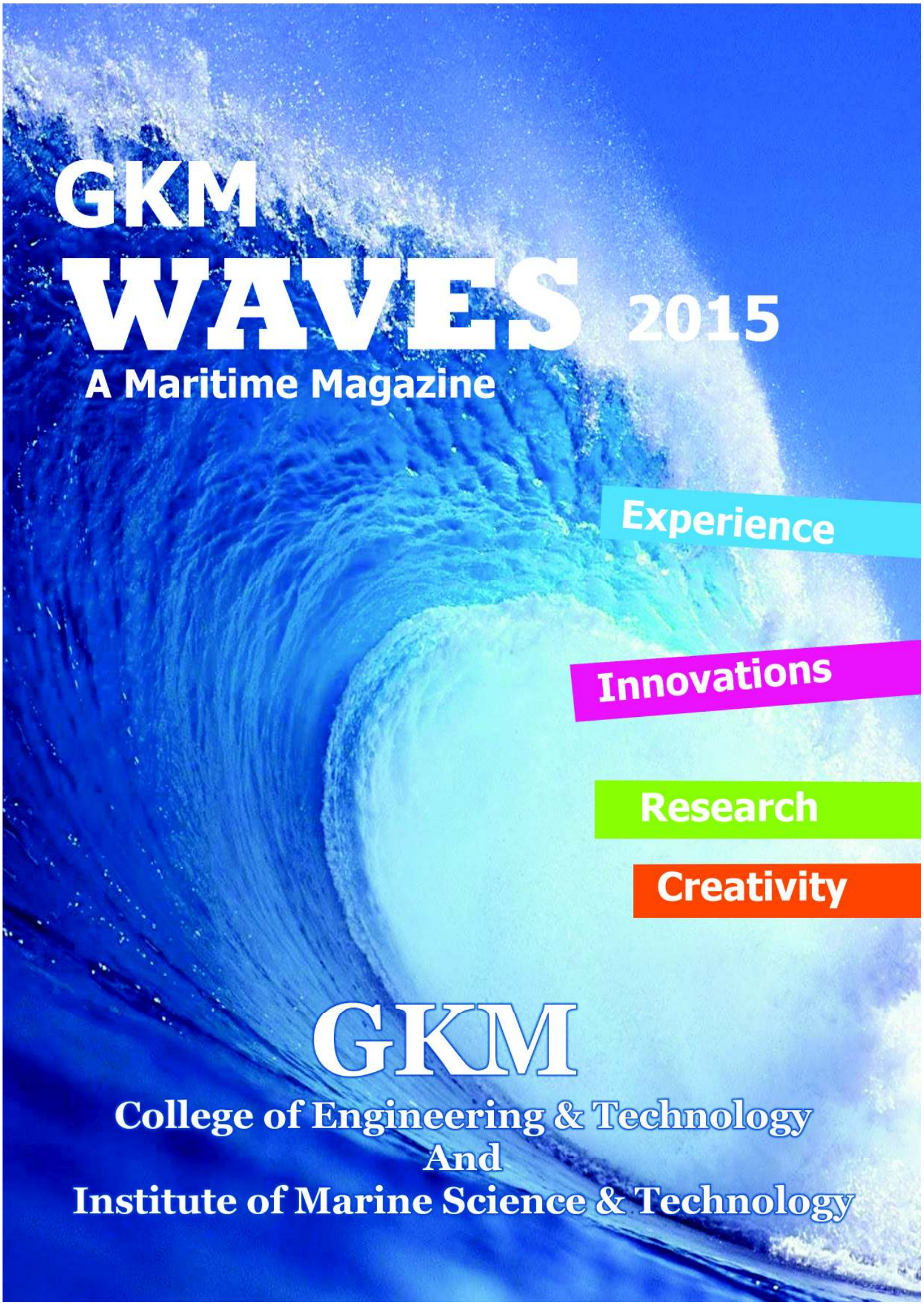
GKM
WAVES 2015
A Maritime Magazine
Experience
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GKM WAVES
2015

GKM Nagar, New Perungalathur
Near Tambarm, Chennai-63
Tamil Nadu

The main purpose of GKM WAVES is to share the knowledge and innovative ideas of the students and staff members. Technical writing is a skill every Engineer should possess. For the last 5 years we are publishing GKM WAVES in a successful manner.

Message from CEO

Dr. SUJATHA BALASUBRAMANIAN

"Discipline is the bridge between goals and accomplishment"

- Jim Rohn

It gives me immense pleasure to address in GKM Waves Technical Magazine. My dear cadets, it is said that mariner's chart their course using the stars. You 'Young Seafarers' of GKM must tune in your compass needles towards the right direction….the Direction of Discipline.

Smooth sailing will never make skilful mariner. GKM believes and imbibes in each one of its students, the art of Self shaping – that is, being both, the sculpture and the sculptor. It is this defining factor coupled with sound technical knowledge that makes GKM students unique and talented from the clad.

Self-motivation threaded with self-respect should be woven into each person's life, more so that of a Mariner.

GKM Waves is one such opportunity to put these benchmarks to practice and exhibit your latent talents. My best wishes to all of you that one day you may shine as bright as those stars that guided your way.

Message from the Director

DR. K.P. JAGANNATHAN

It gives me a great pleasure to know that MATROSE 2015 is schedule on 28 March 2015. I understand that the Day's programme embodies several interesting features. A Programme that is embedded with all constituents of interest to Marine Engineering, Marine Science and other features is relevant to all the participants. I wish the Organising committee of student cadets, Chief Engineers, Master Mariners and Faculty Members a great success.

Looking forward to the Proceedings,

Message from Principal

Dr. C. CHELLAPPAN
Principal
GKMCET

I am immensely happy to see that our Marine Engineering Department is publishing a technical magazine **'GKM Waves'**. This will definitely boost the confidence level of our students and become a platform to share the latest.

GKM Waves provides an opportunity to everyone to demonstrate his/her inherent talent in creative skills and to share knowledge.

I whole heartedly appreciate the students for making efforts bring this magazine in good shape and invite them to take part in the publication of every issue of the magazine.

From Captain's Desk

Capt. N. V. SURESH
CAPTAIN SUPRINTENDENT
GKM IMST

Good days,

The pride of merchant navy is leadership and multitasking abilities. The management and staff of GKM encourage our marine cadets to blend academics and intellectual interests in right proportions so that they inhibit the qualities to become leaders in their profession as captains and chief engineers.

GKM WAVES bring out the capabilities of cadets and it has always been at highest standards in words and sprit.

Our management has a tradition of encouraging the talents of cadets to global needs, so that the institution can offer the best quality cadets to the world shipping industry.

I am sure GKM waves will go a long way in adding values to the shipping industry.

PORT STATE CONTROL

Capt. N.V. SURESH
Captain Superintendent

Port State Control is the control of foreign flagged ships in national ports. However, port state control is not, and can never be a substitute for the proper exercise of flag state responsibility. The primary responsibility to safeguard against substandard ships lies with the flag states. It is when flag states fail to meet their commitments that the port state comes into play.

International conventions have been created and developed on the basis of the safety of the ships being regulated by the flag states. IMO has produced a mass of legislation over the years and majority of countries are members of these conventions. If majority of the countries are members of these conventions, why is it still possible to find ship owners or manning agents who force seafarers to risk their health and lives at sea, or find ships which are unsafe and do not comply with the required technical conditions under the international conventions? Or why are there so many crew members who do not know what to do in case of an emergency?

For a considerable period of time, the shipping community relied on the flag states to

provide overall control. This has been very difficult to achieve especially with the advent of flags of convenience. Flag states also have gradually relied upon more and more on classification societies to regulate and control the standards laid down by the IMO. However, the control mechanisms applied by the flag state and classification societies have proven be not good enough to remove the all-substandard vessels form the industry.

- PSC PRINCIPLES
-
- In principle, there will be no discrimination as to flag.
- Inspections are generally unannounced.
- In general ships will not be inspected within six months of a previous inspection in a MOU port, unless there are “clear grounds” for inspection.

Under the MOUs, the “clear grounds” justifying the undertaking of further inspections are defined as;

a) a report or notification by another authority;
b) a report or complaint by the master, a crew member, or any person or organization with a legitimate interest in the safe

operation of the ship, the shipboard living and working conditions, or the prevention of pollution, unless the authority deems the report or complaint to be manifestly unfounded; and

c) other indications which may warrant a more detailed or an expanded inspection.

In addition to this list, there is a second series of specific "clear grounds" concerning the compliance of vessels with on-board operational requirements. These are;

a) evidence of operational shortcomings revealed during port state control procedures in accordance with the 1974 SOLAS Convention, MARPOL 73/78, and the 1978 STCW Convention;
b) evidence of cargo and other operations not being conducted safely or in accordance with IMO guidelines;
c) involvement of the ship in incidents due to failure to comply with operational requirements;
d) evidence, from the witnessing of a fire or abandoned ship drill, that the crew are not familiar with essential procedures;
e) absence of up-to-date muster list; and
f) indications that the relevant crew members are unable to communicate appropriately with each other, or with other persons on board, or that the ship is unable to communicate with the shoe-based authorities either in a common language or in the language of those authorities;

Who boards a ship to carry out port state control?

Port state control is carried out by a Port State Control Officer (PSCO). The PSCO's powers derive solely from the sovereign state which employs him and is subject to the national laws of the jurisdiction in which he is operating. The PSCO should be an experienced person qualified as a flag state surveyor and able to communicate with the master and key crew members in English. However, the PSCO need not have sailed as master or chief engineer or have had any seagoing experience. *In principle*, he should not have any commercial interest in the port, the ship or be employed by or on behalf of a classification society.

PSC Inspection process:
The targeting system consists of two modules:

i) the generic factor and
ii) the history factor.

The generic factor for an individual ship is calculated by adding together several elements forming a generic profile of the ship. These include: flag states on black list, targeted ship type, non EU recognised classification society, age of the ship, above average class deficiency ratio and flag. The generic factor is updated when the particulars of the ship change or the status of its existing flag or class change. The historic element includes; ships which are entering the region for the first time in the last 12 months; or which have not been inspected in the last six months; ships with a pervious detention in the last 12 months, and those with a number of deficiencies during last 12 months. The overall TF is calculated by adding the generic and historic factor. The targeting factor is only a guideline for selecting ships. Each state or port may have its own priority list of ships to be inspected depending on the type of vessels visiting their ports.

Irrespective of the targeting factors and concentrated inspection campaigns there are a number of circumstances or overriding factors that would take a ship to the top of inspection list. These include:

- Ships that have been reported;
- Ships reported as having outstanding deficiencies;
- Where operational concerns about a ship exist;
- Ships suspended from class.

If a ship has been inspected during the previous six months, and on that occasion, was found to comply with the port state control requirements, it will, in principle, be exempted from further inspection, unless there are clear grounds to warrant further investigation. However, in practice evidence shows that ships are often re-inspected at intervals of less than six months especially when a ship moves between port state regions.

In general the inspection should be limited to check of ship's certificates unless there are clear grounds for believing that the condition of the ship does not substantially reflect those certificates. In the past, this has been interpreted to mean that the inspection should stop once the PSCO has been shown a set of valid certificates. Experience continues to show that valid certificates are no guarantee of compliance with the conventions. Control on compliance with on board operational requirements may be included in the control procedures, particularly if the PSCO has reason to believe that the crew demonstrates insufficient proficiency in that area.

Detention

A PSCO may impose the following courses of action on a ship:

a) Rectification of deficiencies prior to departure;
b) Rectification of deficiencies in the next port, under specific conditions;
c) Rectification of (minor) deficiencies (only) within 14 days;
d) Detention of the ship.

Following an inspection the PSCO has to decide which action has to be taken to correct the deficiencies found and the time within which the corrections are to be made. If the deficiencies found are serious the PSCO has to decide whether he should prevent the ship from sailing until they are rectified.

A PSCO may detain a vessel if there is one deficiency of such serious nature that it warrants the vessel's detention; or if there is a combination of deficiencies which may not warrant detention if viewed individually but when viewed together with other deficiencies, they are seriously sufficient to warrant a vessel's detention.

The Paris MOU gives a list of defects which may constitute grounds for detention. But this is only a guide and it should not be seen as the definitive list of detainable items. The decision to detain requires the PSCO's professional judgment that is why the knowledge, experience, integrity and independence of PSCO is particularly important.

The non-exhaustive list of examples of deficiencies provided by the Paris MOU is as follows:

- Lack of valid certificates;
- SOLAS Convention deficiencies;
- International Bulk Cargo Code deficiencies;
- International Gas Carrier Code deficiencies;
- Load Line Convention Deficiencies;
- MARPOL Convention, Annex I deficiencies;
- MARPOL Convention, Annex II deficiencies;
- Standards of Training, Certification and Watchkeeping Convention-STCW-deficiencies
- ILO Convention deficiencies.
-

Under each category, there is a list of specific deficiencies. When a PSCO decides on the detention of a ship, he will immediately inform the master accordingly and advise him to seek assistance and to arrange remedial action in order not to delay his ship. Following a detention the PSCO officer is required to inform the flag state and the classification society (if it has issued statutory certificates) without delay. This notification includes the PSCO's report of inspection.

A detained ship will only be released once the PSCO is satisfied that the deficiencies found have been properly rectified. In cases where some repairs cannot be carried out in the port of detention, the PSCO may allow the ship to proceed to a repair yard as long as adequate temporary repairs are made and it is safe for the ship to make the voyage.

If the vessel does not comply with the conditions of the release, it will be liable and refused to access to all Paris MOU ports. In order to lift the ban, the vessel needs to be re-inspected to confirm that the ship complies with the conventions. The banning provision has also been extended to cover ships which are required to comply with the ISM Code. The absence of valid ISM certification might also lead to a ship being detained.

PSC has over the years brought a very good safety culture and has helped in bringing down the number of so called "Rust buckets" to a great extent. It has ensured the safety for the seafarers to a very large extend worldwide.

Prof.C.A.Neminathan, B.E,MBA.

Chief Engineer, HOD Marine

A career in merchant navy is a unique blend of variety encompassed in a single domain. By opting for a merchant navy career, individuals can combine a lot of different facets and gain a lot of exposure which would be difficult to gain otherwise.

A very big incentive for anyone to take up a profession is the allure of pay-packages and salaries. The merchant navy offers extremely high payment scales, even for fresh entrants in the profession. The payment scales are set as per the existing IMO (International Maritime Organisation) and ILO (International Labour Organisation) laws.

Additionally, the salary in merchant navy also varies from company to company and on the basis of the qualification and the position held by an individual.

Paying taxes is a responsibility that everyone is wary of. However, people involved in the merchant marines are exempted from paying taxes, if they meet the requirements necessary for exemption purposes as per IT rules ie more than182 days if served in foreign water during that specified financial year.

People involved in the merchant marines get to experience exotic destinations across the whole world. Since jobs in merchant navy require an individual to spend extended periods of time at sea, there is no dearth of time when it comes to exploring these singular destinations.

A professional involved in a merchant marine career gets to meet and mingle with people of different cultures and nationalities. This helps the individual to understand and function better as a team player and learn the nuances of different cultures and traditions at the same time.

Working in the merchant navy enables individuals to function better as a unit. Merchant mariners are required to possess good communication skills and extreme resourcefulness, along with following and maintaining high discipline. These qualities are further honed when a person spends considerable amount of time functioning as a part of a novel team in the high seas. A person not only evolves professionally but also personally while working in merchant navy.

Merchant navy careers offer a lot of exposure to unexpected events, situations and emergencies. By facing such unmitigated

events, professionals gain a widespread knowledge about dealing and facing such problems, in the event of them arising again. The exposure one gets in this field is unlike anywhere else and which helps a person to grow in every aspect.

A career in merchant marines is like having adventures on a day-to-day basis. It's an adventurous life out there. Other routine jobs, involve people having to spend nine hours in an office. This is not for people who like nine-to-five jobs. Merchant mariners get to explore and view the excellent oceanic vista for days on end which, acts as inspiration unlike any. Not only this, the situations which one faces at sea provide experiences of utmost adventurous types.

A career in merchant navy can be taken up immediately after clearing the high school examinations with subjects like physics and mathematics either as an engineer or navigating officer. Not only does it provide good pay but also help in moulding a better career. Having said that, there are career in merchant navy to attain higher qualifications as well. MALMO University in Norway provide this.

Punctuality and discipline are two very important qualities that a person gains through a merchant marine career. Since the oceans are highly unpredictable, a seaman has to be highly cautious, focused and alert to counteract any eventuality. These two qualities are imbibed in maritime professionals right from their college training. The professionals are expected to follow a strict disciplined lifestyle according to navy rules and are also required to wear naval uniforms throughout their careers.

Since the nature of the job requires long working periods, the vacations offered to merchant marine professionals are equally compensating. This enables these professionals to enjoy the best of both worlds – land and water. A 2-4 months vacation is definitely long enough to unwind and follow all your passions. Or 6 months on job and 6 months on vocation how is that?

People with unbridled enthusiasm and zest for life can very well opt for a merchant marine career. It would be satiating without the person ever experiencing any regrets whatsoever in his profession of choice.

Having chosen to be a mariner, the trainee needs to do certain basic things so that he would be a gentleman and a better officer on board.

Upon joining the ship he needs to be polite with his senior officers. Observe and try to learn from them.

On joining the ship initially, the crew member will take advantage ofyou. Hence mix with them freely while on board but never socialize in their cabins?

Nowadays, most of the companies do have alcohol free policy. Observe strictly.

Dress code - always observe this. Use the saloon while dining in proper uniform. That way you will be getting hot food served on your plate. You will also be learning the table manners from your seniors starting from the seating arrangements.

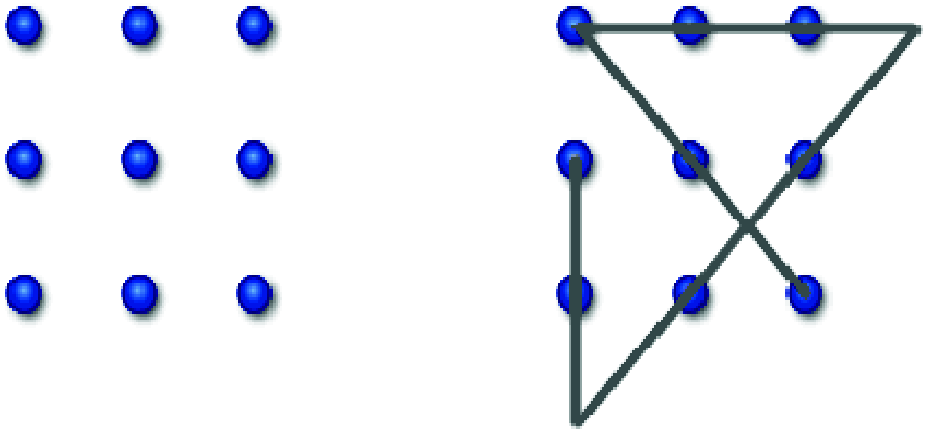
Always follow the code of safe working practices on board.

Few simple ethics are to be practiced like, being sincere, loyal, obedient, reliable trustworthy and hardworking.

Your attitude and aptitude will take to the new altitude in shipping.

For any situation you face either at sea or land, follow the out of box theory.

Example, try and connect 3 rows and 3 columns of dots by four lines



With the existing resource and conditions available you have to solve and sail the ship!

MARINE RESIDUAL FUEL-IF 380-AN EXPERIENCE

Professor V.A.ELANGO

In beginning of 1914 coal burning ships were being commonly in operation. Oil burning steam ships were only modest in operation. Ships with diesel engines were very rare in those days. Subsequently Diesel Engines replaced the external combustion engines. For more than 20 years prior to 1973, the prices of oil had reminded stable. Shipping industry was using IFO 180 at 50°C in Marine Diesel Engines. In 1979 and 1980 due to revolution in Iron, war between Iran and Iraq saw enormous increase in oil price.

This escalation of oil prices forced the R and D departments in find alternate quality fuel resulted in introduction of IF 380. And also the shipping companies decided to operate the vessels in economical speed. The original equipment manufacturers also introduced slow speed nozzles to achieve optimum performance at slow speed operation of the propulsion engines up to 75% MCR.

The author wishes to share his experience with IF 380 which was introduced first time in a ship on experimental basis by a shipping company.

The vessel was a gearless bulk carrier fitted with MAN & BW K90GF180, 20500 BHP at 140 rpm. The ship was provided with one fuel oil settling tank, a service, one fuel oil transfer pump and two fuel oil purifiers. Each unit was provided with 3 fuel injectors (normal speed). The fuel injectors were cooled by the fuel oil supply system and the vessel can be maneuvered in heavy fuel oil.

The owners supplied 100 Mts of IF 380 fuel oil on experimental basis to check the performance of the engine and the system.

Prior to bunkers the following modifications were carried out in fuel oil system as per owner's instructions.

1. Fuel oil transfer pump: Blowing through compressed air arrangement after every transfer was carried out for discharge line from pump to settling tank and suction line from pump to

storage tank as tracing heating steam for these lines were not available to maintain at least 50 deg C at all times.

2. Same arrangements were made for fuel oil purification system.
3. Steam heating coils of settling tank, service tank and a storage tank were pressure tested.

We bunkered IF 380 fuel oil in one of the storage tank. The temperature of the fuel oil had to be kept at 50-55deg C while bunkering and after bunkering. If oil spilled out, it became cake within few minutes.

> "At about 125 rpm, Turbocharger started surging intermittently and continue to surge"

At sea we filled up settling tank in stages and replaced with IF 380 and filled up service tank. After every fuel oil transfer the pump suction line and discharge lines had to be cleared with compressed air. Both oil separators were used as purifiers and ran in series keeping the temperature nearer to 95 deg C. Obviously the purifiers had to be overhauled frequently.

Main Engine was kept at economical speed of 55% MCR. The temperature of fuel oil was found to be 130 deg C to get required viscosity of 15 Cst at the point of injection and the fuel oil pressure was kept at normal value of 4.5 bar.

The performance was checked with indicator cards and was found satisfactory.

Encouraged by the positive results, the owners supplied 500 mts of IF 380 fuel oil for next employment.

As per owner's instructions while increasing Maine Engine rpm to cater the need of charterers to 85% MCR, keeping a close watch on all the parameters, at about 125 rpm, turbo charger started surging intermittently and continue to surge.

Both power and draw cards were taken at that surging rpm.

Indicator card of Unit 1 showed a kink at the end of compression. The Engine was stopped and unit 1 fuel injection pump suction valve was replaced and also all the three fuel valves were pressure tested and fitted in place as found satisfactory.

But the problem persisted and on further increasing rpm the kink was found in other units. Hence we could not increase the rpm beyond 123 on heavy oil.

Main engine was changed over to diesel oil and the performance was checked at 85% MCR and found satisfactory.

Arrival port the following checks were carried out in presence of Service Engineer and found all in order.

1. All 6 units' fuel injectors (3 nos per unit) were tested.
2. All 6 units fuel injection pump timings.
3. All 6 units Exhaust valve cam lead.
4. Relative position of crank shaft, cam shaft, moment compensator etc with trammel gauge.
5. Exhaust uptake silencer and spark arrester for any fouling.
6. Turbo chargers inlet gratings.
7. All units were inspected through the scavenge space.

The performance in presence of service engineer in English Channel was checked by taking indicator cards. The same phenomena were observed and the service engineer left the vessel and assured to refer the same to the Makers.

As the problem persists, with no clue of any abnormal conditions, we decided to increase the fuel oil supply pressure from 4.5 bar after much deliberation while increasing rpm.

For every increase of rpm, the fuel oil pressure was increased gradually. To our surprise there was no surging of turbo chargers. The indicator card also did not show any kink at the end of compression.

With increased fuel oil of pressure to 10 bar, we kept increasing rpm to 85%, the turbocharger did not surge. The indicator cards were taken for every time, all parameters were normal confirming good engine performance.

This encouraged us to carry out the following checks to ascertain the reason for such behaviour of the engine.

The engine ran at 95% MCR at calm weather condition. Indicator cards were taken. We started reducing fuel to Unit 1 by manually pulling fuel pump rack towards reducing the fuel. At one point the forward turbocharger started surging.

One by one same checks were carried out for all units. Some units were stable at low fuel supply. Some other units were less stable at the slightest reduction of fuel supply.

The stability of the individual units also depends upon so many other factors such as length of the high pressure delivery pipe from fuel injection pump to fuel injectors, exhaust gas ducts from cylinder head to the turbochargers and type of shock absorbers in fuel supply system etc.

Conclusion:

There could be two reasons for this problem.

1. Insufficient fuel oil boost pressure to supply correct quantity of fuel oil to the fuel injection pump at and above that rpm (123 rpm) resulting gasification.

Whenever the less stable unit get the insufficient quantity of fuel at that rpm due to gasification, turbocharger started surging.

PIRACY AT SEA

Prof. K.MADHAVAN
GME,Course In-Charge

Piracy in Somalia has been a threat to international shipping since the second phase of the Somali Civil War in the early 21st century.

Since 2005, many international organizations have expressed concern over the rise in acts of piracy. Piracy impeded the delivery of shipments and increased shipping expenses, costing an estimated $6.6 to $6.9 billion a year in global trade in 2011 according to Oceans Beyond Piracy (OBP)Reports.

A United Nations report and several news sources have suggested that the piracy off the coast of Somalia was caused in part by illegal fishing. According to the US House Armed Services Committee, the dumping of toxic waste in Somali waters by foreign vessels also severely constrained the ability of local fishermen to earn a living. In response, the fishermen began forming armed groups to stop the foreign ships. They eventually turned to hijacking commercial vessels for ransom as an alternate source of income.

A survey found that approximately 70% of the local coastal communities at the time "strongly supported the piracy as a form of national defence of the country's territorial waters". The pirates also believed that they were protecting their fishing grounds and exacting justice and compensation for the marine resources stolen.

Some reports have suggested that, in the absence of an effective national coast guard following the outbreak of the civil war and the subsequent disintegration of the Armed Forces, local fishermen formed organized groups in order to protect their waters. This is reflected in the names adopted by some of the pirate networks, such as the National Volunteer Coast Guard, which are testimony to the pirates' initial motivations. However, as piracy became substantially more lucrative, other reports have speculated that financial gain became the primary motive for the pirates.

Combined Task Force, a multinational coalition task force, took on the role of fighting piracy off the coast of Somalia by establishing a **Maritime Security Patrol Area (MSPA) within the Gulf of Aden.**

The increasing threat posed by piracy has also caused concern in India since most of its shipping trade routes pass through the Gulf of Aden. The Indian Navy responded to these concerns by deploying warships in the region on October 2008. In September 2008, Russia announced that it too would join international efforts to combat piracy.

By the first half of 2010, these increased policing efforts by Somali government authorities on land and international naval vessels at sea reportedly contributed to a drop in pirate attacks in the

Gulf of Aden from 86 a year prior to 33, forcing pirates to shift attention to other areas such as the Somali Basin and the wider Indian Ocean.

By the end of 2011, pirates had managed to seize only four ships off the coast of Somalia, 22 fewer than the 26 they had captured in each of the two previous years. They also attempted unsuccessful attacks on 52 other vessels, 16 fewer than the year prior.

As of 27 February 2015, the pirates were holding no major vessels for ransom, although there were twenty-six hostages remaining in their custody from a previous merchant hijacking.

"Somali pirates have attacked hundreds of vessels in the Arabian Sea and Indian Ocean region, though most attacks do not result in a successful hijacking. In 2008, there were 111 attacks which included 42 successful hijackings"

According to another source, there were 151 attacks on ships in 2011, compared with 127 in 2010 – but only 25 successful hijacks compared to 47 in 2010. Pirates had held 10 vessels and 159 hostages in February 2012. In 2011, pirates earned $146m, an average of $4.87 million per ship.

An estimated 3,000 to 5,000 pirates operated; by February 2012 1,000 had been captured and were going through legal processes in 21 countries. According to the European Union Naval Force (EU NAVFOR), intensified naval operations had by February 2012 led to a further drop in successful pirate attacks in the Indian Ocean, with the pirates' movements in the region at large also significantly constrained.

About 25 military vessels from the EU and NATO countries, the United States, China, Russia, India and Japan patrolled approximately 8.3M km2 (3.2 million sq miles) of ocean, an area about the size of Western Europe.

By December 2013, the US Office of Naval Intelligence reported that only nine vessels had been attacked during the year by the pirates, with zero successful hijackings. Control Risks attributed this 90% decline in pirate activity from the corresponding period in 2012 to the adoption of best management practices by vessel owners and crews, armed private security onboard ships, a significant naval presence, and the development of onshore security force.

Summary of recent events

List of ships attacked by Somali pirates

Somali pirates have attacked hundreds of vessels in the Arabian Sea and Indian Ocean region, though most attacks do not result in a successful hijacking. In 2008, there were 111 attacks which included 42 successful hijackings.

However, this is only a fraction of the up to 30,000 merchant vessels which pass through that area. The rate of attacks in January and February 2009 was about 10 times higher than during the same period in 2008 and "there have been almost daily attacks in March" with 79 attacks, 21 successful, by mid-April. Most of these attacks

occurred in the Gulf of Aden but subsequently the pirates increased their range and started attacking ships as far south as off the coast of Kenya in the Indian Ocean. Below are some notable pirate events which have garnered significant media coverage since 2007.

On 28 May 2007, a Chinese sailor was killed by the pirates because the ship's owners failed to meet their ransom demand. On 5 October 2008, the United Nations Security Council adopted resolution 1838 calling on nations with vessels in the area to apply military force to repress the acts of piracy.

At the 101st council of the International Maritime Organization, India called for a United Nations peacekeeping force under unified command to tackle piracy off Somalia (There has been a general and complete arms embargo against Somalia since 1992.)

In November 2008, Somali pirates began hijacking ships well outside the Gulf of Aden, perhaps targeting ships headed for the port of Mombasa, Kenya. The frequency and sophistication of the attacks also increased around this time, as did the size of vessels being targeted. Large cargo ships, oil and chemical tankers on international voyages became the new targets of choice for the Somali hijackers. This is in stark contrast to the pirate attacks which were once frequent in the Strait of Malacca, another strategically important waterway for international trade, which were according to maritime security expert Catherine Zara Raymond, generally directed against "smaller, more vulnerable vessels carrying trade across the Straits or employed in the coastal trade on either side of the Straits."

On 19 November 2008, the Indian Navy warship INS Tabar sank a suspected pirate mothership. Later, it was claimed to be a Thai trawler being hijacked by pirates. The Indian Navy later defended its actions by stating that they were fired upon first.

On 21 November 2008, BBC News reported that the Indian Navy had received United Nations approval to enter Somali waters to combat piracy.

On 8 April 2009, four Somali pirates seized the Maersk Alabama 240 nautical miles (440 km; 280 mi) southeast of the Somalia port city of Eyl. The ship was carrying 17,000 metric tons of cargo, of which 5,000 metric tons were relief supplies bound for Somalia, Uganda, and Kenya. On 12 April 2009, United States Navy SEAL snipers killed the three pirates that were holding Captain Richard Phillips hostage aboard a lifeboat from the Maersk Alabama after determining that Captain Phillips' life was in immediate danger. A fourth pirate, Abdul Wali Muse, surrendered and was taken into custody. On 18 May, a federal grand jury in New York returned a ten-count indictment against him.

On 2 May 2009, Somali pirates captured the M.V Ariana with its 24 Ukrainian crew. The ship was released on 10 December 2009 after a ransom of almost US$3,000,000 was paid.

Armed pirates in the Indian Ocean near Somalia. After the picture was taken, the vessel's crew members opened fire on U.S. Navy ships and the ship's crew members returned fire. One suspected pirate was killed

and 12 were taken into custody (see engaged pirate vessels).

On 8 November 2009, Somali pirates threatened that a kidnapped British couple, the Chandlers, would be "punished" if a German warship did not release seven pirates. Omer, one of the pirates holding the British couple, claimed the seven men were fishermen, but a European Union Naval Force spokesman stated they were captured as they fired AK-47 assault rifles at a French fishing vessel. The Chandlers were released on 14 November 2010 after 388 days of captivity. At least two ransom payments, reportedly over GBP 500 000, had been made.

In early May 2010, Russian special forces retook a Russian oil tanker that had been hijacked by 11 pirates. One died in the assault, and a week later Russian military officials reported that the remainder were freed due to weaknesses in international law but died before reaching the Somali coast. Russian President Dmitry Medvedev had announced the day the ship was retaken that "We'll have to do what our forefathers did when they met the pirates" until a suitable way of prosecuting them was available.

On 15 January 2011 thirteen Somali pirates seized the SamhoJewelry, a Maltese-flagged chemical carrier operated by Samho Shipping, 650 km southeast of Muscat. The Republic of Korea Navy destroyer Choi Young shadowed the SamhoJewlry for several days. In the early morning of 21 January 2011, 25 ROK Navy SEALs on small boats launched from the Choi Young boarded the SamhoJewelry while the Choi Youngs Westland Super Lynx provided covering fire. Eight pirates were killed and five captured in the operation; the crew of 21 was freed with the Captain suffering a gunshot wound to the stomach.

On 28 January 2011, an Indian Coast Guard aircraft while responding to a distress call from the CMA CGM Verdi, located two skiffs attempting a piracy attack near Lakshadweep. Seeing the aircraft, the skiffs immediately aborted their piracy attempt and dashed towards the mother vessel, MV Prantalay 14 – a hijacked Thai trawler, which hurriedly hoisted the two skiffs on board and moved westward. The Indian Navy deployed the INS Cankarso which located and engaged the mothership 100 nautical miles north of the Minicoy Island. 10 pirates were killed while 15 were apprehended and 20 Thai and Burmese fishermen being held aboard the ship as hostages were rescued.

Within a week of its previous success, the Indian Navy captured another hijacked Thai trawler, MV Prantalay 11 and captured 28 pirates aboard in an operation undertaken by the INS Tir pursuant to receiving information that a Greek merchant ship had been attacked by pirates on board high-speed boats, although it had managed to avoid capture. When INS Tir ordered the pirate ship to stop and be boarded for inspection, it was fired upon. The INS Tir returned fire in which 3 pirates were injured and caused the pirates to raise a white flag indicating their surrender. The INS Tir subsequently was joined by CGS Samar of the Indian Coast Guard. Officials from the Indian Navy reported that a total of 52 men were apprehended, but that 24 are believed to be Thai fishermen who were hostages of the 28 African pirates.

In March 2011, the Indian Navy intercepted a pirate mother vessel 600

nautical miles west of the Indian coast in the Arabian Sea on Monday and rescued 13 hostages. Sixty-one pirates have also been caught in the operation carried out by Navy's INS Kalpeni.

In late March 2011, the Indian Navy seized 16 suspected pirates after a three-hour-long battle in the Arabian Sea, The navy also rescued 16 crew members of a hijacked Iranian ship west of the Lakshadweep Islands. The crew included 12 Iranians and four Pakistanis.

On 5 January 2012, an SH-60S Seahawk from the guided-missile destroyer USS Kidd, part of the USS John C Stennis Carrier Strike Group, detected a suspected pirate skiff alongside the Iranian-flagged fishing boat, Al Molai. The master of the Al Molai sent a distress call about the same time reporting pirates were holding him captive.

A visit, board, search and seizure team from the Kidd boarded the dhow, a traditional Arabian sailing vessel, and detained 15 suspected pirates who had been holding a 13-member Iranian crew hostage for several weeks. The Al Molai had been hijacked and used as a "mother ship" for pirate operations throughout the Persian Gulf, members of the Iranian vessel's crew reported.

Methodology

A pirate skiff in Baltiysk, Russia—captured by the Russian Navy

The methods used in a typical pirate attack have been analysed. They show that while attacks can be expected at any time, most occur during the day; often in the early hours. They may involve two or more skiffs that can reach speeds of up to 25 knots. With the help of motherships that include captured fishing and merchant vessels, the operating range of the skiffs has been increased far into the Indian Ocean. An attacked vessel is approached from quarter or stern; RPGs and small arms are used to intimidate the operator to slow down and allow boarding. Light ladders are brought along to climb aboard. Pirates then will try and get control of the bridge to take operational control of the vessel.

According to Sky News, pirates often jettison their equipment in the sea before arrest, as this lowers the likelihood of a successful prosecution.

Weaponry and funding

The pirates get most of their weapons from Yemen, but a significant number come from Mogadishu, Somalia's capital. Weapons dealers in the capital receive a deposit from a hawala dealer on behalf of the pirates and the weapons are then driven to Puntland where the pirates pay the balance. Various photographs of pirates in situ indicate that their weapons are predominantly AKMs, RPG-7s, AK47s, and semi-automatic pistols such as the TT-30. Additionally, given the particular origin of their weaponry, they are likely to have hand grenades such as the RGD-5 or F1.

The funding of piracy operations is now structured in a stock exchange, with investors buying and selling shares in upcoming attacks in a bourse in Harardhere. Pirates say ransom money is paid in large denomination US$ bills. It is delivered to them in burlap sacks which are either dropped from helicopters or cased in waterproof suitcases loaded onto tiny skiffs. Ransom money has

also been delivered to pirates via parachute, as happened in January 2009 when an orange container with $3 million cash inside was dropped onto the deck of the super tanker MV Sirius Star to secure the release of ship and crew. To authenticate the banknotes, pirates use currency-counting machines, the same technology used at foreign exchange bureaus worldwide. According to one pirate, these machines are, in turn, purchased from business connections in Dubai, Djibouti, and other areas.[100] Hostages seized by the pirates usually have to wait 45 days or more for the ships' owners to pay the ransom and secure their release.

In 2008, there were also allegations that the pirates received assistance from some members of the Somali diaspora. Somali expatriates, including some members of the Somali community in Canada, reputedly offered funds, equipment and information.

According to the head of the UN's counter-piracy division, Colonel John Steed, the Al-Shabaab group in 2011 increasingly sought to cooperate with the pirate gangs in the face of dwindling funds and resources for their own activities. Steed, however, acknowledged that he had no definite proof of operational ties between the pirates and the Islamist militants. Detained pirates also indicated to UNODC officials that some measure of cooperation with Al-Shabaab militants was necessary, as they have increasingly launched maritime raids from areas in southern Somalia controlled by the insurgent outfit. Al-Shabaab members have also extorted the pirates, demanding protection money from them and forcing seized pirate gang leaders in Hardhere to hand over 20% of future ransom proceeds. It has been suggested that al-Qaeda have received funding from pirate operations. A maritime intelligence source told CBS News that it was "'inconceivable' to Western intelligence agencies that al Qaeda would not be getting some financial reward from the successful hijackings". They go on to express concern about this funding link being able to keep the group satisfied as piracy gains more publicity and higher **ransoms.**

Effects and perceptions

Costs

Both positive and negative effects of piracy have been reported. In 2005, a liquefied petroleum tanker, MV Feisty Gas, was hijacked and ransomed for $315,000 after being held for about two weeks. In 2009, pirate income derived from ransoms was estimated at around 42.1 million euros (about $58 million), rising to $238 million in 2010. The average ransom had raised to $5.4 million in 2010, up from around $150,000 in 2005.However, by 2011, pirate ransom income dropped to $160 million, a downward trend which has been attributed to intensified counter-piracy efforts.

Besides the actual cost of paying ransoms, various attempts have been made at gauging indirect costs stemming from the piracy; especially those reportedly incurred over the course of anti-piracy initiatives.

During the height of the piracy phenomenon in 2008, local residents complained that the presence of so many armed men made them feel insecure and that their free spending ways caused wild fluctuations in the local exchange rate. Others

faulted them for excessive consumption of alcoholic beverages and khat.

A 2010 report suggested that piracy off the coast of Somalia led to a decrease of revenue for Egypt as fewer ships use the Suez canal (estimated loss of about $642 million), impeded trade with neighboring countries, and negatively impacted tourism and fishing in the Seychelles. According to Sky News, around 50% of the world's containers passed through the Horn of Africa coastline as of 2012. The European Union Naval Force (EU NAVFOR) has a yearly budget of over 8 million Euros earmarked for patrolling the 3.2 million square miles.

A 2011 report by Oceans Beyond Piracy (OBP) suggested that the indirect costs of piracy were much higher and estimated to be between $6.6 to $6.9 billion, as they also included insurance, naval support, legal proceedings, re-routing of slower ships, and individual protective steps taken by ship-owners.

Another report from 2011 published by the consultancy firm Geopolicity Inc. investigated the causes and consequences of international piracy, with a particular focus on such activity off the coast of Somalia. The paper asserted that what began as an attempt in the mid-1990s by Somali fishermen to protect their territorial waters has extended far beyond their seaboard and grown into an emerging market in its own right. Due to potentially substantial financial rewards, the report hypothesized that the number of new pirates could swell by 400 persons annually, that pirate ransom income could in turn rise to $400 million per year by 2015, and that piracy costs as a whole could increase to $15 billion over the same period.

According to a 2012 investigative piece by the Somalia Report, the OBP paper and other similar reports that attempt to calibrate the global cost of piracy produce inaccurate estimates based on a variety of factors. Most saliently, instead of comparing the actual costs of piracy with the considerable benefits derived from the phenomenon by the maritime industry and local parties capitalizing on capacity-building initiatives, the OBP paper conflated the alleged piracy costs with the large premiums made by insurance companies and lumped them together with governmental and societal costs. The report also exaggerated the impact that piracy has had on the shipping sector, an industry which has grown steadily in size from 25,000 billion tonnes/miles to 35,000 billion tonnes/miles since the rise of Indian Ocean piracy in 2005. Moreover, the global costs of piracy reportedly represent a small fraction of total maritime shipping expenses and are significantly lower than more routine costs, such as those brought on by port theft, bad weather conditions or fuel-related issues. In the United States alone, the National Cargo Security Council estimated that between $10–$15 billion were stolen from ports in 2003, a figure several times higher than the projected global cost of piracy. Additionally, while the OBP paper alleged that pirate activity has had a significantly negative impact on regional economies, particularly the Kenyan tourism industry, tourist-derived revenue in Kenya rose by 32% in 2011. According to the Somalia Report investigation, the OBP paper also did not factor into its calculations the overall

decline in successful pirate attacks beginning in the second half of 2011, a downward trend largely brought about by the increasing use of armed guards. According to Admiral Terence E. McKnight, ransom demands and payments have risen exponentially and the financers and pirates decided they are willing to wait as long as it takes to receive "high seven-figure payouts".

Casualties

Piracy off the coast of Somalia has reportedly produced some casualties. According to many interviewed maritime security firms, ship owner groups, lawyers and insurance companies, fear of pirate attacks has increased the likelihood of violent encounters at sea, as untrained or overeager vessel guards have resorted to shooting indiscriminately without first properly assessing the actual threat level. In the process, they have killed bothpirates and sometimes innocent fishermen as well as jeopardizing the reputation of private maritime security firms with their reckless gun use. Since many of the new maritime security companies that have emerged often also enlist the services of off-duty policemen and former soldiers that saw combat in Iraq and Afghanistan, worries of a "Blackwater out in the Indian Ocean" have only intensified of the 4,185 seafarers whose ships had been attacked by the pirates and the 1,090 who were held hostage in 2010, a third were reportedly abused. Some captives have also indicated that they were used as human shields for pirate attacks while being held hostage.

According to Reuters, of the 3,500 captured during a four-year period, 62 died. The causes of death included suicide and malnutrition, with 25 of the deaths attributed to murder according to Intercargo. In some cases, the captives have also reported being tortured. Many seafarers are also left traumatized after release.

Waste dumping

Following the Indian Ocean tsunami of December 2004, there have emerged allegations that after the outbreak of the Somali Civil War in late 1991, Somalia's long, remote shoreline was used as a dump site for the disposal of toxic waste. The huge waves which battered northern Somalia after the tsunami are believed to have stirred up tonnes of nuclear and toxic waste that was illegally dumped in Somali waters by several European firms – front companies created by the Italian mafia. The European Green Party followed up these revelations by presenting before the press and the European Parliament in Strasbourg copies of contracts signed by two European companies—the Italian Swiss firm, Chair Partners, and an Italian waste broker, Progresso—and representatives of the warlords then in power, to accept 10 million tonnes of toxic waste in exchange for $80 million (then about £60 million). According to a report by the United Nations Environment Programme (UNEP) assessment mission, there are far higher than normal cases of respiratory infections, mouth ulcers and bleeding, abdominal hemorrhages and unusual skin infections among many inhabitants of the areas around the northeastern towns of Hobbio and Benadir on the Indian Ocean coast—diseases consistent with radiation sickness. UNEP continues that the current situation along the Somali coastline poses a very serious environmental

hazard not only in Somalia but also in the eastern Africa sub-region.

Anti-piracy measures: Anti-piracy measures in Somalia

As of 2013 three international naval task forces operated in the region, with numerous national vessels and task forces entering and leaving the region, engaging in counter-piracy operations for various lengths of time. The three international task forces which compose the bulk of counter-piracy operations are Combined Task Force 150 (whose overarching mission is Operation Enduring Freedom), Combined Task Force 151 (which was set up in 2009 specifically to run counter-piracy operations) and the EU naval task force operating under Operation Atalanta. All counter-piracy operations are coordinated through a monthly planning conference called Shared Awareness and Deconfliction (SHADE). Originally having representatives only from NATO, the EU, and the Combined Maritime Forces (CMF) HQ in Bahrain, it now regularly attracts representatives from over 20 countries.

Between 2009 and 2010, the government of the autonomous Puntland region in northeastern [illegible] reforms a [illegible] of its offic[illegible] In May 2[illegible] new naval [illegible] located [illegible] commerci[illegible] numerous security measures appear to have borne fruit, as many pirates were apprehended in 2010, including a prominent leader. Puntland's security forces also reportedly managed to force out the pirate gangs from their traditional safe havens such as Eyl and Gar'ad, with the pirates now primarily operating from Hobyo, El Danaan and Harard here in the neighbouring Galmudug region. The Puntland Maritime Police Force is a locally recruited, professional maritime security force that is primarily aimed at fighting piracy off the coast of Somalia.

Have the courage to follow your heart and intuition.
They somehow know what you truly want to become.
-Steve Jobs

INLAND WATERS ALONG EAST COST OF INDIA

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Logistics is a supply chain from the manufacturer to the end user. In general multi model transportation is involved in logistics to complete the supply chain. Among the multimodal transport, **water ways** is the **cheapest** in transporting the goods and also maximum quantity of the material is transported through that. Though in INDIA there are many rivers and canals, inland water transport is used least (**App.3%** only), whereas **China** is using app.**35%** of the inland water ways for transporting the cargo. So **for improving the economy, inland water transport has to be efficiently used for minimising the cost and maximising the profit.**

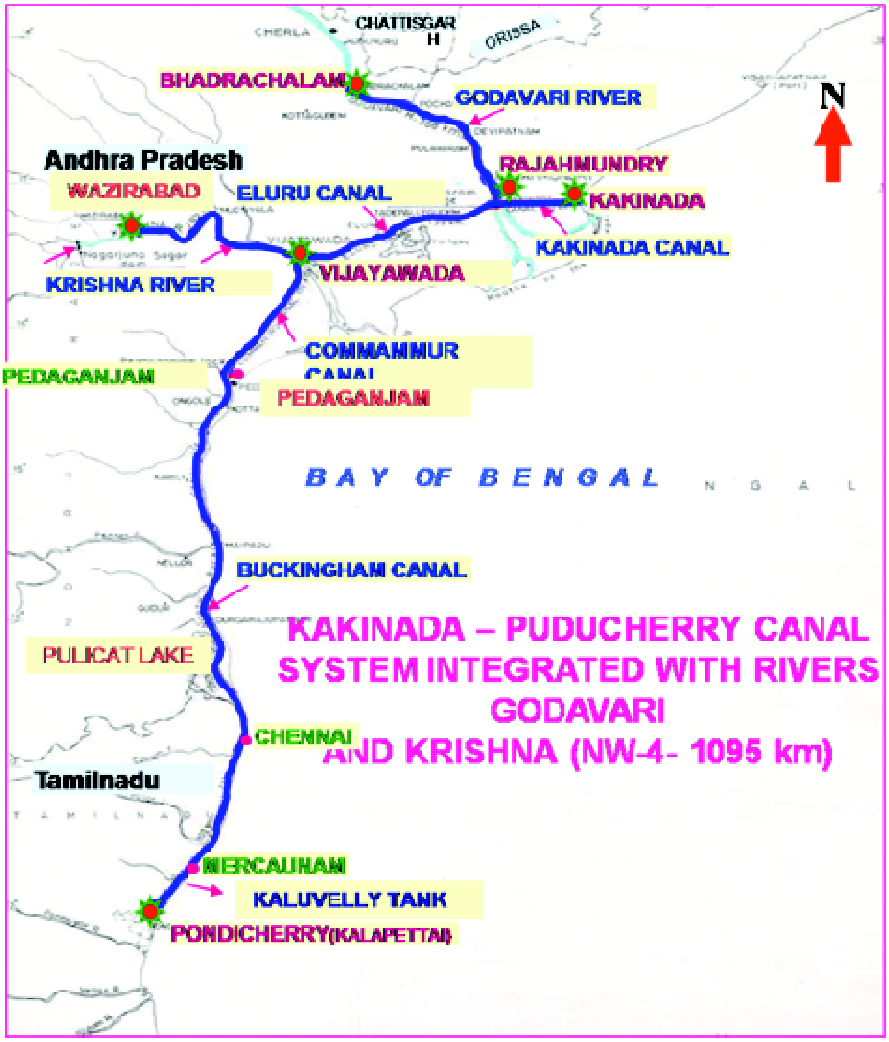
A part of eastern India's inland water way is analysed:

National Waterway 4 (India)

National Waterway 4 (NW-4)	
Details	
Location	Kakinada, Chennai, Puducherry
Length	**1095 km**
No. of terminals	**15**
Owner	**Inland Waterways Authority of India(IWAI)**
Operator	**Central Inland Water Transport Corporation (CIWTC)**

National Waterway 4 (NW-4) is a **1,095 kms** long waterway in India. It has been declared as an Indian National Waterway and is currently under development. It connects the Indian states of Andhra Pradesh, Tamil Nadu, and the union territory of Puducherry. The NW-4 runs along the Coromandal Coast through Kakinada, Eluru, Commanur, Buckingham Canals and also through part of Krishna and Godavari rivers in South India. It was declared a National Waterway on 24 November 2008 under the Provisions of National Waterways Bill, 2006. It is being developed by the Inland Waterways Authority of India (IWAI), and is scheduled for completion in 2013.

BUCKINGHAM CANAL



The Buckingham Canal is a salt-water navigation canal with a length of 420 km. It extends parallel to the Coromandel Coast of South India from the Krishna District in the state of Andhra Pradesh to the Villupuram District in the state of Tamil Nadu. The canal joins majority of the natural backwaters along the coast to the port of Chennai (formerly Madras). It was built by the British Raj, and was a significant waterway throughout the late nineteenth and the twentieth century.

The first section of the canal was built in the year 1806, from Chennai north to Ennore. After that, it was stretched towards the Pulicat Lake, 40 km north of Chennai. The canal came under the jurisdiction of the Madras Presidency in 1837 and was again extended. It eventually extended up to 315 km north of Chennai to Peddaganjam on the Krishna River in the Krishna

District of the state of Andhra Pradesh, and 103 km south of Chennai to Marakkanam in the state of TamilNadu.

During the years 1877 and 1878 the people of Chennai fell prey to a terrible famine. More than 3 million people died. The eight-kilometre stretch, connecting the Adyar and the Cooum rivers, was constructed in 1877-78 at a cost of Rs.3 million to aid the famine-affected people. The canal received the name Buckingham Canal in 1878 because the link was built under the supervision of the then Governor, the Duke of Buckingham and Chandos. The canal runs around 1 km back from the shore. The Cooum River joins the canal to the Bay of Bengal in the heart of Chennai. The segment north of the Cooum is called the North Buckingham Canal, and the section south of the Cooum is known as the South Buckingham Canal. 257 km of the total length of the canal is in Andhra Pradesh, and 163 km is in Tamil Nadu. About 31 km is within the city boundaries of Chennai.

Buckingham Canal

The Buckingham Canal was previously used to transport goods up and down the coast to Chennai. The cyclones of 1965, 1966 and 1976 spoiled the canal, and it is currently of little or no use. Inside the city of Chennai the canal is shoddily contaminated from sewage and industrial effluent, and the silting up of the canal has left the water sluggish. But the nice thing is that during the 2004 Indian Ocean tsunami, the Buckingham Canal acted as a safeguard zone and regulated the tsunami waves on the coastal area over almost 310 km from PeddaGanjam to Chennai.

Act as a Buffer Zone for high waves:

The canal all along the coastline was packed with tsunami water, which poured out at a few places and retreated back to the sea within 10 to 15 min. This helped a long way in saving the lives of a number of fishermen, particularly in coastal Andhra Pradesh and fractions of the Chennai city and also helped in clearing the aquaculture remains. The natural growth of vegetation on both the sides of the canal also helped in listening the impact of the tsunami. Buckingham canal had saved several people from the fury of Tsunami of 26th Dec 2004. It acted as Buffer Zone to save people from Tsunami.

An article regarding this is published in "**The Hindu dt.Aug.11th 2005**" about saving of life from Tsunami.

History

National waterways in India

In India, the national waterways are developed by the central government through the Inland Waterways Authority of India (IWAI) - the regulatory body for the Inland Waterways Transport (IWT) sector. IWAI was set up by the Inland Waterways Authority of India Act in 1985 and given responsibility of development, maintenance, and regulation of national waterways in the country. It is a statutory autonomous body for regulating and developing navigation and shipping in the inland waterways. Along with IWAI, Central Inland Water Transport Corporation (CIWTC) also supports the IWT sector through transportation of cargo via inland waterways and the operation and maintenance of the vessels and waterway terminals. The first national waterways established in India were the NW-1,2& 3 (est. in mid 1980s & 1993). They have a combined length of 2,716 kms.

Development of NW-4, 5 & 6

As early as 1993-95, IWAI commenced studies for developing an integrated canal linking Kakinada and Chennai. The Indian government initiated the process for developing three more national waterways in 2005. In July 2006, the Minister of Shipping, Road Transport and Highways announced the proposal for development of NW-4 in the LokSabha. In addition to the three existing national waterways, the government also declared the following inland waterways as national waterways:

Lengths of Individual Stretches (NW-4)	
Stretch	**Length in km**
Kakinada canal	50
Eluru canal	139
Krishna river section	157
Godavari river section	171
Commamur canal	113
North Buckingham canal	316
South Buckingham canal	110
Marakkanam-Pondicherry section	22
Total	1095

- Kakinada-Pondicherry canals along with Godavari and Krishna rivers (1,095 kilometres (680 mi)) as NW-4.

The proposals were made into law with the passage of the Inland Vessels (Amendment) Bill, 2005 in 2007. In October 2008, another bill - the National waterways Bill, 2006 - was passed in Parliament. It declared the Kakinada-Pondicherry stretch of canals comprising the Kakinada

canal, Eluru canal, Commamur canal, Buckingham canal, the Kaluvelly tank, Bhadrachalam-Rajahmundry stretch of riversGodavari, Wazirabad-Vijayawada stretch of river Krishna in Andhra Pradesh, Tamil Nadu and Puducherry as national waterways. According to this bill, it will take five years and ₹ 542 crores (5.42 Billion) (in 2002 prices) for the completion of the proposed new national waterways.

Course

The National Waterway NW-4 comprises nearly 690 kms of canal and 328 kms of river sections. In turn, the river section of the NW-4 comprises two major sections - a) " Godavari river section" and b) " Krishna river section" (after the two main rivers of the state of Andhra Pradesh). The Godavari River section stretches from Bhadrachalam toDowleiswaram, Rajahmundry. The Krishna River section stretches from Wazirabad Nalgonda district to PrakasamBarrage,Vijayawada. The canal section of NW-4 is formed by a combination of the Kakinada canal, the Eluru canal, Commamur canal, and the Buckingham canal. The Kakinada canal runs between Kakinada and Rajahmundry for a length of 50 kms. Starting from Dowleiswaram on the left bank of the river Godavari through a head sluice and lock to Kakinada (app. 5 kms downstream from Kakinada Port). The canal gets its water from the Godavari through the Dowleiswaram barrage and thereafter connects Kakinada anchorage port. It connects the Godavari river section from Bhadrachalam to Rajahmundry. The Eluru canal comprises two distinct irrigation-cum – navigation canals, namely the Krishna Eluru canal of the eastern Krishna delta and the Godavari Eluru canal of western Godavari delta. It runs between Vijayawada to Vijjeswaram lock at Sir Arthur Thomas Cotton Barrage for a total distance of 139 kms . The Krishna Eluru canal takes off from the river section on the left bank of Krishna river on the upstream of Prakasam barrage through a head sluice at Vijayawada and meets Godavari Eluru canal at east Tammileru lock at Eluru.The Godavari Eluru canal takes off from the River section of river Godavari at Vijjeswaram (16°56′2″N 81°43′27″E) in Rajahmundry on the upstream of Dowleiswaramanicut through a head sluice and joins Krishna Eluru canal at East Tammileru lock. The Commamur canal runs between Vijayawada Seethanagaram lock and Peddaganjam lock for a total length of 113 kms. It takes off from the Krishna River section in river Krishna in Vijayawada on the right side upstream off Prakasam barrage through a head sluice at Seethanagaram and joins the Buckingham canal at Peddaganjam Lock near Ongole. The Buckingham canal is a tidal canal stretching from Peddaganjam lock to Chennai and further down south up to Marakkanam. The stretch of the canal from Peddaganjam lock to Chennai for a length of 316 kms is called "North Buckingham canal" and the canal path from Chennai to Marakkanam for a total length of 110 kms is called "South Buckingham canal". It was constructed during the 19th century along theCoromandal Coast. Marakkanam is connected to the Sea (Bay of Bengal) at Pondicherry by the Kalluvelly tank.

The lengths of the Tamil Nadu and Puducherry parts of rivers and canals are given below:

S.No	State	Description of Canals & Rivers	Total Length
1	Tamil Nadu	North Buckingham canal (AP-TN border at Tada to Basin Bridge), South Buckingham canal and Kalluvelly tank	210 kms

2	Puducherry	Southern portion of Kalluvelly tank – Pondicherry link	2 kms

Geographical boundaries

Development

The concept of National Waterways was introduced in 1982 to promote the development of inland water transport in the country. At present, out of six declared National Waterways, developmental works are being carried out on NW-1, 2, and 3 only by Inland Waterways Authority of India (IWAI). The first three National Waterways (NW-1, 2 & 3) are being developed for shipping and navigation by providing basic inland transport infrastructural facilities, including navigational channel with required depth and width, aids for day and night navigation, and terminals at selected locations for berthing and loading/unloading of vessels.

In NW-1 & 2, IWAI undertakes river conservatory works to provide navigational channel of 3 metres, 2 metres, and 1.5 metres depth in different stretches during the low water period. In NW–3, IWAI is carrying out dredging to provide a navigational depth and width of 2 metres and 32 metres, respectively. Development works are being carried out with the objective of making all three National waterways fully operational with cargo and other inland vessels by March 2012.

For National Waterways 4 and 5, IWAI initiated the proposals for development in July 2010. Techno-economic studies for establishment of National Waterways NW-4 was done by Water And Power Consultancy Services (WAPCOS), a subsidiary of Ministry of Water Resources

The completion period for NW-4 was estimated at seven years by Detailed Project Report prepared by WAPCOS, which is contrary to that of 2002 estimates which indicated five years as completion period. 1707 Hectares of land are required for NW-4 construction; 300 Ha, 1380 Ha, and 27 Ha land has to be acquired in the states of Tamil Nadu, Andhra Pradesh, and Puducherry respectively.

Traffic

Current traffic

There is no significant traffic in the waterway except for movement of country boats which carry local produce. The main reason for lack of IWT movement is the absence of other infrastructure facilities and coordinated effort for improvements.

Potential traffic

NW-4 has been divided into four major cargo belts, namely Kakinada belt, Krishna belt, South Andhra Pradesh belt, and Chennai belt. Based on the survey conducted by WAPCOS, the 11 million tonnes of cargo is expected to be transported through NW-4 every year. Types of cargo include coal, rice, food grains, cement, fertilisers, forest products,salt, and other bulk cargo.The Godavari river system flows through the Bhadrachalam forests and coal deposits. The Krishna River flows through limestone deposits and cement industries at Jaggayyapeta.

North Buckingham Canal

The canal can form significant traffic because of salt pans located all along the canal stretch. Rice, food grains, fertilisers, Chilli, peppers, tobacco, fish, granite and vegetables inthe downstream direction from Peddaganjam to Chennai. In the upstream direction from Chennai to Peddaganjam, the main traffic consists of fertilizers from Madras Fertilisers(MFL) plant located at Ennore and salt from Chennai.

South Buckingham Canal &Kaluvelly Tank

The canal stretch from Basin bridge up to Marakkanam can constitute significant traffic of salt and marine products because of salt pans and aquaculture shrimp farms all along the route. In the upstream direction from Pondicherry via Marakkanam to Chennai, the main traffic consists of salt, fertilizers and timber from Marakkanam, Tiruvallur, kanchipuram, Villupuram and Pondicherry.

Cost

The cost for developing a waterway in India is approximately INR 0.5 Crore per km, whereas developing a railway or roadway costs around INR 4-6 crore per km. As per estimates drawn by consultants M/s RITES, the project will cost INR 542 crore (as per 2002 prices) and facilitate movement of 100 tonne vessels in the irrigation canal portion and 350 tonne in the rivers and Buckingham canal portion. The developmental works for NW-4 involve the widening of canal, dredging, excavation, bank protection, construction and repair of locks, modification of bridges and roads, navigational aids, and setting up of IWT terminals.

The cost estimated by WAPCOS is around ₹ 1515 Crore, which involves two phase development of the project. Phase one of the project envisages development of a stretch comprising Godavari and Krishna rivers, and Kakinada and Eluru canals, which has maximum cargo potential, at an estimated cost of INR 390 Crore and land acquisition for remaining stretch at an estimated cost of INR 219 crore. Phase two of the project involves development of North and South Buckingham Canal, Commamur canal, and Kaluvelly Tank at an estimated cost of INR 906 crore

In the Tenth Five-Year Plan, Planning Commission has increased the budgetary provision for the development of inland water transport infrastructure to INR 636.73 crores, against INR 150.00 crores in the Ninth Five-Year Plan.

Delay in the project

Common factors attributable for delay in development of IWT are lack of infrastructure, absence of fixed scheduled services, poor navigational aids, lack of connectivity, longer river distances, multiple handling, and limited flow of private investments. The Eleventh Five-Year Plan envisaged development of six national inland waterways. Although the government demarcated **five such National Waterways**, the shipping ministry is unable to start the work on developing two of them (NW-4 & NW-5), as Planning Commission has not approved the development plans until now. Ministry of Shipping awaits the sum of INR 500 Crores that it needs to carry out the development works. As a result of the delay in getting the Planning Commission approval and the funds, the ministry has suspended the plans for developing the sixth national inland waterway.

Conclusion:

We, mariners, plan for using the inland water ways once it commences operations to the fullest possible extent because we know about the advantages of using the waterways than anybody

else. By doing this let us give our share for improving our country's economy by minimising the cost of the product.

Reduction of NOx and Smoke Emission with the effect of Biodiesel-Water Emulsion Mixture Fuel in a DI Diesel Engine

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Abstract--- Biodiesel fuels derived from vegetable oils are quite promising alternative fuels for diesel engines, because of their low environmental impact and has potential as an alternative fuel for diesel engine without any modification on the engine. The present investigation focuses on the study on simultaneous reduction of NOx and smoke emissions by water emulsion of Cotton seed oil methyl ester (CSME) in a single cylinder, direct injection diesel engine. The quantity of water was varied from 10 % to 30 % (by vol.) in steps of 10%. Water-emulsified diesel fuel has been proven to reduce nitrogen oxides (NOx) and smoke simultaneously at relatively low cost compared to other emission control methods. From the results, it is observed that 30% water emulsion with biodiesel results in a substantial reduction of NOx by 30 % and smoke emissions by 32% with a marginal decrease in brake thermal efficiency compared to diesel fuel at full load conditions without emulsion.

INTRODUCTION

Diesel engines are dominant in the field of transportation, heavy industries and agricultural sectors due to their better fuel to power conversion efficiency. It is one of the major pollution contributors to present time. Due to stringent emission regulations, researchers have investigated alternative fuels for diesel engines. In earlier days efforts have been taken to use straight vegetable oils as fuel in diesel engines. The vegetable oil could not be used directly in diesel engine due their high viscosity .So the vegetable oils can be converted into biodiesel using trans esterification process in the presence of catalyst. Biodiesel is a promising substitute fuel for diesel engine which gives better performance, reduced emissions and does not require any engine hardware modifications. Several researchers have investigated the properties of a bio-diesel from vegetable oils in diesel engines and found that particulate matter (PM), CO, and Soot emissions were decreased, while NOx emissions were increased. Emissions like NOxcan be reduced either by retarding the injection timing or by including the exhaust gas recirculation (EGR) system.

Water emulsified fuels are most preferably used in diesel engine due to the simultaneous reduction of NOxand smoke emissions. In the case of water emulsion diesel/biodiesel, water is mixed homogeneously with the base diesel fuel on volume basis in the presence of an appropriate surfactant, which helps to produce stable emulsion fuel. Water emulsion diesel is a convenient renewable fuel option as the existing engine does not require any modification of the engine The emulsified diesel/biodiesel can lead to other advantages, such as; additional momentum in jet behavior which may assist better mixing of fuel and air.

MATERIALS AND METHODS

PREPARATION OF BIO-DIESEL

Cotton seed oil was selected for this study and it is converted into its methyl ester by the trans esterification process. In trans esterification reaction, 8 gram of KOH catalyst per litre of oil was mixed with 200 ml of methyl alcohol to produce methoxide. The methoxide and the Cottonseed oil mixture were heated at 65°C with constant stirring. The reaction was allowed for one hour and

the final products were allowed to settle in the separating funnel for 8 hrs and then the settled glycerin layer was drained off. After decantation of glycerol, the methyl ester was washed with distilled water to remove excess methanol. The properties of cotton seed oil methyl esters were found out and compared with that of diesel. The comparison shows that the methyl ester properties have relatively closer to properties of diesel fuel. The properties of diesel, cotton seed oil and its methyl ester are listed in Table.1. Water was added in the ratios of 10%, 20% and 30% with biodiesel by volume and emulsified.

TABLE 1 Properties of Diesel, Cotton seed oil and its methyl ester

Properties	Diesel	Cottonseed oil	CSME
Density (kg/m^3)	840	910	860
Viscosity(mm^2/s)	3.8	55.6	5.37
C.V (MJ/kg)	42.5	38	38.45
Flash Point (^{o}C)	50	210	195
Fire Point (^{o}C)	60	218	205
Cetane Number	47	42	52

EXPERIMENTAL SET UP

A Kirloskar Diesel engine of AV1 model, four stroke, direct injection, water cooled diesel engine was used to investigate this study. The schematic of experimental set-up is shown in Fig. 1. The engine was coupled with an eddy current dynamometer. Fuel flow rates are obtained with calibrated burette. The cylinder pressure was measured by a piezoelectric sensor. The pressure signals were amplified with a charge amplifier and analyzed with a combustion analyzer to obtain the heat release rate. A crank angle encoder was employed for crank-angle signal acquisition. The exhaust gas emissions like CO, HC, and NO were measured with the help of AVL-444 five gas analyzer and the smoke emissions were measured by Bosch smoke meter. Inlet and outlet water temperatures and exhaust gas temperatures were measured by using *K* type thermocouples. The engine specifications are listed in Table.1. The experiments were conducted in different loads like 25, 50, 75% and 100% load with emulsified biodiesel. Similar experiments were done with diesel fuel, biodiesel fuel so as to make comparisons.

Engine	Kirloskar, AV-I,
Power(kW)	3.67
Bore (mm)	80
Stroke(mm)	110
Compression ratio	16.5:1
Speed (rpm)	1500
Number of cylinders	1

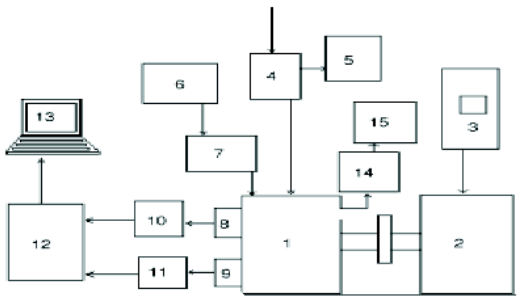
TABLE 2

Test engine specifications

RESULTS AND DISCUSSIONS

PERFORMANCE CHARACTERISTICS

The variations of brake thermal efficiency (BTE) with brake power for all test fuels shown in Fig. 2. The brake thermal efficiency increases with the increase in load for all test fuels. The BTE of biodiesel is lower than that of diesel fuel due to its lower calorific value and volatility. The BTE of biodiesel with water emulsified fuel gives slightly higher BTE at full loads compared to biodiesel. This may be due to the micro explosion phenomenon and volatility difference between water and fuels, which enhances the air fuel mixing during higher engine loads and hence the improvement in combustion efficiency. This could be the possible reason for higher BTE even though the calorific values of the emulsions are less than that of biodiesel. The BTE of 20% emulsified biodiesel is 7% higher than that of biodiesel fuel at full load, and10% and 30% emulsified biodiesel shows an increase of 3.23% and 6.67% respectively at full load.



(1) – Diesel engine, (2) – Electrical dynamometer, (3) – Dynamometer controls, (4) – Air box, (5) – U-tube manometer, (6) – Fuel tank, (7) – Fuel measurement, (8) – Pressure transducer, (9) – TDC position sensor, (10) – Charge amplifier, (11) – TDC amplifier circuit, (12) – Analog to digital card, (13) – Personal computer, (14) – Exhaust gas analyzer, (15) Bosch smoke meter

Fig.1.Schematic view of experimental setup

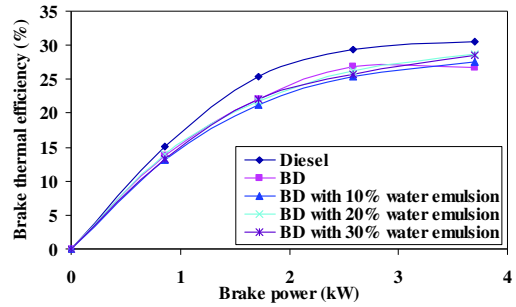


Fig. 2. Variations of brake thermal efficiency with BP

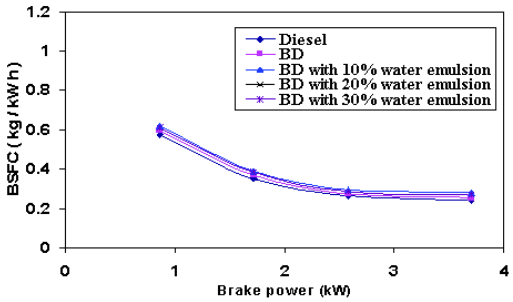


Fig. 3. Variations of brake specific fuel consumption with BP

Figure 3 shows the variation of brake specific fuel consumption (BSFC) with brake power for all the test fuels. The BSFC of all the test fuels are decreases with increase in load. It is observed that the 10% water emulsion of biodiesel has higher specific fuel consumption as compared to diesel and biodiesel fuel. The BSFC of diesel fuel and biodiesel fuel are fuel is 0.242 kg/kW-h and 0.257 kg/kW-h where as for 10% water emulsion biodiesel is 0.278 kg/kW-h at full load. This is due to lower energy content of biodiesel which has resulted in more fuel consumptions for all the emulsified biodiesels.

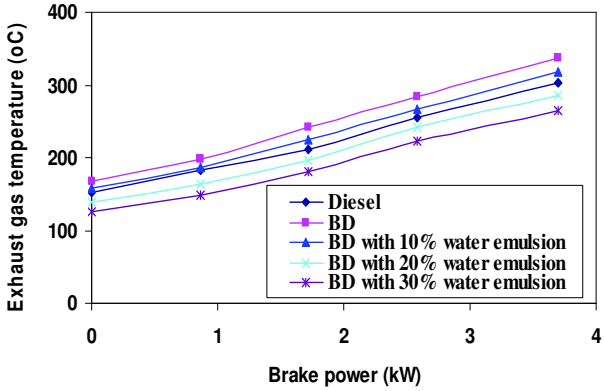


Fig. 4. Variations of exhaust gas temperature with BP

The variations of exhaust gas temperature (EGT) with brake power for all test fuels shown in Fig. 4. The exhaust gas temperature increases with increase in loadbecausemore fuel is burnt at higher loads to meet the power requirement. The EGT of biodiesel is higher than that of diesel fuel. The heavier molecules of biodiesel lead to continuous burning even during exhaust which causes higher EGT and for emulsified fuels, the exhaust gas temperatures are observed to be lesser than that of biodiesel. This is because the water in the emulsion gets vaporized during the combustion process and absorbs the heat energy which decreasing the adiabatic flame temperature. This leads to lower EGT than those of biodiesel fuel. The exhaust gas temperatures for diesel and biodiesel are 302^{o}C and 338^{o}C respectively, where as for 10%, 20% and 30% water emulsion of biodiesel are 318^{o}C, 286^{o}C and 265^{o}C respectively at full load. The 30% emulsified biodiesel shows 26% EGTreduction than in biodiesel, whereas 16% and 6% reduction is observed for 20% and 10% emulsified biodiesel respectively at full load.

EMISSION CHARACTERISTICS

Figure 5 shows the variations of carbon monoxide emission with brake power for all test fuels. The formation of CO emission depends upon mixture strength and

the availability of oxygen quantity and the fuel viscosity. The CO emission increases with increase in load for all the test fuels. It is observed that water emulsified biodiesel exhibits higher carbon monoxide emission as compared to diesel and biodiesel fuel. This is due to the presence of water in the emulsified fuels resulting in incomplete combustion. The carbon monoxide emission of diesel and biodiesel fuel are 0.075%Vol and 0.05 %Vol respectively, where as for 10%, 20% and 30% water emulsion of biodiesel are 0.26%, 0.29% and 0.30%Vol respectively at full load.

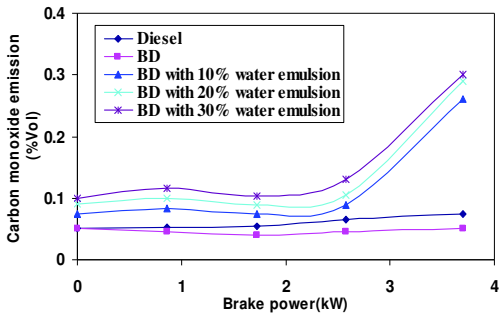


Fig.5.Variations of CO emission with brake power

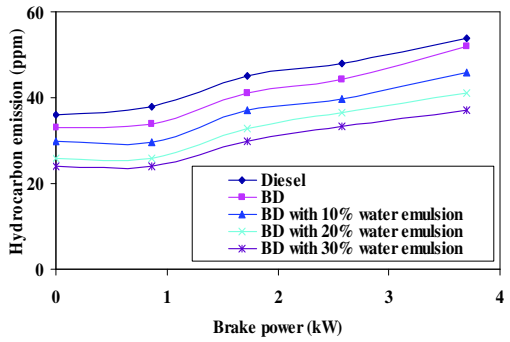


Fig.6.Variations of HC emission with BP

The variations of hydro carbon emissions (HC) with brake power for different fuels have been shown in Fig. 6. The production of HC emission depends upon mixture strength and the availability of oxygen quantity and fuel viscosity, in turn atomization. The HC emissions of water emulsified biodiesel fuels are lower than that of diesel and biodiesel. This may be due to the micro explosion phenomenon on the emulsified biodiesel, which improves the combustion process and hence the reduction of HC emissions. The hydro carbon emission of diesel and biodiesel fuel are 54ppm and 51ppm whereas for 10%, 20% and 30% water emulsion of biodiesel are 46 ppm 41ppm and 37ppm respectively at full load. It is observed that 30% emulsified biodiesel showed29% reduction in HC emission whereas 21% and 12% reduction is observed for 20% and 10% emulsified biodiesel respectively compared to biodiesel at full load.

Figure 7 depicts the variations of nitrogen oxide emission (NO)with brake power for all test fuels. The NO emissions are formed by oxidation ofthe atmospheric nitrogen at sufficiently high temperatures. The NO emission is increases while the load is increased for all the test fuels. It is also observed that the NO emissions are increased at full load due to more oxygen molecules present in the biodiesel as compared to diesel .It is observed that NO emissions of water emulsified biodiesel fuels are found decreasing than diesel and biodiesel at full load. This may be due to the lower peak combustion temperature, due to the presence of water in the emulsified fuels, reduces the formation of Nitrogen oxide emissions at full load. The NO emission of diesel and biodiesel fuel at full load is 496ppm and 538ppm respectively, where as for 10%, 20% and 30% water emulsion of biodiesel are 451ppm, 409ppm and 379 ppm respectively at full load. It is observed that 30% emulsified biodiesel showed 30% reduction in NOemissionthan biodiesel, whereas 24% and 16% reduction is observed for 20% and 10% emulsified biodiesel respectively at full load.

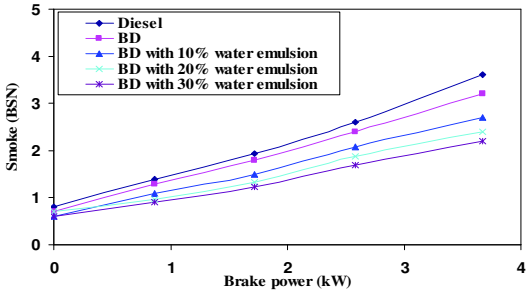


Fig 8. Variation of smoke emission with BP

` The variations of smoke emission with brake power at different loads for all test fuels have been shown in Fig. 8. The smoke emission of biodiesel is lower than diesel fuel due to more oxygen molecules present in the bio diesel . Water emulsified fuels show considerable reduction in smoke compared to biodiesel at full load. This may be due to water gets vaporized by absorbing the heat energy during combustion process. This increases the ignition delay period of emulsified fuels. This increase in delay period improves the mixing process which leads to faster combustion reaction and hence the reduction of smoke emission. It is observed that 30% emulsified biodiesel showed 32% smoke reduction than biodiesel, whereas 25% and 15% reduction is observed for 20% and 10% emulsified biodiesel respectively compared to biodiesel at full load.

CONCLUSION

In this study, the experiment was conducted to study the performance, combustion and emission characteristics of a diesel engine with 10%, 20% and 30% water emulsified biodiesel and the results were compared with thebiodiesel fuel. From this experimental study the following conclusions were drawn.

1. The brake thermal efficiency is increased by 3.23%, 7.0% and 6.67% for 10%, 20% and 30% emulsified biodiesel compared to biodiesel at full load.
2. The exhaust gas temperature is decreased by 26% for 30% emulsified biodiesel and for 20% and 10% emulsified biodiesel is 16% and 6% is observed respectively compared to biodiesel at full load.
3. The CO emission is increased for all emulsified biodiesel due to water content present in the biodiesel, whereas the HC emission is decreased by 29% for 30% emulsified biodiesel and for 20% and 10% emulsified biodiesel it is 21% and 12% respectively compared to biodiesel at full load.
4. The NO emissions are decreased by 30% for 30% emulsified biodiesel and 24% reduction for 20% emulsified biodiesel and 16 % reduction for 10% emulsified fuel compared to biodiesel and full load.
5. The smoke emission decreased by 32% for 30% emulsified biodiesel and 25% and 15% reduction in smoke is observed for 20% and 10% emulsified biodiesel respectively compared to biodiesel at full load.
6. The higher peak pressure and heat release rate is observed for 10%, 20% and 30% water emulsified biodiesel compared to biodiesel at full load.
7. From the detailed study, it is observed that 20% emulsified biodiesel showed best performance and 30% emulsified biodiesel showed best emission reduction than biodiesel at full load.

THE IMPORTANCE OF COMMUNICATIVE COMPETENCE IN MARITIME ENGLISH

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Absract

It is acknowledged by all concerned that effective knowledge of English at sea and in ports is a must for all seafarers responsible for safety and security of the ship, its crew and its passengers. Yet as evidenced by recent reports, articles and papers particularly accidents reports by major and reputable investigation authorities that the standard of English of some seafarers is so bad that they have difficulty in communicating not only between themselves but also with agencies outside the ship. Investigations into the human factor regarding disasters at sea, which focused on communication behaviour revealed that one third of accidents, happen primarily due to insufficient command of maritime English. The present article is about the rising number of human errors in the maritime industry due to poor communication. Human errors are inevitable. Everybody makes mistakes. However the number of accidents caused by human error in the maritime industry is too high and on the increase. Many of these accidents are due to poor communication. It is imperative that improved standards in maritime English could help minimise the number of these accidents dramatically.

Education is the most powerful weapon which you can use to change the world

-Nelson Mandela

Introduction

An engineer including Marine Engineer might interact with technology all day, but that doesn't mean he has no interaction with other people. He communicates with other engineers, with team members outside of engineering and often with customers as well. Within engineering, effective communication makes it possible to transform requirements into the best possible working or workable solutions. Outside of engineering, effective communication makes it possible to verify the team is working on all of the right requirements, and to ensure the resulting solution can, in fact, be implemented. While all engineers should have good communication skills, global engineers face additional challenges, making effective communication an imperative.

Communication Barriers for Global Engineers

Engineers are technically-minded by nature. This can put them at a disadvantage when it comes to communicating with people outside of engineering, let alone the technically challenged. Communicating with non-engineers, however, is not the only challenge faced by engineers on global projects. Global engineers can encounter communication barriers even with fellow engineers from other countries due to cultural differences, language barriers and even technical differences. Special attention must be given to developing the skills needed to overcome these barriers.

Language Differences

Even if all team members are native English speakers, communication barriers can be encountered based on the version of English each member is accustomed to speaking. British-English is subtly different from American-English, as is Canadian-English and even Australian-English. While the differences are mostly seen in spelling, such as colour vs. color, some variations in grammar and slang can compound the communication barriers encountered by non-native English speakers. All team members should keep communications simple, concise and to-the-point to avoid misinterpretations and lost meanings.

The Importance of Maritime English

It is imperative that it is important to make a new and innovative approach to the Maritime English Language of mariners. It is based on the premise that effective knowledge of English at sea and in ports is essential for all seafarers who have responsibility for the safety and security of their ship. Approximately one third of accidents at sea are caused by an insufficient command of Maritime English. To improve the standard of Maritime English we need to introduce Standard Marine Communication Phrases. The aim is to get around the problem of language barriers at sea and to avoid misunderstandings which can cause accidents.

Conclusion

There are two very important considerations. Firstly, the need for competence in English language by all seafarers and a means of monitoring and measuring this competence. Secondly, without competence in English language when emergencies do occur psychology plays an important role. If these marine communication phrases are not learned in a context of English language environment, then at the time of panic there will be chaos and confusion. Hence, English should be taught in the context of maritime English which is the only solution to avoid accidents to a greater extend.

References

Allen M, Bourhis J (1996). The relationship between communication apprehension to behavior: A meta-analysis. (2011).

Jensen, H.P., Strategic planning for the education process in the next century,(2000).

Keane, A. and Gibson, I.S., Communication trends in engineering firms: implications for undergraduate engineering courses.

Loginovsky, V A Verbal Communication Failures and Safety at Sea, (2002)

A Literature collection of flexible manipulators and dynamic response analysis, Control schemes of manipulators data for development of sub-marine systems

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ABSTRACT:

A survey of the literature related to
(1) Dynamic analyses of flexible robotic manipulator have been carried out.
(2) In this work, both link and joint flexibility are considered.
(3) An effort has taken to critically examine the methods used in these analyses.
(4) Flexible manipulators advantages and shortcomings are discussed.
(5) Possible extension of these methods to be applied to a submarine system problems.
(6) Research papers are collected and classified according to
(a) Modeling
(b) Control
(c) Experimental studies.
(7) In case of modeling schemes, they are subdivided according to
(a) Method of analysis
(b) Number of links involved in the analysis.

1. INTRODUCTION:

EXISTING ROBOTIC MANIPULATORS:

Robotic manipulators are widely used to help in dangerous, monotonous and tedious jobs.

The existing robotic manipulators are designed and build in a manner to maximize stiffness for the purpose is to minimize the vibration of the end-effectors to achieve good position accuracy.

This high stiffness is achieved by using heavy material and a bulky design.

The existing heavy rigid manipulators are inefficient in terms of power consumption or speed with respect to the operating payload.

HIGH PRECISION ROBOT MANIPULATORS:

The operation of high precision robots is severely limited by their dynamic deflection, which persists for a period of time after a movement is completed.

The settling time required for this residual vibration delays subsequent operations, thus conflicting with the demand of increased productivity.

These conflicting requirements between high speed and high accuracy have rendered the robotic assembly task a challenging research problem and many industrial manipulators face the problem of arm vibrations during high speed motion.

INDUSTRIAL ROBOT MANIPULATORS:

To improve industrial productivity, it is required to reduce
(1) The weight of the arms or
(2) To increase their speed of operation.
For these purposes it is desirable to build flexible robotic manipulators.

FLEXIBLE LINK MANIPULATORS:

Compared to heavy and bulky robots, flexible link manipulators have the potential advantage of
(1) Lower cost,
(2) Larger work volume,
(3) Higher operational speed,
(4) Greater payload-to-manipulator-weight ratio,
(5) Smaller actuators,
(6) Lower energy consumption,
(7) Better maneuverability,
(8) Better transportability and safer operation due to reduced inertia.

GREAT DISADVANTAGE:

The greatest disadvantage of flexible robot manipulators is the vibration problem due to low stiffness.

Due to the importance and usefulness of these topics, researchers worldwide are nowadays engaged in the investigation of dynamics and control of flexible manipulator.

In the following literatures dealing with the application aspect of flexible manipulators are given.

The study on the control of a flexible arm manipulator started as a part of the space robots research, as a space manipulator should be as light as possible in order to reduce its launching cost, [2] studied flexible manipulators used for space applications.

Shi et al. [3] discussed some key issues in the dynamic control of light weight robots for space and terrestrial applications.

Powerful and large robotic manipulators are needed in nuclear maintenance, e.g., to perform decontamination tasks. The nozzle dam positioning task for maintenance of a nuclear power plant steam generator is an example of a task that requires a strong manipulator with very fine absolute positioning accuracy [4].

Jansen et al. [5] studied the long-reach-manipulator system for waste storage tank remediation.

Kress et al. [6] studied modeling and control of waste tank cleanup manipulator.

Kumar et al. [7] studied flexible manipulators used for micro-surgical operation and Riviere et al.
[8] Describes research in active instruments for enhanced accuracy in micro-surgery.
Meggiolaro [9] analyzed the patient positioning system used for cancer patient treatment at Massachusetts General Hospital.
Chang and Fu [10] analyzed the flexible manipulator system for automated de-burring operation.
[11] Studied the high speed precise control of robot arms for trajectory generation.

Yang and Sadler [12] used the finite element method (FEM) to study the dynamics of high speed machinery.

Pfeiffer and Bremer [13] studied a surface polishing operation.

Gruber and Schiehlen [14] and Schiehlen [15] studied the biped walking and walking machines using the multi body dynamics approach.

Flexible manipulators can find many applications but since the main problem is to control their vibrations, many researchers have tried to solve this problem by improving the dynamic models and incorporating different control strategies.

This review will show the state-of-the-art in this research to engineers, manufacturers, and scientists working on flexible manipulators.

2. Modeling of flexible manipulators:

The different modeling techniques used in the analysis of flexible manipulators are briefly explained.

There are two kinds of errors introduced if the flexibility effect is not considered in the mathematical model,
(1) The torque requirement for the motors.
(2) The positioning inaccuracy of the end-effectors.

The positioning of the end-effectors for precision jobs should involve very small amplitudes of vibration, ideally no vibration at all. Therefore, to achieve greater accuracy one has to start with very accurate mathematical models for the system.

Different schemes of modeling of the manipulators:

The mathematical models of the manipulators are generally derived from energy principles.

RIGID:

A simple rigid manipulator, the rigid arms store kinetic energy by virtue of their moving inertia and store potential energy by virtue of their position in the gravitational field.

FLEXIBLE:

The flexible arms store potential energy by virtue of the deflections of its links, joints, or drives.

JOINTS:

Joints have concentrated compliance which may often be modelled as a pure spring storing only potential energy.

Drive components such as shafts or belts may appear distributed but store little kinetic energy due to their low inertia and a lumped parameter spring model often succeeds well for them.

Link: Linksare subjected to torsion, bending, and compression.

Torsion of a link:

Torsion of a link stores potential energy but little kinetic energy due to the low mass moment of inertia about the longitudinal axis of the beam and is thus well represented as a mass less spring.

Compression of a link:

Compression stores little potential energy due to high compression stiffness and the dynamics along this axis is often well described by a rigid mass.

Bending of a link:

Links subjected to bending store potential energy by virtue of their deflection as well as kinetic energy by virtue of their deflection rates and a good model must include this distributed nature.

To include bending one may often use the Euler–Bernoulli equation which ignores shearing and rotary inertia effects.

These two effects may be incorporated using a Timoshenko beam element which generally must be used if the beam is short relative to its diameter. But, since links may be considered as being rigid,

Books [16], in most models of flexible manipulator Euler–Bernoulli beams are used. The original dynamics of a flexible link robot, being described by partial differential equations and thus possessing an infinite dimension, is not easily available to be used directly in both system analysis and control design. Most commonly the dynamic equations are truncated to some finite dimensional models with either the assumed modes method (AMM) or the finite element method (FEM).

The robotic systems with flexible links are continuous dynamical systems characterized by an infinite number of degrees of freedom and are governed by nonlinear coupled, ordinary and partial differential equations. The exact solution of such systems is not feasible practically and the infinite dimensional model imposes severe constraints on the design of controllers as well. Hence, they are discretized using assumed modes, finite elements or lumped parameter methods.

The assumed mode method and the finite element method use either the Lagrangion formulation or the Newton–Euler recursive formulation.

ASSUMED MODE MODEL:

In assumed mode model formulation, the link flexibility is usually represented by a truncated finite modal series in terms of spatial mode Eigen functions and time-varying mode amplitudes.

The main drawback of this method is the difficulty in finding modes for links with non-regular cross sections and multi-link manipulators [17].

FINITE ELEMENT METHOD:

The finite element method is used for elastic deformation analysis by assuming a known rigid body motion. Later super posing an elastic deformation to a rigid body motion.

In order to solve a large set of differential equations derived by the finite element method, a lot of boundary conditions have to be considered, which are, in most situations, uncertain for flexible manipulators, Hastings and Book [18].

Using the assumed mode method to derive the equations of motion of the flexible manipulators, only the first several modes are usually retained by truncation and the higher modes are neglected.

LUMPED PARAMETER MODEL:

The lumped parameter model, which is the simplest one for analysis purpose, the manipulator is modeled as spring and mass system, which does often not yield sufficiently accurate results.

Classical analytical techniques can be employed to derive the dynamic equations of motion for flexible structures. Due to the complexity of these equations, some kind of discretization technique is typically used to construct a finite dimensional system of ordinary differential equations. In these context two families of natural modes, i.e., the unconstrained and constrained modes of vibration are considered [19].

The unconstrained mode solution is defined as the natural motion obtained in the absence of all external influences. In this case the structure as a whole is allowed to vibrate and the solution involves inertia properties of the rigid and flexible parts. In contrast, the constrained mode solution is defined as the natural motion obtained in the absence of all external influences and the rigid body is constrained to be fixed or attached to an inertial reference frame [20]. Book [21] presents a tutorial on flexible manipulators, where he examines the mathematical representations commonly used in modeling flexible links and joints and discussed the design consideration directly arising from the flexible nature of the arms.

3. Single-link manipulators:

The modeling of single flexible link manipulators is discussed and the contributions are grouped under the following categories

[1] Assumed mode method,
[2] Finite element method,
[3] Lumped parameter models and
[4] Other studies.

The assumed mode of model formulation, the link flexibility is usually represented by a truncated finite modal series, in terms of spatial mode Eigen functions and time-varying mode amplitudes. Although this method has been widely used, there are several ways to choose link boundary conditions and mode Eigen functions.

[1] Studied single-link flexible manipulators using Lagrange's equation and the assumed mode method. (21)

[2] Study Used a Newton–Euler formulation to model a single-link manipulator. (22)

[3] Used an extended Hamilton's principle to derive the equation of motion and studied the unconstrained and constrained mode of vibration. (23)

[4] Used the same principle to derive the equation of motion and further studied the nonlinear phenomena using a perturbation technique. (24)

[5] Using the same method, studied single-link robots fabricated from orthotropic composite materials (25).They have shown that the magnitude of the control spillover effects, an issue of great concern in designing control systems for flexible structures, is very small for the composite robotic arms.

[6] Though many researchers studied manipulators with revolute joints.

[7] Only few works are reported on prismatic joints.

[8] Developed the nonlinear equation of motion of an axially moving beam and then linearized these equations to obtain one closed-form similarity solution and a semi-analytic solution for specific axial velocities. (26)

[9] Established the dynamic model of flexible manipulators with the elongation deformation and gave the relationship between the transverse and elongation deformation. (27)

[10] Developed the dynamic model of a translating flexible beam with a prismatic joint and studied different issues related to control in this case. (28)

[11] Dealt with single-link flexible manipulators with prismatic joints. (29)

[12] Carried out modeling of a hydraulically actuated single-link flexible manipulator with prismatic joint. (30)

[13] Studied a Cartesian manipulator with roller support at one end. (31)

Finite element method:

[1] Derived elemental and system equations for systems with both elastic and rigid links. (32)

[2] Used the FEM to study elastic manipulators. (33)

[3] Used finite element discretization to discuss the end-point trajectory tracking for flexible arms and showed that a non-causal solution for the actuating torque enables tracking of an arbitrary tip displacement with any desired accuracy. (34)

[4] developed an enhanced equivalent rigid link system (ERLS) model using natural-mode shape functions for flexible manipulators and an experimental validation of the model was performed for a single-link manipulator. The Lagrangian dynamics and the finite element methods are used to derive the equation of motion. (35)

[5] Developed dynamic models for a single-link flexible manipulator using the finite element approach and compared the modal frequencies found experimentally to validate the FE modeling in some cases. They used bang–bang type of torque to study the dynamic response. Also they have applied a command shaping technique to control the vibration of single-link manipulator. (36)

[6] Derived a nonlinear dynamic model using the Lagrange approach. (37)

[7] Give a very good comparison between the assumed mode method and the finite element method used for flexible manipulators. (38)

[8] Used FEM analysis to study the effectiveness of visco-elastic passive damping augmentation to active control of a large flexible space manipulator. They have shown very low frequency modes due to joint

flexibility and high frequency modes due to bending in the booms which results in significant end - point motion. (39)

[9] derived the dynamic model of a single-link flexible manipulator using FEM and then studied the feed-forward control strategies for controlling the vibration using command shaping techniques based on input shaping, low-pass and band-stop filtering. (40)

[10] Carried out the dynamic analysis using FEM. (41)
[11] Studied a single-link flexible manipulator in a 3D work space using FEM. (42)
[12] Used a geometrically nonlinear finite element dynamic model to study the large deflection of a three-dimensional, three-link robot manipulator with a flexible prismatic link fabricated from composite material operating at a high speed. He observed unstable behavior when the axial sinusoidal motion frequency is close to twice of any transverse oscillation frequency of the flexible link. (43)

Lumped parameter models:
[1] Considered a lumped model to simulate the tip position tracking of a single-link flexible manipulator. (431)

[2] Used a lumped elasticity model for flexible mechanical systems. (44)

[3] Used a variation of the finite segment multi body dynamics approach to model and simulate planar flexible link manipulator with rigid tip connections to revolute joints. The formulation employs a consistent mass matrix in order to provide better approximation than the traditional lumped masses often encountered in the finite segment approach. (45)

[4] Used a floating or shadow frame and inertia-frame methods. (46)

[5] Studied the stability of very flexible cantilever beams to show the existence of multiple equilibrium solutions under a given load condition. (47)

[6] Used multi-layered piezoelectric polymers for the control of flexible manipulators and also studied the distributed modal identification and vibration control. (48)

[7] Studied the use of a spring and damper attachment to damp out vibration in a flexible single link manipulator. (49)

[8] Considered the optimal structural design of robotic manipulators with fiber reinforced composite materials. (50)

4. Two - link manipulators:

Manipulators with two flexible links are attractive. But severe control problems associated with
The large inertia forces generated when the large-mass,
Rigid links in the conventional robots move at high speed.

In the following modeling aspects of two-link flexible manipulators are reviewed in the sequence of application of
1. Assumed mode-method,
2. Finite element method and
3. Lumped parameter methods similar to that carried out for single-link manipulator.

5. Multi-link manipulators:

In this section, the literature review is carried out for manipulators with more than two-links, similar to the previous two sections.
The references are grouped according to
1. Assumed-mode method,
2. FEM and
3. Lumped parameter models.

6. Flexible joint manipulators:

In modeling flexible robots the accuracy of the dynamic model obtained from

the analytical formulation is highly dependent on the adopted mode shapes of the link deflection. The mode shapes for flexible link, flexible-joint robots are certainly different from the flexible link, rigid joint robots, since the joint flexibility may influence the mode shapes.

7. Inverse dynamics and computational programs:

Bayo [51] introduced a method for the inverse dynamic analysis of a single-link flexible robot to find the torque to move the end - effectors in a given trajectory in Cartesian space.

Bayo et al. [52] made similar analysis including the nonlinear Carioles and centrifugal effects. The experimental validation of the technique using

8. Experimental investigations:

In this section, study on experimental investigations for flexible manipulators are listed according to (a) the number of flexible links used in the experiments and

(b) The measurement techniques are mentioned in these cases.

[1] Initiated, experiments on single-link flexible manipulator. (53)

[2] Further carried out to control the vibration. (54)

[3] Also conducted experiments using a single link mounted on a stepper motor to validate to their FEM results. (55)

[4] Conducted experiments to study pseudo-clamped and pseudo-pinned end-conditioned in slewing links. (56)

[5] Carried out experiments on manipulators with prismatic joints. (57)

[6] Used a strain based measurement technique to study the flexible robot arm. (58)

[7] Presented a modal data based and experiment-oriented method to predict the dynamic response of a robot manipulator with elastic members. Case studies were conducted for robot trajectory planning of a prismatic- and- revolute manipulator. (59)

[8] Demonstrated that force profiles can be developed to control flexible dynamic systems with minimal vibration. By defining an appropriate cost function, a force profile can be derived that efficiently allocates kinetic energy so that excitation is minimized at the system resonances and maximum energy is used for system motion. (60)

[9] Compared a modified command filtering technique that eliminates the first two modes of Vibration in a large flexible manipulator to track circular trajectory with that of pre-shaped command input. (61)

[10] Carried out experiments for two-degrees of freedom single-link flexible manipulator with hydraulic actuator. (62)

[11] Perform experiments to verify their proposed FEM based analytical model for a single-link flexible manipulator. (63)

[12] Using a micro-manipulator at the end of a large flexible manipulator,

[13] Performed experiments to damp out the vibration. (64)

[14] Experiments for two-link manipulators are carried out (65).

[15] Used some identification techniques to find the generalized friction for an experimental planar two-link flexible manipulator. (66)

[16] Experiments on flexible joints were carried out. (67)

[17] Experiments were carried out on two-link direct drive planar robot manipulator. (68)

[18] Studied the interaction between human and robot in micro-surgery experimentally. (69)

[19] Used an optical sensing system consisting of a laser diode, a position sensitive detector, for the real time measurement of the dynamic deflection. Utilizing a nonlinear, coupled and measurement based dynamic system model, they proposed a Lyapunov - type controller based on the deflection feedback to damp out the tip oscillation of a single-link flexible robot arm. (70)

9. Control of flexible manipulators:

There are several control schemes such as
Modal reference adaptive control,
Self-tuning control,
Feed-forward control and
Regular PID control

The above control methods are used, to regulate the motion of the manipulators. In all these schemes an efficient and accurate mathematical model is necessary.

10. Conclusion:

The literature review on the state-of-the-art for flexible manipulators reveals that the dynamic analysis and control of flexible manipulators is an emerging area of research in the field of [1] Manufacturing
[2] Automation,
[3] Simple picks and place operations of an industrial robot
[4] Micro-surgery,
[5] Maintenance of nuclear plants
[6] Space robot.

The review of the recent literature shows that limited research has been carried out for the design of a flexible manipulator with both joint and link flexibility.

Also in almost all cases, linearised models of the link flexibility are considered which reduced the complexity of the model based controller. These models cannot take care of even moderately large elastic deflections of the manipulator.

Also, in most cases modal interactions which will lead to internal resonances are not considered and in the considered cases the study is limited to single-link only. In most analyses of multi-link manipulators only linearised models are considered.

Hence there is a need to re-investigate the modeling strategy to incorporate

[1] Large deformation,
[2] Modal interaction,
[3] Coupling of bending-bending,
[4] Bending - torsion modes in the links.

Very few researchers considered the possibility of modeling manipulators with composite materials. This will be an emerging research area where lot of work is required to control the flexibility effect. More analysis is required considering joint flexibility incorporating Friction, Clearances, etc. Also more experimental investigations are required in order to validate the theoretical modeling. Finally, more efforts should be made to develop manipulators with low energy requirement by incorporating some active elements like springs or dampers.

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ENDANGERED INDIAN SEAFARERS IN GLOBAL MARKET

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ABSTRACT

The Indian seafarer is fast becoming a crucial asset on the world's seafaring stage. But to maximise this growth in demand, we need to collectively justify the support we expect from the government and at the same time encourage deeper dialogue and coordination among industry players for a more committed approach to building up India as a global supplier of quality seafarers. We need to improve the attractiveness of a career at sea; select from the right employment areas and ensure our training competence remains world class. If we achieve this then the future debate in years to come may be about our success rather than our failings.

I am confident in saying that the global shipping industry is increasingly relying on India as a favoured source of its current and future seafarer demand, because it acknowledges that India has the means to satisfy the numbers shortage and the Indian academic system provides the strongest foundation for building high standards of skills, initiatives, professionalism and leadership required of the modern seafarers. Due to their high levels of education and training there is a huge demand for Indian seafarers. The growth in regulations and the amount of complicated paperwork required to be filled in and checked by seafarers has meant that more than ever before seafarers need a solid education and an excellent grasp of the English language to achieve this task. Out of its total population of 1.1 billion, India's current pool of seafarers amasses a mere 110,000. The well-established education infrastructure and the vast population of India ensure a continuous supply of quality seafarers to the world, for an almost indefinite period. Will this growth be sustainable amid the scenario of alternate options and tarnishing image of shipping? Will it plug the seafarer gap? And if not, what needs to be done?

World is seeing the demand for skilled man power from India surpassing all other nationalities. Indian youth is much sought after in the fields of IT technology, service sector, banking, engineering and research. Seafaring as a career option is facing stiff competition from other streams and lucrative options opening up to the youth. The decline of the era where the people that owned the ships, managed the ships and hired theirown crews saw the development of Ship Management firms and Manning Agencies. As the supply of seafarers moved from the traditional maritime nations to India, the Far East andAsia the services of the manning agencies were gradually built into the system.The wide variation in the quality of services provided by manning agencies led to quality shippingcompanies retaining

their own crew recruitment and management services or establishing preferredrelationships with selected manning agencies.In the labour supply states with an oversupply of potential seafarers manning agencies can exercisequite powerful control over job seekers.Certain manning agencies are major players in treating seafarers as commodities.

Human resource management is essential for business, because it is not possible to accomplish ideas without competent, organized and well trained employees. Previous statement is the reason why we all need well trained and educated seafarers, according to international conventions. If we look back in past few years, we shall notice that EU (European Union) has dedicated an enormous interest in establishing regulations that concern education and training of seafarers, which had a big impact on maritime industries. Today it is not possible to generate quality seafarers unless they are educated and trained in accordance with many conventions such as SOLAS (Safety of Life at Sea), STCW (Standards of Training and Certification and Watch keeping) and many others which accurately define education and training for seafarers. Planning education system is essential for all transition countries which need to deal with carrying out radical reforms of education system so that it is in line with standards of EU. For example, EU has determined long-life learning for seafarers based on knowledge. On the other side, Montenegro is far away from goals as far as long-life learning is considered. We need to generate our efforts in education of seafarers, because we create human resources that need to find their job in international labor market. Following international trends of seafarer's education is essential.

According to presented research results in 2000 there was a shortage of 16 000 officers which is approximately 4 % of total officer pool. Predictions for 2010 there is a shortage of 46 000 officers. Research results indicate that current labour market of seafarers has a significant shortage of senior officers that are educated and well trained. Positive variation of demand and supply of ratings suggests that shortage of senior officers could be caught up with additional education of ratings. On the other hand traditional distribution of professions on board, as well as big differences in education, indicate that mentioned solution could not be good for long term view. This survey also indicates that this problem is caused by two factors. First factor is quality of education system and second factor is lack of interest for navigation. Goal of conducted survey was to define most appropriate measures to boost up interest for career in maritime industries. Identifying dynamics of education system need to be determined. New economic paradigms in contemporary period of knowledge requires sophisticated methods of workforce managing, instead of supervising manpower what was main characteristic for industrial paradigms. The main problem is how to reach to quality seafarers whose

The present world-wide shortage will continue at least until end of 2008/2009,

While the crew supplying nations keep increasing the number of trainees beinginducted into the seafaring profession.

The challenge to the industry, though, will be to continue recruiting

seafarers. Continuously and not abandon training, as was done after the recession of 1980s rightup to the mid-nineties.

The crisis we have today is a result of the short-sighted approach in the past, wherecompanies did not provide cadet berths on board. Some such companies still continuethis approach even today!!

In Asia, India and Philippines will continue to be very important crew sources. WhileChina will continue to increase the number of seafarers, the phenomenal growth of theChinese shipping industry is unlikely to allow for too many officers being availablefor global supply.

Increasing Chinese domination of the global economy will be a negative for Indian seafarer job prospects, because this will likely be accompanied by a demographic shift of tonnage ownership to China. Chinese crews will dominate on those ships- they are already a significant source of manpower in Hong Kong and Taiwan. Owners have so far chosen, for many reasons, not to mix Chinese crews with other nationalities; As Chinese crew numbers go up, Indians will lose out on Hong Kong flagged vessels in the future.

Japanese and European ship owners continue to show a marked preference for Filipinos over Indians. No doubt, the fact that the quality of product from India has declined has much to do with it; it is hard to justify higher wages with uneven performance. Nonetheless, increasingly strengthening links between countries in the EU and the Filipino maritime machine- despite the threatened EMSA boycott of Filipino certificates- is an ominous development for Indian seamen. It is clear that Europe is betting on Filipino officers in the near future; EU member States are putting resources in the Philippines to improve quality of their officers- whose numbers are growing, unlike in India.

As just one example, 176 Filipino officers recently completed training in a joint project between their nodal seafarer agency DOLE and the Netherlands. In comparison, although quite a few ship management agencies have set up their own training establishments in India, I remain unconvinced that the calibre of the output is significantly higher than that of the Philippines that is producing far greater numbers of tomorrow's officers.

Norwegian owners Gear bulk announced last week that they will lay off all European seafarers on their ships and replace them with Asian crews. This trend may well accelerate, and it will be interesting to see how many of these jobs will come to Indian officers and Ratings. I am guessing not the majority.

A shrinking job market, the advent of giant ships and a paucity of training berths are factors that affect seafarer jobs regardless of nationality and contribute to a decline in overall demand. (A Valemax carries twice or thrice the load of even a large bulker and 18,000 TEU box ships are coming out in numbers; remember 6000 TEU ships were considered huge not so long ago). Along with the consolidation and route collaboration between large companies as they fight market conditions, this will reduce the number of oceangoing ships in future, with a corresponding decrease in overall jobs. In this scenario, consistent preference for non-Indian crews (or East European and, who knows, the Chinese or even Nigerians tomorrow) may well strike another blow to an Indian seafarer's job prospects.

EXHAUST GAS POWERD REFRIGERATION

AKASH E
Final Year BE Marine(2011-15)

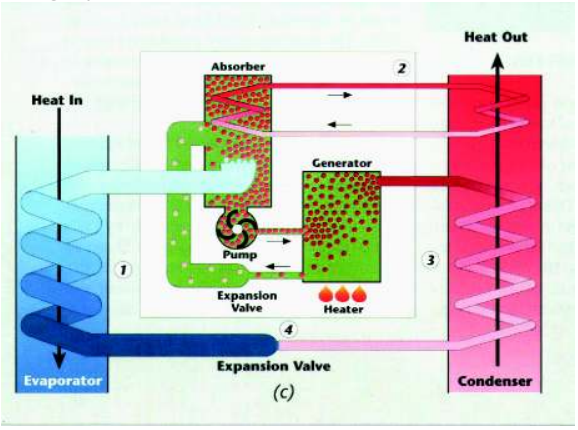
Due to greenhouse effect & changing environment and atmospheric effect, the air conditioning and refrigeration system on board a ship; rules and regulations are changing day by day. On board a ship the main engine and auxiliary engine exhaust a large amount of energy through exhaust gas. And it is dumped in to environment. This waste energy we currently used for turbocharger, exhaust gas boiler, etc. after this also a large amount of energy we are wasting. A part of this energy can be recovered from exhaust gas by introducing vapour absorption refrigeration. This refrigeration can be implemented for ship freezer, air conditioning as well as refer containers.

Vapour Absorption System

An absorption refrigerator is a refrigerator that uses a heat source (e.g., solar, kerosene-fuelled flame, waste heat from factories or district heating systems) to provide the energy needed to drive the coolingsystem. In the early years of the twentieth century, the vapour absorption cycle using water-ammonia Systems was popular and widely used. Ammonia-water combination possesses most of the desirable qualities which are listed below:

• $1m^3$ of water absorbs $800m^3$ of ammonia (Nh3).
• Latent heat of ammonia at-15 C = 1314 kJ/kg.
• Critical temperature of NH_3 = 132.6°C.
• Boiling point at atmospheric pressure = -33.3°C

The NH_3-H_2O system requires generator temperatures in the range of 125°C to 170°C with air cooled absorber and condenser and 80°C to 120°C when water-cooling is used. These temperatures cannot be obtained with flat-plate collectors. The coefficient of performance (COP), which is defined as the ratio of the cooling effect to the heat input, which vary between 0.6 to 0.7 °C. Ammonia is highly soluble in water.



Currently we are using vapour compression refrigeration system on board a ship. If we are replacing this to vapour absorption refrigeration system then we can use the exhaust gas from main engine and auxiliary engine as the heating source. So that no need of compressor. By this we can reduce power consumption as well as noise and vibration. Currently this exhaust gas refrigeration is implemented in some of the automobiles for air conditioning system.

Advantages

- Uses Engine heat as source of energy hence enhances the efficiency of engine.
- Moving parts are only in the pump, hence operation becomes smooth and also wearing and tearing is reduced.
- The system works at low evaporator pressures.

- Environmental friendly, no release of CFC derivatives
- Helps in protecting OZONE layer from depletion.

OCEANIC FACTS

VIJIN L DHAS
Final Year BEMarine(2011-15)

Tired of technical stuff? Ok come on! Check out for few fun facts and mystery about the mighty oceans and seas that we are going to sail!! Around 70 % of the Earth's surface is covered by ocean! And let's see which facts are going to make your eyebrows lift!

- The world's ocean contains enough water to fill a cube with edges over **1000 kilometers (621 miles)** in length!
- There are at least 226,408 marine species but there are most likely at least 750,000 marine species (50% of 1.5 million) and possibly as many as 25 million marine species(50% of 50 million species).
- The ocean covers 71%(and rising) of the Earth's surface and contain 97% of the Earth's water. Less than 1% is fresh water and 2-3% is contained in glaciers and icecaps (and is decreasing).
- 90% of **volcanic activity** occurs in the oceans.
- The highest tide in the world is at the **Bay of Fundy**, which separates New Brunswick from Nova Scotia. At some times of the year the difference between high tide and low tide is **16.3m**ie. taller than a three-storey building!
- The pressure at the deepest point in the ocean is more than **11,318 tons/sq.m** or the equivalent of one person trying to hold-up 50 jumbo jets against the force of gravity!!
- The top 10 feet of the ocean holds as much heat as the entire atmosphere.
- Undersea earthquakes, volcanoes and landslides can cause **tsunamis**(Japanese word meaning "harbor waves") or seismic waves. The largest recorded tsunami measured 210 feet above the sea level when it reached **Siberia's Kamchatka Peninsula** in 1737.
- Antarctica has as much ice as the Atlantic ocean has water!
- The Arctic produces 10,000-50,000 icebergs annually. The amount produced in Antarctic region is inestimable! Icebergs normally have a life-span of four years.
- **Air pollution** is responsible for **33%** of the toxic contaminants that end up in oceans and coastal waters. About **44%** of the toxic contaminants come from run-off via rivers and streams.
- **Oil** is one of the ocean's greatest resources. Nearly one-third of the oil comes from offshore fields in our oceans. Areas most popular for oil drilling are the Arabian Gulf, the North Sea and the Gulf of Mexico.
- The record for the deepest free dive is held by Jacques Mayol. He dove to an astounding depth of **86m** without any breathing equipment.
- A mouthful of seawater may contains millions of bacterial cells, hundreds of thousands of phytoplankton and tens of thousands of zooplankton!

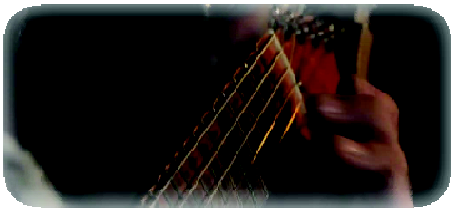
- **More than 90%** of the trade between the countries is carried by **ships** and about half the communications between nations use **underwater cables.**
- **Swordfish** and **Marlin** are the fastest fish in the ocean reaching speeds upto**121kph** in quick bursts! ohh!! that's the real fast!!
- Because the architecture and chemistry of coral is so similar to human bone, **coral** has been used to replace bone grafts in helping human bones to heal quickly and cleanly.
- **The Antarctic** ice sheet that forms and melts over the ocean each year is nearly twice the size of the **United States.**
- If extracted, it is estimated that all the **gold** suspended in the world's sea water would give each person on Earth **9 pounds!! hello Indians??**
- The word **'pacific'** means **'peaceful'**. However, the Pacific Ocean is far from peaceful. Thousands of volcanoes rise up from the Pacific Ocean!
- The average depth of the ocean is more than **2.5 miles.**
- The **speed of sound** in water is **1,435 m/sec**-nearly five times faster than the speed of sound in air.
- **The Pacific Ocean**, the world's largest water body a third of the Earth's surface. The Pacific contains about **25,000** islands(more than the total number in the rest of the world's oceans combined).
- Canada has the longest coastline of any country at **56,453** miles or around 15% of the world's **372,384** miles of coastlines.
- Mount Everest, the highest point on the Earth's surface 5.49 miles is more than one mile shorter than the Challenger Deep, the deepest point in the ocean at **6.86 miles**.
- The deepest known spot in the ocean is the **Mariana Trench**, southwest of Guam, it is **36,198 feet** below the surface ie.11,033 meter.
- If the ocean's salt content were dried it would cover the continents to a depth of 5 feet!
- The volume of Earth's moon is the same as the volume of the Pacific Ocean!

There are many more mysteries and facts which are undiscovered in these mighty water bodies. Knowing Oceanography can enhance the conditions for trade, communications and defense. Hope you all enjoyed the 'Oceanic Facts'!

Ye Mariners of the world

BADUGU AJITH
First Year BSc Nautical Science(2014-17)

YE Mariners of the World
That guard our native seas!
Whose flag has braved a thousand years
The battle and the breeze!
Your glorious standard launch again
To match another foe;
And sweep through the deep,
While the stormy winds do blow!
While the battle rages loud and long
And the stormy winds do blow.



The spirits of your fathers
Shall start from every wave--
For the deck it was their field of fame,
And Ocean was their grave:
Where Blake and mighty Nelson fell
Your manly hearts shall glow,

As ye sweep through the deep,
While the stormy winds do blow!
While the battle rages loud and long
And the stormy winds do blow.

Britannia needs no bulwarks,
No towers along the steep;
Her march is o'er the mountain-waves,
Her home is on the deep.
The thunders from her native oak
She quells the floods below,
As they roar on the shore,
When the stormy winds do blow!
When the battle rages loud and long,
And the stormy winds do blow.

Our song and feast shall flow
To the fame of your name,
When the storm has ceased to blow!
When the fiery fight is heard no more,
And the storm has ceased to blow.

Maritime security

KARTHIK P
Second Year BE Marine(2013-17)

IMO's mandate to make trade and travel by sea as safe as possible extends to maritime security. The Organization responds to threats in two ways: by developing appropriate regulations and guidance through its Maritime Safety Committee; and through capacity-building work. IMO's multi-donor International Maritime Security Trust Fund supports global, regional and national projects around the world which enhance the capacity of countries to deal with security threats, while specific trust funds support work in the Gulf of Guinea and in the western Indian Ocean. International Ship and Port Facility Security Code (ISPS Code)

The cornerstone of IMO regulations to address maritime security is the International Convention for the Safety of Life at Sea (SOLAS) chapter XI-2 Special Measures to enhance maritime security, which makes mandatory the International Ship and Port Facility Security Code (ISPS Code). The ISPS code contains detailed security-related requirements for Governments, port authorities and shipping companies in a mandatory section (Part A), together with a series of guidelines about how to meet these requirements in a second, non-mandatory section. Piracy and armed robbery against ships

IMO has been addressing maritime piracy for some time and a series of measures, developed in co-operation with Member States and the shipping industry, have helped significantly reduce piracy in the hot spots of the world. In the late 1990s and the early 2000s the focus was on the South China Sea and the Straits of Malacca and Singapore. More recently, since 2005, IMO has addressed piracy off the coast of Somalia, in the Gulf of Aden and the wider Indian Ocean, and is currently implementing a strategy for enhancing maritime security in West and Central Africa. Capacity building - Djibouti Code of Conduct

In 2009, the IMO-convened Djibouti meeting adopted the Code of Conduct concerning the Repression of Piracy and Armed Robbery against Ships in the Western Indian Ocean and the Gulf of Aden (The Djibouti Code of Conduct), to address the then-growing problem of piracy off the coast of Somalia.Since then, the IMO Djibouti Code Trust Fund has funded numerous projects, coordinated by the Secretariat's Project Implementation Unit, to improve regional capacity to counter-piracy by developing enhanced regional cooperation and coordination, based on the four pillars of Legislation, Training, Capacity Building, and Information Sharing.Capacity building - Gulf of Guinea.

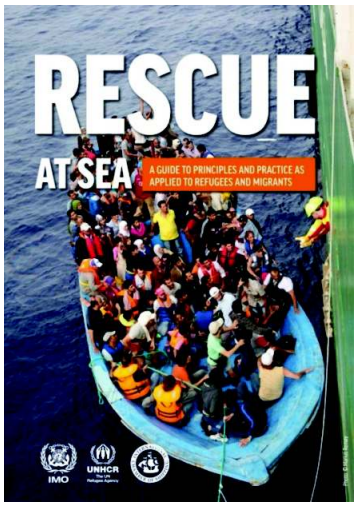
A code of Conduct concerning the repression of piracy, armed robbery against ships, and illicit maritime activity in west and central Africa was adopted formally in Yaoundé in June 2013 by Heads of State or their representatives from 25 West and Central African countries. IMO's strategy and initiatives for enhancing maritime security and supporting development of a vibrant, sustainable maritime sector in West and Central Africa aims to ensure successful implementation of the Code of Conduct. IMO assists Member Countries in revising national legislation to criminalize piracy, attacks against ships, and other illicit

maritime activities; coordinating structures and procedures; and having in place well-trained operational, technical and logistical personnel.

IMO guidance and best management practices.IMO has issued a range of guidance aimed at addressing maritime security concerns. For piracy and armed robbery against ships, this includes Guidance to Governments, shipowners and ship operators, shipmasters and crews on preventing and suppressing acts of piracy and armed robbery against ships; investigation of offences and the use of armed personnel.. Regionally focussed Best Management Practices, developed by international shipping industry bodies, have also been disseminated by IMO.
Arms on board ships.IMO does not take a position on the carriage of arms on board ships - it is the responsibility of individual flag States to determine if the use of privately contracted armed security personnel is appropriate and legal. IMO has issued guidance to flag, port and coastal States; and to shipowners, ship operators and shipmasters on the use of privately contracted armed security personnel on board ships in the High Risk Area, as well as guidance to those. Private maritime security companies.

Through the Convention on Facilitation of International Maritime Traffic (FAL Convention), IMO has issued standards and recommended practices for addressing the problem of stowaways, associated guidance and is working with a number of countries to help address the problem

Currently, IMO is exploring ways to work in partnership with the UN Office on Drugs and Crime (UNODC), the International Labour Organization (ILO), the Office of the High Commissioner for Human Rights (OHCHR), UNHCR, the International Organization for Migration (IOM), INTERPOL and others, to address this significant humanitarian problem which also places burdens on coastal states and ship owners.The Facilitation and Maritime Safety Committees have initiated consideration of cyber security matters and will work on this matter in consultation with other United Nations bodies and relevant international organizations such as the International Telecommunication Union (ITU).



IMO participates in the work of UN Security Council Counter Terrorism Committee's Executive Directorate and the UN General Assembly's Counter Terrorism Implementation Task Force, through country assessment visits, capacity building coordination, and exchange of policy developments with other UN and partner entities involved in Border Management and Law Enforcement.IMO's SUA Treaties were adopted in 1988 and underwent a comprehensive revision in 2005. The SUA Treaties aim to provide the international legal framework to ensure that appropriate action is taken against persons committing unlawful acts against ships (and fixed platforms on the continental shelf). These unlawful acts listed in the treaties include the seizure of ships by force; acts of violence against persons on board ships; and the placing of devices on board a ship which are likely to destroy or damage it.

GREEN TUGS

VISHWAS K.V
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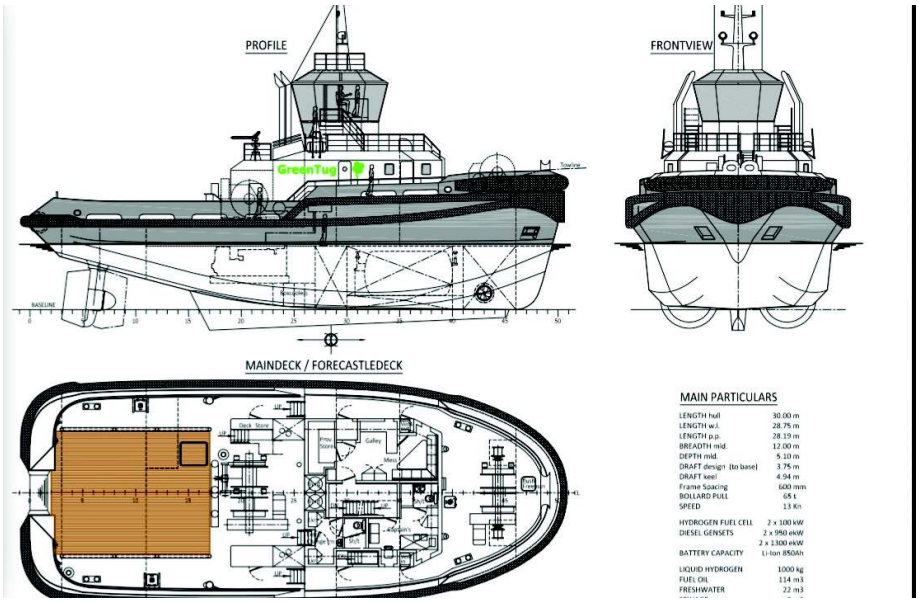
A tug is usually a small and powerful boat which is used for towing large boats and ships especially in a harbour, narrow canal when the ships cannot move by themselves. They are also used for safety purposes such as fire fighting. The latest development in these tugs is the green tugs.

WHAT ARE GREEN TUGS?

A green tug is a small boat that runs on both diesel and electricity. But the usage of diesel is been reduced to the least. They use a diesel-electric propulsion. In order to reduce the emissions while mobilizing a job, the tug will sail on battery power. The energy management system ensures that the master of the tug gets sufficient power he needs regardless if the power comes from one or more diesel generators. When sailing at cruising speed only one generator is used. This cuts down the fuel consumption and maintenance. The vessel will have a 70 t bollard pull and is equipped with a double drum, creating an independently controlled forward winch system.

MAIN FEATURES OF A GREEN TUG:-

- Electric energy is supplied by a combination of diesel generators and fuel cells.
- A battery pack is available to supply short peak loads.
- Diesel electric power is used during assist operations.
- Green Mode: ZERO emission transit/standby operations during approximately 1 hour at maximum 7 knots.
- Optimum diesel loads and battery peak saving by means of Power Management System leading to highest efficiency of diesel filtering systems.



MACHINERY :-

Main generator sets : 2 x 950 ekW+2x1300 ekW

Propulsion : 2 x azimuth thrusters 2600mm

Fuel cell : 2 x 100 ekW

Battery pack : Li-Ion 850Ah

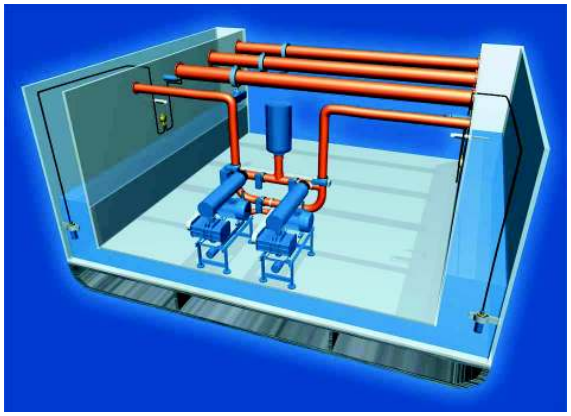
Bow thruster : 1 x 300 Kw

Compared to a conventional tug the green tug project reduces the Co_2 and fuel consumption with 30-50%.During standby operation of the vessel the tug will sail in green mode, using fuel cells and batteries which supply power to the E-propulsion motors. During other it will sail on the diesel generator sets which run in parallel with power management taking care of an ideal load on the diesel engines and also reduced and optimized emissions and balanced fuel consumption. THUS GREEN TUG GIVES A TEMPERORILY EMISSION FREE OPERATION WITH SIGNIFICIANT FUEL SAVINGS.

U-Tank Stabilization System

GOKUL B
Third Year BE Marine(2012-16)

There are several types of roll damping system introduced to reduce a vessel's roll motion at sea. The U-Tank Stabilization System is individually sized for each specific application. Number of tanks, proper dimensions, shape, location, internal structure and volume are varied to match each type of vessel. The liquid flow within the tank will naturally lag behind the roll motion of the ship by 90°. This will create a stabilizing force directly opposing the forces created by the wave.



A U-Tank Stabilization System is a passive U-tube typeanti-roll tank combined with a monitoring and an activecontrol system. The stabilizer consists of two wing tanks
Interconnected via a crossover duct either through or above the double bottom and a closed air duct system with remote operated valves. The fluid flow within the stabilizer is used to create a stabilizing moment reducing decreasing roll angles and accelerations. The stabilizer's dimensions and boundaries determine its natural response period which has to be
close to roll period of the vessel. A change of the response period is achieved by restricting the airflow. This is controlled by the remote operated valves.
The control unit HOMIP contains the software package for monitoring the roll sensor unit, tank pressure sensors, level switches and valve positions. This system monitors the tank movement as well pressure and level inside tank to act according to roll damping performance and safety.
The U-Tank Stabilization System can be combined with a
Blower Anti-Heeling System using the same tanks. During loading operations, the Blower System provides heel angle compensation.

ANTI-FOULING SYSTEMS

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INTRODUCTION

Ships travel faster through water and consume less fuel when their hulls are clean and smooth –free from fouling organisms, such as barnacles, algae or molluscs. In the early days of sailing ships, lime and later arsenical and mercurial compounds and pesticides were used to coat ships' hulls to act as anti-fouling systems. During the 1960s the chemicals industry developed efficacious and cost-effective anti-fouling paints using metallic compounds, in particular the organotin compound tributylin (TBT).Fouling is an unwanted growth of biological material - such as barnacles and algae - on a surface immersed in water.

TYPES OF ANTI FOULING

- **Eroding antifouling**
- **Hard antifouling**
- **Thin film antifouling**

ERODING ANTI-FOULINGS:

This type of antifouling is partially soluble and therefore as water passes across the coated hull, its action steadily reduces the thickness of the antifouling at a regulated rate. The minimal build up of the coating at the end of the season reduces the maintenance and preparation needed when it is time to apply next season's antifouling.

For High speed powerboats , the eroding nature of this type of antifouling is not suitable, because the action of the powerboats against the water will reduce the thickness of the film at too fast rate, leaving an unprotected hull at mid-season.

HARD ANTI-FOULINGS:

The technical term for this type of antifouling is 'contact leaching.' After application, the paint film dries to a hard, burnishable surface that is porous. To prevent any fouling growth the film is packed with biocides which leach out on contact with water. The leaching process is chemically designed for release in a controlled manner throughout the season, until most of the biocide is exhausted and only a hard film remains.

A disadvantage of the hard products is the buildup of residual antifouling which can occur if the surface is not properly abraded before new coats are applied each season. Hard antifouling's available are

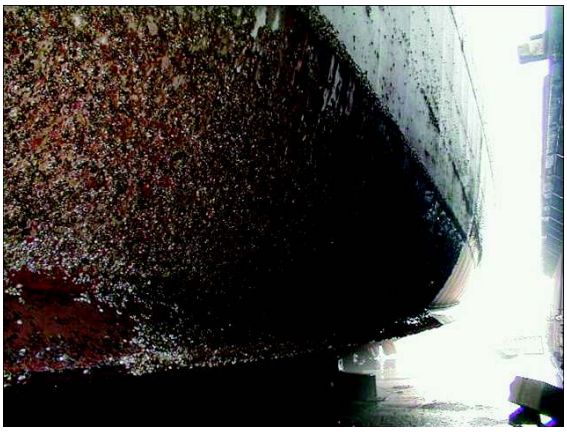
Interspeed Ultra, Trilux, Waterways and VC Offshore.

THIN FILM ANTI-FOULINGS:

It is combine a hard, thin film of active ingredients with Teflon to provide an effective antifouling surface with a super sleek finish particularly suited to the performance boater. These antifouling's apply as easily as water and dry in minutes to an incredibly thin film which in itself reduces drag and the problems of build-up of old layers of antifouling. But their main advantage is the superbly smooth finish which allows the hull to move through water with minimal friction and drag. It is the advantages that have made thin film antifouling's the definitive choice among professional racers, both power and sail, with winners of virtually all the highest profile global, transatlantic and offshore racers selecting this exclusive technology. The smooth, slippery final film surface makes it extremely difficult for fouling organisms to adhere to this type of antifouling. However, as it relies on a smooth underlying surface for maximum performance, it is important to use the specially formulated smooth film VC primer which has been specifically developed for this type ofproduct. The thin film antifouling available is VC17m.

ANTI-FOULING BY ELECTROLYSIS AND RADIATION:

The most common method is to produce hypochlorous acid (HClO), ozone bubbles, hydrogen peroxide or bromine through electrolysis of sea water. Because of their strong oxidizing ability, HClO and other compounds will spread all over the ship's hull and eliminate areas of fouling organisms.



However, some of these systems are not highly efficient because of a large voltage drop across the surface, and they will intensify the corrosion problems of steel. Titanium supported anodic coating has been suggested because of its advantages such as having low decomposition tension, higher current efficiency, lower energy consumption , although the development of this has been limited. Antifouling could also be achieved by microcosmic electrochemical methods, which are based on direct electron transfer between an electrode and the microbial cells. However, the huge power consumption of these methods is difficult to overcome. Finally, other studies have evaluated magnetic fields, ultraviolet radiation and radioactive coatings, but these methods are not practical in application.

MONUMENT OF MERCHANT MARINE

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NARESHKUMAR K
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LOOK!

There's an interesting monument

What's that all about?

WELL!

A man fell into the water

Some men are pulling him out

OH!

Go on to another tourist sight

Lot to see before might

STOP!

Not just a monument much more

A tribute to unknown heroes

Whose lifeboat never teaches the shore

WAIT!

Look once more and you may see

Valiant heroes of the sea

Who,where there long on deal was done

Remained un head of and unsung

SALUTE the must of her chaut mariners

Seamen strong and true

In war and peace of 300 year

They brought the cargo through

HONOR the men of the merchant marine

Too long discounted and demeaned

The time has come to pay our

RECOGNITION,REMEMBRANE AND RESPECT!

NATURAL GAS A SOLUTION TO THE POLLUTION

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Second Year BE Marine(2013-17)

- Propulsion means power, it also means pollution, particularly when it comes to powering ships. Burning diesel and Heavy Fuel Oil creates greenhouse gases, mainly SOx,NOx and CO2, are emitted into the atmosphere.

- Propulsion system requires seals and bearings to reduce friction. Due to the harsh condition and varying loads of the ships weaken the sealsthat, leads to the leakage of the lube oil which causes the oil spill in the ocean.

- The emission of the greenhouse gases and the oil spill causes pollution to the environment.On the other hand diesel is a non-renewable energy source and the cost of the fuel (i.e. diesel) is increasing day by day.

- In order to made the environment free from pollution and to put an end to the costly and pollution causing diesel, the natural gas can be used as an alternative energy source.

- Natural gas is a mixture of several different gases. The primary constituent is methane, which typically makes up 85-99% of the total volume.

- Natural is an excellent for SI engines. As a gas in normal conditions it mixes readily with air in any propotion.

- Unlike liquid fuels , the natural gas need to vaporize before burning.

- The cold engine starting is easier especially at low temperature and cold start enrichment is not required which is the major source of CO emission.

- Natural gas has high ignition temperature and it is resistant to self-ignition.

- Natural gas has excellent anti-knock properties.

- Pure methane has an equivalent research octane number of 130 which is highest of any commonly used fuel.

- Because of its antiknock properties, natural gas can safely be used with engine compression ratio as high as 15:1(compared to 8-10:1 for 91 octane gasoline).

- Natural gas engines using these higher compression ratios can reach significantly higher efficiencies than are gasoline.

- Methane,the main ingredient in the natural gas has the potential to deliver large amount of energy. During complete combustion, fuel plus oxygen are converted to carbon dioxide and water. The heat derived from combustion propels the ship.

Comparing the heats of combustion (kJ/g) for the fuels (approximate values)

Fuels	Heat of combustion
Ethanol	30 kJ/g
Diesel	45 kJ/g
Gasoline	47 kJ/g
Propane	50 kJ/g
Methane	55 kJ/g

- Methane delivers more energy than any other fuel.

- The combustion of natural gas is much cleaner. During complete combustion, the only by-products are carbon dioxide (a greenhouse gas) and water, both colourless. The natural gas is free from sulphur and reduce NOx emissions by up to 90% and CO2 by up to 20% with little amount of smoke.

- The other fuels gives off black smoke due to carbon monoxide and elemental carbon produced during combustion. Diesel also has a tendency to produce smoke.

- Therefore, the natural gas which gives the solution to made the environment free from pollution caused by the ships to a great extent.

PIRACY & ARMED

HAREEHARAN.J
First Year BE Marine(2014-18)

INTRODUCTION

Ship's crew are hired for their navigational or engineering training and experience and not for resisting armed attacks on vessels.

PIRACY

Maritime crime poses potential hazards throughout the world.The definition for piracy was given by John Bouvier in 1897.It is a robbery or forcible depredation on the high seas, without law full authority in attention of universal hostility. The people involved in piracy were called as pirates.

1650-1720 was called as the 'Golden age' of Piracy.

BLUE SEA BUCCANEERS

Pirates were also called as corsairs or buccaneers.Theyare robbers who travel by water.Main target was ships some time coastal town.Famous pirates were Blackbeard(Edward teach),William 'captain' Kidd and 'Calico' Jack Rackham.

Corsairs are pirates who operated in Mediterranean sea.They used swift oar-powered boats.Buccaneers who lived in Caribbean island of Hispaniola.

RECENT INCIDENT

On Feb 11,2015 on Malta-flagged VLCC MT Kaslamos was attacked in Nigerian coast. But it was controlled by board security.

WEAPONS USED BY PIRATES

Modern pirates usually attack in small speedboats,using automatic weapons and rocket propelled grenades to force a vessel to stop.They use rope and ladders to climb.

ARMED AGAINST PIRACY

1. Long range acoustic device(LRAD)

Non-lethal and uses pain inducing sound.

2. Laser device

Gives visual warning to pirates and can be used in both day &night.

2. Water canon

Delivers powerful and impenetrable stream of water.

Electric secure fence
It can be folded when not in use.

5. Nets-boats trap

6. Slippery foam-Mobile Daniel system
It is a anti-traction material used to make deck of ship slippery.

7. Foul smelling liquid
It makes burning and stink sensation.

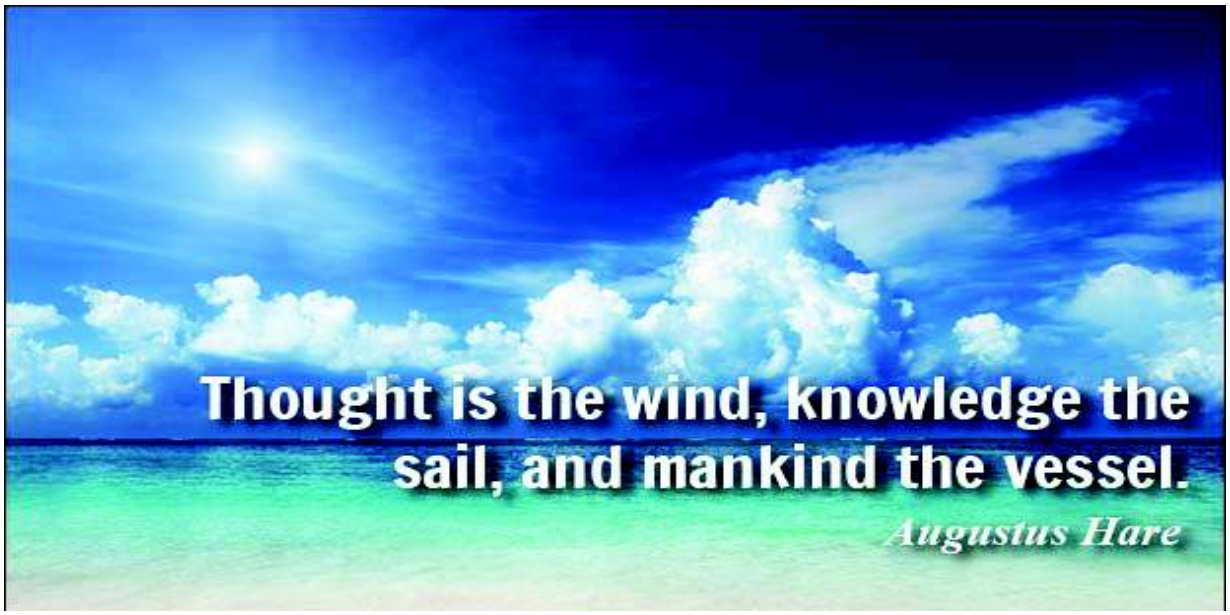
8. Anti boarding device
Uses canisters with sharp razor.

9. Non-lethal/stun grenade
Produces blinding flash light and loud noise.

10.Rubber ball grenade

Sprays rubber bullets on detonation.

Rise of piracy in Somali coast iscall to arms.A latest new named "Captain Phillips" by SonyPictures portrayed us true story of merchant vessel Maersk Alabama. IMO is taking necessary action to control piracy.



ALTERNATE FUEL (METHANOL) FOR MARINE DIESEL ENGINES

SATHISHKUMAR.V
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ABSTRACT

Due to the large growing demand in marine industry and increase in vessels everyday causes demand for fuel. Availability of fuel oil is reducing on earth by statistics. The search for alternative fuel has begun already. In this way methanol has proved itself as an alternative fuel to petroleum fuels.

Methanol is the only one that has been produced for a long period at large industrial scale. Due to the abundant availability of sources of methanol, less production cost and lowest GHG emissions when used as a fuel, but requires some infrastructure modification and faces substantial acceptance challenges. Many modern vessels have been retrofitted to methanol fuel and methanol dual fuel.

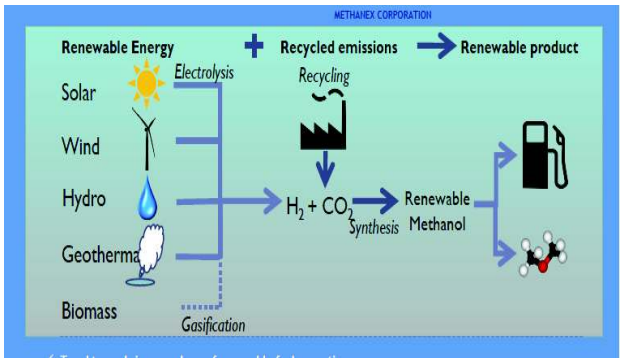
INTRODUCTION:

In the 21st century, methanol could replace oil in many transport applications, Because of its environmental benefits.Methanol is totally miscible in water and easily degrades in the environment.Methanol is a ready available fuel. Methanol produced from renewable sources could seamlessly be introduced to the methanol supply to shift towards a fully renewable fuel.Methanol fuel will displace reliance on oil. This will cause a modest reduction in greenhouse gases and eliminate ecologically harmful crude petroleum spills.

PRODUCTION:

Methanol fuel is currently marketed in two basic forms. The first is pure methanol, or M100. The second is a mixture of 85 percent methanol and 15 percent gasoline, called M85.Methanol, also known as methyl alcohol orwood alcohol, is the simplest alcohol and widelyused in the chemical industry. It is also used asan energy source, and this application isgrowing. The majority of methanol producedtoday is from natural gas, the same feedstockused for LNG. Although it takes more energy toproduce methanol, there are many advantagesdue to the simplified distribution and use. It is aliquid transported in chemical product tankers atatmospheric temperature and pressure, andstored in tanks similar to those used forgasoline. Thus distribution, handling, andbunkering systems for methanol would bevery similar to those used today for traditionalmarine fuels.Methanol can be produced from a wide range of feedstocks – any carbon

source canbe used. Natural gas and coal are the most common, but the most exciting for the future arethe renewables. Some examples of renewable feedstock used in current production are forest biomass, municipal waste, and black liquor from pulp mills.



METHANOL FUELLED ENGINES:

Methanol is an excellent fuel for internal combustion engines, especially for Otto but also for Diesel type engines with appropriate technical adaption. It does not emit any SOX or particles and since it burns at lower temperatures than petroleum fuels it emits lower NOX. Natural gas based methanol does not have a lower globalwarming potential than marine gas oil, but since it can be produced from many different material list has potential to be sustainable in the future.

Methanol burns very cleanly with low NOx and particulate (soot) emissions and contributes to reduced emissions when mixed with typical fuels.Methanol burns with an almost invisible flame but fuel grade methanol containing lubricants and possibly other additives (e.g. gasoline) could make the flame visible.Methanol has around half the energy density (15.8 MJ/liter) of diesel or gasoline. This is not considered a large problem for use in ships, since it can be stored in space usually reserved for ballast water tanks.

Regarding the infrastructure methanol is very similar to petrol and can use the same infrastructureif small modifications in the harbors are made. Methanol is easy to store and transport. It hasbeen tested in diesel engines using a glow plug concept and also by using a pilot fuel for ignition.The forecast of the availability looks promising.

CONCLUSION:

For 2015 a switch towards methanol is not seen as realistic. Further research and establishment ofregulations and distribution systems are needed; however there are indications that a shift will bepossible sometime between 2015 and 2020. Therefore methanol is suggested as the fuel to be used in2020, but for 2015 a shift towards marine gas oil is what is recommended. When shifting to marinegas oil only small modifications of the fuel system has to be made and the investment cost is low,but the fuel price is higher than methanol, why a shift towards methanol is preferred as soon as themarket is ready.

For 2020 a shift towards methanol is recommended. Fuel supply and infrastructureMethanol is widely available and can easily and safely be transported to all geographies. The shipping is much the same as petrol and is typically shipped in product or chemical tankers. Infrastructure such as tanks, pipelines, barges, and trucks are also similar to oil products like petrol and diesel the previous worldwide methanol production as well as the future Forecast.

AN ECONOMICAL SAILING - SLOW STEAMING OF SHIPS A PREDESSOR TO EEDI & SEEMP

BALAMURALI MANOHAR N
Final Year BE Marine(2011-15)

ABSTRACT:

Slow steaming is a process of deliberately reducing the speed of cargo ships to cut down fuel consumption and carbon emissions. In slow steaming, a container ship travels at a speed of around 12-19 knots instead of the usual 20-24 knots. This results in reduction of engine power and fuel consumption. Slow steaming has successfully helped ship owners in reducing the amount of fuel needed to run ships, which in turn has lead to significant decrease in carbon emissions.

Slow steaming has been adopted by majority of companies and ship owners in order to survive in the tough times of rising fuel prices and financial recession. The pressure to reduce carbon emissions and improve ship efficiency has also pushed shipping companies to implement slow steaming on their ships.

It was found that up to 4,000 tonnes of bunker oil could be saved during a round trip from Europe to Singapore on a large ship like Emma Maersk. Later, Maersk Line also introduced a Bunker Leap with the aim of driving down consumption of energy and fuel expenditure, a move that brought slow steaming into full focus. But industry engineers were quick to voice their fears that the practice would foul engines and only harm them in the long run.

To counter industry doubts, Maersk Maritime Technology introduced standardised visual reports of engines during regular port inspections, while Maersk Line created detailed procedures for sailing at low engine loads.Together they enabled Maersk to provide facts on the benefits of slow steaming and convince engine manufacturers that going slower was neither harmful to the engine nor dangerous for crews. In late 2008 and early 2009 engine manufacturers MAN Diesel and Wärtsila published Letters of No Objection for low-load operations.

An effective endorsement, this owed to the combination of technical experience and expertise with more comprehensive reporting and data gathering. As a result, Maersk Line introduced its first unified low load policy to its entire container fleet of around 500 vessels in early 2009.Originally started for Container Shipping by Maersk Lines and justified by the cost sheets and economics, the concept of slow steaming has now been borrowed by other types of ships including tankers and dry bulk ships, whose operating speeds are traditionally low. Long before other ship owners caught on with the concept, Maersk shipping experimented with slow steaming and presented to its customers and ship owners the complete fact sheet of the concept along with the financial viabilities.

In order to maximise the financial and environmental impact of its findings, Maersk decided to share its technical and commercial insight with the ship owners Maersk Line charters vessels from and those with which it shares routes (the so-called Vessel Sharing Agreements).

Again, Maersk Line had to convince the sceptics, engineers especially, that slow steaming would not damage engines but instead reap big commercial advantages in a volatile market plagued by high oil prices. At this point the Letters of No Objection came in handy. They gave a few ship owners the confidence to give it a try. As the first owners came on board, the slow steaming practice rapidly spread around the world.

Apart from the benefits, implementing slow steaming on ships also requires a variety of factors such as technical requirements, various modes of slow steaming including super slow steaming, retrofitting, modifications with the upgrade kits and suitability of intelligent marine.
Slow steaming has helped shipping companies to improve their performance, along with reducing their carbon footprints.
Though issues such as longer time to transport cargo and negative effects on the engine have been bothering companies, the overall benefits of the strategy has made them overlook the downsides, at least for the time being. The major benefits

- Higher fuel savings
- Reduction in carbon emissions (CO2, NOx and Sox)
- Improved reliability
- Increased efficiency

In the transient times of changing standards, stricter regulations and new emerging technology it finally translates to the ship's chief engineer and his team of marine engineers in consultation with the company's technical management toimplement the required changes related to slow steaming on the ship. Ship owners instruct their chief engineers to run the ship on economy speed, also called eco speed or slow steaming. It is up to the marine engineers, working in the engine room of the ship, to ensure that slow steaming is smoothly implemented and there are minimum damages to the engine. Thus apprehensions regarding the concept are obvious.

As slow steaming is not a regular affair for marine engineers nor have they been trained for the same, some efforts have to be made to remove the traditional mindset and reluctance of the engine staff by retraining them. In addition, the engineers have to be instructed about additional routines and inspections of the main engine, which is operating outside its designed optimal range when slow steaming is implemented

Scope of deck Cadets

A ADARSH
RAHUL SINGH
First Year BSc Nautical Science(2014-17)

Once you have passed all of your classes, paid all your dues and spent your 3 years of training time aboard a ship, you can then apply to become an entry level seaman or officer. From there, you can continue on and work your way up the career chain.

Seamanship and safety are also of great importance for in spite of all the safeguards allowed by modern technology the sea will forever be a hostile environment. All of these skills will be learned by a mixture of training and practical experience. The ultimate goal of the Deck officer is to become Master of his/her own ship; leadership skills and man management are, therefore, also essential ingredients here.

Experienced mariners are in great demand in various shore assignments because of their ability to handle all types of jobs, their resourcefulness, sense of responsibility and ability to work under most demanding circumstances. A deck officer is very valuable and responsible member of ship's team. He has to navigate the ship from one port to another.

But there are compensation as well a class III certificate of competence holder starts as a third officer (approx. Salary: US$ 3000) with prospectus of becoming a master in about 8 years (approx. salary US$ 7000-14000) plus leave and allowances. The Master is the overall incharge of the ship and is more popularly known as the Captain. But one has to join at the bottom rung of the marine ladder and spend years of training to become an officer. A cadet starts at the bottom of the maritime job ladder. Much like in the armed forces, a cadet is, simply put, a future officer under training. Although rules about training and certification (the examinations a cadet and later, an officer takes regularly to be eligible for a higher rank) vary from country to country, the basics are the same. The

Captain or the Master of the ship is the overall in charge. He is responsible for the safety navigation of the vessal and is incharge of the ship, all the officers and crew, the safety its crew and the cargo. He has, working under his command, the first mate, second mate and third mates, all of whom have navigational and cargo duties.

The First Mate / Chief officer is the second in-command. He is incharge of cargo, maintenance of the Deck Department and crew discipline. The Second Mate / Second officer, assistant to the First Mate is in-charge of navigational equipment and charts. He is the 'Navigating Officer'. He reports to the Chief Officer on cargo matters. The Third Mate / Third officer is responsible for keeping lifeboats, liferafts and other safety and firefighting equipment in order. He reports to the Chief Officer on cargo matters and assists the Second Officer in the upkeep of nautical publications. The Start Trainees, or cadets, must join the 'Deck' or Navigation department to progress towards a Master's (Captain's) rank. The options the student who wants to join the merchant navy as a deck cadet will include either - a 3 year degree course in Nautical Science for (10+2) students . After completing of the 3-year course, a student is awarded a Degree in Nautical Science and is required to go on board ship for sea training or around a year or in some cases a little more..or a 3 months course for Deck Cadets for (10+2) students. After completion of the course, the student has to get sea training for anything between eighteen months and 3 years, depending on the country. The student will be usually paid a stipend while under sea training in either case. Room and board is free, of course, and medical benefits and some others are common

AIR POLLUTION AND GREEN HOUSE EMISSION

RAJASEKAR R
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AIR POLLUTION:

Contamination of air is called air pollution.Air pollutions from ships is generated by diesel engines that burns high sulphur content fuel oil which is called as bunker oil, producing SO2 and NOx ,CO2and its hydro carbon. Out of total air emissions shipping accounts for 18 to 30 percent nitrogen oxides and 9% of sulphur oxides. Annual SO2 emissions from ships were estimated at 16.2 million tonnes in 2006, rising to 22.7 million tonnes in 2020 under the "business-as-usual" scenario. Since they cause acidification of soil and water, the emissions of SO2andNOx continue to be a serious problem in large parts of Europe. NO also contributes to the formation ofground-level ozone, which damages vegetation as well as human health, and contributes toglobal warming. Moreover, NOx lead to eutrophication, which negatively affects biodiversity both on land andin coastal waters.

Acidification: In 2000, the depositions of sulphurand nitrogen exceeded the critical loads for acidifyingsubstances over 260,000 square kilometers (20%) of sensitive forest ecosystems.

Eutrophication: In 2000, the depositions of nitrogen in the EU exceeded the critical loads for eutrophicationover more than 1 million square kilometers (70%) ofsensitive terrestrial ecosystems.

Ozone: In 2000, approximately 800,000 square kilometers(60%) of the EU forest area were exposed to ozoneconcentrations exceeding the critical level.

Examples of countries where the proportionof air pollutant depositions of sulphur and nitrogenoxides from shipping is most marked

Sulphur	**NOx-nitrogen**
Denmark 45%	27%
Sweden 23%	22%
Netherlands 21%	18%
UK 19%	19%
Ireland 18%	20%
France 12%	14%
Finland 12%	14%
Belgium 12%	1 3%

The researchers used global inventories of ships' emissionsof SO2, NOx and PM for the year 2002. Throughchemical reactions in the air, SO2 and NOx is convertedinto fine particles, sulphate and nitrate aerosols.Tiny airborne particles are linked to premature deaths.The particles get into the lungs and are small enough topass through tissues and enter the blood. They can thentrigger inflammations which eventually cause heart

andlung failures. Ship emissions may also contain carcinogenicparticles.

Measures to reduce air pollution*HAM, Humid Air Motor,* preventsNOx-formationduring combustion by adding water vapour to the combustionair. The method is able to reduce NOx by 70–85%.*Selective Catalytic Reduction, SCR,* is a system forafter-treatment of exhaust gases. Itcan reduce emissionsofNOx by more than 90%, and operates better withlow-sulphur fuel oil. There are now around 100 shipsfitted with SCR – many of them are frequent callers at
Swedish ports.

Gas engines

Ship engines can also operate on natural gas (LNG) andin this way reduce SO2 emissions to almost zero sincethere is no sulphur in LNG. Emissions of NOx and PMare also significantly reduced, by 80% or more.

Shore-side electricity

While docked at the port, ships shut off their propulsionengines, but use their auxiliary engines to power refrigeration, lights, pumps and other equipment. If ships connectto a shore-side power supply instead, emissions of SO2,NOx and PM can be cut by 90% or more.

Alternative energy sources

The use of fossil fuel must come down. Experiments withwind power (SkySails) and fuel cells are ongoing. Smallcraft operate on solar power and scaling this technology

GREEN HOUSE GAS EMISSION

The gases which are responsible for global warming is called greenhousegases.The increase in earth temperature due to over deposition of greenhouse gases is called global warming.six types of GHGs, namely CO2, CH4, N2O, HFCs, PFCs and SF6.Global shipping emits over 3% of manmade greenhouse gases. Shipping emitted approximately 1,000Mt CO2 in 2007 globally, and international shipping approximately 870 Mt CO2 (IMO, 2009). These figures amount to 3.3 and 2.7% of global man made greenhouse gas (GHG) emissions, respectively (CEDelft, Going Slow to Reduce Emissions, 2010).About 3.5to 4% of climatic changes are caused by shipping air pollution. Greenhouse gas emission causes dramatic climatic changes it will causes acid rain and leads to global warming. LNG is a low carbon fuelwhich results in a CO2 reduction of 25-30%. Anotherof LNG fuel is the contribution to airemission reduction for NOx (85% reduction) and Sox(100%reduction) . CO2 is considered as the primary gas for greenhouse gas emission,by controlling emission of CO2 greenhouse effect caused by ships can be controlled. Fortunatelythere are a wide range of technical and operationaloptions for **reducing GHG**

emissions from shipping:speed reductions, improved fleet management, voyage optimization, alternative fuels, use of renewables, and improved vessel hull and engine design among them.some of technical measures are modified hull form,modified propeller, use of energy from exhaust heat recovery.

CONCLUSION

The study and modal comparison performed show that there are several technicaland operational measures that could be implemented to limit GHG emissions fromships. Reduction of speed is identified as the single measure that results in highestemissions reductions. Implementation of new and improved technology is identifiedas the second best approach to reduce emissions, in terms of technical emissionsreduction potential. Following strategy for policy implementation for IMO to curb GHGemissions could be feasible:1. Explore the interests for entering into voluntary agreement on GHG emissionlimitations between the IMO and the ship owners, or to use environmentalindexing2. Start working on how to design emission standards for new and possibly also onexisting vessels.3. Pursue the possibilities of credit trading from additional abatement measures implemented on new and possibly also on existing vessel.

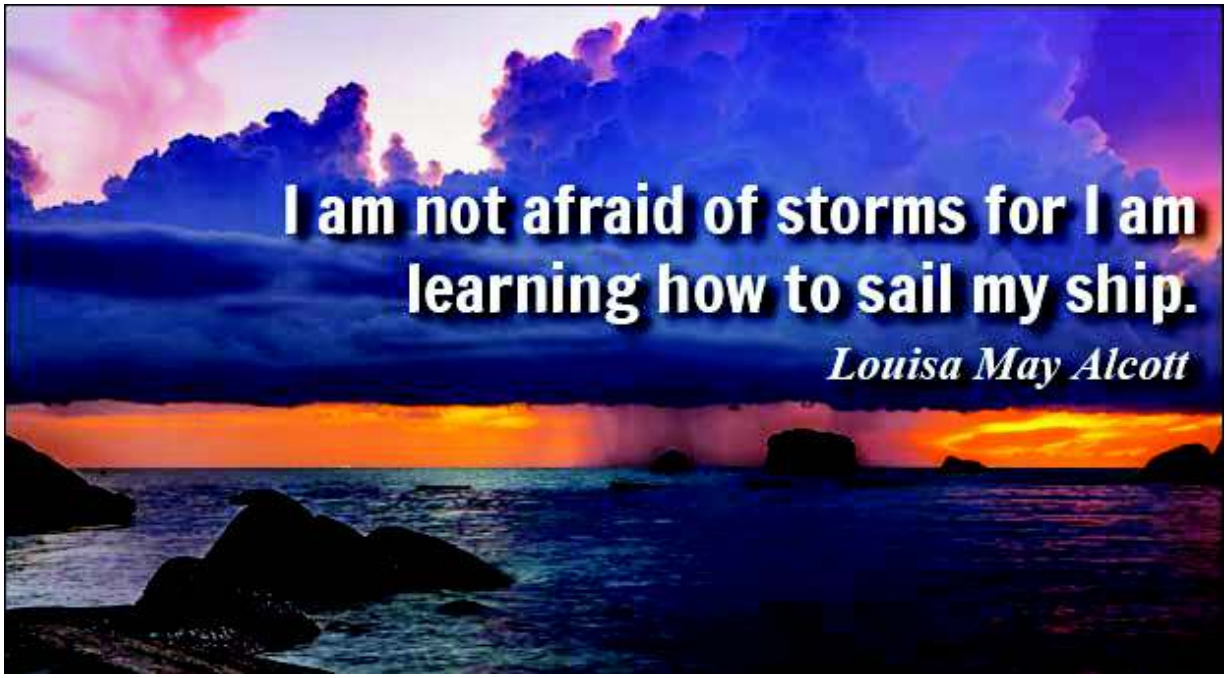

PHOTO GALLERY

COLLEGE DAY CELEBRATION

GREEN SHIP (NATURE CLUB PROGRAMES)

REPUBLIC DAY CELEBRATION