

# Lean Operations Management in Ports

Port operations encompass a vast network of activities, processes, and equipment that facilitate the efficient movement of goods and vessels within a port. Ports serve as vital hubs for international trade, connecting businesses and consumers across the globe.



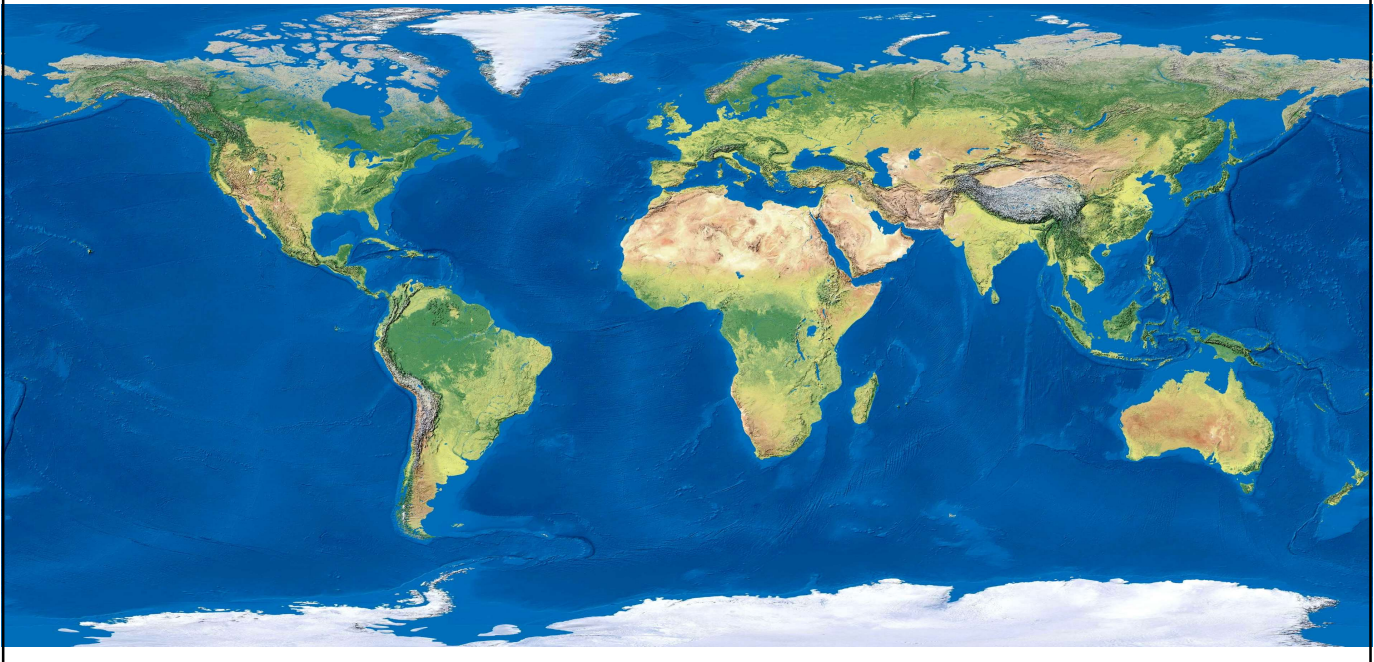
**Srinivasu Chaganti**

**B.Com., M.F.T., LL.B., MBA (IIM)**

Director @ Gammon Group [AJR Infra and Tolling Limited] | Legal Drafting, Case Law Research | Guest Faculty - IIM

1

71% of the Earth is covered by Water



2

## Modes of Transport

Road	- Lesser Quantities	- High Cost
Rail	- Moderates Quantities	- Moderate Costs
Air	- Lesser Quantities	- Very High Cost
<b>Sea</b>	<b>- Bulk / Massive</b>	<b>- Affordable Cost</b>

3

## World-Wide Bulk Cargo Trading: At a glance

4



## Key Commodities: Driving Global Trade

### 1 Coking Coal

Coking coal is a key ingredient in steel production, fueling the construction and manufacturing sectors worldwide. It's a significant commodity in international trade.

### 2 Steam Coal

Steam coal powers electricity generation plants across the globe. Its trade is essential for providing energy to homes and businesses.

### 3 Iron Ore

Iron ore is a fundamental raw material for steelmaking, making it a core commodity in international trade and a driver of global economic activity.

### 4 Other Bulk Cargoes

This includes various agricultural products, like grains, fertilizers, and mineral resources like bauxite and manganese ore.

5

## Global Seaborne Trade Volumes and Percentages

Commodity	Volume (Million Tons)	Percentage of Global Seaborne Trade
Iron Ore	1,500	25%
Coking Coal	800	13%
Steam Coal	900	15%
Other Bulk Cargoes	2,000	33%



6

# Indian Shipping Trade Trends and Market Share

## Trade Growth

India's bulk cargo trade has experienced 8% annual growth in the last 5 years, reaching over 1.2 billion metric tons in 2021.

## Global Share

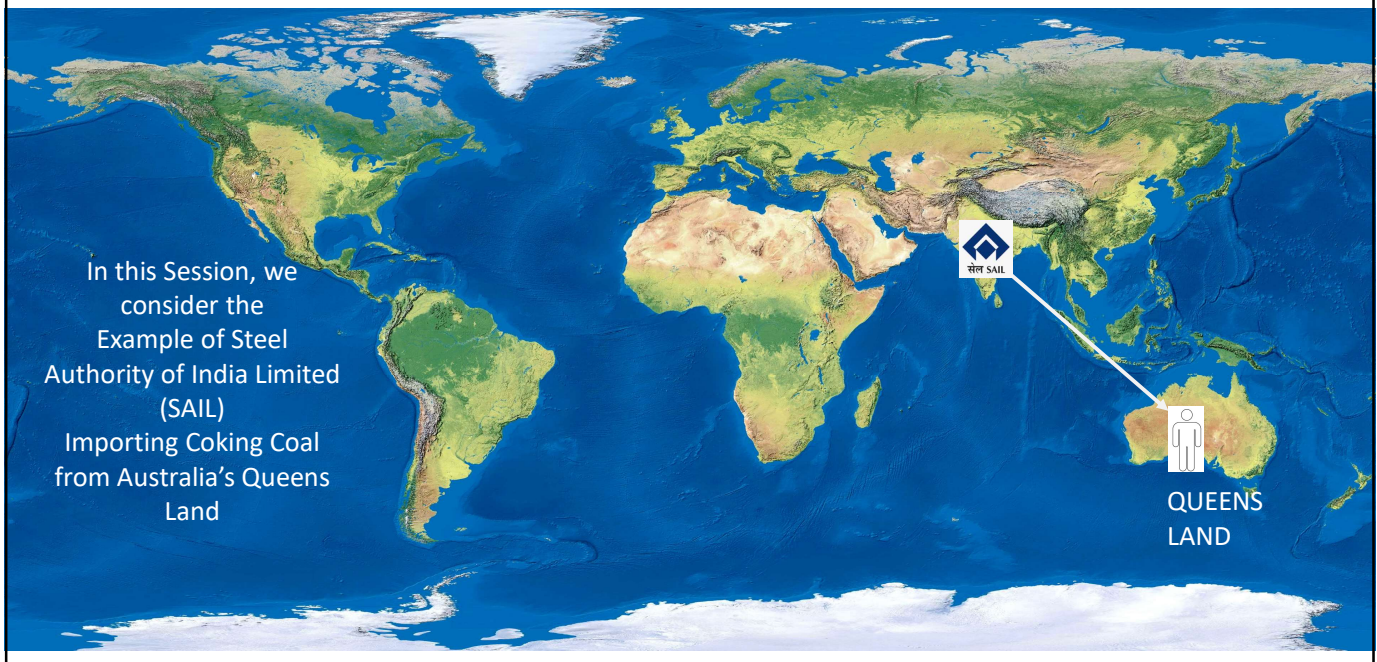
India accounts for 12% of global seaborne trade in iron ore, 18% in coking coal, and 7% in steel - making it a major player in key commodity markets.

## Market Dynamics

The Indian shipping industry faces challenges like 30% port congestion and a 25% increase in fuel costs, but also opportunities from \$82 billion in planned infrastructure investment.

7

## Importer & Exporter Trading Relation



8

## Hiring a Car



Hatchback



Sedan



SUV



Car Owner

9

## RENTAL TERMS



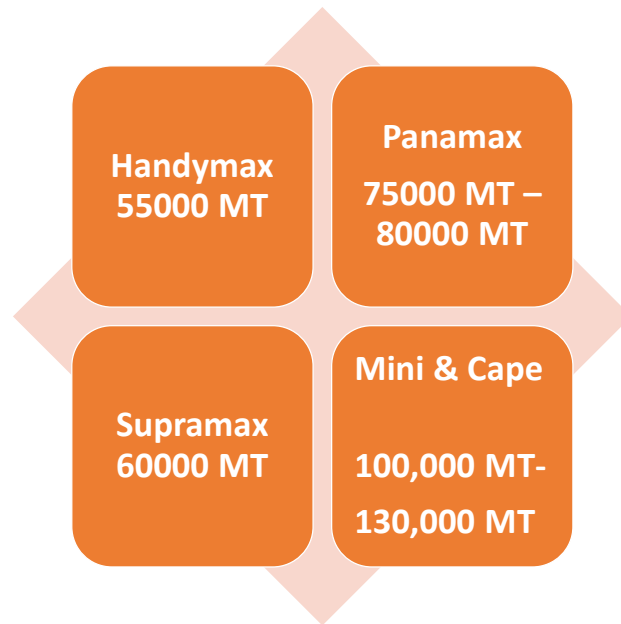
Rent Per Day	:	INR 2800/-
Kms Covered	:	80 Kms
Extra Per Km	:	INR 18/-
Tolls	:	Extra
Night Halt	:	Extra INR 900/-
Driver Batta	:	INR 400 / Day
	:	INR 700 / Night
Rent out for	:	3 Days
Extra Day	:	INR 4000 Per Day

Applicable Laws: Indian laws

10

# Most prevailing Vessel Types

[based on Carrying Capacity]



11

## Hiring a Vessel [Chartering]

Parties to Shipment



Ship Brokers / Charterer



To Transport



Coking Coal



Handymax



Supramax



Panamax



Vessel Owner

12

# SAIL's Requirement



SHIPMENT REQUIREMENT FOR RUNNING STEEL PLANT		
	Parameter	Description
A	Importer	STEEL AUTHORITY OF INDIA LTD
B	Commodity	Coking Coal
C	Mines	Queensland, Australia
D	Per Annum Qty	4 Million Tons
E	Qty in Tons	40,00,000
F	Vessel Type	Panamax
G	Parcel Size in MT	75000
H	No. of Vessels/Year	53.33
I	No. of Vessels/Month	4.44

SAIL operates and owns five integrated steel plants at **Bhilai**, Rourkela, Durgapur, Bokaro and Burnpur (Asansol) and three special steel plants at Salem, Durgapur and Bhadravathi. It also owns a Ferro Alloy plant at Chandrapur.

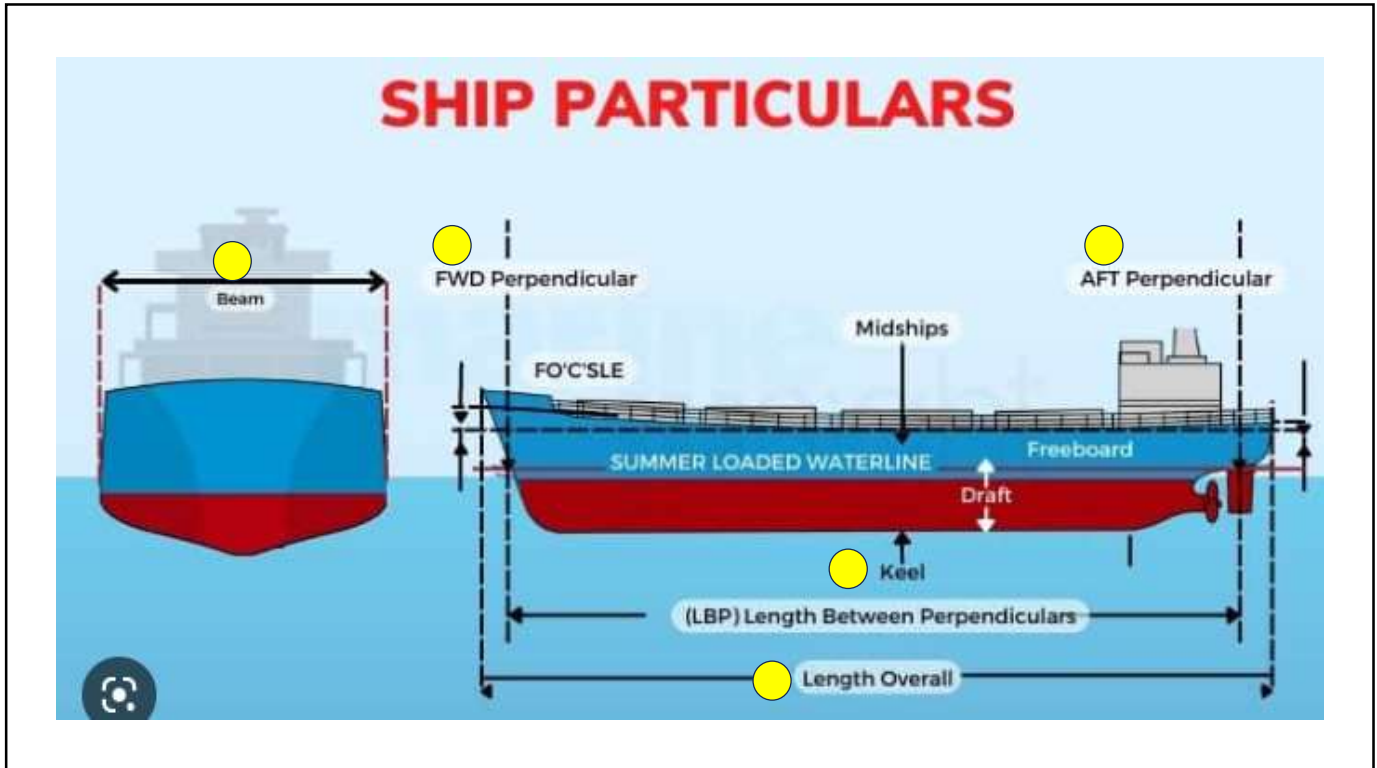
PARTIES TO THE SHIIPMENT	
Importer	SAIL
Exporter	Queensland
Vessel Owner	Xiang Hu Corp.,
Charterer	Chang Lee Charterers
Agreement	Charter Party Agreement
Voyage Time	17 Days
Per Month Vessels	4

13

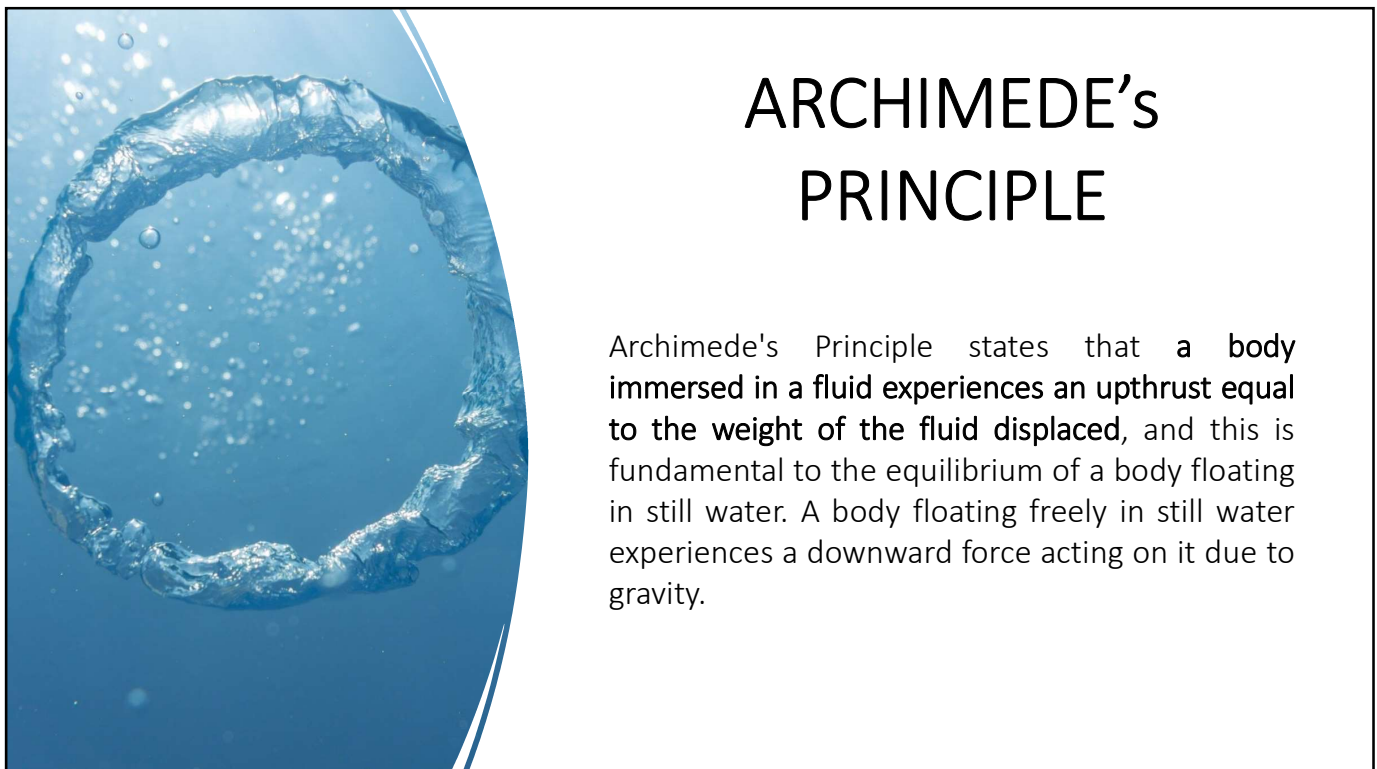
## Port Services Contract Terms

CARGO HANDLING CONTRACT TERMS		
Cargo Importers	SAIL	Unit/Remarks
Name of the vessel	MV JAL VIHAR (Panamax)	
Cargo Quantity in MT	43850	MT
Cargo	Coking Coal (Australian)	Bulk
Discharging Rate / day	25,000	Mt/ Day
Demurrage Rate	10,000	Per Day
Laytime to count from [Vessel to Berth on]	Within 24 Hours of NOR	
Handling Rate Per Ton	500	Per Ton
Advance Payment prior Vessel Arrival	80%	On Invoice
Balance Payment	20%	On Completion of discharge
Onward Cargo Movement	By Rail	Two Rakes Per Day

14



15



16

## What is What at Ports...



### Draught (Vessel)

The draught refers to the vertical distance between the waterline and the bottom of the vessel's hull. It's crucial for ensuring safe navigation and proper berthing.

### Berth Depth

The depth of the water at the berth is crucial to ensure safe and efficient vessel operations. It must be sufficient for the vessel's draft.

17

## What is What at Ports .....

### Berth Length

The length of the berth determines the size of the vessel that can be accommodated. It should be long enough to accommodate the vessel's overall length, including any overhang.

### Berth Width

The width of the berth should be sufficient to allow for safe maneuvering of the vessel and cargo handling equipment.

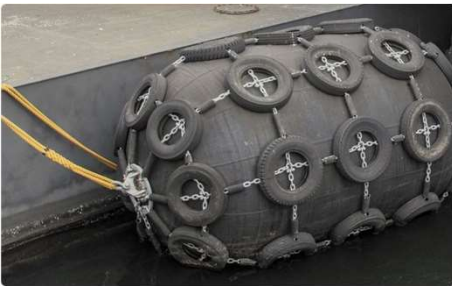


18

# What is What at a Berth

## Fenders

Fenders are essential for protecting the vessel and berth structure during berthing and unberthing. They absorb the impact of the ship, reducing stress and damage.



## Bollards

Bollards are robust structures attached to the berth, providing strong points for securing mooring lines. They are designed to withstand the high forces exerted by the vessel.



19

# Who is who in Shipping



## Vessel Owner

The owner of the vessel has a legal responsibility to ensure the vessel is seaworthy and operates safely.



## Traffic Manager

A traffic manager is responsible for planning and coordinating the movement of cargo through the supply chain.



## Charterer

A charterer is a person or company that leases a vessel for a specific period of time.

## Stevedore

A stevedore is responsible for loading and unloading cargo from ships, using specialized equipment and skilled labor.



## Ship Broker

A ship broker acts as an intermediary between ship owners and charterers.

## Transporter

A transporter moves goods between the port and other destinations, utilizing rail, road, or other means of transportation.



## Marine Surveyor

A marine surveyor inspects vessels to assess their condition and ensure they meet safety standards.

Car Example

20

# Regulatory Agents

## Customs

Customs authorities are responsible for enforcing import and export regulations, collecting duties, and preventing smuggling.

## Housing Agent

A housing agent is responsible for finding storage facilities for imported goods. They coordinate with customs and other regulatory agencies to ensure the safe and secure storage of goods.

21

# Cargo Handling Equipment and Processes

## Shore Cranes

Shore cranes are large, powerful machines used for lifting and moving cargo between the vessel and the dock.



## Vessel Gear

Some vessels are equipped with their own cranes and other cargo handling equipment, facilitating loading and unloading operations.



22



## Bulk Material Handling Systems



### Conveyor Belts

Conveyor belts transport bulk materials efficiently over long distances, facilitating continuous flow within the port.



### Stacker Reclaimer

Stacker reclaimers are specialized machines for stacking and reclaiming bulk materials in storage yards, optimizing space utilization.



### Bucket Wheel Loader

Bucket wheel loaders are ideal for loading bulk materials into vessels or rail cars, offering high capacity and efficiency.



### Mechanized Wagon Loading

Mechanized wagon loading systems automate the loading of bulk materials into wagons, improving speed and accuracy.

23



## Vessel Arrival and Berthing

1

### Approach

The vessel approaches the designated **berth**, guided by **pilots** and **tugboats**. Communication channels ensure smooth coordination and safe navigation.

2

### Berthing Sequence

A carefully planned sequence of maneuvers guides the vessel towards the berth, involving **tugs** for precise **positioning** and **fenders** to absorb impact.

3

### Securing / Mooring

Once the vessel is securely alongside, **mooring** lines are attached to **bollards**, ensuring a stable connection and preventing movement.

24

## Vessel Departure and Tug Assistance

1

### Unmooring

The vessel is released from the **berth** by slackening **mooring** lines, preparing for departure.

2

### Tug Assistance

**Tugboats** provide maneuverability and control during departure, ensuring a safe and efficient passage from the berth.

3

### Departure

The vessel departs the port, guided by pilots and tugboats, navigating towards open waters.



25

## Commercial Terms & Applicable Laws

26

# Incoterms 2024

Incoterms 2024, the latest version of the **International Chamber of Commerce's** Incoterms rules, are a set of international trade terms that define the **responsibilities of buyers and sellers in international transactions**. They are designed to clarify the roles and responsibilities of parties in an international sale of goods.



27

Types of Transport	Any Mode or Modes of Transport		Sea and Inland Waterway Only				Any Mode or Modes of Transport				
INCOTERMS 2020	EXW	FCA	FAS	FOB	CFR	CIF	CPT	CIP	DAP	DPU	DDP
Transfer of Risk	At Buyer's Disposal	On Buyer's Transport	Alongside Ship	On Board Vessel	On Board Vessel	On Board Vessel	At Carrier	At Carrier	At Named Place	At Named Place Unloaded	At Named Place
Responsibilities & Charges											
Export Packaging	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER
Loading Charges	BUYER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER
Delivery to Port/Place	BUYER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER
Export Duty, Taxes & Customs Clearance	BUYER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER
Origin Terminal Handling Charges	BUYER	BUYER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER
Loading on Carriage	BUYER	BUYER	BUYER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER
Freight Charges	BUYER	BUYER	BUYER	BUYER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER	SELLER
Insurance	Negotiable	Negotiable	Negotiable	Negotiable	Negotiable	SELLER	Negotiable	SELLER	Negotiable	Negotiable	Negotiable
Destination Terminal Handling Charges	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	SELLER	SELLER	SELLER	SELLER	SELLER
Delivery to Destination	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	SELLER	SELLER	SELLER
Unloading at Destination	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	SELLER	BUYER
Import Duty, Taxes & Customs Clearance	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	BUYER	SELLER

INCOTERMS

28

## Incoterms [Most prevailing are shown]



29

## Charter Party & Similar Terms at Discharge Port

CHARTER PARTY TERMS	
<i>All Prices in USD Per Ton unless Specified</i>	
Inco Terms	FOB (Free on Board)
Freight in USD/Ton	48
Ex. Rate for USD - INR	Charterparty Date
Laycan Load Port	3, 9, 18, 27 Calendar Days
Laycan Dis Port	Load Port + 24 Days
NOR	24 Hours
Demurrage in USD/Day	20000
Dispatch	50%
Dis Rate Per Day MT	25000
Terms	WWDSHINC
Voyage Days	17 Days

SAIL's REQUIREMENT AT DISCHARGE PORT	
Berth Required	Panamax Compatible
Vessel to Berth	Within 24 Hours of NOR
Discharge Rate	25000 Tons Per Day
Demurrage	20000 USD for Underperformance
Dispatch Money	Commercial Wisdom
Handling Rate	Commercial Wisdom
ONWARD MOVEMENT OF CARGO TO PLANT	
Mode	Rail Transport to Bhilai
Per Day Rakes	3
Per Rake Qty MT	3800
Per Day Qty MT	11400
Per Month	342000
Per Year	4104000

30

## Important Terminology

### 1 Lay Time

Lay time refers to the agreed-upon period for a vessel to load or unload cargo at a port.

### 2 NOR

Notice of Readiness given by the Master of the Vessel with his readiness to Berth the Vessel. Given to Port Authority

### 3 Demurrage

Demurrage is a fee charged to the charterer for exceeding the agreed-upon lay time.

### 4 Dispatch Money

Dispatch money is a bonus paid to the charterer for completing loading or unloading within a shorter time than agreed.

### 5 Charter Party

A charter party is a contract outlining the terms and conditions of a vessel lease between the charterer and ship owner.

31

## Customs and Documentation

### 1 Shipping Bill

A document that details the cargo being imported or exported, including details about the vessel, shipper, and consignee.

### 2 Out of Charge

A declaration that customs duty has been paid, allowing the release of cargo from customs custody.

### 3 Customs Duty

Taxes levied on imported goods, payable to the customs authority in the importing country.

### Key International Shipping Documents

#### Shipper's Letter of Instruction

Detailed export shipping instructions summary for freight forwarder to follow.

#### Bill of Lading (BOL)

Issued by the carrier to the shipper, it provides ownership of the cargo to the holder.

#### Commercial Invoice

Proof of sale between seller and buyer. It acts like a freight passport and allows global shipments to clear customs.

#### Packing List

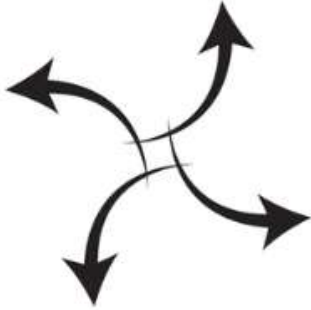
Allows parties to verify, all along the journey, that the items that were shipped are what was received.

#### Certificate of Origin

Certifies that goods were manufactured or processed in a particular country.

32

## Shipper Accountability



### Accurate Documentation

The shipper is responsible for providing accurate documentation, including invoices, packing lists, and bills of lading.

### Delivery on Time

The shipper is responsible for ensuring that the goods are delivered to the carrier on time.

33

## Receiver Accountability



### Inspecting Goods

Upon receipt of the goods, the receiver is responsible for inspecting them for any damage.



### Verifying Documentation

The receiver is responsible for verifying that the documentation matches the goods received.



### Unloading Goods

The receiver is responsible for unloading the goods from the carrier.



### Making Payment

The receiver is responsible for making payment to the shipper in accordance with the agreed-upon terms.



34

## Insurance Agent

### Coverage

Insurance agents help determine the appropriate coverage for the goods being shipped.

### Claims

They assist with filing claims in the event of damage or loss to the goods.



### Negotiation

They negotiate with insurance companies on behalf of the insured party.

### Risk Management

Insurance agents provide guidance on risk management strategies to mitigate potential losses.

35

## Letter of Credit in Shipping for International Trade

A letter of credit is a financial instrument used in international trade to ensure payment for goods or services. It acts as a guarantee from a bank to the seller, promising payment provided that certain conditions are met. This mechanism helps mitigate risk for both parties.



36

# Role of Bankers in Letter of Credit Transactions

## Issuing Bank

The issuing bank is the bank that issues the letter of credit on behalf of the buyer. This bank assumes the obligation to pay the seller if the seller fulfills the terms of the letter of credit.

## Advising Bank

The advising bank informs the seller about the issuance of the letter of credit. This bank may also provide additional services like verifying the authenticity of the letter of credit.

## Negotiating Bank

The negotiating bank is the bank that pays the seller against presentation of the required documents. This bank often checks if the documents comply with the terms of the letter of credit.

37

## Negotiable Documents in Letter of Credit Transactions

### 1 Bill of Lading

A bill of lading is a document that serves as a contract between the shipper and the carrier. It acknowledges receipt of the goods and outlines the terms of transportation.

### 3 Certificate of Origin

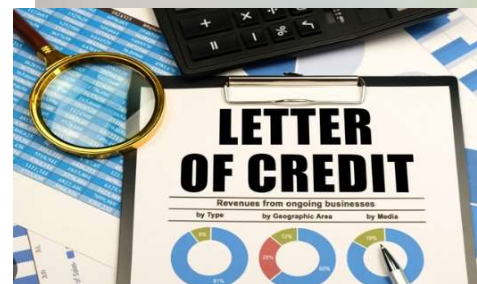
A certificate of origin is a document that certifies the country where the goods originated. This document may be required by the buyer's country for customs purposes.

### 2 Commercial Invoice

A commercial invoice is a document that details the goods being shipped, the price, and the buyer and seller information.

### 4 Insurance Certificate

An insurance certificate provides proof that the goods are insured against loss or damage during transportation.



38

## Governing Principles of Letter of Credit with Images

1

### Autonomy Principle

The letter of credit is independent from the underlying contract for the sale of goods. This means that the bank's obligation to pay is not dependent on the fulfillment of the underlying contract.

2

### Strict Compliance Principle

The seller must present documents that comply strictly with the terms of the letter of credit. Any discrepancies may lead to non-payment.

3

### Good Faith Principle

All parties involved in the letter of credit transaction are expected to act in good faith and provide accurate information.



39

## ECONOMICAL BUSINESS OPERATIONS

**ECONOMICAL** does not mean "CHEAP".  
**BENFIT / COST = VALUE**



40

**Lean is a process of eliminating waste with the goal of creating value for enterprise stakeholders.**

*-Lean Enterprise Value, Murman et al*

41



## **Supercharge Your Bulk Bulk Port Operations Operations with Lean**

### **Lean Tactics**

Bulk port operations are the backbone of global trade, but trade, but often struggle with **inefficiencies** that lead to **costly** to **costly delays and loss of productivity**. Unleash the power of lean operations to eliminate waste, optimize processes, and drive unparalleled efficiency and profitability.

42

# The Seven Forms of Waste

<b>D</b>	<b>DEFECTS</b>
<b>O</b>	<b>OVER PRODUCTION</b>
<b>W</b>	<b>WAITING TIME</b>
<b>N</b>	<b>NON-ENGAGING EMPLOYEES</b>
<b>T</b>	<b>TRANSPORTATION UNWANTED</b>
<b>I</b>	<b>INVENTORY IN EXCESS</b>
<b>M</b>	<b>MOTION UNNECESSARY</b>
<b>E</b>	<b>EXCESS PROCESSING</b>

43

## Defects



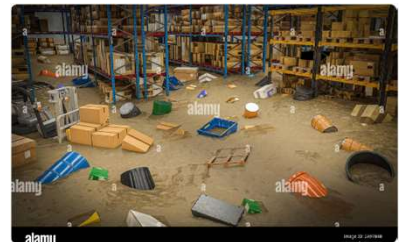
### Causes

Poor quality materials, faulty equipment, and inadequate handling practices.



### Impact

Increased rework, delays, and potential for potential for safety hazards.



### Solutions

Quality control measures, preventive maintenance, and training for proper handling.

44

# Overproduction

## Causes

Unpredictable demand, inefficient planning, lack of communication, and excessive safety stock.

## Impact

Increased storage costs, potential for material degradation, and risk of obsolescence.

## Solutions

Demand forecasting, just-in-time production, and optimized inventory management.



45

# Waiting at Roads



1

2

3

## Causes

Equipment breakdowns, delays in ship arrival, inefficient loading and unloading processes, and poor communication.

## Impact

Increased turnaround time, reduced throughput, and idle equipment costs.

## Solutions

Preventive maintenance, efficient scheduling, and optimized processes to minimize downtime.

46

# Transportation

## Causes

Unnecessary movements, poorly designed layout, and inefficient transportation methods.

## Impact

Increased fuel consumption, time delays, and wear and tear on equipment.

## Solutions

Optimized layout, efficient routing, and use of appropriate transportation equipment.

47



# Inventory

## Causes

Unpredictable demand, excessive safety stock, and inefficient inventory management.

1

2

## Impact

Storage costs, material handling costs, and risk of damage or obsolescence.

## Solutions

Demand forecasting, just-in-time inventory, and optimized warehousing processes.

3

48



## Motion



### Unnecessary Movement

Workers walking unnecessarily long distances to complete tasks.



### Reaching for Items

Workers reaching for tools or materials that are not within easy reach.



### Excessive Bending

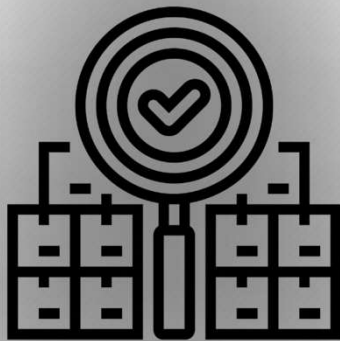
Workers bending or twisting repeatedly to perform tasks, leading to fatigue and injuries.



### Improper Lifting

Workers lifting heavy items improperly, increasing the risk of injury.

49



## Excess processing

Causes	Redundant checks, unnecessary rework, and inefficient handling.
Impact	Increased processing time, wasted resources, and potential for errors.
Solutions	Streamlined processes, standardized procedures, and continuous improvement initiatives.

50

## Improving Downtime in Bulk Port Operations

Downtime in bulk port operations can be a major source of inefficiency, impacting productivity and profitability.

Implementing **lean principles** can significantly improve downtime by reducing delays, streamlining processes, and optimizing resource utilization.

This increases the **Vessel Turn Around** time at Ports.



*Let us try... more ground level improvements.....*

51

## How to achieve Lean Management in Bulk Port Operations

- |   |                                       |
|---|---------------------------------------|
| ✓ Execute the Cargo Handling Contract             | [To have a valid contract in place]   |
| ✓ Plan the Vessel Sequence efficiently            | [To avoid Bunching of Vessels]        |
| ✓ Pre-vessel-arrival meetings                     | [To Plan cargo movement]              |
| ✓ Plan Manpower well in advance                   | [To meet the demand at work area]     |
| ✓ Keep Labour Holidays in mind before planning    | [To meet contingencies]               |
| ✓ Allocate cargo handling equipment               | [To meet the contractual terms]       |
| ✓ Coordinate with the Berthing Department         | [To ensure vessel is berthed on time] |
| ✓ Ensure Payment of Port Service Charges          | [To avoid contractual disputes]       |
| ✓ Berth the Vessel only when Customs Duty is Paid | [To move Cargo out E.g. Import]       |
| ✓ Ensure Hand-to-hand relieving                   | [To ensure highest output]            |
| ✓ Plan evacuation of cargo                        | [To maximize storage capacity]        |
| ✓ Effectively close the Vessel Operations         | [To conclude the Shipment]            |

52

# Case Studies and Best Practices

Port of Rotterdam	Automated container terminals, innovative energy solutions.
Port of Singapore	Seamless cargo flow, digitalization initiatives.
Port of Long Beach	Green technology adoption, environmental sustainability programs.



# Open for Discussion

