Introduction

“It has been established that seafaring is one of the most physically demanding profession in one of the most dangerous work environments: The Sea”

-International Maritime Health Association, 2012

Merchant navy is a profession, in which a group of people stay away from homes for months on a ship travelling across the world. This profession has been recognized as a high-risk occupation and the safety and health aspects of work on ships are a major concern for ship owners and merchant navy officers. There is a group of around 25-30 people working on a single ship for months. They sail together from one port to another. There are three types of ships on which they work. These are the passenger ships, that travel across the world taking humans from one country to another, e.g. Cruise. The second type is Container ships, that carry large containers which contain parcels and other goods, e.g. ships for import-export purpose. The third type of ships are Tankers that carry materials like petroleum, LPG and other chemical substance with them from one port to another (Jensen et al., 2006).

With the emerging global markets in the last few decades, sea transport remains the cheapest means of ferrying imported and exported bulk items in a variety of forms – liquid, solid and gas and over long distances (Cafruny, 1987). Recent statistics estimate that over the last three decades, the volume of international trade hauled by sea has risen to 90% (Hoffmann and Kumar 2010). Therefore, the shipping industry plays a pivotal role in global trade and ships have been described as ‘the lifeline’ of the 21st century global political economy (Marisec, 2006). India currently supplies around 12.8% of officers and around 14.5% of non officers to the world seafaring community. This is one of the highest of any country.

Merchant navy ships refer to civil ships engaged in cargo and/or passenger traffic. The grouping of merchant ships can be determined by, e.g., Maritime Traffic Areas, route, type of hull, type of machinery, type of cargo and type of ship. Different types of ships can also be divided into subgroups. Various types of ships also imply various types of demands. Not only are there differences in routes, working hours,
time spent on board and skills, the training requirements and mandatory certificates differ as well (International Maritime Organization, 1996a; Transportstyrelsen, 2010).

The Port State Control (PSC) is an inspection of foreign ships in port of call. It is carried out by the national maritime administration and the inspection embraces safety, prevention of pollution by ships and living and working conditions on board ships (Eldh, 2004).

Work characteristics, such as high work stress, job demands, lack of support and physical hazards have also been found to be associated with acute as well as long term fatigue among seafarers (Wadsworth, Allen, McNamara, & Smith, 2008). Long work time on shift, variable working hours, and high levels of perceived work stress, as well as high job demands were strongly associated with higher levels of psychological health problems. Highly significant negative associations with self-reported general health was also found in seafarers due to variable work hours, high levels of work stress, as well as high job demands (Wadsworth, Allen and Smith, 2008).

Seafaring is one of the professions which are at the highest risk of stress. The work environment at the sea as compared to that of ashore is hard, which results in a number of harmful factors concentrated in a small area. This includes chemical, physical and biological factors associated with the peculiarities of working at sea (Jaremin, 2005).

According to Iversen (2012), seafarers spend months or even years away from their homes, they feel lonely, face stress and fatigue, lack of shore leaves, short ship turn-around times, criminalization, harassment and bullying, and dangers from piracy. All these factors can lead to psychological issues like anxiety and depression and in some cases to suicide. Depression and suicide have devastating consequences, not only for seafarer’s families but also for ship co-mates and the companies that employ them.

From the analysis of previous literature, a number of sources of stress that usually include deprivation of basic needs, resulting from the prolonged separation from family and friends (Leka, 2004 and Peplinska, 2011), being in a closed group of
people resulting in social threats (Peplinska, 2011), onerous physical conditions of work-rocking, vibration, noise, changes in climate and time zone (Carotenuto, Molino, Fasanaro and Amenta, 2012), psychological and physical load associated with working in difficult weather conditions, such as during storms, cyclones etc. (Leszczynska, 2010).

There is a requirement of a continuous upgrading of technical knowledge and skills necessary to manage a team of people in this fast changing labour market. Moreover, seafarers actions are continually assessed, which causes a significant increase in their levels of tension and stress (Peplinska, Lipowski and Nieckarz, 2011).

Working in rough conditions may have negative health consequences and influence the psychological well-being of workers, which negatively affects the team and the organisation (Kuoppala, Lamminpaa, Liira and Vainio, 2008; Carotenuto, Molino and Fasanaro, 2013). In the case of the seafarers, we not only speak about managing a team of people, but also managing the ship, responsibility for people and equipments in a high stress environment. A burden for the organism that is both physical and mental (resulting from the separation from friends and family and isolation and deprivation of needs). The data about morbidity and health problems among mariners suggests that officers comprise a high percentage of those experiencing heart attacks, or reposting problems with circulation or respiration (Carotenuto, Molino, Fasanaro and Amenta, 2012).

Zeitlin (1995) in a study on 22,763 seafarers in the US merchant fleet, illness reports were analysed and the results revealed that the deck officers showed higher rates of cardiovascular diseases, heart attack, psychoneurosis, suicide and asthma while the engine officers showed higher rates of heart attack and asthma compared to engine non-officers. The ongoing downsizing along with the swift technological and organizational changes in the merchant ship was found to have the largest impact on the midlevel officers.

Studies have revealed the hazardous effects of exposure to oil and chemicals (Nilsson, 1998; Nilsson, Nordlinger, Moen, Övrebö, Skorve and Tagesson, 2004; Forsell, Hagberg and Nilsson, 2007). The exposure of polycyclic aromatic hydrocarbons found in oils, soot and exhausts gases can cause cancer in the lungs,
skin and possibly urinary bladder (Nilsson, Nordlinder, Moen, Övrebö, Skorve and Tagesson, 2004; Forsell, Hagberg and Nilsson, 2007). The incidence of lung cancer was found to be more than twice as high as expected among engine officers and non-officers, which could not be explained by smoking habits (Nilsson, 1998).

Seafarers’ health and safety aboard ship: factors and consequences

Figure 1.1: Seafarer’s health and safety aboard ship: Factors and Consequences

(Source: Borovink, 2011)

At the mercy of the sea and market conditions, merchant navy officers work around the clock. Shift work and unpredictability are a part of maritime life. It is important to assess what impact these factors might be having in terms of fatigue. Folkard, Lombardi and Tucker (2005) highlighted three key trends which emerged from research into shift schedules and safety:

1. Risk of accidents is high while working at night (and to a lesser extent working in the afternoon) compared to the morning shifts.
2. Risk of accidents increases over a series of shifts, especially at night.
3. Risk of accidents increases as shift’s length increases over 8 hours.

Due to the continuously changing shipping technology, seafarers feel more stressed and possibly result in greater number of accidents and collisions. Good number of seafarers is choosing shore jobs after a short period at sea (Folkard, Lombardi and Tucker, 2005).

Merchant navy officers work in an environment of multiple cultures, multiple languages with demands for higher skills. They have to be ready for 24 hours either for normal operations or for catering to the requirements of contingencies. So, the team work, stress tolerance, job satisfaction etc. appear to be relevant to the working life of a sailor. The study on behavioural profiles of seafarers and their effect on accidents are likely to throw light in the common endeavour to minimize accidents, wastage and improve risk management process. It is of great importance for merchant navy officers to be in optimum condition all the time due to the isolated working environment on board, so that they can respond to any kind emergencies. This however, has lead to neglect of the welfare of seafarers and there is a decrease in job satisfaction and psychological and physical well-being, further contributing to the onset of stress which leads to the problem of poor performance of duties (Gupta, 2014).

According to Carter (2005) Seafaring is a profession in which there are a number of features which suggest that psychosocial issues are likely to be even more significant contributors to the health and performance than is the case on land. Work and non-work activities are, for the duration of spell of duty, spent in the same constrained environment with only long term oscillation between home life and life/work at sea.

Improvements in safety standards, shorter contracts, duration on board, and technological progress which allow better communication with families, despite these advances in the modern maritime sector, seafaring is still the most demanding, stressful and a high-risk occupation (Oldenburg, Baur and Schlaich, 2010; Carotenuto, Molino, Fasanaro and Amenta, 2012).
Malakauskiene (2006) studied that long separation, staying away from home, social isolation and its effects on seafarers, decreased number of seafarer per ship and increased automatization were primary cause of major psychological problems.

As compared to the land based workplaces, the occupation of seafarers and crew on ships as a whole differ a lot. Since seafarers work in shifts, resulting in tough working hours and often time pressure connected to travelling times and operations as unloading and loading of the cargo have to be performed and there are many psychological stressors as a result of all this. Inadequate rest between watches and sleep loss by being woken unexpectedly often are seen as main sources of stress (Kristiansen, 2005).

There are evidences of mental health problems amongst seafarers. An Australian study on Fatigue, Stress and Occupational Health among seafarers found that 60% reported moderate to high stress levels (Parker, 1997). In various researches, three main psychological problems among seafarers were identified by harbour physicians in Rotterdam, they were: loneliness, homesickness, and “burn-out” syndrome. There was a decrease in number of seafarers per ship, and increased automation due to the problems caused by long periods away from home (Agterberg and Passchier, 1998).

Often seafaring is considered as a dangerous occupation. Numerous studies and reports have been done on the physical and mental health of merchant navy officers and on their illnesses and causes of death. There are many working conditions that pose difficulties for the merchant navy officers. Weather conditions play a major role in the professional lives of the mariners. Bad weather conditions like high waves, tornadoes, cyclones etc create a lot of difficulty for the mariners to sail a ship properly. They are not only concerned about the ship but also the well being of other sailors sailing with them and the material they are carrying. Those sailing in calm seas show less depressive symptoms than those who have survived cyclones etc (International Maritime Health Association, IMHA, 2012).

According to Seven seas navigation (2017) The ship is divided into 2 Departments i.e. The Deck Department and The Engine Department.

1. **Deck Department** – The primary work of the officers from this department is
to look after the ship’s navigation, loading and unloading of cargo and general maintenance and administration of the ship. In addition, electronic navigation aids such as radar, depth measuring devices, long range navigation equipment and global positioning system etc are also handled by officers from this department. The officer joins in the rank of 3rd officer and is promoted to the rank of 2nd officer, Chief Officer and finally the Master or Captain of the ship.

2. **Engine Department** – During the 20th century, due to the advances in marine technology, engine department on merchant vessels is considered equally important as the deck department and trained engineers are required to handle the ship’s machinery. The officers in this department are qualified in Marine Engineering. Initially they join as 4th Engineer and later, get promoted to 3rd engineer then the 2nd engineer and lastly as the Chief Engineer, subjected to their passing the competency exams and performance onboard during voyages. Apart from looking after the main engines the duty of the Engine department is also to take care of the equipment like power generation, cargo pumps and air – conditioners etc.

![Various Ranks and Departments in Merchant Navy](source: Seven seas Navigation, 2017)
Professional Categories on board and their roles

The Captain on board is responsible for the whole ship and belongs organisationally to the deck department. The deck officers are mainly responsible for the navigation of the ship and the cargo handling. The deck crew assists them in watch keeping duties, cargo handling and maintenance work on deck (Eldh, 2004).

The head of the engine department is the Chief engineer. They are responsible for the operation and maintenance of the engine equipment on the ship. There are engine non-officers also who are there for the assistance of these engine officers, who are mainly involved in different kinds of maintenance activities and repair work. Some ships also have an electrical engineer, or electrician (Eldh, 2004).

Both these departments have officers and crew members who perform their specific duties headed by the Captain. These officers are ranked in the order of deck cadet, third officer, second officer and chief officer under the deck branch. In engineering branch officers are ranked as the trainee maritime engineer, third engineer, second engineer and chief engineer. And the head of the ship is the Captain. All type of facilities are provide to these merchant navy officers on ship such as games, gym, bar, television room, smoking room, computer room, swimming pool, library, reading room etc, (Maritime labour convention, 2006).

Hill (1972) found that between shipmates, the quality of relationship on a ship becomes extremely important both vertically and horizontally.

According to International Maritime Organization (2010), Job profile of Deck and Engine Merchant navy officers are as follows:

A Deck officer's typical work activities include:

- Using a range of satellite and radar systems and equipment to navigate the vessel
- Updating navigational charts, keeping them updated, making passage plans
- Tracing the weather and reports of navigation and taking proper action
- Taking care of the safe loading, storage and unloading of the cargo at the port
- Supervising the deck crew
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- Maintenance of the ship's hull, cargo gears, accommodations
- Directing line handlers, cargo watches, directing anchor detail and training
- The life saving appliances
- Supervising the operation and maintenance of deck machinery, e.g. winches and cranes
- Managing ship communication systems
- Monitoring and maintaining safety, fire-fighting and life-saving equipment
- Overseeing the ship to ensure that the highest levels of health and safety are maintained
- Maintaining legal and operational records, e.g. the ship's log
- Keeping updated with developments in maritime legal, commercial and political matters

An Engineering officer's typical work activities include:

- Directing others in the operation and maintenance of the mechanical and electrical equipment on board
- Managing power, fuelling and distribution systems
- Repairing and upgrading systems and equipment, e.g. air compressors, pumps and sewage plants
- Implementing regular equipment inspections and maintenance programmes
- Keeping up to date with developments in the marine engineering field

Carter (2005) stated that the increase in systems of management and audit introduced from on-shore have to be followed by officers from both departments and any incidents or damage is seen as their personal responsibility, irrespective of whether the imposed workload is a tolerable one. This may pose an identity crisis; they see themselves as a floating clerk and scapegoat. The concept of sick leave is not valid on board and there is no scope for immediate replacement of anyone who is not well. The pressure to stay on duty and to ignore any health related impairment can create psychological problems for the seafarers, as well as creating potential risk for the vessel and for other crew members.

The requirements for probability in the shipping industry have resulted in the reduction of crew members and mixed nationality crews, extended work hours, increased automation, short turn-around time in ports and a strive to optimize the
cargo hold with regards to capacity and logistics (Bloor, Thomas and Lane, 2000; Lutzhoft, Bohil and Nodin, 2008). Due to the technical developments and increased automation both on the bridge and the engine department, there is a reduction in the number of crew members. Not only has the increase in automation led to those tasks being performed differently, but new tasks have also been added, especially administrative duties (Lutzhoft, 2004). However, a lot of the maintenance work, repairs and different routines have been unaffected by development of technology, and still have to be carried out to the same extent despite reduced seafarers on ship. Work continues for 24/7 hours, often with permanent shift work and extended work (Havold, 2005; Hetherington, Flin and Meanrs, 2006).

Chronic fatigue and sleeping problems have been associated with the working conditions in the shipping industry, disturbed circadian rhythms and various stress-related problems and psychosomatic health problems (Zeitlin, 1995; Hetherington, Flin and Meanrs, 2006; Wadsworth, Allen, McNamara and Smith, 2008). The increased automation and the decreased number of seafarers per ship have been reported as one of the major causes of stress related psychological issues (Zeitlin, 1995; Agterberg and Passchier, 1998; Bloor, Thomas and Lane, 2000; Hetherington, Flin and Meanrs, 2006).

There is a strong association between long shifts, variation in work hours, higher levels of perceived work stress and job demands with higher levels of psychological health problems and self-reported general health problems among seafarers (Wadsworth, Allen, McNamara and Smith, 2008).

The new work tasks has also been previously reported to have discontent among the seafarers (Lutzhoft, 2008), due to the increased computerization, the increase administrative tasks that have been imposed on them. According to the same study, many seafarers also feel their skills and education are inadequate for new tasks. It seems highly probable that this profound and rapid technical, organizational and economical development in the entire shipping industry is a prominent cause behind the relatively high levels of work role conflict.

The responsibilities for the health of seafarers is set within a framework of national and international laws, which is itself supported by a set of concepts and
assumptions about practical actions. Studies have shown that merchant navy officer’s fatigue is common and widespread. There are clear serious risks and consequences inherent in allowing ships to be manned by fatigued officers and crew (Ship Management International, 2012). These can be summarized as follows: leading to more maritime disasters, economic costs caused due to penalties for accidents, losses and increased insurance premiums, and serious health and safety implications for seafarers.

Life at sea involves living in an isolated micro-community. This profession has not yet got the new information communication technologies and has not yet met the needs of the human factors of shipping. In the present time of technological advancement, seafarers have become even more isolated from their family, friends and the world in general as the opportunity to interact and communicate at sea is also becoming difficult. This may result in reducing interaction and socialising, thus increasing the isolation among the crew that creates a dysfunctional and unattractive micro-community that is unattractive to potential applicants and current seafarers. Seafarers are now working and surviving in high levels of isolation and in demanding physical and social environments either working with little time for socialising or being asleep. During watch-keeping, seafarers are essentially alone even when sharing the bridge, particularly when bridges on mega ships span 50 or so meters (Cahoon and Haugstetter, 2008).

The emphasis on physical health is reflected by the seafarer’s routine medical examination which tests for physical impairments such as eye sight, hearing etc. and the presence of chronic illnesses like diabetes etc. but only explores psychological health in a limited way (Maritime & Coastguard Agency, 1999). Yet, seafaring is a psychologically demanding occupation, often necessitating long work hours, frequently in socially isolated conditions. For a seafarer, the ship is both a workplace and a home. Due to fast turnaround times, reduced crewing levels and offshore discharge/ loading facilities, seafarers have few opportunities to go on shore or communicate with family at home and the world outside that of the ship.

Psychological health problems can also be seen to be reflected by the significant proportion of deaths at sea that causes suicide. Research on occupational mortality among seafarers in the British, Singapore and Hong Kong Fleets between
1981 and 1995 showed that approximately 5% of deaths in each fleet were attributable to suicide (Roberts, 1998a). Many of the suicides may have been linked to factors such as marital and other family problems, symptoms of depression or more severe mental illness, or work or financial related as per the statements from crew members when inquired. It was also found that seafarers who were reported have ‘disappeared at sea’ might have committed suicide by jumping in the ocean from the ship.

According to the investigations in the cases of suicide at sea, the roles of marital and family problems have been found to be the contributory factors (Roberts, 1998a). Some evidences have suggested that seafarers find their periodic absences from home problematic. Recent research by the Australian Maritime Safety Association (AMSA) found that the ‘home work’ interface was the largest source of stress among seafarers (Parker, Hubinger, Green, Sargaent, and Boyd, 1997). Similar difficulties were reported by the wives of Great Barrier Reef pilots (Parker, Clavarino and Hubinger, 1998).

The described developments, reduced manning, extended working hours, mixed manning, technological changes and shorter turnaround times in port increase the demands and affect the situation on board. Both on the bridge and in the engine department, a reduction in manning has been made possible by technical developments and increase of automation (Mårtensson, 2006). However, despite reduced manning, lot of the maintenance work, repairs and different routines are basically not affected by the technological development, and still have to be carried out the same way (Bloor, Thomas and Lane, 2000). To uphold the safety on ship, the national Administration stipulates the minimum number of crew members on board (Riksdagen, 2003).

Various studies have found that engine room personnel have a lower stress level than deck officers due to long working days and time pressure or hectic activities probably because of a regular pattern of working hours and routine procedures in the engine room, whereas the deck personnel have to react to permanently changing job demands (port clearance, district routes and watch-keeping at sea). Correspondingly, these activities have been considered to be the most stressful
job activities (Oldenburg, Jensen, Xaver and Baur, 2009; Carotenuto, Molino, Fasanaro and Amenta, 2012 and Rengamani and Murugan, 2012)

As per Standards of Training, Certification and Watch keeping (STCW, 2006) every officer has limited working hours. Each officer has to take rest of 77 hours in 7 days. The rest hours taken by each officer is up to 10 hours a day, which they have to put in records which may be inspected during Port State Control inspections. (Maritime accident investigation branch, MAIB, 2004).

There are 5 major piracy alert zones declared by International Maritime Organization (IMO, 2005). Every year a number of ships are hijacked by these pirates and merchant navy officers are kidnapped. They are treated badly by the pirates and that ill treatment leaves a scar on their brains for life time. Piracy is not a small issue, a couple of laws have been developed and special armed force is appointed to control such incidents. Still every year many cases of piracy take place.

Such attacks and hostage situations are causing serious psycho-trauma with short and long term consequences for seafarers and their families. Some may develop post-traumatic psychological disorders (PTSD) or substance abuse problems requiring professional assessment and treatment from psychologists, psychiatrists or other mental health professionals. For example, 69% of seafarers who were victims of piracy have been shown to have psychological problems after their release, so access to additional competent support may be necessary (Nikolic, 2012).

The maritime newspaper Telegraph (2012) reported that “Naval forces have helped to secure a significant reduction in the number of successful pirate attacks. The International Maritime Bureau (2012) statistics show that Somali pirates hijacked 40% fewer ships in 2011 and that the total number of attacks fell from 445 in 2010 to 439 in 2011 — ending four consecutive years of increases. The working conditions make it harder for them to maintain shore relationships and fewer connections with friends or social circle resulting in social marginality and isolation (Forsyth and Bankston, 1984). An interview conducted on 134 merchant navy officers showed that 59.7% of them consider “long separation from family” as the main stress factor on board.
Dreele (2006) also says, “Chaplains and ship visitors often confront the clash of cultures and nationalities on ship”. Some nationalities should never be put together on the same ship. Racism and abuse are quite prevalent on many open registry ships today. To compound all of this, the merchant navy officer has to deal with immense isolation aboard ship. These sailors sail together for months carrying material form one port of the country to another country. Depression among these mariners increase during prolong stressful conditions such as short voyage. In short voyage, the port arrival is soon and lot of cargo operations are involved which increases the work load and more the number of ports, more will be the work pressure.

Carter (2005) reported that merchant navy officers feel different from other workers because of the patterns of their work and life, which has been equated with the regulated, restricted and secluded world of the prison or asylum by some investigators. While there is a seafaring identity, there is rarely a common identity within a crew because of its divisions by rank, department, country and watch. This can also result in considerable isolation. Gupta (2014) studied stress and job satisfaction of the Indian merchant navy officers who work on the ship. Merchant navy officers spend more time on board with few visits ashore during their duties on board. The merchant navy officers work in an environment of multiple cultures, multiple languages with demand for higher skills. Thus, team work, stress tolerance, job satisfaction etc. appear to be relevant to the working life of sea.

Currently there is a shortage of seafarers, particularly integrated rating and officers, for example, according to the Baltic International Maritime Council (BIMCO) and International Shipping Federation (ISF) study of the demand and supply of seafarers, there is a shortage of 10,000 merchant navy officers worldwide and by 2015 this may reach 27,000 (BIMCO/ISF 2005). The labour shortage is impacting both seafaring and onshore shipping-related positions, particularly in western countries. The shipping industry is not holding the same level of attraction for the young entrants to the job market as it did for the baby boomers and generation x. The younger entrants or gen y as they are widely referred to exhibit different characteristics to their predecessors which when coupled with the changes in the shipping industry are resulting in not only a labour shortage but also a skills and knowledge shortage is yet to fully manifest itself.
Indian Seafarers

India shares 26,950 officers and 55,650 non-officers in all, which is about 6% manpower share of world in maritime industry as per Government of India report, 2006 with latest figures not being updated.

Since the year 1998 till 2006, the number of ships globally has increased by more than 30% and it was expected to increase by 40% in coming five years. As per the prestigious shipping journal Lloyd’s Ship Manager, Norway itself would require more than 10,000 employees to operate the new ships that are presently on order in different shipyards. Efforts are made to heir more European seafarers into shipping career and the applicants in the main Maritime Education and Training institutions is doubled in UK, Denmark, Sweden, Russia etc (Lloyds Ship Manager, 2007).

According to Dixit (2013) there are about 20 or 21 seafarers with four engineers on large ships. A few decades back these used to be about 45 seafarers on board. Due to the increased automation, there is a reduction in the crew members. However, isolation and mental agony increase due to the lack of companionship on board and lonely sailings with increased workload. This eventually affects the productivity and moral of the crew. These factors eventually force the sailors to leave sea life, especially the Indian sailors who culturally are psychologically soft and more attached to their families. This also de-motivates the fresh seafarers. The officers from Organization of Economic Cooperation & Development (OECD) countries continue sailing for many years. According to a study by BIMCO officers from the Indian subcontinent choose to quit sea life after few years and their reduction rate is comparatively high (BIMCO /ISF, 2005). This will lead to an increased shortage of officers in shipping industry. According to Bajpaee (2006), the Indian dropout rate is only 1% and the global average dropout rate of the cadets who enter the shipping is 10%.

In general, it is perhaps of no surprise that very little attention has been given to the impact of seafaring on family life or the effect of prolonged separation from home and family on the seafarers themselves. Health research tends to focus on accidents and injuries (ILO/WHO, 1993; Hansen, 1996 and Mayhew, 1999) or occupational physical illness (Saarni, Niemi, Pentti, and Hartiala, 1992; Hansen, Hansen and Andersen, 1996; Nilsson, Nordliner, Hogstedt, Karlsson and Jarvholm,
1997) rather than psychological or emotional well-being (Bloor, Thomas and Lane, 2000 and Lane, 2002).

**Various Governing Bodies and Codes in Seafaring**

**International Maritime Organization (IMO)**

International Maritime Organization (2015) is a specialized agency of the United Nations (UN) responsible for regulating shipping. The IMO's primary purpose is to develop and maintain a comprehensive regulatory framework for shipping and its work process today includes safety, environmental concerns, legal matters, technical co-operation, maritime security and the efficiency of shipping. On 23 February 2006, the 94th International Labour Conference (Maritime) adopted the Maritime Labour Convention, 2006, which sets out the conditions for decent and proper work in the increasingly globalized maritime industry. The International Maritime Organization Conventions have a direct impact on living and working conditions of sailors so they are an important part of seafarer’s life.

The International Maritime Organization (2006) sets international maritime standards through a number of Conventions and guidelines. The three main International Maritime Organization Conventions are:

- **International Convention for the Safety of Life at Sea (SOLAS)** – this covers safety at sea
- **Standards of Training, Certification and Watchkeeping Convention (STCW)** – this covers training and professional standards for seafarers
- **International Convention for the Prevention of Pollution from Ships (MARPOL)** – this addresses environmental concerns

**The International Labour Organization (ILO)**

To deal with the issues of labours United Nations established an agency International Labour Organization (2017) that specifically deals with the standards of international labours, their social protection, and opportunities of work. Minimum requirements for seafarers to work on a ship and contains provisions on conditions of employment, hours of work and rest, accommodation, recreational facilities, food and catering, health protection, medical care, welfare and social security protection all are set by this convention. The Convention also provides for a maritime labour certificate,
which can be issued to ships once the flag State has verified that labour conditions on board a ship comply with national laws and regulations implementing the Convention. The motto of International Maritime Organization is “Safer ships and cleaner oceans”.

The International Labour Organization sets international labour standards through key international agreements:

Declaration of Fundamental Rights at Work (1998) provides the right of workers to organise and bargain effectively, it also provides freedom from any discrimination and other basic employment rights.

Eight ‘core’ International Labour Organization Conventions (1998) cover the fundamental rights expressed in the Declaration. These Conventions cover:

- Forced labour
- Freedom of association and protection of the right to organise
- Right to organise and collective bargaining
- Equal remuneration
- Abolition of forced labour
- Discrimination (employment and occupation)
- Minimum age
- Elimination of the worst forms of child labour

Major achievements of the International Labour Organization over the past few years include the adoption of the Maritime Labour Convention, 2006, and the Work in Fishing Convention.

The International Labour Organisation (ILO) Convention 180 on Seafarer’s Hours of Work and Manning of Ships that came into force in the year 2002 dictate a maximum amount of work of 14 hours in any 24 hour period and up to 72 hours in any 7-day period. The minimum hours of rest should be not less than 10 hours in any 24 hour period and 77 hours in any 7-day period. The hours of rest may be divided into no more than 2 periods, one of which must be at least 6 hours in length and the interval between consecutive periods must not exceed 14 hours.

The ILO’s Maritime Labour Convention was adopted in February 2006, it ensures satisfactory conditions for the world’s seafarers and sets the minimum standards of employment. It brings together and updates over 65 other ILO maritime
labour instruments, while introducing a system of certification and inspection to enforce it.

**Standards of Training, Certification & Watchkeeping Convention (STCW)**

In the year 1978 Standards of Training, Certification & Watchkeeping Convention was developed and was the first step for seafarers on an international level in establishing basic requirements on training, certification and watch keeping. Previously individual countries established such standards, without reference to practices in other countries. Minimum standards for the seafarers are set by the Convention that are related to their training, certification and watch keeping and the countries have to meet these standards. This Convention came in force in 1984. (International Maritime Organization, 2017)

The new amended convention referred as STCW’95 came in force in July 1997 and is today accepted by 151 countries having more than 98.77% of total world fleet (IMO, 2008). This convention was reorganized and amended in 1995 and is universally applied. This convention specified requirements for different levels of watch keeping personnel working on ships. These requirements are detailed in the form of competencies desired which are achieved in training and confirmed through subsequent examination and certification.

The Convention also contains requirements for specialized ships e.g. oil tankers, passenger ships etc. Some other special requirements for training in fire fighting, first aid and other medical treatment, survival techniques etc. are also included. The convention is dynamic and can be amended if necessary.

**The International Safety Management (ISM) Code**

Japsen, Zhao and Leeuwen (2015) stated that the purpose of International safety management code is to provide an international standard for the safe management and operation of ships and for pollution prevention. The company is responsible for ensuring their captain’s ministering and managing of their own working or rest hours so that they do not suffer from fatigue. It is the responsibility of the company to ensure that the captain, officers and crew are properly qualified, experienced, trained and familiarised with ship and its equipments and are sufficient in number. The code requires the company to prepare plans and instructions,
including checklists for ‘key ship board operations’, which will depend on the type of ship and its operational requirements. The management of personal and their work and rest hours should ensure that the various tasks can be performed safely and that fatigue is prevented. Sailors who are tired for acting safely should not perform operational activities. While the perfection can not be achieved from ISM Code, it should initiate proactive steps and a cycle of continuous improvements. Learning from experienced system failures, it allows a reactive approach, by including previous corrective actions. In any situation on board where a seafarer is not getting minimum hours of rest or works excessive hours and is suffering from fatigue must be recorded in the log books and report to the company.

**Safety of Life at Sea (SOLAS)**

According to International Maritime Organization (IMO, 1976) the main objective of the International Convention for the Safety of Life at Sea (SOLAS Convention) is to set minimum standards for the construction, equipment and operation of ships, compatible with seafarers safety are the Flag States which are responsible for ensuring that the ships under their flag complies with its requirements, and a number of certificates are prescribed in the Convention as a proof that standards have been well taken care of. Port State Control is a procedure in which Contracting Governments are allowed by the control provisions to inspect ships of other Contracting States. They inspect if there are clear grounds for the ship and its equipments comply with the requirements of the SOLAS.

The SOLAS deals with maritime safety and covers a wide range of aspects designed to improve the safety on ship including fire fighting and lifesaving appliances and arrangements (IMO, 2001). The Life Saving Appliance (LSA) Code and Resolution as described by Maritime Safety Committee (1996) is the international standard for the life-saving equipment and its testing and evaluation (IMO, 2003a). The evacuation and safety equipment on board is challenging to handle even under controlled circumstances during trials, and occasional accidents have been reported (Tsychkova, 2000; Simões Ré & Veicht, 2001, 2002; Andersson, 2005; Ekman, 2005;

**Maritime Labour Convention (MLC)**

According to International Labour Convention (2013) MLC, 2006 was adopted by government, employer and worker representatives at a special ILO International Labour Conference to provide international standards for the world’s first genuinely global industry in February 2006. It is unique in its effect on both seafarers and quality ship owners, widely known as the “seafarers’ bill of rights,” The Convention ensures the rights for the seafarer’s working conditions, their living conditions onboard, their minimum age, working hours and rest hours, salaries and wages, paid leaves, medical care on ships, placement services and accommodation and prevention from accidents and handling complaints of seafarers.

The key Conventions of the International Maritime Organization (IMO) that deals with safety and security of merchant vessels and protection of the marine environment, MLC was designed to for the global application, easily understandable, can be updated, equally enforced and for quality shipping of the international regulatory regime it will become the "fourth pillar".

**Directorate General (DG) of Shipping India**

The main office of Ministry of shipping, Government of India is the Directorate General of Shipping (2012). All executive matters, relating to merchant shipping are handled by DG Shipping. Indian shipping remained a deferred subject till independence. It was after the development of shipping attracted the state policy. The subject of Shipping till the year 1949, was dealt by the Ministry of Commerce but it was shifted to the Ministry of Transport and Shipping in 1951. Aiming at the complete development of the shipping industry the Government of India in 1949 announced the National Policy on Shipping. The necessity for a centralized Administrative organization was felt to accelerate the developmental efforts so in Bombay in September 1949, the Directorate General of Shipping was established with its Headquarters.
All matters concerning the Maritime Administration, Education and Training, development of Marine Industry and related subjects are dealt by this Directorate.

The initial objectives of the Directorate General of Shipping were:

- Matters that affect the Merchant Shipping and navigation and administration of the Maritime Law
- Measures to ensure safety of life and ships at sea
- Development of Indian Shipping
- International Conventions relating to Maritime matters
- Provision of facilities for training of Officers and ratings for Merchant Navy
- Regulation of Employment of Seamen and their welfare
- Development of Sailing Vessel Industry and
- Regulation of Ocean freight rates in overseas trades

To ensure the safety of life of seafarers and ships at sea, the Directorate General of Shipping deals with implementation of shipping policy and legislation, prevention of marine pollution, in co-ordination with the International Maritime Organisation promotion of maritime education and training, employment and welfare regulation of seafarers, coastal shipping development, shipping tonnage augmentation, examination and certification of Merchant Navy Officers, Supervision and Control of the allied departments and officer under its administrative jurisdiction.

An important factor within the human element which contributes to fatigue and stress are the biological clock/circadian rhythms. The biological clock within an individual’s body makes him/her sleepy or alert on normal schedule whether they are working or not (Cardiff University, 1996). Similarly, circadian rhythm represents various processes and states in a human body within 24 hours such as sleeping/waking, hormones levels and body temperature. In light of these considerations, the biological clock heavily conflicts with the working patterns of the merchant navy officers due to the irregular schedules on ship caused mainly by crossing time zones while the vessel is en-route and shifting rotations (IMO, 2001).
Consequently, the circadian rhythm of the mariners will be out of synchronization leading to sleeping disorders and tiredness which are major contributing factors to the impairment of the seafarer’s performance at work (Fatigue: IMO guidance, 2006).

**Statement of the problem**

The present study aimed to compare the Deck and Engine merchant navy officers on Depression, Stress, Quality of Life, Job Satisfaction and Subjective Well being. In the present investigation, Quality of Sleep was also be assessed separately as it is an important dimension of Quality of life in merchant navy officers.