on board.](image)

Study as per Figure 6 shows that 32% of the seafarers agree to the fact that senior officers were interested in imparting training on ships while 68% of the seafarers claim that senior officers were not interested in training them.
During shipboard operations, practical demonstrations and training should be given to less experienced seafarers. Familiarity gained through regular practice will lead to use of shipboard equipment’s confidently.

6. CONCLUSION:

Although the number and severity of marine accidents have reduced in the past years due to improved equipment’s, well implemented safety management systems, improved regulations, identification and implementation of best practices, incidents still occur with catastrophic consequences. Human error still plays a major role in all accidents. In this study seafarers working on board chemical tanker ships were used for collecting information regarding the day to day shipboard operations. The above statistical information helps in ascertaining the basic mistakes which finally lead to a major incident or accident on board. Information on health and safety hazards obtained from personnel directly involved with the work are the best sources since they can also suggest effective control measures in abating the same. Besides practical conclusions, this study has also revealed theoretical insights as follows:

i) Effectiveness of on-board practical training and increased team awareness
ii) Difficulties in effective implementation of international regulations
iii) Impact of continuous monitoring by senior officers
iv) Effect of commercial pressure on senior management which in turn affects the safety framework
v) New skill sets and improved training technologies required for ever increasing automations

Situational awareness of crew members on chemical tankers can obviously break the chain of errors which leads to an accident. Managing crew fatigue by efficiently allocating workloads will be key towards safe operations. Ergonomic aspects taken in account while designing a ship will indirectly give significant increase in work efficiency. It is only when people carry out their duties reliably and safely, operations on board a chemical tanker can be successfully completed.

In conclusion, this study has revealed reasons for human errors caused on-board ships which leads to minor or major incidents. Reducing these errors can definitely increase work efficiency
and reduce injury and incident rates. Well managed ships are safe to work and earns more profit not just for the ship owner but also to everyone associated with the import and export of cargo. The conversion of all possible weaknesses and threats identified in this study into potential strengths can improve the safe working environment on ships and increase overall productivity. The findings will be used as inputs for further research for implementing safe operational procedures on chemical tanker ships.

REFERENCES:


------------------------------------------------------------------------------------------------------------------

ABOUT THE AUTHOR:

Sajith Babu

Mr. Sajith is a licensed Master Mariner sailing on merchant ships for 15 years. His sailing experience ranges from containers, oil tankers, product tankers and even parcel chemical tankers. He is also an Associate Fellow and Technical Committee member of The Nautical Institute, London. A registered research scholar with Indian Maritime University, his area of interest includes chemical tanker operations, new training methodologies and Augmented reality.

Email Id: sajithbabu@gmail.com
THE 1st WORD IN MARITIME TRAINING

- Maintaining the record of being India’s Largest Maritime Institute in terms of numbers of courses approved by DGS for over 15 years.
- World’s Largest Class DNV-GL awards ‘Grade AI-OUTSTANDING’ to all Postsea Competency courses & Pressea courses.
- HIMT has also been awarded DNV-GL Standard for Certification of “MARITIME TRAINING PROVIDER” in addition to having been awarded ISO 9001:2015 by Bureau Veritas (BV)
- HIMT becomes the 1st institute in South India to Commerence various courses approved by Maritime & Coastguard Agency, United Kingdom (MCA, UK).
- First Institute in South & East India to be Accredited by Nautical Institute, UK for Dynamic Positioning & Maintenance (DF) courses on Latest Kongsberg Simulator.
- HIMT has received or been nominated for at least one International / National Award every year for past 14 Years in the category Maritime Education & Training.
- HIMT Won the award of “Outstanding Colleges in India” on ‘EdTechReview 2020’ at New Delhi on Mar’20

- Mr. Sanjeev S Vakil, CEO, HIMT has been bestowed 13th National level VIBHUSHAN AWARD (Treasure of Shipping Award) for exemplary contribution to the Maritime Industry in the field of “Maritime Leadership” at MAREX Kashti Awards 2019 at New Delhi on Oct’19.
- Seafarers’ choice Awards for the Best Maritime Institute for Value Added Courses (South & East India) 2016 & 2018 by Offing etc.
- Shipping Minister presents an Award for Excellence in Maritime Education & Training at the World Shipping Forum 2013.
- Winner of Seatrade Award 2010, Dubai - Presented by former Secretary General of IMO.
- Sanjeev S. Vakil, CEO, is World’s first Marine Engineer to be conferred with the prestigious Fellowship by The Nautical Institute, UK.
- The only Institute in India that has ranked by various rating agencies approved by the Director General of Shipping - SMERA, CRISIL, CARE, ICRA, DNV-GL and Class NK.
- Entry Level to Advanced level training courses under one Umbrella with World Class Facilities.

VIZAG HIMT has opened for DGS approved courses

www.himtmarine.com | www.himtcollege.com
ISF Institute of Research and Education (IIRE)

Developing and Delivering Integrated Educational and Research Programs

- Benchmarking surveys
- Industry research
- Peer reviewed journal
- Working paper series
- White papers
- Application notes
- Training material distribution
- Book publishing

Compensation and Benefits Surveys

IIRE has been conducting a ‘Compensation and Benefits Survey’ since 2009 for the sailing officers in various ranks of all types of merchant vessels of foreign shipping companies. The report of the survey has become necessary for the industry players helping them in positioning themselves with regards to wages of seafarers.

IIRE Journal of Maritime Research and Development (IJMRD)

IIRE Journal of Maritime Research and Development (IJMRD) is a platform for publication of articles, manuscripts, technical notes, etc. on a wide range of Maritime related topics. The academic works are reviewed by a panel of experienced academicians prior to publication.

ISF Working Paper Series (ISFIRE)

ISFIRE is a platform for authors in Economics to publish their research/book chapters, academic articles, reviews/notes which are under submission, or forthcoming elsewhere. The papers are reviewed by experts and eminent academicians.

Publishing of Books

IIRE is a one stop solution for publications with designing, proof reading and copy editing support. IIRE also has an ISBN number for its publications and supports distribution through online book stores.
**Management & Consultancy**
- Management of Institutes
- Design, Development and Delivery of Courses
- Quality Assurance
- Human Resource Management and Organizational Development

**E - Solutions:**
- E Learning and E Assessment,
- Competence, Aptitude, Psychometric Profiling
- Cadet Selection and Recruitment
- Learning Management Systems
- Audit and Inspections Reporting System
- Career Guidance Platform

**Training:**
- Value Addition Programs for Officers & Ratings
- Electrical, Electronics, Automation
- Electronic Engines
- Soft Skills
- Safety Briefings
- Safety Officers Training
- Distance Learning Programmes

**Research:**
- Surveys;
  - Salary Surveys
  - Compensations and Benefits Exercises,
- Publication of Journals and Research Work

---

**Inner Search Foundation**

**ISF Maritime Services Pvt. Ltd.**

**ISF Group International Pte. Ltd.**
Singapore - www.isfgroup.com

---
