BA4061 FUNDAMENTALS OF SHIPPING L T P C
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COURSE OBJECTIVES:

- To provide the knowledge about fundamentals of shipping management
- To equip the students with the knowledge of shipping, ship building and repair

UNIT I INTERDICTION OF SHIPPING 9

Role of Shipping in International trade-Types of ships and cargoes carried by them - International Organizations serving the shipping industry (IMO, BIMCO, ICS, IACS, IAPH)- Ship Registration and Classification.

UNIT II LINER SHIPPING OPERATIONS 9

Liner shipping business - Types of Liner services - Container shipping lines and their services - Break bulk, Ro-Ro and project cargo services - Liner freight rates - Liner cargo documentation - Liner agency functions

UNIT III DRY BULK BUSINESS 9

Dry Bulk shipping business- World's leading dry bulkports and cargoes handled by them - Types of Dry bulk ships and the Dry Bulk industry structure - Dry bulk market indices - Types of Chartering - Port agency functions.

UNIT IV TANKER OPERATIONS AND BUSINESS 9

Liquid Bulk shipping business - World's leading wet bulk ports and cargoes handled by them- Types of tankers and gas carriers - Tanker freighting system (worldscale) -Factors affecting Tanker markets-Marine pollution conventions.

UNIT V SHIP BUILDING AND REPAIR 9

Service providers to shipping industry -Ship management companies -Ports, inland terminals and Container Freight Stations- Ship building and repair yards -Financing the Shipping industry - Marine insurance providers.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- The students would be acquainted with the basics of shipping management
- The students will learn the skills needed for shipping industry

REFERENCES:

1. Michael Robarts, Branch‟s Elements of Shipping, Ninth Edition, Routledge, 2014.
2. Peter Brodie, Commercial Shipping Handbook, Third Edition, Informa Law from Routledge, 2014.
3. Review of Maritime Transport, UNCTAD, 2014.
4. Coyle et.al, Management Of Transportation, 7th Edition, Cengage Learning, 2011

UNIT – I

INTRODUCTION

Role of Shipping in International trade

Ship transport is watercraft carrying people (passengers) or goods (cargo).

Sea transport has been the largest carrier of freight throughout recorded history. Although the importance of sea travel for passengers has decreased due to aviation, it is effective for short trips and pleasure cruises. Transport by water is cheaper than transport by air, despite fluctuating exchange rates and CAF charges to account for such.

Ship transport can be realized over any distance by boat, ship, sailboat or barge, over oceans and lakes, through canals or along rivers. Shipping may be for commerce, recreation or the military purpose. Virtually any material can be moved by water; however, water transport becomes impractical when material delivery is highly time-critical.

Containerization revolutionized ship transport starting in the 1970s. "General cargo" includes goods packaged in boxes, cases, pallets, and barrels. When a cargo is carried in more than one mode, it is intermodal or co-modal.

Ships and watercraft

Ships and other watercraft are used for ship transport. Types can be distinguished by propulsion, size or cargo type. Recreational or educational craft still use wind power, while some smaller craft use internal combustion engines to drive one or more propellers, or in the case of jet boats, an inboard water jet. In shallow draft areas, such as the Everglades, some craft, such as the hovercraft, are propelled by large pusher-prop fans.

Most modern merchant ships can be placed in one of a few categories, such as:

Bulk carriers, such as the Sabrina I (seen here), are cargo ships used to transport bulk cargo items such as ore or food staples (rice, grain, etc.) and similar cargo. They can be recognized by the large box-like hatches on their deck, designed to slide outboard for loading. A bulk carrier could be either dry or wet. Most lakes are too small to accommodate bulk ships, but a large fleet of lake freighters has been plying the Great Lakes and St. Lawrence Seaway of North America for over a century.

Container ships are cargo ships that carry their entire load in truck-size containers, in a technique called containerization. They form a common means of commercial intermodal freight transport. Informally known as "box boats," they carry the majority of the world's dry cargo. Most container ships are propelled by diesel engines, and have crews of between 10 and 30 people. They generally have a large accommodation block at the stern, directly above the engine room.

Tankers are cargo ships for the transport of fluids, such as crude oil, petroleum products, liquefied petroleum gas (LPG), liquefied natural gas (LNG) and chemicals, also vegetable oils, wine and other food - the tanker sector comprises one third of the world tonnage.

Refrigerated ships (usually called Reefers) are cargo ships typically used to transport perishable commodities which require temperature-controlled transportation,mostly fruits, meat, fish, vegetables, dairy products and other foodstuffs.

Roll-on/roll-off ships, such as the Chi-Cheemaun, are cargo ships designed to carry wheeled cargo such as automobiles, trailers or railway carriages. RORO (or ro/ro) vessels have built-in ramps which allow the cargo to be efficiently "rolled on" and "rolled off" the vessel when in port. While smaller ferries that operate across rivers and other short distances still often have built-in ramps, the term RORO is generally reserved for larger ocean-going vessels.

Coastal trading vessels, also known as **coasters**, are shallow-hulled ships used for trade between locations on the same island or continent. Their shallow hulls mean that they can get through reefs where seagoing ships usually cannot (seagoing ships have a very deep hull for supplies and trade etc.).

Ferries are a form of transport, usually a boat or ship, but also other forms, carrying (or *ferrying*) passengers and sometimes their vehicles. Ferries are also used to transport freight (in lorries and sometimes unpowered freight containers) and even railroad cars. Most ferries operate on regular, frequent, return services. A foot-passenger ferry with many stops, such as in Venice, is sometimes called a waterbus orwater taxi. Ferries form a part of the public transport systems of many waterside cities and islands, allowing direct transit between points at a capital cost much lower than bridges or tunnels. Many of the ferries operating in Northern European waters are ro/ro ships. See the Herald of Free Enterprise and M/S Estonia disasters.

Cruise ships are passenger ships used for pleasure voyages, where the voyage itself and the ship's amenities are considered an essential part of the experience. Cruising has become a major part of the tourism industry, with millions of passengers each

year as of 2006. The industry's rapid growth has seen nine or more newly built ships catering to a North American clientele added every year since 2001, as well as others servicing European clientele. Smaller markets such as the Asia-Pacific region are generally serviced by older tonnage displaced by new ships introduced into the high growth areas. On the Baltic sea this market is served by **cruiseferries**.

Ocean liner is a passenger ship designed to transport people from one seaport to another along regular long-distance maritime routes according to a schedule. Ocean liners may also carry cargo or mail, and may sometimes be used for other purposes.

Ocean liners are usually strongly built with a high freeboard to withstand rough seas and adverse conditions encountered in the open ocean, having large capacities for fuel, food and other consumables on long voyages. These were the main stay of most passenger transport companies, however, due to the growth of air travel, the passenger ships saw a steady decline. Cruise ships later filled the void and are primarily used by people who still have a love of the sea and offer more amenities compared to the older passenger ships.

Cable layer is a deep-sea vessel designed and used to lay underwater cables for telecommunications, electricity, and such. A large superstructure, and one or more spools that feed off the transom distinguish it.

A **tugboat** is a boat used to manoeuvre, primarily by towing or pushing other vessels (see shipping) in harbours, over the open sea or through rivers and canals. They are also used to tow barges, disabled ships, or other equipment like towboats.

A **dredger** (sometimes also called a dredge) is a ship used to excavate in shallow seas or fresh water areas with the purpose of gathering up bottom sediments and disposing of them at a different location.

A **barge** is a flat-bottomed boat, built mainly for river and canal transport of heavy goods. Most barges are not self-propelled and need to be moved by tugboats towing or towboats pushing them. Barges on canals (towed by draft animals on an adjacent towpath) contended with the railway in the early industrial revolution but were outcompeted in the carriage of high value items due to the higher speed, falling costs, and route flexibility of rail transport.

A Multi-purpose ship (sometimes called a general cargo ship) is used to transport a variety of goods from bulk commodities to break bulk and heavy cargoes. To provide maximum trading flexibility they are usually geared and modern examples are fitted for the carriage of containers and grains. Generally they will have large open holds and tweendecks to facilitate the carriage of different cargoes on the same voyage. The crew will be highly competent in the securing of break bulk cargoes and the ship will be equipped with various lashings and other equipment for sea fastening.

A **liner** will have a regular run and operate to a schedule. The scheduled operation requires that such ships are better equipped to deal with causes of potential delay such as bad weather. They are generally higher powered than tramp ships with better seakeeping qualities, thus they are significantly more expensive to build. Liners are typically built for passenger and container operation though past common uses also included mail and general cargo.

A **tramp** has no fixed run but will go wherever a suitable cargo takes it. Thus a ship and crew may be chartered from the ship owner to fetch a cargo of grain from Canada to Latvia, the ship may then be required to carry a cargo of coal from Britain to Melanesia. Bulk carriers and cruise ships are examples of ships built to operate in this manner.

International trade is the exchange of capital, goods, and services across international borders or territories, which could involve the activities of the government and individual.[1] In most countries, such trade represents a significant share of gross domestic product (GDP). While international trade has been present throughout history (for example Uttarapatha, Silk Road, Amber Road,salt road), its economic, social, and political importance has been on the rise in recent centuries.

Size categories

Container ships are distinguished into 7 major size categories: small feeder, feeder, feedermax, Panamax, Post-Panamax, New Panamaxand ultra-large. As of December 2012, there are 161 container ships in the VLCS class (Very Large Container Ships, more than 10,000 TEU), and 51 ports in the world can accommodate them.

The size of a Panamax vessel is limited by the Panama canal's lock chambers, which can accommodate ships with a beam of up to 32.31 m, a length overall of up to 294.13 m, and a draft of up to 12.04 m. The Post-Panamax category has historically been used to describe ships with a moulded breadth over 32.31 m, however the Panama Canal expansion project caused some changes in terminology. The New Panamax category is based on the maximum vessel-size that is able to transit a new third set of locks, which opened on June 2016.The third set of locks were built to accommodate a container ship with a length overall of 366 metres (1,201 ft), a maximum width of 49 metres (161 ft), and tropical fresh-water draft of 15.2 metres (50 ft).Such a vessel, called New Panamax class, would be wide enough to carry 19 rows of containers, have a total capacity of approximately 12,000 TEU and be comparable in size to a capesize bulk carrier or a Suezmax tanker.

Container ships under 3,000 TEU are generally called feeders. Feeders are small ships that typically operate between smaller container ports. Some feeders collect their cargo from small ports, drop it off at large ports for transshipment on larger ships, and distribute containers from the large port to smaller regional ports.This size of vessel is the most likely to carry cargo cranes on board.

Container Ship Size Categories						
Name	**Capacity (TEU)** [18]	**Length**	**Beam**	**Draft**	**Example**	
Ultra Large Container Vessel (ULCV)	14,501 and higher	1,200 ft (366 m) and longer	160.7 ft (49 m) and wider	49.9 ft (15.2 m) and deeper	With a length of 400 m, a width of 59 m, draft of 14.5 m, and a capacity of 18,270 TEU, ships of the Maersk Triple E class class are able to transit the Suez canal. (Photo: MV *Mærsk Mc-Kinney Møller*.)	

New Panamax	10,000–14,500	1,200 ft (366 m)	160.7 ft (49 m)	49.9 ft (15.2 m)	With a beam of 43 m, ships of the *COSCO Guangzhou* class are much too big to fit through the Panama Canal's old locks, but could easily fit through the new expansion. (Photo: The 9,500 TEUMV *COSCO Guangzhou* pierside in Hamburg.)	
Post-Panamax	5,101–10,000					
Panamax	3,001–5,100	965 ft (294.13 m)	106 ft (32.31 m)	39.5 ft (12.04 m)	Ships of the Bay-class are at the upper limit of the Panamax class, with an overall length of 292.15 m, beam of 32.2m, and maximum depth of 13.3 m. (Photo: The 4,224 TEU MV *Providence Bay*passing through the Panama Canal.)	
Feedermax	2,001–3,000				Container ships under 3,000 TEU are typically called feeders. In some areas of the world, they might be outfitted with cargo cranes. (Photo: The 384 TEU MV *TransAtlantic*	
Feeder	1,001–2,000					
Small	Up to					

International Organizations serving the shipping industry

The International Chamber of Shipping is the world's principal shipping organisation, representing around 80% of the world's merchant tonnage, through membership by national shipowners' associations. It is concerned with all regulatory, operational and legal issues.

A major ICS activity is as a consultative body at the United Nations agency with responsibility for the safety of life at sea and the protection of the marine environment, the International Maritime Organization.

ICS is unique in that unlike other international shipping trade associations it represents the global interests of all the different trades in the industry: bulk carrier operators, tanker operators, passenger ship operators and container liner trades, including shipowners and third party ship managers.

ICS has consultative status with a number of other intergovernmental bodies which affect shipping, these include: the World Customs Organization, the International Telecommunications Union, the United Nations Conference on Trade and Development, and the World Meteorological Organization. The ICS also has close relationships with industry organisations representing different maritime interests such as shipping, ports, pilotage, the oil industry, insurance and classification societies responsible for the surveying of ships. The ICS is also responsible for several publications in use in the marine industry, in conjunction with Witherby Seamanship. The UK Chamber of Shipping is a primary member of the ICS.

International Maritime Organization (IMO)

IMO flag.

International Maritime Organization :

The International Maritime Organization (IMO), formerly known as the Inter-Governmental Maritime Consultative Organization (IMCO), was established in 1948 through the United Nations to coordinate international maritime safety and related practices. However the IMO did not enter into full force until 1958.

Headquartered in London, United Kingdom, the IMO promotes cooperation among government and the shipping industry to improve maritime safety and to prevent marine pollution. IMO is governed by an Assembly of members and is financially administered by a Council of members elected from the Assembly. The work of IMO is conducted through five committees and these are supported by technical sub-committees. Member organizations of the UN organizational family may observe the proceedings of the IMO. Observer status may be granted to qualified non-governmental organizations.

The IMO is supported by a permanent secretariat of employees who are representative of its members. The secretariat is composed of a Secretary-General who is periodically elected by the Assembly, and various divisions including, *inter alia*, marine safety, environmental protection, and a conference section.

BIMCO :

The **Baltic and International Maritime Council** (BIMCO) is the largest of the international shipping associations representing ship-owners; its membership controls around 65 percent of the world's tonnage and it has members in more than 120 countries, including managers, brokers and agents. The association's main objective is to protect its global membership through the provision of

quality information and advice, and while promoting fair business practices, facilitate harmonisation and standardization of commercial shipping practices and contracts.

In support of its commitment to promote the development and application of global regulatory instruments, BIMCO is accredited as a Non-Governmental Organisation (NGO) with all relevant United Nations organs. In an effort to promote its agenda and objectives, the association maintains a close dialogue with governments and diplomatic representations around the world, including maritime administrations, regulatory institutions, and other stakeholders within the areas of EU, the United States, and Asia.

Headquarter

BIMCO also conducts various training programmes around the world for the Maritime Community

BIMCO

BIMCO Education offers a number of live courses (master classes, seminars, workshops, shipping schools) and online courses throughout the year.

Classification society

A **classification society** is a non-governmental organization that establishes and maintains technical standards for the construction and operation of ships and offshore structures. The society will also validate that construction is according to these standards and carry out regular surveys in service to ensure compliance with the standards.

To avoid liability, they explicitly take no responsibility for the safety, fitness for purpose,or seaworthiness of the ship.

Responsibilities

Classification societies set technical rules, confirm that designs and calculations meet these rules, survey ships and structures during the process of construction and commissioning, and periodically survey vessels to ensure that they continue to meet the rules. Classification societies are also responsible for classing oil platforms, other offshore structures, and submarines. This survey process covers diesel engines, important shipboard pumps and other vital machinery.

Classification surveyors inspect ships to make sure that the ship, its components and machinery are built and maintained according to the standards required for their class

Flags of convenience

The advent of open registers, or flags of convenience, has led to competition between classification societies and to a relaxation of their standards.

Flags of convenience have lower standards for vessel, equipment, and crew than traditional maritime countries and often have classification societies certify and inspect the vessels in their registry, instead of by their own shipping authority. This made it attractive for ship owners to change flag, whereby the ship lost the economic link and the country of registry. With this, also the link between classification society and traditional maritime country became less obvious - for instance Lloyd's Register with the United Kingdom and ABS with the United States. This made it easier to change class and introduced a new phenomenon; *class hopping*. A ship owner that is dissatisfied with class can change to a different class relatively easily. This has led to more competition between classes and a relaxation of the standards. In July 1960, Lloyds Register published a new set of rules. Not only were scantlings relaxed, but the restrictions on tank size were just about eliminated. The other classification Societies quickly followed suit.[4] This has led to the shipping industry losing confidence in the classification societies, and also to similar concerns by the European Commission

To counteract *class hopping*, the IACS has established TOCA (Transfer Of Class Agreement).

In 1978, a number of European countries agreed in The Hague on memorandum that agreedto audit whether the labour conditions on board vessels were according to the rules of the ILO. After the *Amoco Cadiz* sank that year, it was decided to also audit on safety and pollution. To this end, in

1982 the Paris Memorandum of Understanding (Paris MoU) was agreed upon, establishing Port State Control, nowadays 24 European countries and Canada. In practice, this was a reaction on the failure of the flag states - especially flags of convenience that have delegated their task to classification societies - to comply with their inspection duties.

Today

Today there are a number of classification societies, the largest of which are Bureau Veritas, the American Bureau of Shipping, Lloyd's Register and DNV GL. Classification societies employ ship surveyors, material engineers, piping engineers, mechanical engineers, chemical engineers and electrical engineers, often located at ports and office buildings around the world.

Marine vessels and structures are classified according to the soundness of their structure and design for the purpose of the vessel. The classification rules are designed to ensure an acceptable degree of stability, safety, environmental impact, etc.

In particular, classification societies may be authorised to inspect ships, oil rigs, submarines, and other marine structures and issue certificates on behalf of the state under whose flag the ships are registered.

As well as providing classification and certification services, the larger societies also conduct research at their own research facilities in order to improve the effectiveness of their rules and to investigate the safety of new innovations in shipbuilding.

There are more than 50 marine classification organizations worldwide, some of which are listed below.

List of classification societies

Name	Abbreviation	Date	Head office	IACS member?
Lloyd's Register	LR	1760	London	Yes
Bureau Veritas	BV	1828	Paris	Yes

Name	Abbreviation	Date	Head office	IACS member?
Croatian Register of Shipping/ Austrian Veritas	CRS	1858/ 1949	Split	Yes
Registro Italiano Navale	RINA	1861	Genoa	Yes
American Bureau of Shipping	ABS	1862	Houston	Yes
DNV GL	DNV GL	1864	Oslo	Yes
Nippon Kaiji Kyokai (ClassNK)	NK	1899	Tokyo	Yes
Russian Maritime Register of Shipping	RS	1913	Saint Petersburg	Yes
Hellenic Register of Shipping	HR	1919	Piraeus	No
Polish Register of Shipping	PRS	1936	Gdańsk	Yes
Phoenix Register of Shipping	PHRS	2000	Piraeus	No
Bulgarian Register of Shipping	BRS (БКР)	1950	Varna	No
CR Classification Society	CR	1951	Taipei	No
China Classification Society	CCS	1956	Beijing	Yes
Korean Register of Shipping	KR	1960	Busan	Yes
Turk Loydu	TL	1962	Istanbul	No

Name	Abbreviation	Date	Head office	IACS member?
Biro Klasifikasi Indonesia	BKI	1964	Jakarta	No
Vietnam Register	VR	1964	Hanoi, Vietnam	No
Register of Shipping Albania	ARS	1970	Durres	No
Union Marine Classification Society	UMCS	1970	Union of Comoros	No
Registro Internacional Naval[7]	RINAVE	1973	Lisbon	No
Indian Register of Shipping	IRS	1975	Mumbai	Yes
International Naval Surveys Bureau	INSB	1977	Piraeus	No
Asia Classification Society	ACS	1980	Tehran	No
Brazilian Register of Shipping	RBNA	1982	Rio de Janeiro	No
Registro Cubano de Buques	RCB	1982	La Habana	No
International Register of Shipping	IROS	1993	Miami	No
Ships Classification Malaysia	SCM	1994	Shah Alam	No
Isthmus Bureau of Shipping	IBS	1995	Panama	No
Guardian Bureau of Shipping	GBS	1996	Syria	No

Name	Abbreviation	Date	Head office	IACS member?
Shipping Register of Ukraine	RU (РУ)	1998	Kyiv	No
Orient Register of Shipping	ORIENT Class	2000	Philippines	No
Overseas Marine Certification Services	OMCS	2004	Panama	No
Intermaritime Certification Services	ICS Class	2005	Panama	No
Iranian Classification Society	ICS	2007	Tehran	No
Venezuelan Register of Shipping	VRS	2008	London	No
Tasneef-Emirates Classification society	TASNEEF	2012	Abu Dhabi	No
Mediterranean Shipping Register	MSR	2012	Great Britain	No
International Classification of Ship Malaysia	ICSM	2008	Kuala Lumpur	No
Pacific Marine Services	PMS	2013	Ajman	**No**

IAPH

International Association of Ports and Harbors

The **International Association of Ports and Harbors** (IAPH) is the global trade association for seaports worldwide.

It is headquartered in Tokyo, Japan. Formed in 1955, it is now recognised as the NGO representing ports worldwide. With over 200 ports in membership, as well as numerous national port representative bodies, it now has consultative status with 5 UN agencies, including UNCTAD and the IMO.

History :

On November 7th 1955, some 100 delegates from 38 ports and maritime organizations in 14 countries gathered in Los Angeles to announce the creation of the International Association of Ports and Harbors (IAPH). It marked its 50th Anniversary (Golden Jubilee) in 2005. Over the past six decades, IAPH has steadily developed into a global alliance of ports, representing today some 180 ports and some 140 port-related businesses in 90 countries. The member ports together handle well over 60% of the world's sea-borne trade and nearly 80% of the world container traffic. It is a non-profit-making and non-governmental organization (NGO) headquartered in Tokyo, Japan.

UNIT–II

Liner shipping business:

A **cargo ship** or **freighter** is any sort of ship or vessel that carries cargo,goods, and materials from one port to another. Thousands of cargo carriers ply the world's seas and oceans each year, handling the bulk of international trade. Cargo ships are usually specially designed for the task, often being equipped with cranes and other mechanisms to load and unload, and come in all sizes. Today, they are almost always built by welded steel, and with some exceptions generally have a life expectancy of 25 to 30 years before being scrapped.

Definitions

The words cargo and freight have become interchangeable in casual usage. Technically, "cargo" refers to the goods carried a board the ship for hire, while "freight" refers to the compensation the ship or charterer receives for carrying the cargo.

Generally, the modern ocean shipping business is divided into two classes:

1. Liner business: typically (but not exclusively) container vessels (wherein "general cargo" is carried in 20 or 40-foot containers), operating as "common carriers", calling a regularly published schedule of ports. A common carrier refers to a regulated service where any member of the public may book cargo for shipment, according to long-established and internationally agreed rules.

2. Tramp-tanker business: generally this is private business arranged between the shipper and receiver and facilitated by the vessel owners or operators, who offer their vessels for hire to carry bulk (dry or liquid) or break bulk (cargoes with individually handled pieces) to any suitable port(s)in the world, according to a specifically drawn contract, called a charter party.

Larger cargo ships are generally operated by shipping lines: companies that specialize in the handling of cargo in general. Smaller vessels, such as coasters, are often owned by their operators.

The earliest records of waterborne activity mention the carriage of items for trade; the evidence of history and archaeology shows the practice to be widespread by the beginning of the 1st millennium BC, and as early as the 14th and 15th centuries BC small Mediterranean cargo ships like those of the 50 foot long(15- 16metre) Ulubu run ship were carrying 20tons of exotic cargo; 11tons of raw copper, jars, glass, ivory, gold, spices, and treasures from Canaan, Greece, Egypt, and Africa. The desire to operate trade routes over longer distances, and throughout more seasons of the year, motivated improvements in ship design during the Middle Ages.

Before the middle of the 19th century, the incidence of piracy resulted in most cargo ships being armed, sometimes quite heavily, as in the case of the Manila galleon sand East India men. They were also sometimes escorted by warships.

Types

A US cargo ship off Mc Murdo Station, Antarctica

Cargo ships/freighters can be divided into five groups, according to the type of cargo they carry. These groups are:

1. General cargo vessels
2. Tankers
3. Dry bulk carriers
4. Multi-purpose vessels
5. Reefer ships

General cargo vessels carry packaged items like chemicals, foods, furniture, machinery, motor- and military vehicles, footwear, garments, etc.

Tankers carry petroleum products or other liquid cargo.

Dry bulk carriers carry coal, grain, ore and other similar products in loose form.

Multi-purpose vessels, as the name suggests, carry different classes of cargo – e.g. liquid and general cargo – at the same time.

A Reefer (or Refrigerated) ship is specifically designed[1]and used for shipping perishable commodities which require temperature-controlled, mostly fruits, meat, fish, vegetables, dairy products and other foods tuffs.

Specialized types of cargo vessels include container ships and bulk carriers(technically tankers of all sizes are cargo ships, although they are routinely thought of as a separate category). Cargo ships fall into two further categories that reflect the services they offer to industry: liner and tramp services. Those on a fixed published schedule and fixed tariff rates are cargo liners. Tramp ships do not have fixed schedules. Users charter them to haul loads. Generally, the smaller shipping companies and private individuals operate tramp ships. Cargo liners run on fixed schedules published by the shipping companies. Each trip a liner takes is called a voyage. Liners mostly carry general cargo. However, some cargo liners may carry passengers also. A cargo liner that carries 12 or more passengers is called a combination or passenger-cum-cargo line.

Terms of shipment

Harbour cranes unload cargo from a containership at the Jawaharlal Nehru Port,Navi Mumbai,India.

Common trading terms used in shipping goods internationally include:

- Free on board (FOB)[1]–the exporter delivers the goods at the specified location (and on board the vessel). Costs paid by the exporter include load, lash, secure and stow the cargo, including securing cargo not to move in the ships hold, protecting the cargo from contact with the double

bottom to prevent slipping, and protection against damage from condensation. For example, "FOBJNPT" means that the exporter delivers the goods to the Jawaharlal Nehru Port, India, and pays for the cargo to be loaded and secured on the ship. This term also declares that where the responsibility of shipper ends and that of buyer starts. The exporter is bound to deliver the goods at his cost and expense. In this case, the freight and other expenses for outbound traffic are borne by the importer.

- Carriage and freight (now known in the US as "cost and freight")(C&F, CFR, CNF): Insurance is payable by the importer, and the exporter pays all expenses incurred in transporting the cargo from its place of origin to the port/airport and ocean freight/air freight to the port/airport of destination. For example, C&F Los Angeles (the exporter pays the ocean shipping/air freight costs to Los Angeles).most of the governments ask their exporters to trade on these terms to promote their exports worldwide such as India and China. Many of the shipping carriers (such as UPS,DHL,FedEx) offer guarantees on their delivery times. These are known as GSR guarantees or "guaranteed service refunds"; if the parcels are not delivered on time, the customer is entitled to a refund.

- Carriage, insurance and freight (now known in the US as "cost, insurance and freight")(CIF): Insurance and freight are all paid by the exporter to the specified location. For example, at CIF Los Angeles, the exporter pays the ocean shipping/air freight costs to Los Angeles including the insurance of cargo. This also states that responsibility of the shipper ends at the Los Angeles port.

- The term "best way" generally implies that the shipper will choose the carrier who offers the lowest rate (to the shipper) for the shipment. In some cases, however, other factors, such as better insurance or faster transit time will cause the shipper to choose an option other than the lowest bidder.

Break bulk, Ro-Ro and project cargos ervices

Break bulk cargo

Steve do reson a NewYork dock loading barrels of corn syrup onto a barge on the Hudson River. Photograph by Lewis Hine, circa 1912

In shipping ,**break bulk cargo** or **general cargo** are goods that must be loaded individually, and not in intermodal containers nor in bulk as with oil or grain. Ships that carry this sort of cargo are often called general cargo ships. The term *break bulk* derives from the phrase **breaking bulk**—the extraction of a portion of the cargo of a ship or the beginning of the unloading process from the ship's holds. These goods may not be in shipping containers. Break bulk cargo is transported in bags, boxes, crates, drums, or barrels. Unit loads of items secured to a pallet or skid are also used.[1]

A break-in-bulk point is a place where goods are transferred from one mode of transport to another, for example the docks where goods transfer from ship to truck.

Break bulk was the most common form of cargo for most of the history of shipping. Since the late1960sthevolumeofbreakbulkcargohasdeclineddramaticallyworldwide as containerization has grown. Moving cargo on and off ship in containers is much more efficient, allowing ships to spend less time in port. Break bulk cargo also suffered from greater theft and damage.

Loading and unloading

Mixedcargobeingloadedintoshipsat PortAdelaidecirca1927

Unloadingbarrelsfromaship,Accra,circa1958

A refrigerated general cargo ship.The Gladstone Star was built in 1957 and scrapped in1982.

Although cargo of this sort can be delivered straight from a truck or train on to a ship, the most common way is for the cargo to be delivered to the dock in advance of the arrival of the ship and for the cargo to be stored in warehouses. When the ship arrives the cargo is then taken from the warehouse to the quay and then lifted on board by either the ship's gear (derricks or cranes) or by the dock side cranes. The discharge of the ship is the reverse of the loading operation.

Loading and discharging by break bulk is labour-intensive. The cargo is brought to the quay next to the ship and then each individual item is lifted on board separately. Some items such as sacks

or bags can be loaded in batches by using a sling or cargo net and others such as cartons can be loaded onto trays before being lifted on board. Once on board each item must be stowed separately.

Before any loading takes place any signs of the previous cargo are removed. The holds are swept, washed if necessary and any damage to them repaired. Dunnage is laid ready for the cargo oris just be put in bundles ready for the stevedores to lay out as the cargo is loaded.

There are many sorts of break bulk cargo but amongst them are:

Bagged cargo

Bagged cargo(e.g. coffee in sacks) is stowed on double dunn age and kept clear of the ship's sides and bulkheads. Bags are kept away from pillars and stanchions by covering it with matting or waterproof paper.

Baled goods

Baled goods are stowed on single dunnage at least 50 mm (1.97in) thick. The bales must be clean with all the bands intact. Stained or oily bales are rejected. All fibres can absorb oil and are liable to spontaneous combustion. As a result, they are kept clear of any new paintwork. Bales close to the deckhead are covered to prevent damage by dripping sweat.

Barrel sand casks

Woodenbarrelsarestowedontheirsideson"beds"ofdunnagewhichkeepsthemiddleofthe side (the bilge) off the deck and they are stowed with the bung at the top. To prevent movement wedges called quoins are put in on top of the "beds". Barrels should be stowed fore and aft and not athwart ships. Once the first tier has been loaded the next tier of barrels fits into the hollows between the barrels, this is known as stowing "bilge and cant line".[4]Barrels which are also known as casks or tuns are primarily use for transporting liquids such as wine, water, brandy, whiskey, and even oil. They are usually built in spherical shape to make it easier to roll and have less friction when changing direction.

Corrugated boxes

Corrugated boxes are stowed on a good layer of dunnage and kept clear of any moisture. Military and weather resistant grades of corrugated fiberboard are available. They are not over stowed with anything other than similar boxes. They are frequently loaded on pallets to form a unit load; if so the slings that are used to load the cargo are frequently left on to facilitate discharge.

Wooden shipping containers

Wooden boxes or crates are stowed on double dunnage in the holds and single dunnage in the 'tween decks. Heavy boxes are given bottom stowage. The loading slings are often left on to aid

Drums

Metal drums are stowed on end with dunnage betweentiers, in the longitudinal space of the ship

Paperreels

Reels or rolls are generally stowed on their sides and care is taken to make sure they are not crushed.

Motorvehicles

Automobiles are lifted on board and then secured using lashings. A great deal of care is taken tomakesuretheydonotgetdamaged.Vehiclesarealsopreparedbyensuringpotentiallyhazardous

liquids(gasoline,etc.)have been removed.(This is in contrast to Ro-ro(Roll-on/roll-off)vessels where vehicles are driven on and off the ship on their own wheels.)

Steel girders

Any long heavy items are stowed fore and aft. If they are stowed athwart ships they are liable to shift if the ship rolls heavily and pierce the side of the ship.

Advantagesanddisadvantages

The biggest disadvantage with break bulk is that it requires more resources at the wharf at both ends of the transport—longshoremen, loading cranes, warehouses, transport vehicles—and often takes up more dock space due to multiple vessels carrying multiple loads of break bulk cargo. Indeed, the decline of break bulk did not start with containerisation; rather, the advent of tankers and bulk carriers reduced the need for transporting liquids in barrels and grains in sacks. Such tankers and carriers use specialised ships and shore facilities to deliver larger amounts of cargo to the dock and effect faster turnarounds with fewer personnel once the ship arrives; however, they do require large initial investments in ships, machinery, and training, slowing their spread to areas where funds to overhaul port operations and/or training for dock personnel in the handling of cargo on the newer vessels may not be available.As modernization of ports and shipping fleets spreads across the world, the advantages of using containerization and specialized ships over break-bulk has sped the overall decline of break-bulk operations around the world. In all, the new systems have reduced costs as well as spillage and turnaround times; in the case of containerisation, damage and pilfering as well.

Break bulk continues to hold an advantage in are as where port development has not kept pace with shipping technology; break-bulk shipping requires relatively minimal shore facilities—a wharf for the ship to tie to, dock workers to assist in unloading, warehouses to store materials for later reloading onto other forms of transport. As a result, there are still some areas where break-bulk shipping continues to thrive. Goods shipped break-bulk can also be offloaded onto smaller vesselsandlightersfortransportintoeventhemostminimally-developedportwherethenormally large container ships, tankers, and bulk carriers might not be able to access due to size and/or water depth. In addition, some ports capable of accepting larger container ships/tankers/bulk transporters still require goods to be offloaded in break-bulk fashion; for example, in the outlying islands of Tuvalu, fuel oil for the power stations is delivered in bulk but has to be offloaded in barrels.

Roll-on/roll-off

"Carcarrier"redirectshere.ForROROtrain,see Rollinghighway.Fortherailroadcar, see Autorack. For the trailer owed by a tractor, see car carrier trailer.

"RORO"redirectshere.Forotheruses,seeRoro(disambiguation).

Roll-on/roll-off(**RORO**or**ro-ro**)shipsarevesselsdesignedtocarrywheeled cargo,such ascars,trucks,semi-trailertrucks,trailers,andrailroadcars,thataredrivenonandofftheshipon their own wheels or using a platform vehicle, such as a self-propelled modular transporter. This is in contrast to lift-on/lift-off (LoLo) vessels, which use a crane to load and unload cargo.

Loadingaro-ropassengercarferry

RORO vessels have either built-in or shore-based rampsthat allow the cargo to be efficiently rolled on and off the vessel when in port. While smaller ferries that operate across rivers and other short distances often have built-in ramps, the term RORO is generally reserved for large oceangoing vessels. The ramps and doors may be located in stern, bow or sides, or any combination thereof.

History

Atfirst,wheeledvehiclescarriedascargoonoceangoingshipsweretreatedlikeanyothercargo. Automobileshadtheirfueltanksemptiedandtheirbatteriesdisconnectedbeforebeinghoistedinto

The ship'shold, where they were chocked and secured. This process wastedious and difficult, and vehicles were subject to damage and could not be used for routine travel.

An early roll-on/roll-off service was a train ferry, started in 1833 by the Monkland and Kirkintilloch Railway, which operated a wagon ferry on the Forth and Clyde Canal in Scotland.[1]

Types

Types of RORO vessels include ferries,cruise ferries,cargo ships,barges, and RoRo service for air deliveries. New automobiles that are transported by ship are often moved on a large type of RORO called a pure car carrier (PCC) or pure car/truck carrier (PCTC).

Elsewhere in the shipping industry, cargo is normally measured by the metric tonne, but RORO cargo is typically measured in *lanes in metres* (LIMs). This is calculated by multiplying the

MSCJesses

cargo length in metres by the number of decks and by its width in lanes (lane width differs from vessel to vessel, and there are several industry standards). On PCCs, cargo capacity is often measured in RTorRT43 units(based on a 1966ToyotaCorona,thefirstmass-produced car to be shipped in

specialised car-carriers and used as the basis of RORO vessel size. 1 RT is approximately4m of lane space required to store a 1.5m wide Toyota Corona) or in car-equivalent units (CEU).

The largest RORO passenger ferry is MS*Color Magic*, a 75,100GTcruise ferry that entered service in September 2007 for Color Line. Built in Finland by Aker Finnyards, it is 223.70 m (733ft 11 in) long and 35 m (114 ft 10 in) wide, and can carry550 cars, or 1270 lane meters of cargo.

The RORO passenger ferry with the greatest car-carrying capacity is *Ulysses*(named after anovel by James Joyce), owned by Irish Ferries.*Ulysses* entered service on 25 March 2001 and operates between Dublin and Holyhead.The50,938GTshipis209.02m(685ft9 in)long and 31.84m(104 ft6in)wide, andcancarry1342cars/4101 lane meters of cargo.

Car carriers

Thecarcarrier*JohannSchulte*duringdischargeofVolkswageninBaltimore

Apurecarcarriership'sstarboardsideshowingsideramp

MV*Tønsberg*,thelargestcar/truckcarrier.

The first cargo ships specially fitted for the transport of large quantities of cars came into service in the early sixties. These ships still had their own loading gear and so-called hanging decks inside.They were, for example, chartered by the German Volkswagen AGto transport vehicles in the U.S. and Canada. Since 1970, the market for exporting and importing cars has increased dramatically and the number and type of ROROs has increased also. In 1973, Japan's K Linebuilt*European Highway*, the first pure car carrier (PCC), which carried 4,200 automobiles. Today's pure car carriers and their close cousins, the pure car/truck carrier (PCTC), are distinctive ships with a box-like superstructure running the entire length and breadth of the hull, fully enclosing the cargo. They typically have a stern ramp and a side ramp for dual loading of thousands of vehicles (such as cars, trucks, heavy machineries, tracked units, Mafi trailers, and loose statics), and extensive automatic fire control systems.

The PCTCh as lift able decks to increase vertical clearance, as well as heavier decks for"high-and-heavy" cargo.A6,500-unit car ship,with12 decks, can have three decks which can take cargo up to150shorttons(136t;134longtons)withliftablepanelstoincreaseclearancefrom1.7to6.7m (5ft 7 in to 22 ft 0in) on some decks. Lifting decks to accommodate higher cargo reduces the total capacity.

With the building of Wallenius Wilhelmsen Logistics's8,000-CEU car carrier *Faust*out of Stockholm in June 2007 car carriers entered a new era of the large car and truck carrier (LCTC). Currently, the largest are Wilh. Wilhelmsen's "Mark V" ships, led by MV *Tønsberg*.

The car carrier *Auriga Leader*, built in 2008 with a capacity of 6,200 cars, is the world's first partially solar powered ship

Variations

USNS*Shughart*,anon-combatantRORO vessel,unloadingStrykerarmoredvehicles

ROPAX

The acronym **ROPAX**(roll-on/roll-off passenger) describes a RORO vessel built for freight vehicle transport along with passenger accommodation. Technically this encompasses all ferries with both a roll-on/roll-off car deck and passenger-carrying capacities, but in practice, ships with facilities for more than 500 passengers are often referred to as cruise ferries.

ConRO

The **ConRo** vessel is a hybrid of a RORO and a container ship. This type of vessel has a below-deck area used for vehicle storage while stacking containerized freight on the top decks. ConRo ships, such as those in the fleet of Atlantic Container Line,can carry a combination of 1,900twenty-foot equivalent units (TEU) of containers, upto1,000TEU of heavy equipment, project and oversized cargo on three decks, and up to 2,000 automobiles on five decks. Separate internal ramp systems within the vessel segregate automobiles from other vehicles, Mafi trailers, and break-bulk cargo.

RoLo

A**RoLo**(roll-on/lift-off) vessel is another hybrid vessel type, with ramps serving vehicle decks but with other cargo decks only accessible when the tides change or by the use of a crane.

LMSR

Large, Medium-Speed Roll-on/Roll-off (LMSR) refers to several classes of Military Sealift Command(MSC) roll-on/roll-off type cargo ships. Some are purpose-built to carry military cargo, while others are converted.

Project cargo

Projectcargoisatermusedtobroadlydescribethenationalorinternationaltransportationof large, heavy, high value or a critical (to the project they are intended for) pieces of equipment. Also commonly referred to as Heavy lift, this includes shipments made of various components which need disassembly for shipment and reassembly after delivery,

Project cargo is also a term used in the international insurance industry to describe DSU (Delay in Start Up) Marine Insurance, a specialized form of Marine cargo insurance.

Freight rate

A **freight rate**(historically and in ship chartering simply **freight**[1])is a price at which a certaincargoisdeliveredfromonepointtoanother.Thepricedependsontheformofthecargo, the mode of transport (truck,ship,train,aircraft),the weight of the cargo,and the distance to the delivery destination. Many shipping services, especially air carriers, use dimensional weight for calculating the price, which takes into account both weight and volume of the cargo.

For example,bulk coal long-distance rates in America areapproximately1cent/ton-mile.
[2]So a 100 car train, each carrying 100 tons, over a distance of 1000 miles, would cost $100,000. On the other hand, Intermodal container shipping rates depend heavily on the route taken over the weight of the cargo, just as long as the container weight does not exceed the maximum lading capacity.

Pricescanvarybetween$400-$10,000per Twenty foot equivalent unit (TEU)depending on the supply and demand of a given route.

In ship chartering, freight is the price which a charterer pays a ship owner for the use of a ship in a voyage charter.

How Freight Rate is Determined

The cost which a shipper (the consumer or business providing goods for shipment) or consignee (the person or company to whom commodities are shipped) is charged for the transportation of goods is determined by a number of factors. The main factors in determining the freight rate are: mode of transportation, weight, size, distance, points of pickup and delivery, and the actual goods being shipped. All of these factors play their own independent role in determining the price or rate at which the freight will be transported but they are also all interconnected. When determining which mode of transportation will be used to deliver the freight to its destination there are many things which need to be taken into consideration which will all have an effect on the freight rate.[7]Federal, State, and Local authorities all have their own laws and regulations with regards to the size, weight, and type of freight which can be transported on their roads. Transportation of freight by Rail, Water, or air craft all have their own regulations which take into account Federal, State, and Local regulations as well as safety concerns which contribute to the rate at which freight is transported. In general, the more freight you transport, the cheaper it is. This is an important factor in the rate charged to people or companies shipping freight. There are many businesses out there whose sole purpose is to make the transportation of freight cheaper and easier for small businesses and individuals who need to move freight.

Consolidators: a firm which groups together shipments from different companies into a single shipment. Customs Broker: A person or firm, licensed by the treasury department of their country when required, engaged in entering and clearing goods through Customs for a client (importer). Freight Forwarder: A person whose business is to act as an agent on behalf of the shipper to arrange transportation services. A freight forwarder frequently makes the booking reservation. In the United States freight forwarders are licensed by the FMC as Ocean Transportation Intermediaries and are only designated freight forwarders for export shipments. Non-Vessel-Operating Common Carrier (NVOCC): A cargo consolidator in ocean trades that will buy space from a carrier and re-sell it to smaller shippers. The NVOCC issues bills of lading, publishes tariffs and otherwise conducts itself as

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an ocean common carrier, except that it will not provide the actual ocean or intermodal service Most of the freight shipped within the United States travels bytruck or railcar, but many of the people and businesses shipping freight do not have enough of a good to fill a whole truck or rail car every time they need something shipped.

Consolidators, customs brokers, freight forwarders, and NVOCC's can be a factor in determining freight rate because of their experience, business relationships, and the volume at which they operate. These factors help keep the freight rate down for small businesses and the individual with a shipping need. In the commercial trucking industry, many shippers tender loads to freight brokers whose job it is to find qualified carriers to move the freight at an acceptable price for all parties. Brokers have access toa suite of technological tools to help determine the most cost-effective way to move cargo, including access to load boards. The best load boards provide rate analysis tools based on actual transactions on every lane in North America, since their databases hold a wealth of pricing information. For example, Dial-a-truck(DAT) offers RateViewfor carriers, brokers and shippers, providing access to shippers' contract rates and spot market (broker buy) rates. This allows brokers to analyze market demand and capacity to assure competitive pricing.

Shipping agency

A **shipping agency** or **shipping agent** is the design at person or agency held responsible for handling shipments and cargo, and the general interests of its customers, at ports and harbors worldwide, on behalf of ship owners, managers, and charterers. In some parts of the world, these agents are referred to as **port agents** or **cargo brokers**. There are several categories of shipping agents such as: *portagents*, *lineragents,* and *own agencies*,each rendering specific services depending on the shipping company they represent.

In other words, a ship agent is any person or company that carries out the functions of an agent,. Irrespective of whether they are in business as a ship agent, or they perform such functions as a adjunct to, or conjunction with, other activities such as ship owning or operating, providing cargo handling or similar.

Shipping agents will usually take care of all the regular routine tasks of a shipping company quickly and efficiently. They ensure that essential supplies, crew transfers, customs documentation, and waste declarations are all arranged with the port authorities without delay. Quite often, they also

provide the shipping company with updates and reports on activities at the destination port so that shipping companies have real-time information available to them while goods are in transit.

Tasks and Responsibilities

Succinctly, the term **shipping agent** refers to the relationship between the principal (in this case the shipping company conveying the goods) and its representative, whereby the principal, expressly or impliedly, authorizes the agent to work under his control and on his behalf.

The responsibilities/competencies as well as the remuneration of the agent may be explicitly entered into a contract which has been concluded between himself and the ship owner. This practice is very common in the cargo trade, booking agents, etc.

The duties of a cargo broker are similar to those of a shipping agent, but may also vary. For example, a cargo broker will also book outward cargo and inform the shippers on which and when the goods are to be presented and when loading and unloading is due to start. He will draw up booking lists according to the incoming bookings and ensure that the manifest department collects the shipping documents (shipping permits, bills of lading) which are necessary to commence the loading and unloading operations. The collected documents are also compared with the booking lists.

Responsibilities of Shipping Agents Include:

- Ensuring a berth for the incoming ship
- Arranging for the pilot and the tugs if necessary
- Drawing up the documents for the customs and harbor services
- Arranging for the necessary ship freshwater/ provisions
- Arranging for the necessary doctor for the crew any medical assistance
- Arranging for storage bunkers if these are needed
- Arranging for the necessary repairs
- Conveying instructions to and from the ship owner
- Organizing the supply, transport and the handling of the goods
- Organizingthenecessarycontactswiththestevedores

- Collecting freights, cargoes
- Contacting shippers and the receivers of the goods

In the case of damage to cargo or the ship, the shipping agent also makes the necessary arrangements (at the request of the ship's master or owner)with the insurance company, and for nautical inspections and the services of experts or surveyors, etc.

The specific tasks of a cargo broker or portagent include:

- Providing the necessary information concerning the freight rates and the publication of the sailing lists
- Looking for cargo via notices and sailing lists
- Booking of cargo and the conclusion of the agreements
- Drawingup,initiatinganddeliveringtherequireddocuments(bookinglists,shipping permits, delivery orders) related to the cargo
- Contactingtheshippers/forwarderswithregardtothedeliveriesforshipment
- Fulfillingthenecessaryformalitiesregardingthedeliveryandreceptionofthegoods (customs etc.)
- Settling cargo claims with insurance companies

FREIGHTFORWARDER

A **freight forwarder**, **forwarder**, or **forwarding agent**, also known as a**non-vessel operating common carrier (NVOCC)**, is a person or company that organizes shipments for individuals or corporations to get goods from the manufacturer or producer to a market, customer or final point of distribution. Forwarders contract with a carrier or often multiple carriers to move the goods. A forwarder does not move the goods but acts as an expert in the logistics network. These carriers can use a variety of shipping modes, Including ships, airplanes, trucks, and rail roads, and often multiple modes for a single shipment. For example, the freight forwarder may arrange to have cargo moved from a plant to an airport by truck, flown to the destination city, then moved from the airport to a customer's building by another truck.

International freight forwarders typically handle international shipments. International freight forwarders have additional expertise in preparing and processing customs and other documentation and performing activities pertaining to international shipments.

Information typically reviewed by a freight forwarder includes the commercial invoice, shipper's export declaration, bill of lading and other documents required by the carrier or country of export, import, and/or transshipment. Much of this information is now processed in a paperless environment.

The FIATA shorthand description of the freight forwarder as the 'Architect of Transport' illustrates the commercial position of the forwarder relative to its client. In Europe, some forwarders specialize in 'niche' areas such as rail-freight, and collection and deliveries around a large port.

Document transfer fee/document handover fee

International freight forwarders, NVOCCs and customs brokers often charge for transferring documents to another transportation company at destination. This fee is a part of the ocean freight charges, being paid by the importer at the port of discharge in the International Commercial Term (incoterm) FOB (free on board), and by the exporter at the origin in the in coterms CFR (cost and freight) and CIF (cost, insurance and freight). This fee is separate from documentation fees charged by carriers and NVOCCs as part of the freight charges on a bill of lading and is separate from other fees for document preparation or for release of cargo. Some companies call this an administration fee, document fee, document transfer fee, but it exists in some form in most destinations and is well known to most shippers. Steamship carriers do not have this fee.

Bill of lading

A **bill of lading**(sometimes abbreviated as **B/L** or **BoL**) is a document issued by a carrier(or his agent) to acknowledge receipt of a shipment of cargo.

A bill of lading must be negotiable, and serves three main functions:

- It is a conclusive receipt, i.e. an acknowledgment that the good shave been loaded ; and
- It contains or evidences the terms of the contract of carriage; and
- It serves as a document of title to the goods ,subject to the *nemodat*rule.

Bills of lading are one of three crucial documents used in international trade to ensure that exporters receive payment and importers receive the merchandise. The other two documents are a policy of insurance and an invoice. Whereas a bill of lading is negotiable, both a policy and an invoice are assignable.

Types of bills of lading

Bills of lading may take various forms, such as on-board, and received-for-shipment.

- An on-board bill of lading denotes that merchandise has been physically loaded onto a shipping vessel, such as a freighter or cargo plane.
- A received-for-shipment bill of lading denotes that merchandise has been received, but is not guaranteed to have already been loaded onto a shipping vessel. (Typically, it will be issued by a freight-forwarder at a port or depot). Such bills can be converted upon being loaded.
- A straight bill of lading is used when payment has been made in advance of shipment and requires a carrier to deliver the merchandise to the appropriate party.
- An order bill of lading is used when shipping merchandise prior to payment, requiring a carrier to deliver the merchandise to the importer, and at the endorsement of the exporter the carriermaytransfertitletotheimporter.Endorsedorderbillsofladingcanbetradedas a security or serve as collateral against debt obligations.

"Claused"bills of lading

A bill of lading that denotes that merchandise is in good condition upon being received by the shipping carrier is referred to as a "clean" bill of lading, while a bill of lading that denotes that merchandise has incurred damage prior to being received by the shipping carrier would be known as a "foul" or "claused" bill of lading. A claused bill of lading will have a statement (clause) written onto the bill of lading noting down any damage or other issues. Letters of credit usually will not allow for foul bills of lading, and the buyer is not obliged to accept any bill of lading that is not clean.

Bills of lading and charter parties compared

A charter party governs the relationship between the ship owner and the charterer. The bill of lading governs the relationship between the shipper and the carrier (who will be either a ship owner or a demise charterer). If the exporter (the shipper) is shipping a small amount of cargo, he will arrange for a carrier to carry the goods for him, using a bill of lading. If the exporter needs the whole (or a very substantial part) of the ship's cargo capacity, the exporter may need to charter the vessel, and he will enter into a charter party agreement with the ship owner.

If the charter party is a time or voyage charter party, the ship owner will still have control of the ship and its crew. If there is a demise (or "bareboat") charter party, the charterer will effectively have a long lease and will have full control of the vessel. If the master (the captain) issues a B/L to a shipper, he will be acting as an agent for the carrier, who will be either the ship owner (time or

voyage) or the charterer (demise).

In a time-charter party or voyage-charter party, if the charterer is shipping his own cargo (rather than the cargo of a third party) he will receive a bill of lading from the master, acting as agent of the ship owner; but that B/L will serve solely as a receipt and document of title, and its terms will

Sea way bills and electronic data interchange(EDI)

Under Art. III of the Hague-Visby Rules, a carrier must, on demand, provide the shipper with a bill of lading; but if the shipper agrees, a lesser document such as a "sea waybill" may be issued instead. In recent years, the use of bills of lading has declined, and they have tended to be replaced with the sea waybill.

The main difference between these two documents is that the waybill does not confer title of the goods to the bearer, and as a result there is no need for the physical document to be presented for the goods to be released. The carrier will automatically release the goods to the consignee once the import formalities have been completed. This results in a much smoother flow of trade, and has allowed shipping lines to move towards electronic data inter change which may greatly ease the flow of global trade.

However, for letter of credit and documentary collection transactions, it is important to retain title to the goods until the transaction is complete. This means that the bill of lading still remains a vital document within international trade.

If a so-called bill of lading is declared to be "non-negotiable", then it is not a true B/L, and instead will be treated as a sea waybill.

Electronic bill of lading

For many years, the industry has sought a solution to the difficulties, costs and inefficiencies associated with paper bills of lading. One answer is to make the bill an electronic document. An electronic bill of lading (or **eB/L**) is the legal and functional equivalent of a paper bill of lading. An electronic bill of lading must replicate the core functions of a paper bill of lading, namely its functions as a receipt, as evidence of or containing the contract of carriage and as a document of title.

UNIT – III

INTRODUCTION :

Liquid Bulk shipping business:

The bulk shipping service including all marine transportation businesses other than the liner trade business. Our safe, high-quality transport services and our global sales and marketing network have earned high evaluations from customers around the world.

Bulk cargo is commodity cargo that is transported unpackaged in large quantities. It refers to material in either liquid or granular, particulate form, as a mass of relatively small solids, such as petroleum/crude oil, grain, coal, or gravel. This cargo is usually dropped or poured, with a spout or shovel bucket, into a bulk carrier ship's hold, railroad car/railway wagon, ortanker truck/trailer/semi-trailer body. Smaller quantities (still considered "bulk") can be boxed (or drummed) and palletised. Bulk cargo is classified as liquid or dry.

The Baltic Exchange is based in London and provides a range of indices benchmarking the cost of moving bulk commodities, dry and wet, along popular routes around the seas. Some of these indices are also used to settle Freight Futures, known as FFA's. The most famous of the Baltic indices is the Baltic Dry Indices, commonly called the BDI. This is a derived function of the Baltic Capesize index (BCI), Baltic Panamax index (BPI), Baltic Supramax index (BSI) and the Baltic Handysize index (BHSI). The BDI has been used as a bellwether for the global economy as it can be interpreted as an indicator of an increase or decrease in the amount of raw commodities countries are importing/exporting.

- Bauxite
- Bulk minerals (sand & gravel, copper, limestone, salt, etc.)
- Cements
- Chemicals (fertilizer, plastic granules & pellets, resin powder, synthetic fiber, etc.)
- Coals and cokes
- Agricultural products such as dry edibles (for animals or humans: alfalfa pellets, citrus pellets, livestock feed, flour, peanuts, raw orrefined sugar, seeds, starches, etc.)
- Grains (wheat, maize, rice, barley, oats, rye, sorghum, soybeans, etc.)
- Iron (ferrous & non-ferrous ores, ferroalloys, pig iron, scrap metal, pelletized taconite), etc.
- Wood chips
- Refrigerated goods
- Livestock and animal products
- Unitised goods
- Wheeled and heavy units

Liquid bulk cargo ("wet" trades)

Non edible and dangerous liquids

- Hazardous chemicals
- Petroleum
- Gasoline
- Liquefied natural gas (LNG)
- Liquid Nitrogen

Liquid edibles and non dangerous liquids

- Cooking oil
- Rubber
- Vegetable oil
- Fruit juices

Gallery

A milk tank car for bulk loading.

DME 49328, a covered hopper owned and operated by the Dakota, Minnesota and Eastern Railroad

A rotary car dumper

Bulk loading of a feeder ship

Gas carrier

A **gas carrier** (or **gas tanker**) is a ship designed to transport LPG, LNG or liquefied chemical gases in bulk.

Types

Fully pressurized gas carrier

Moss type LNG tanker

The seaborne transport of liquefied gases began in 1934 when a major international company put two combined oil/LPG tankers into operation. The ships, basically oil tankers, had been converted by fitting small, riveted, pressure vessels for the carriage of LPG into cargo tank spaces. This enabled transport over long distances of substantial volumes of an oil refinery by-product that had distinct advantages as a domestic and commercial fuel. LPG is not only odourless and non-toxic, it also has a high calorific value and a low sulphur content, making it very clean and efficient when being burnt.

Today, most fully pressurised oceangoing LPG carriers are fitted with two or three horizontal, cylindrical or spherical cargo tanks and have typical capacities between 3,500 and 7,500 m^3 (120,000 and 260,000 cu ft). However, in recent years a number of larger-capacity fully pressurised ships have

been built, most notably a series of 10,800 m^3 (380,000 cu ft) ships, built in Japan between 2003 and 2013. Fully pressurised ships are still being built in numbers and represent a cost-effective, simple way of moving LPG to and from smaller gas terminals.

Semi-pressurised ships

Semi-pressurised ship *Gaschem Jümme*

These ships carried gases in a semi-pressurized/semi-refrigerated state however due to further development semi-pressurised/fully refrigerated gas carriers had become the ship owners' choice by providing high flexibility in cargo handling. These carriers, incorporating tanks either cylindrical, spherical or bi-lobe in shape, are able to load or discharge gas cargoes at both refrigerated and pressurised storage facilities.

Ethylene and gas/chemical carriers

Ethylene carriers are the most sophisticated of the gas tankers and have the ability to carry not only most other liquefied gas cargoes but also ethylene at its atmospheric boiling point of −104 °C (−155 °F). These ships feature cylindrical, insulated, stainless steel cargo tanks able to accommodate cargoes up to a maximum specific gravity of 1.8 at temperatures ranging from a minimum of −104 °C to a maximum of +80 °C (176 °F) and at a maximum tank pressure of 4 bar.

Fully refrigerated ships

Fully refrigerated ship LPG/C*Maersk Houston*

They are built to carry liquefied gases at low temperature and atmospheric pressure between terminals equipped with fully refrigerated storage tanks. However, discharge through a booster pump and cargo heater makes it possible to discharge to pressurized tanks too. The first purpose-built, fully refrigerated LPG carrier was constructed by a Japanese shipyard, to a United States design, in 1962. Prismatic tanks enabled the ship's cargo carrying capacity to be maximised, thus making fully refrigerated ships highly suitable for carrying large volumes of cargo such as LPG, ammonia and vinyl chloride over long distances. Today, fully refrigerated ships range in capacity from 20,000 to 100,000 m^3 (710,000 to 3,530,000 cu ft). LPG carriers in the 50,000–80,000 m^3 (1,800,000–2,800,000 cu ft) size range are often referred to as VLGCs (Very Large Gas Carriers). Although LNG carriers are often larger in terms of cubic capacity, this term is normally only applied to fully refrigerated LPG carriers.

The main type of cargo containment system utilised on board modern fully refrigerated ships are independent tanks with rigid foam insulation. The insulation used is quite commonly polyurethane foam. Older ships can have independent tanks with loosely filled perlite insulation. In the past, there have been a few fully refrigerated ships built with semi-membrane or integral tanks and internal insulation tanks, but these systems have only maintained minimal interest. The large majority of such ships currently in service have been constructed by shipbuilders in Japan and Korea.

Liquefied natural gas (LNG carrier)

LNG-carrier *Galea*

` The majority of LNG carriers are between 125,000 and 135,000 m^3 (4,400,000 and 4,800,000 cu ft) in capacity. In the modern fleet of LNG carriers, there is an interesting exception concerning ship size. This is the introduction of several smaller ships of between 18,000 and 19,000 m^3 (640,000 and 670,000 cu ft) having been built in 1994 and later to service the needs of importers of smaller volumes.

Cargoes carried on gas carriers

- Butadiene
- Ethylene
- LPG
- LNG
- Propylene
- Chemical gases such as ammonia, vinyl chloride, ethylene oxide, propylene oxide and chlorine.

3.1.1 Gas carrier codes

The Gas Codes, developed by International Maritime Organization apply to all gas carriers regardless of size. There are three Gas Codes and these are described below.

Gas carriers built after June 1986 (the **IGC Code**)

The Code which applies to new gas carriers (built after 30 June 1986) is the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk. In brief, this Code is known as the IGC Code. The IGC Code, under amendments to International Convention for the Safety of Life at Sea (SOLAS), is mandatory for all new ships. As proof that a ship complies with the Code, an International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk should be on board. In 1993, the IGC Code was amended and the new rules came into effect on 1 July 1994. Ships on which construction started on or after 1 October 1994 should apply the amended version of the Code but ships built earlier may comply with previous editions of the IGC Code.

Gas carriers built between 1976 and 1986 (the **GC Code**) The regulations covering gas carriers built after 1976 but before July 1986 are included in the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk. It is known as the Gas Carrier Code or GC Code in short. Since 1975, International Maritime Organization(IMO) has approved four sets of amendments to the GC Code. The latest was adopted in June 1993. All amendments are not necessarily agreed by every government. Although this Code is not mandatory, many countries have implemented it into national law. Accordingly, most charterers will expect such ships to meet with Code standards and, as proof of this, to have on board a Certificate of Fitness for the Carriage of Liquefied Gases in Bulk.

Gas carriers built before 1977 (the **Existing Ship Code**) The regulations covering gas carriers built before 1977 are contained in the Code for Existing Ships Carrying Liquefied Gases in Bulk. Its content is similar to the GC Code, though less extensive. The Existing Ship Code was completed in 1976 after the GC Code had been written. It therefore summarises current shipbuilding practice at that time.

It remains as an IMO recommendation for all gas carriers in this older fleet of ships. The Code is not mandatory but is applied by some countries for ship registration and in other countries as a necessary fulfilment prior to port entry. Accordingly, many ships of this age are required by charterers to meet with Code standards and to have on board a Certificate of Fitness for the Carriage of Liquefied Gases in Bulk.

Cargo containment systems

A cargo containment system is the total arrangement for containing cargo including, where fitted:

- A primary barrier (the cargo tank),
- Secondary barrier (if fitted),
- Associated thermal insulation,
- Any intervening spaces, and
- Adjacent structure, if necessary, for the support of these elements.

For cargoes carried at temperatures between −10 and −55 °C (14 and −67 °F) the ship's hull may act as the secondary barrier and in such cases it may be a boundary of the hold space.

The basic cargo tank types utilised on board gas carriers are in accordance with the list below:—

Independent Type

- **Independent Type 'A'**

Type A Independent Tanks are prismatic and supported on insulation-bearing blocks typically consisting of wooden chocks and located by anti-roll chocks located at the top of the tank inside the void space and anti-flotation chocks located inside the void space usually just above the double bottom tanks. The tanks are normally divided by a centre line liquid-tight bulkhead; by this feature, together with the chamfered upper part of the tank, the free liquid surface effect is reduced and thus the virtual rise of the Centre of gravity and the stability is increased. When these cargo tanks are designed to carry LPG (at −50 °C), the tank is constructed of fine-grained low-carbon manganese steel or even stainless steel as seen in the Maersk J class Ships. The hold space (void space) in this design is normally filled with dry inert gas or Nitrogen but may be ventilated with air during a ballast or gas free passage. The Conch design has been developed for carriage of LNG (at-163oC). The

material for these cargo tanks has to be either 9% nickel steel or aluminium. The maximum allowable relief vapour setting (MARVS) is < 0. 7 bar.

- **Independent Type 'B'**

Type B Independent Tanks are generally spherical and welded to a vertical cylindrical skirt, which is the lone connection to the ship's main hull. The hold space (void space) in this design is normally filled with dry inert gas or Nitrogen but may be ventilated with air during a ballast or gas free passage. A protective steel dome covers the primary barrier above deck level, and insulation encloses the outside of the primary barrier surface. This containment system has been used for carriage of LNG. The material of construction is either 9% nickel steel or aluminium.[9] The maximum Allowable relief vapour setting (MARVS) is < 0. 7 bar.

- **Independent Type 'C'**

Type C Independent Tanks are deck pressure vessels or cylindrical pressure tanks mounted horizontally on two or more cradle-shaped foundations. The tanks may be fitted on, below or partly below deck and be both longitudinally and transversely located. Lobe-type tanks are commonly used at the forward end of the ship, to improve the poor utilization of the hull volume. This containment system is used for LPG, Ethylene and small scale LNG carriers. The material, if used for the construction of tanks designed to carry ethylene, is 5% nickel steel. The maximum Allowable relief vapour setting (MARVS) is > 0. 7 bar.

Tanker freighting system

Worldscale is a unified system of establishing payment of freight rate for a given oil tanker's cargo. Worldscale was established in November 1952 by London Tanker Brokers' Panel on the request of British Petroleum and Shell as an average total cost of shipping oil from one port to another by ship. A large table was created as result.

The same scale is used today, although it was merged with the American Tanker Rate Schedule (ATRS) in 1969. By 2002, the table included the average cost of 320,000 voyages in permutations of from one load and one discharge port to five loads and ten discharge ports. Worldscale is produced by Worldscale Association (NYC) Inc. for the Americas and by Worldscale Association (London) Ltd. for the rest of the world. The freight for a given ship and voyage is normally expressed in a percentage of the published rate and is supposed to reflect the freight market demand at the time of fixing.

Following are some samples.

From Yokohama to:	US$/tonne	Miles
Adelaide	10.60	10,574
Aden	12.39	13,038
Chiba	2.90	50

In negotiating a price to pay, the above table is referred to as WS100 or 100% of World scale. The actual price negotiated between ship owner and charterer can range from 1% to 1000% and is referred to respectively as WS1 to WS1000, depending on how much loss the first is willing to take on that voyage and how much the latter is willing to pay.

The freight market

The freight market consists of ship owners, charterers and brokers. They use four types of contractual arrangements: the voyage charter, the contract of a freightment, the time charter and the bareboat charter. Ship owners contract to carry cargo for an agreed price per tonne while the charter market hires out ships for a certain period. A charter is legally agreed upon in a charter-party in which the terms of the deal are clearly set out.

Freight derivatives

Freight derivatives, which includes Forward Freight Agreement (FFA), container freight swap agreements and options based on these, are financial instruments for trading in future levels of freight rates, for dry bulk carriers, tankers and containerships. These instruments are settled against various freight rate indices published by the Baltic Exchange (for Dry and most Wet contracts) & Platt's (Asian Wet contracts).

FFAs are often traded over-the-counter, through broker members of the Forward Freight Agreement Brokers Association (FFABA), such as Clarkson's Securities, Marex Spectron, SSY - Simpson Spence Young, Braemar Sea scope LTD, Ifchor, Freight Investor Services, BGC Partners, GFI Group, ACM Shipping Ltd, BRS, Tradition-Platou and ICAP. However, screen-based trading is becoming more popular, through various screens. Trades can be given up for clearing by the broker to one of the clearing houses that support such trades. There are five clearing houses for freight: NOS Clearing/NASDAQ OMX, LCH. Clear net, CME Clear port, ICE Futures Europe and SGX. Freight derivatives are primarily used by ship owners and operators, oil companies, trading companies, and grain houses as tools for managing freight rate risk. Recently, with

commodities standing at the forefront of international economics, the large financial trading houses, including banks and hedge funds, have entered the market.

Baltic Dry Index measures the cost for shipping goods such as iron ore and grains. The trading volume of dry freight derivatives, a market estimated to be worth about $200 billion in 2007, grew as those needing ships attempted to contain their risks and investment banks and hedge funds looked to make profits from speculating on price movements. At the close of the 2007 financial year, the number of traded lots on dry FFAs doubled the derived physical product.

The sale and purchase market

In the sale and purchase market, second-hand ships are traded between ship owners. The administrative procedures used are roughly the same as in the real-estate business, using a standard contract. Trading ships is an important source of revenue for ship owners, as the prices are very volatile. The second hand value of ships depends on freightrates, age, inflation and expectations.

The new building market

The new building market deals with transactions between ship owners and shipbuilders. Contract negotiation can be very complex and extend beyond price. They also cover ship specifications, delivery date, stage payments and finance. The prices on the new building market are very volatile and sometimes follow the prices on the sale and purchase market.

The demolition market

On the demolition market ships are sold for scrap. The transactions happen between shipowners and demolition merchants, often with speculators acting as intermediaries.

Freight rate

A **freight rate** (historically and in ship chartering simply **freight** is a price at which a certain cargo is delivered from one point to another. The price depends on the form of the cargo, the mode of transport (truck, ship, train, aircraft), the weight of the cargo, and the distance to the delivery destination. Many shipping services, especially air carriers, use dimensional weight for calculating the price, which takes into account both weight and volume of the cargo.

Marine pollution conventions:

The Inter-Governmental Conference on the Convention on the Dumping of Wastes at Sea, which met in London in November 1972 at the invitation of the United Kingdom, adopted this instrument, generally known as the London Convention. The London Convention, one of the first international conventions for the protection of the marine environment from human activities, came into force on 30 August 1975. Since 1977, it has been administered by IMO.

The London Convention contributes to the international control and prevention of marine pollution by prohibiting the dumping of certain hazardous materials. In addition, a special permit is required prior to dumping of a number of other identified materials and a general permit for other wastes or matter.

"Dumping" has been defined as the deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures, as well as the deliberate disposal of these vessels or platforms themselves. Annexes list wastes which cannot be dumped and others for which a special dumping permit is required.

Amendments adopted in 1993 (which entered into force in 1994) banned the dumping into sea of low-level radioactive wastes. In addition, the amendments phased out the dumping of industrial wastes by 31 December 1995 and banned the incineration at sea of industrial wastes.

In 1996, Parties adopted a Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (known as the**London Protocol**) which entered into force in 2006.

The Protocol, which is meant to eventually replace the 1972 Convention, represents a major change of approach to the question of how to regulate the use of the sea as a depository for waste materials. Rather than stating which materials may not be dumped, it prohibits all dumping, except for possibly acceptable wastes on the so-called "reverse list", contained in an annex to the Protocol.
The permitted substances are:

1. Dredged material
2. Sewage sludge
3. Fish waste, or material resulting from industrial fish processing operations
4. Vessels and platforms or other man-made structures at sea
5. Inert, inorganic geological material

6. Organic material of natural origin

7. Bulky items primarily comprising iron, steel, concrete and similar unharmful materials for which the concern is physical impact and limited to those circumstances, where such wastes are generated at locations, such as small islands with isolated communities, having no practicable access to disposal options other than dumping

8. CO2 streams from CO2 capture processes.

FUNDAMENTALS OF SHIPPING – UNIT - IV
LIQUID BULK CARGO :

INTRODUCTION

All of us will have come across liquid bulk cargoes in everyday life in one from or another. From gasoline to fuel our cars, to fruit juices and cooking oil for consumption in the home, it's difficult to live the lives we live today without them.

These free-flowing liquid cargoes, which also include crude oil, liquefied natural gas and chemicals, are not boxed, bagged or hand stowed. Instead, they are poured into and sucked out of large tank spaces, known as the holds, of a tanker.

This section of the industry has attracted more than its fair share of public attention over the years, as a result of high-profile incidents where crude oil has leak from tankers and polluted our seas and coastlines. But there has been much legislation passed and increasing commitment from those that carry oil cargoes to further improve this section of the industry. And importantly, there has been a substantial reduction in marine pollution over the last 15 years, especially in the amount of oil spilled into the sea, despite a massive increase in world seaborne trade.

The port of Rotterdam is an important hub and trade location for liquid bulk cargo products, from crude oil, gasoline, diesel and biofuels to liquid chemicals and edible oils and fats. Businesses

and traders choose the port of Rotterdam because of its central location in Europe, the excellent maritime access, the economies of scale, the wide range of independent liquid bulk terminals and the reliable services.

Oil Carriers

The tanker is a very specialized vessel. It is designed to deal with bulk liquid cargoes permitting quick loading and discharge, thereby ensuring a fast turn-round (loading and discharge of cargo). Vessels return in ballast as it is seldom possible

to obtain return cargoes.

In addition to oil tankers, liquid cargo is carried by specialized vessels such as chemical or product carriers, LPG (liquefied petroleum gas) and LNG (liquefied natural gas) vessels.

A typical LNG vessel has the crew accommodation and machinery aft. Cargo is contained in prismatic internally insulated aluminium tanks, three of which are fitted into each of the three holds. To keep the gas in liquid form, it must be keptdown to minus 161° centigrade (-258°F).

VLCCs (Very Large Crude Carriers)

VLCC have a size ranging between 180,000 to 320,000 DWT. They are capable of passing through the Suez Canal in Egypt, and as a result are used extensively around the North Sea, Mediterranean and West Africa. VLCC are very large shipping vessels with dimensions of up to 470 m (1,540 ft) in length, beam of up to 60 m (200 ft) and draught of up to 20 m (66 ft). But the standard dimensions of these ships range between 300 to 330 meters in length, 58 meters breath and 31 meters in depth. They are known for their flexibility in using terminals and can operate in ports with some depth limitations. The cost of a VLCC ranges between

$100 million to $120 million depending on its age.

ULCCs (Ultra Large Crude Carriers):

2 The term ULCC describes tankers which range from 300/500,000 DWAT 1 . They are mainly used forlong haul operations between The Gulf and the Far East, Europe and North America, discharging theircargo at terminals especially constructed to handle such large vessels.

3 World‟s leading wet bulk ports :

		Volume	2014	(Million	TE	Volume 2012
Rank	**Port**	**TEU)**			**U)**	**(Million TEU)**
1			33.			
	Shanghai, China	35.29	62	32.53	31.74	www.portshanghai.com.cn
			32.			
2	SIngapore	33.87	6	31.65	29.94	www.singaporepsa.com
			23.			
3	Shenzhen, China	24.03	28	22.94	22.57	www.szport.net
			22.			
4	Hong Kong, S.A.R., China	22.23	35	23.12	24.38	www.mardep.gov.hk
			17.			
5	Ningbo-Zhoushan, China	19.45	33	16.83	14.72	www.zhoushan.cn/english
			17.			
6	Busan, South Korea	18.65	69	17.04	16.18	www.busanpa.com
			15.			
7	Qingdao, China	16.62	52	14.50	13.02	www.qdport.com
			15.			
8	Guangzhou Harbor, China	16.16	31	14.74	14.42	www.gzport.com
	Jebel Ali, Dubai, United Arab		13.			
9	Emirates	15.25	64	13.30	13.00	www.dpworld.ae
			13.			
10	Tianjin, China	14.05	01	12.30	11.59	www.ptacn.com
			11.			
11	Rotterdam, Netherlands	12.30	62	11.87	11.88	www.portofrotterdam.com
			10.			
12	Port Klang, Malaysia	10.95	35	10.00	9.60	www.pka.gov.my
13	Kaohsiung, Taiwan, China	10.59	9.94	9.78	9.64	www.khb.gov.tw
			10.			
14	Dalian, China	10.13	86	8.92	6.40	www.dlport.cn
15	Hamburg, Germany	9.73	9.30	8.89	9.01	www.hafen-hamburg.de
16	Antwerp, Belguim	8.98	8.59	8.64	8.66	www.portofantwerp.com
17	Xiamen, China	8.57	8.01	7.20	6.47	www.portxiamen.gov.cn
18	Tanjung Pelepas, Malaysia	8.50	7.63	7.70	7.50	www.ptp.com.my

19	Los Angeles, U.S.A.	8.33	7.87	8.08	7.94	www.portoflosangeles.org
20*	Keihin Ports, Japan	7.85	7.81	7.85	7.64	www.city.yokohama.lg.jp/en
21	Long Beach, U.S.A.	6.82	6.73	6.05	6.06	www.polb.com
22	Laem Chabang, Thailand	6.58	6.04	5.93	5.73	www.laemchabangport.com
23	Tanjung Priok, J Indonesia	6.40	6.59	6.46	5.65	www.priokport.co.id www.indonesiaport.co.id
24	Ho Chi Minh, Vietnam	6.39	5.96	5.19	4.53	www.vpa.org.vn
25	Bremen/Bremerhaven, Germany	5.78	5.84	6.13	5.92	www.bremen-ports.de
26	New York-New Jersey, U.S.A.	5.77	5.47	5.53	5.50	www.panynj.gov
27	Yingkou, China	5.77	5.30	4.85	4.03	www.ykport.com.cn
28**	Hanshin Ports, Japan	5.32	5.32	5.00	4.80	www.hanshinport.co.jp/en
29	Lianyungun, China	5.01	5.49	5.02	4.85	www.lyg.gov.cn
30	Columbo, Sri Lanka	4.91	4.31	4.26	4.26	www.slpa.lk
31	Algerciras Bay, Spain	4.56	4.50	4.11	3.60	www.apba.es
32	Jawaharlal Nehru, India	4.45	4.12	4.26	4.32	www.jnport.gov.in
33	Suzhou, China	4.45	5.31	--	--	suzhou.jiangsu.net/transportation
34	Valencia, Spain	4.44	4.33	4.47	4.33	www.valenciaport.com
35	Jeddah, Suadi Arabia	4.20	4.56	4.74	4.01	www.ports.gov.sa
36	Port Said East, Egypt	3.50	3.12	2.86	3.2	www.ppc.com.pa/balboa.php
37	Balboa, Panama	3.47	3.19	3.30	3.23	www.vpa.org.vn
38	Haiphong, Vietnam	3.45	3.02	.96	1.01	www.portseattle.org
39	Seattle-Tacoma NW Seaport Alliance, U.S.A.	3.43	3.46	3.51	3.59	www.atlasliman.com
40	Ambarli, Turkey	3.38	3.38	3.10	2.69	www.gaports.com
41	Georgia Ports, U.S.A.	3.35	3.03	2.97	2.94	www.amp.gob.pa
42	Colon, Panama	3.29	3.36	3.52	3.37	www.perakport.co.id
43	Tanjung Perak, Surabaya, Indonesia	3.13	3.02	2.89	2.64	www.tmpa.ima
44	Tanger Med, Morocco	3.08	2.56	1.82	2.09	www.salalah.com
45	Salalah, Oman	3.03	3.34	3.63	3.20	www.scctportsaid.com

Truck to Ship and Truck to Storage

The Material Feeder is the key feature that enables the Samson Mobile Shiploader and Stacker systems to handle a whole range of loose dry bulk cargoes from light and free flowing, such as grains, through to wet and sticky materials such as synthetic gypsum.

The unique ability of the Material Feeder to receive almost any dry bulk cargo without underground pits and hoppers eliminates the need for any fixed port infrastructure and permits operation on any suitable existing berth.

Types of tankers and gas carriers

Independent Mobile Material Feeder feeds an existing ship loader

1.2.1Maximising Berth Utilisation

The Mobile Shiploader immediately converts an existing multi-purpose berth for handling loose dry bulk cargoes delivered to the port direct from tipping trucks. When not required for bulk export the Shiploader is simply travelled clear to a suitable parking position.

The Mobile Shiploader may be used for loading bulk carriers to post Panamax size and when equipped with twin Samson® Material Feeders of peak loading rates to over 2,000 tons per hour are possible, with Through-the-Ship rates in excess of 1,500 tons per hour. Operating at this rate, a 75,000 DWT Panamax size ship would be loaded in less than 60 hours; taking into account proper hold trimming for safe cargo stowage.

Absolute Mobility

Port of Immingham located on the East Coast of England is a large import and export terminal handling both bulk and containerised shipments. Flexibility is paramount, allowing the port to maximise the efficiency of every inch of berth space within the enclosed dock section.

The Sterling series Mobile Shiploader, illustrated here, employs vertical elevation to raise cereals from the four Samson® Material Feeders to the radial and luffing outloading boom conveyor.

This unit has a compat and efficient design loading rate of up to 1,200 tons per hour handling wheat. c

Even with this 400 ton leviathan, full mobility is included allowing the Shiploader to be travelled under its own power to clear the berth for other port operations.

A total of 24 tyers carry the load, mounted in sets of six, to drive bogies mounted to slew rings allowing the wheel units to be aligned for any direction of travel and

for steering using electronically controlled Ackermann geometry, without mechanical linkage. Similar systems are available for all machine sizes and specifications.

Drive bogie

Granular Materials

For free flowing materials that may be discharged through the “Grain Door”, the flow rate from the truck may be regulated. Therefore material may be tipped directly to the feed boot of the Mobile Shiploader or narrow belt intermediate feeder conveyor, as shown below.

Stacking and Ship Loading

The Lancaster series Mobile Shiploader and Stacker provides the ideal solution for storage and export of coal from this Russian baltic port. Supplied with a larger feed hopper, the unit will accept coal or similar light bulk cargoes direct from wheeled loaders.

Loading coal to small bulk carriers

Multi-level undergear for maximum stacking height

Replacing the large shovel hopper with a standard feed boot allows the Lancaster series or Shiploader unit to operate with one or two Mobile Samson® Material Feeders to receive

non-free- flowing cargoes direct from tipping trucks.The Material Feeder eliminates double handling and is a receiving unit, feeder and buffer hopper all in one, delivering a controlled feed rate, and, thanks to the buffer capacity, an increased average overall loading rate.

Import Mobility

The import of loose dry bulk cargo direct by grab crane using either geared vessels or independent mobile harbour cranes offers complete flexibility. The equipment is moved clear after use for the discharge or loading of other freight.

The Eco Hopper and Shiploader may be supplied with any combination of towed or self powered travel systems,including stabiliser jacks for the Truck transfer from Eco Hopper to inland storage larger machines.

Drive may be from own on-board gen-set providing independent electrical power for the complete equipment.

Truck Intake to Local Storage

The Material Feeder is the ideal reception unit for the intake of almost any dry bulk cargo, from road tipping trucks or mining dump trucks for discharge to off-port storage thus eliminating the need for expensive deep underground hoppers and associated civil works.

Coal and pet-coke intake to a cement plant located adjacent to the port using a fleet of road trucks operating Material Feeder discharges direct to a surface mounted belt on a merry-go-round basis are able to discharge small bulk carriers at an average rate of 600 tons per hour.

Combining mobile equipment on the berth with surface mounted solutions at the plant offers the most economical and flexible overall handling solution.

M.I.E.T. ENGINEERING COLLEGE

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Recognized by UGC under section 2(f) & 12(B) of UGC Act, 1956
Trichy – Pudukkottai Road, Tiruchirappalli – 620 007. Phone:0431-2660 303
Website:www.miet.edu, E-mail:principalengg@miet.edu, contact@miet.edu

Truck Intake to Silo Storage

For silo storage, the combination of Material Feeder with vertical elevator offers a compact plant footprint with the minimum of transfer points and much simplified installation and maintenance demands if compared to traditional underground hoppers and feeders.

Integrating Material Feeder with an Aumund Central

Chain Bucket Elevator offers high handling rates and fast truck discharge. Ideal for the intake of imported cement clinker, gypsum and other additives to a cement grinding plant.

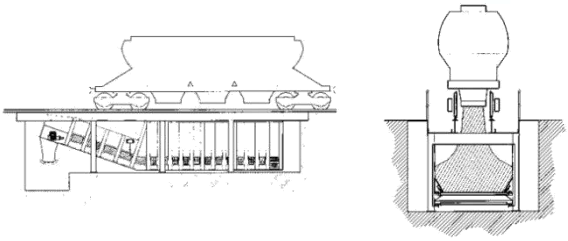
The Material Feeder provides a buffer capacity and regulated discharge to the elevator boot.

3.2.1Rail Intake to Local Storage

The Material Feeder - Under Rail is the ideal solution for the intake of dry bulk cargo to terminals and associated process plants, or as part of a railborne to waterborne transhipment operation including often local internal or external storage facilities.

The Under Rail shallow pit concept is ideal in a port environment to minimise civil works, construction cost and groundwater ingress.

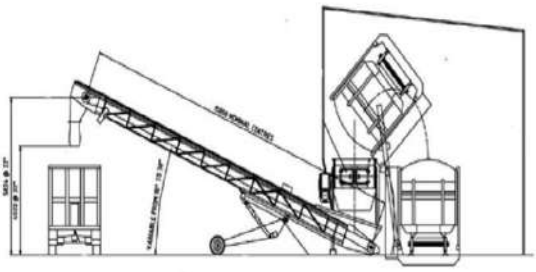
Low free fall reduces dust generaton and material degradation. Pit depth of less than 4.0 metres



Material Feeders for Wagon Tipplers

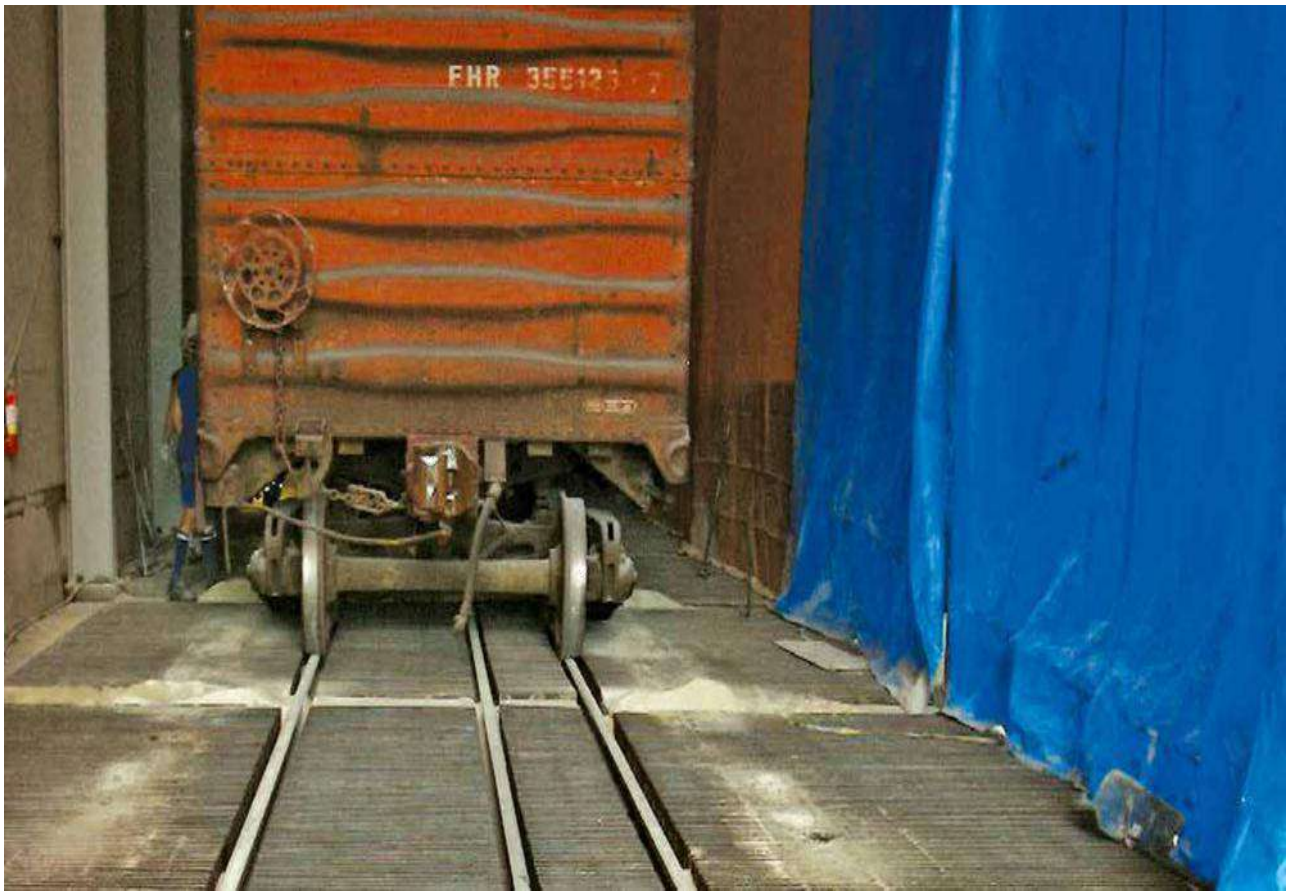
The Material Feeder - Under Rail may be incorporated beneath conventional wagon tipplers or supplied as a "Box-Feeder" to receive material from pivot frame or hydraulic box tippler designs, particularly handling cohesive materials liable to bridge and block.

Skid mount box feeder receives from wagon tippler

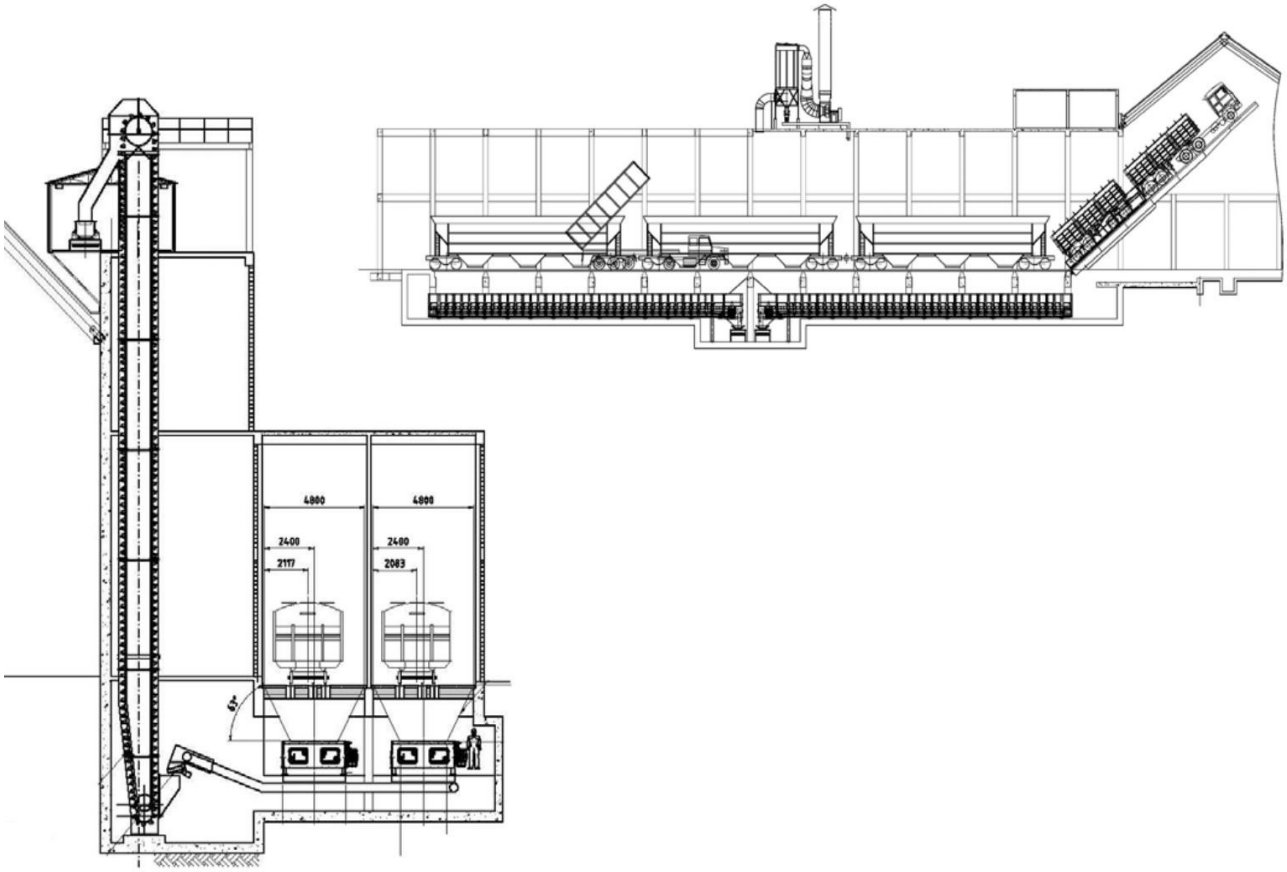


Surface installation
mob transfer conveyor

Transhipment from rail wagon to tipping truck



Multiple Road and Rail Intake :



Tipping trucks discharge alongside the rail wagons

Road trucks discharge using a tipping platform

Material Feeder - Under Rail receive raw sugar from road and rail with space for six rail wagons to be discharged. Vertical elevators raise the sugar to flat storage ready for bulk export from the port of Santos in Brazil.

The wide apron belt design not only minimises the excavation depth to reduce civil works costs, but also eliminates the bridging and blockage associated with tapered hoppers handling this extremely sticky material, when coupled with vertical elevators it gives a very compact plant footprint.

Each pair of feeders discharges to common belt conveyors each loading to vertical belt-bucket elevators.

A **tanker** (or **tank ship** or **tankship**) is a merchant vessel designed to transport liquids or gases in bulk. Major types of tankship include the oil tanker, the chemical tanker, and gas carrier. In the United States Navy and Military Sealift Command, any type of tanker used to refuelother ships is called an *oiler*.

Size categories

Oil tanker size categories

AFRA Scale[41]		**Flexible market scale**[41]			
Class	**Size in DWT**	**Class**	**Size in DWT**	**New price**[42]	**Used price**[43]
General Purpose tanker	10,000–24,999	Product tanker	10,000–60,000	$43M	$42.5M
Medium Range tanker	25,000–44,999	Panamax	60,000–80,000		
LR1 (Large Range 1)	45,000–79,999	Aframax	80,000–120,000	$60.7M	$58M
LR2 (Large Range 2)	80,000–159,999	Suezmax	120,000–200,000		

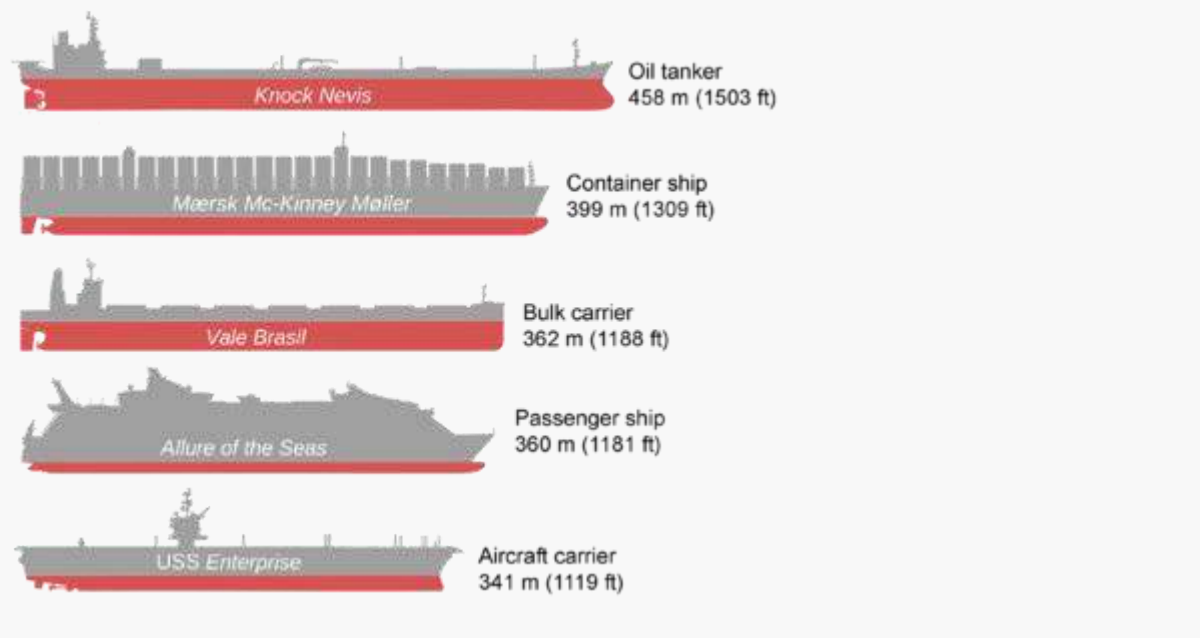
In 1954 Shell Oil developed the average freight rate assessment (AFRA) system which classifies tankers of different sizes. To make it an independent instrument, Shell consulted the *London Tanker Brokers' Panel (LTBP)*. At first, they divided the groups as *General Purpose* for tankers under 25,000 tonsdeadweight (DWT); *Medium Range* for ships between 25,000 and 45,000 DWTand *Large Range* for the then-enormous ships that were larger than 45,000 DWT. The ships became larger during the 1970s, which prompted rescaling.

The system was developed for tax reasons as the tax authorities wanted evidence that the internal billing records were correct. Before the New York Mercantile Exchange started trading crude oil futures in 1983, it was difficult to determine the exact price of oil, which could change with every contract. Shell and BP, the first companies to use the system, abandoned the AFRA system in 1983, later followed by the US oil companies. However, the system is still used today. Besides that, there is the flexible market scale, which takes typical routes and lots of 500,000 barrels (79,000 m^3).

Merchant oil tankers carry a wide range of hydrocarbon liquids ranging from crude oil to refined petroleum products. Their size is measured in deadweight metric tons (DWT). Crude carriers are among the largest, ranging from 55,000 DWT Panamax-sized vessels to ultra-large crude carriers (ULCCs) of over 440,000 DWT.

Smaller tankers, ranging from well under 10,000 DWT to 80,000 DWT Panamax vessels, generally carry refined petroleum products, and are known as product tankers.The smallest tankers, with capacities under 10,000 DWT generally work near-coastal and inland waterways. Although they were in the past, ships of the smaller Aframax and Suezmax classes are no longer regarded as supertankers.

Supertankers (VLCC and ULCC)



The *Knock Nevis* (1979–2010), a ULCC supertanker and the longest ship ever built.

"Supertankers" are the largest tankers, including very large crude carriers (VLCC) and ULCCs with capacities over 250,000 DWT. These ships can transport 2,000,000 barrels (320,000 m^3) of oil/318,000 metric tons.By way of comparison, the United Kingdom consumed about 1.6 million barrels (250,000 m^3) of oil per day in 2009. ULCCs, commissioned in the 1970s, were the largest vessels ever built, but the longest ones have already been scrapped. By 2013 only a few ULCCs remain in service, none of which are more than 400 meters long.

Because of their great size, supertankers often cannot enter port fully loaded. These ships can take on their cargo at off-shore platforms and single-point moorings. On the other end of the journey, they often pump their cargo off to smaller tankers at designated lightering points off-coast. A supertanker's routes are generally long, requiring it to stay at sea for extended periods, up to and beyond seventy days at a time.

Chartering

Oil tanker at Guanabara Bay, in Rio de Janeiro, Brazil.

The act of hiring a ship to carry cargo is called chartering. Tankers are hired by four types of charter agreements: the voyage charter, the time charter, the bareboat charter, and contract of affreightment. In a voyage charter the charterer rents the vessel from the loading port to the discharge port.In a time charter the vessel is hired for a set period of time, to perform voyages as the charterer directs. In a bareboat charter the charterer acts as the ship's operator and manager, taking on responsibilities such as providing the crew and maintaining the vessel. Finally, in a contract of affreightment or COA, the charterer specifies a total volume of cargo to be carried in a specific time period and in specific sizes, for example a COA could be specified as 1 million barrels (160,000 m^3) of JP-5 in a year's time in 25,000-barrel (4,000 m^3) shipments. A completed chartering contract is known as a charter party.

One of the key aspects of any charter party is the freight rate, or the price specified for carriage of cargo. The freight rate of a tanker charter party is specified in one of four ways: by a lump sum rate, by rate per ton, by a time charter equivalent rate, or by Worldscalerate. In a lump sum rate arrangement, a fixed price is negotiated for the delivery of a specified cargo, and the ship's owner/operator is responsible

to pay for all port costs and other voyage expenses.Rate per ton arrangements are used mostly in chemical tanker chartering, and differ from lump sum rates in that port costs and voyage expenses are generally paid by the charterer. Time charter arrangements specify a daily rate, and port costs and voyage expenses are also generally paid by the charterer.

The Worldwide Tanker Normal Freight Scale, often referred to as Worldscale, is established and governed jointly by the Worldscale Associations of London and New York.Worldscale establishes a baseline price for carrying a metric ton of product between any two ports in the world.In Worldscale negotiations, operators and charterers will determine a price based on a percentage of the Worldscale rate.The baseline rate is expressed as WS 100. If a given charter party settled on 85% of the Worldscale rate, it would be expressed as WS 85.Similarly, a charter party set at 125% of the Worldscale rate would be expressed as WS 125.

A **freight rate** (historically and in ship chartering simply **freight**[1]) is a price at which a certain cargo is delivered from one point to another. The price depends on the form of the cargo, the mode of transport (truck, ship, train, aircraft), the weight of the cargo, and the distance to the delivery destination. Many shipping services, especially air carriers, use dimensional weight for calculating the price, which takes into account both weight and volume of the cargo.

For example, bulk coal long-distance rates in America are approximately 1 cent/ton-mile. [2] So a 100 car train, each carrying 100 tons, over a distance of 1000 miles, would cost $100,000. On the other hand, Intermodal container shipping rates depend heavily on the route taken over the weight of the cargo, just as long as the container weight does not exceed the maximum lading capacity. Prices can vary between $400-$10,000 per Twenty foot equivalent unit (TEU) depending on the supply and demand of a given route.

In ship chartering, freight is the price which a charterer pays a shipowner for the use of a ship in a voyage charter.

Marine pollution occurs when harmful, or potentially harmful, effects result from the entry into the ocean of chemicals, particles, industrial, agricultural and residential waste, noise, or the spread of invasive organisms. Eighty percent of marine pollution comes from land. Air pollution is also a contributing factor by carrying off pesticides or dirt into the ocean. Land and air pollution have proven to be harmful to marine life and its habitats.

The pollution often comes from non point sources such as agricultural runoff, wind-blown debris and dust. Nutrient pollution, a form of water pollution, refers to contamination by excessive inputs of nutrients. It is a primary cause of eutrophication of surface waters, in which excess nutrients, usually nitrogen or phosphorus, stimulate algae growth.

Many potentially toxic chemicals adhere to tiny particles which are then taken up by plankton and benthos animals, most of which are either deposit or filter feeders. In this way, the toxins are concentrated upward within ocean food chains. Many particles combine chemically in a manner highly depletive of oxygen, causing estuaries to become anoxic.

When pesticides are incorporated into the marine ecosystem, they quickly become absorbed into marine food webs. Once in the food webs, these pesticides can cause mutations, as well as diseases, which can be harmful to humans as well as the entire food web.

Toxic metals can also be introduced into marine food webs. These can cause a change to tissue matter, biochemistry, behaviour, reproduction, and suppress growth in marine life. Also, many animal feeds have a high fish meal or fish hydrolysate content. In this way, marine toxins can be transferred to land animals, and appear later in meat and dairy products.

Types of pollution

4.2.1Acidification

Island with fringing reef in theMaldives. Coral reefs are dying around the world.

The oceans are normally a natural carbon sink, absorbing carbon dioxide from the atmosphere. Because the levels of atmospheric carbon dioxide are increasing, the oceans are becoming more acidic. The potential consequences of ocean acidification are not fully understood, but there are concerns that structures made of calcium carbonate may become vulnerable to dissolution, affecting corals and the ability of shellfish to form shells.

Oceans and coastal ecosystems play an important role in the global carbon cycle and have removed about 25% of the carbon dioxide emitted by human activities between 2000 and 2007 and about half the anthropogenic CO_2 released since the start of the industrial revolution. Rising ocean temperatures and ocean acidification means that the capacity of the ocean carbon sink will gradually get weaker, giving rise to global concerns expressed in the Monaco and Manado Declarations.

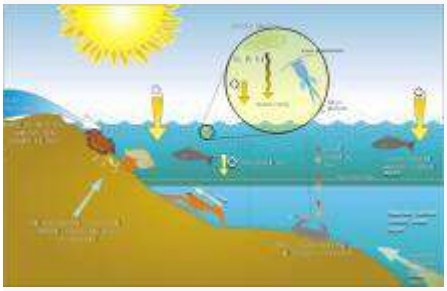
A report from NOAA scientists published in the journal Science in May 2008 found that large amounts of relatively acidified water are upwelling to within four miles of the Pacific continental

shelf area of North America. This area is a critical zone where most local marine life lives or is born. While the paper dealt only with areas from Vancouver to northern California, other continental shelf areas may be experiencing similar effects.

A related issue is the methane clathrate reservoirs found under sediments on the ocean floors. These trap large amounts of the greenhouse gas methane, which ocean warming has the potential to release. In 2004 the global inventory of ocean methane clathrates was estimated to occupy between one and five million cubic kilometres. If all these clathrates were to be spread uniformly across the ocean floor, this would translate to a thickness between three and fourteen metres. This estimate corresponds to 500–2500 gigatonnes carbon (Gt C), and can be compared with the 5000 Gt C estimated for all other fossil fuel reserves.

Eutrophication

Polluted lagoon.



Effect of eutrophication on marinebenthic life

Eutrophication is an increase in chemical nutrients, typically compounds containing nitrogen or phosphorus, in an ecosystem. It can result in an increase in the ecosystem's primary productivity (excessive plant growth and decay), and further effects including lack of oxygen and severe reductions in water quality, fish, and other animal populations.

The biggest culprit are rivers that empty into the ocean, and with it the many chemicals used as fertilizers in agriculture as well as waste from livestock and humans. An excess of oxygen depleting chemicals in the water can lead to hypoxia and the creation of a dead zone.

Estuaries tend to be naturally eutrophic because land-derived nutrients are concentrated where runoff enters the marine environment in a confined channel. The World Resources Institute has identified 375 hypoxic coastal zones around the world, concentrated in coastal areas in Western Europe, the Eastern and Southern coasts of the US, and East Asia, particularly in Japan. In the ocean, there are frequentred tide algae blooms that kill fish and marine mammals and cause respiratory problems in humans and some domestic animals when the blooms reach close to shore.

In addition to land runoff, atmospheric anthropogenic fixed nitrogen can enter the open ocean. A study in 2008 found that this could account for around one third of the ocean's external (non-recycled) nitrogen supply and up to three per cent of the annual new marine biological production. It has been suggested that accumulating reactive nitrogen in the environment may have consequences as serious as putting carbon dioxide in the atmosphere.

One proposed solution to eutrophication in estuaries is to restore shellfish populations, such as oysters. Oyster reefs remove nitrogen from the water column and filter out suspended solids, subsequently reducing the likelihood or extent of harmful algal blooms or anoxic conditions. Filter feeding activity is considered beneficial to water quality by controlling phytoplankton density and sequestering nutrients, which can be removed from the system through shellfish harvest, buried in the sediments, or lost through denitrification. Foundational work toward the idea of improving marine water quality through shellfish cultivation to was conducted by Odd Lindahl et al., using mussels in Sweden.

Plastic debris

A mute swan builds a nest using plastic garbage.

Marine debris is mainly discarded human rubbish which floats on, or is suspended in the ocean. Eighty percent of marine debris is plastic– a component that has been rapidly accumulating since the end of World War II. The mass of plastic in the oceans may be as high as100,000,000 tonnes (98,000,000 long tons; 110,000,000 short tons).

Discarded plastic bags, six pack rings and other forms of plastic waste which finish up in the ocean present dangers to wildlife and fisheries. Aquatic life can be threatened through entanglement, suffocation, and ingestion. Fishing nets, usually made of plastic, can be left or lost in the ocean by

Remains of an albatross containing ingested flotsam

fishermen. Known as ghost nets, these entangle fish, dolphins, sea turtles, sharks, dugongs,crocodiles, seabirds, crabs, and other creatures, restricting movement, causing starvation, laceration and infection, and, in those that need to return to the surface to breathe, suffocation.

Many animals that live on or in the sea consume flotsam by mistake, as it often looks similar to their natural prey. Plastic debris, when bulky or tangled, is difficult to pass, and may become permanently lodged in the digestive tracts of these animals. Especially when evolutionary adaptions make it impossible for the likes of turtles to reject plastic bags, which resemble jellyfish when immersed in water, as they have a system in their throat to stop slippery foods from otherwise escaping. Thereby blocking the passage of food and causing death through starvation or infection.

Plastics accumulate because they don't biodegrade in the way many other substances do. They will photodegrade on exposure to the sun, but they do so properly only under dry conditions, and water inhibits this process. In marine environments, photodegraded plastic disintegrates into ever smaller pieces while remaining polymers, even down to the molecular level. When floating plastic particles photodegrade down to zooplankton sizes, jellyfish attempt to consume them, and in this way the plastic enters the ocean food chain. Many of these long-lasting pieces end up in the stomachs of marine birds and animals,[61] including sea turtles, and black-footed albatross.

Marine debris on Kamilo Beach, Hawaii, washed up from the Great Pacific Garbage Patch

Plastic debris tends to accumulate at the centre of ocean gyres. In particular, the Great Pacific Garbage Patch has a very high level of plastic particulate suspended in the upper water column. In samples taken in 1999, the mass of plastic exceeded that of zooplankton (the dominant animal life in the area) by a factor of six. Midway Atoll, in common with all the Hawaiian Islands, receives substantial amounts of debris from the garbage patch. Ninety percent plastic, this debris accumulates on the beaches of Midway where it becomes a hazard to the bird population of the island. Midway Atoll is home to two-thirds (1.5 million) of the global population of Laysan albatross.Nearly all of these albatross have plastic in their digestive system and one-third of their chicks die.

Toxic additives used in the manufacture of plastic materials can leach out into their surroundings when exposed to water. Waterbornehydrophobic pollutants collect and magnify on the surface of plastic debris, thus making plastic far more deadly in the ocean than it would be on land. Hydrophobic contaminants are also known to bioaccumulate in fatty tissues, biomagnifying up the food chain and putting pressure on apex predators. Some plastic additives are known to disrupt the endocrine system when consumed, others can suppress the immune system or decrease reproductive rates. Floating debris can also absorb persistent organic pollutants from seawater, including PCBs, DDT and PAHs. Aside from toxic effects, when ingested some of these are mistaken by the animal brain for estradiol, causing hormone disruption in the affected wildlife.

Toxins

Apart from plastics, there are particular problems with other toxins that do not disintegrate rapidly in the marine environment. Examples of persistent toxins are PCBs, DDT, TBT,pesticides, furans, dioxins, phenols and radioactive waste. Heavy metals are metallic chemical elements that have a relatively high density and are toxic or poisonous at low concentrations. Examples are mercury, lead, nickel, arsenic and cadmium. Such toxins can accumulate in the tissues of many species of aquatic life in a process called bioaccumulation. They are also known to accumulate in benthic environments, such as estuaries and bay muds: a geological record of human activities of the last century.

Specific examples

- Chinese and Russian industrial pollution such as phenols and heavy metals in the Amur River have devastated fish stocks and damaged its estuary soil.
- Wabamun Lake in Alberta, Canada, once the best whitefish lake in the area, now has unacceptable levels of heavy metals in its sediment and fish.
- Acute and chronic pollution events have been shown to impact southern California kelp forests, though the intensity of the impact seems to depend on both the nature of the contaminants and duration of exposure.
- Due to their high position in the food chain and the subsequent accumulation of heavy metals from their diet, mercury levels can be high in larger species such as bluefin andalbacore. As a result, in March 2004 the United States FDA issued guidelines recommending that

pregnant women, nursing mothers and children limit their intake of tuna and other types of predatory fish.

- Some shellfish and crabs can survive polluted environments, accumulating heavy metals or toxins in their tissues. For example, mitten crabs have a remarkable ability to survive in highly modified aquatic habitats, including polluted waters. The farming and harvesting of such species needs careful management if they are to be used as a food.
- Surface runoff of pesticides can alter the gender of fish species genetically, transforming male intofemale fish.
- Heavy metals enter the environment through oil spills – such as the Prestige oil spill onthe Galician coast – or from other natural or anthropogenic sources.
- In 2005, the 'Ndrangheta, an Italian mafia syndicate, was accused of sinking at least 30 ships loaded with toxic waste, much of it radioactive. This has led to widespread investigations into radioactive-waste disposal rackets.
- Since the end of World War II, various nations, including the Soviet Union, the United Kingdom, the United States, and Germany, have disposed of chemical weapons in theBaltic Sea, raising concerns of environmental contamination.

Underwater noise

Marine life can be susceptible to noise or the sound pollution from sources such as passing ships, oil exploration seismic surveys, and naval low-frequency active sonar. Sound travels more rapidly and over larger distances in the sea than in the atmosphere. Marine animals, such as cetaceans, often have weak eyesight, and live in a world largely defined by acoustic information. This applies also to many deeper sea fish, who live in a world of darkness. Between 1950 and 1975, ambient noise at one location in the Pacific Ocean increased by about ten decibels (that is a tenfold increase in intensity).

Noise also makes species communicate louder, which is called the Lombard vocal response Whale songs are longer when submarine-detectors are on If creatures don't "speak" loud enough, their voice can be masked by anthropogenic sounds. These unheard voices might be warnings, finding of prey, or preparations of net-bubbling. When one species begins speaking louder, it will mask other species voices, causing the whole ecosystem to eventually speak louder

According to the oceanographer Sylvia Earle, "Undersea noise pollution is like the death of a thousand cuts. Each sound in itself may not be a matter of critical concern, but taken all together, the noise from shipping, seismic surveys, and military activity is creating a totally different environment than existed even 50 years ago. That high level of noise is bound to have a hard, sweeping impact on life in the sea.

Shipping market

The shipping market is the whole that determines the sale and purchase of ships. How the shipsare chartered and the way the prices of this is established. The actors moving this market are

shipowners, shipbuilders, charterers and shipping companies. This market is formed by five marketsthat interact to form and are each part of the overlapping market:

1. The newbuilding market
2. The freight market
3. The sale and purchase market
4. The demolition market
5. FFA-Forward Freight Agreements Market

The newbuilding market

This market is set by the shipbuilders and the brokers who act as mediators between first mentioned and shipowners (to be). The largest difference between other markets is that the product traded does if fact not yet exist. Payment is usually done in parts as the new ship is being completed. Newbuild ships are not necessarily more expensive than similar second-hand ships. This is because of the time it takes for the ship to be available and the current fluctuations of offer and demand.

The freight market

The freight market is the trading of freight and the means to transport this freight. The better known origin of this market lies in the Baltic Exchange. This has now become a website. And most of this trade now goes by the internet. As shipping companies sell the use of ships, the way these ship are deployed must be agreed upon, including whether the charter has full control or a certain degree of it. This is done by the charter. In this contract the obligations of both parties are described. This can be done on basis of time, voyage, freight, etc. Even the party responsible for maintenance andcrewing is hereby settled.

The sale and purchase market

The actors are again the same as in previously mentioned markets. Despite the reason of sale, this is typically done free of any financial obligations tied to the ship and with instant delivery. Shipbrokers usually act as a middle man in these sales, but the internet replaces more and more of them. The price of the ship depends on many factors. The most important is the momentary demand for transport which that type of ship could deliver. Despite any debt that a selling owner may have, or

the interest that a third party may have, in a ship being sold, the crew always has first lien to the valueof the ship if they are still to be paid.

The newbuild market

The significant difference with the sale and purchase market is that the ships that are sold here don't exist yet. Anticipation of the market is crucial for those contracting the construction of a ship. Payment is usually done in five parts. Ten percent upon signing the contract. The rest in even parts during different phases of construction; cutting of the steel; laying of the keel; launching; delivery. Prices are determined, as always, by price and demand. Also resources must be taken into account.

The demolition market

After a ship's lifespan is exceeded it will be demolished. Its steel and components will be dismantled and sold.

Since this work is hard, dangerous and badly paid it is done in the Far East or Northern parts of the UK.

UNIT - V

INTRODUCTION

Ports in India

- India has a long coastline, spanning 7516.6 kilometres, forming one of the biggest peninsulas in the world. It is serviced by 13 major ports (12 government and 1 corporate) and 187 notified minor and intermediate ports. The latest addition to major ports is Port Blair on June 2010, the 13th port in the country.
- Major ports handled over 74% of all cargo traffic in 2007. However, the words "major", "intermediate" and "minor", do not have a strict association with the traffic volumes served by these ports.

- As an example, Mundra Port, a newly developed minor port in the state of Gujarat registered a cargo traffic of around 28.8 million tonnes per annum during the financial year of 2008, which is higher than that of many major ports.
- The classification of Indian ports into major, minor and intermediate has an administrative significance. Indian government has a federal structure, and according to its constitution, maritime transport falls under the "concurrent list", to be administered by both the Central and the State governments.

- While the Central Shipping Ministry administer the major ports, the minor and intermediate ports are administered by the relevant departments or ministries in the nine coastal states—West Bengal, Orissa, Andhra Pradesh, Tamil Nadu, Kerala, Karnataka, Goa, Maharashtra and Gujarat.
- Several of these 187 minor and intermediate ports are merely "notified"; little or no cargo handling actually takes place. These ports have been identified by the respective governments to be developed, in a phased manner, a good proportion of them involving public–private partnership

- Cargo handling is projected to grow at 7.7% until 2013-14. Some 60% of India's container traffic is handled by the Mumbai Port and Jawaharlal Nehru Port Trust in Navi Mumbai.

Major ports

- There are also 7 shipyards under the control of the central government of India, 2 shipyards controlled by state governments, and 19 privately owned shipyards. The major ports handled 423.4 million tons of cargo for the financial year 2005-2006, with Visakhapatnam, Kochi, Paradip Port, Chennai Port and Kandla carrying the greatest tonnage.

- Major ports can collectively handle 400+ million tons of cargo annually, and port operations have improved since the mid-1990s. All major ports, except one (Ennore Port), are government administered, but private-sector participation in ports has increased. Karaikal Port Private Limited (KPPL), a private port developed by MARG Limited, became operational in April, 2009

SERVICE PROVIDERS TO SHIPPING INDUSTRY

CHENNAI PORT, TAMIL NADU

Jawaharlal Nehru Trust Port

- MUNDRA PORT, GUJARAT
- Visakhapatnam Port, Andhra Pradesh
- Kochi Port, Kerala

Recent developments

- In 2000 there were 102 shipping companies operating in India, of which five were privately owned and based in India and one was owned by the government (Shipping Corporation of India). In 2000 there were 639 government-owned ships, including 91 oil tankers, 79 dry cargo bulk carriers, and 10 cellular container vessels. Indian-flagged vessels carried about 15 per cent of overseas cargo at Indian ports for financial year 2003.
- The Port Pipavav in Saurashtra, handled by **APM terminals**; developed by AFCONS is one of the most efficient Port functioning in India. Giving a push to infrastructure development, the government in 2013 approved a proposal to set up two major ports in West Bengal and Andhra Pradesh at an investment of about Rs. 15,820 crore.
- Port of Dhamara in Orissa was inaugurated in August 2010 which is 18 meter deep) of India. There are another 5 ports offing in Orissa.

SHIP MANAGEMENT COMPANIES

Port infrastructure development

- The 6,000 km long Indian coastline has 12 major ports and 181 minor/ intermediate ports out of which 139 are operable. Indian Ports are the gateways to India's international trade by sea and are handling over 90% of foreign trade.
- The major ports are located at Calcutta/ Haldia, Chennai, Cochin, Ennore, Jawaharlal Nehru Port at Nhava Sheva, Kandla, Mormugao, Mumbai, New Mangalore, Paradip, Tuticorin and Vishakhapatnam.
- The 12 major Indian ports, which are managed by the Port Trust of India under Central Government jurisdiction, handle 90 percent of the all-India port throughput, and thus bear the brunt of sea borne trade.
- The 139 minor ports are under the jurisdiction of the respective State Governments. Dry and liquid bulk make up about 80 percent of the port traffic in volume with general cargo, including the containerised cargo, constituting the remaining traffic.
- Though the bulk of Indian trade is carried by sea routes, the existing port infrastructure is insufficient to handle trade flows effectively. The current capacity at major ports is overstretched.

PORTS, INLAND TERMINALS AND CONTAINER FREIGHT STATIONS

The major ports together have a capacity of 215 million metric tonnes (MMT) at 1997- 98 levels.

- During 2001- 2002 , the total cargo handled at major ports was 287.56 million tonnes as against 281.10 million tonnes during 2000- 2001. The traffic for total ports in India was worth 740.3 million tons (MT) in 2009 and this is expected to rise to 1,373.1 MT in 2015. Traffic at major ports is expected to grow at a compound annual growth rate (CAGR) of 7.6 percent from 2010 to 2015.
- The Indian ports sector is poised for significant growth driven by new manufacturing and power projects and higher cargo traffic at ports. Increase in containerized trade coupled with the Government's active initiatives to develop the Indian ports sector, is expected to further boost the growth.
- The commissioning of power projects based on imported coal and the setting up of steel projects and offshore exploration and production projects are likely to drive the Indian ports sector.

- The situation of limited capacity and high demand has inevitably resulted in port congestion. This results in overstretched berths leading to pre-berthing delays and longer ship turnaround time.
- In recent years, major investments in port construction have centred on container as well as bulk facilities. Modern equipment exists for container and bulk handling.
- The equipment- mix for handling general cargo has to be planned and provided in a manner that suits the needs of each port.
- However, several major ports lack sufficient draft for large crude tankers. Large vessels are berthed at Colombo, Singapore, or Dubai, and cargo is shipped to India later in smaller vessels, thereby escalating the freight cost.
- Additionally, all leading ports such as Mumbai, Jawaharlal Nehru Port Trust (JNPT), Visakhapatnam, and Mormugao handle more cargo than their designed capacities, further contributing to congestion and resulting in a longer turnaround time

SHIP BUILDING AND REPAIR YARDS

- The Indian Government prioritized the expansion and modernization of ports as part of its five-year plan initiatives in 2007. It has been instrumental in redefining the role of ports from mere trade gateways to integral parts of the global and logistics chain.
- The Committee of Infrastructure constituted a Committee of Secretaries to recommend time-bound identification and complete connectivity projects to successfully address issues regarding port connectivity.
- Several projects are underway for the deepening of drafts at major ports as a part of the national maritime development program.
- The productivity of ports in terms of Average Ship Turn Around (ASTA) and Average Ship Berth Output (ASBO) has improved in past years.
- The ASTA has decreased from 8.1 days in 1990- 91 to 7.8 days in 1996-97 to 5.06 days in 1998-99 and further to 4.72 days in 1999-2000 (April-Sept).

- The average ASBO increased from 3372 tonnes in 1990- 91 to 4,249 tonnes in 1996- 97.
- Although the ports in India have shown considerable improvement over years, benchmarking them against the ports in Hong Kong, Los Angeles, and Rotterdam reveals that there needs to be marked improvement in many parameters to get Indian ports at par with international standards.
- On three important parameters- capacity, productivity and efficiency, Indian ports lack in comparison to some of the major international ports.
- In international terms, labour and equipment productivity levels are still very low due to the out-dated equipment, poor training, low equipment handling levels by labour, uneconomic labour practices, idle time at berth, time loss at shift change and high mining scales and low datum.
- In keeping with general policy of liberalisation and globalisation of economy of the Government of India, the Port sector has been thrown open to private sector participation.

FINANCING THE SHIPPING INDUSTRY

- Private Sector participation in provision of port facilities at various major ports is envisaged in a big way.
- There is no legal bar to private sector participation in port facilities as per the provisions of the existing Major Port Trusts Act, 1963.
- The government has been promoting public-private participation in the ports sector on a build-operate-transfer (BOT) basis, thereby stepping-up capacities and traffic handling at ports, besides enhancing their efficiency.
- In order to handle the increase in the sea-borne traffic on account of increase in foreign and coastal trade, major expansion is required in the port infrastructure sector in the country and this will need mobilisation of substantial resources. Hence, the opening up of the port sector for privatisation.

MARINE INSURANCE PROVIDERS

- It is expected that privatisation would also improve the efficiency, productivity and quality of services and also bring competitiveness in port services.
- It is also expected that the private sector participation would help bringing in latest technology and improved management techniques.
- It is felt necessary to encourage the private sector participation in enhancing port capabilities and also in modernisation of port equipment.
- Port operators and other undertakings which need to be located in the Port, lease the land, infrastructure and associated services and provide them to the secondary users - cargo owners, ship