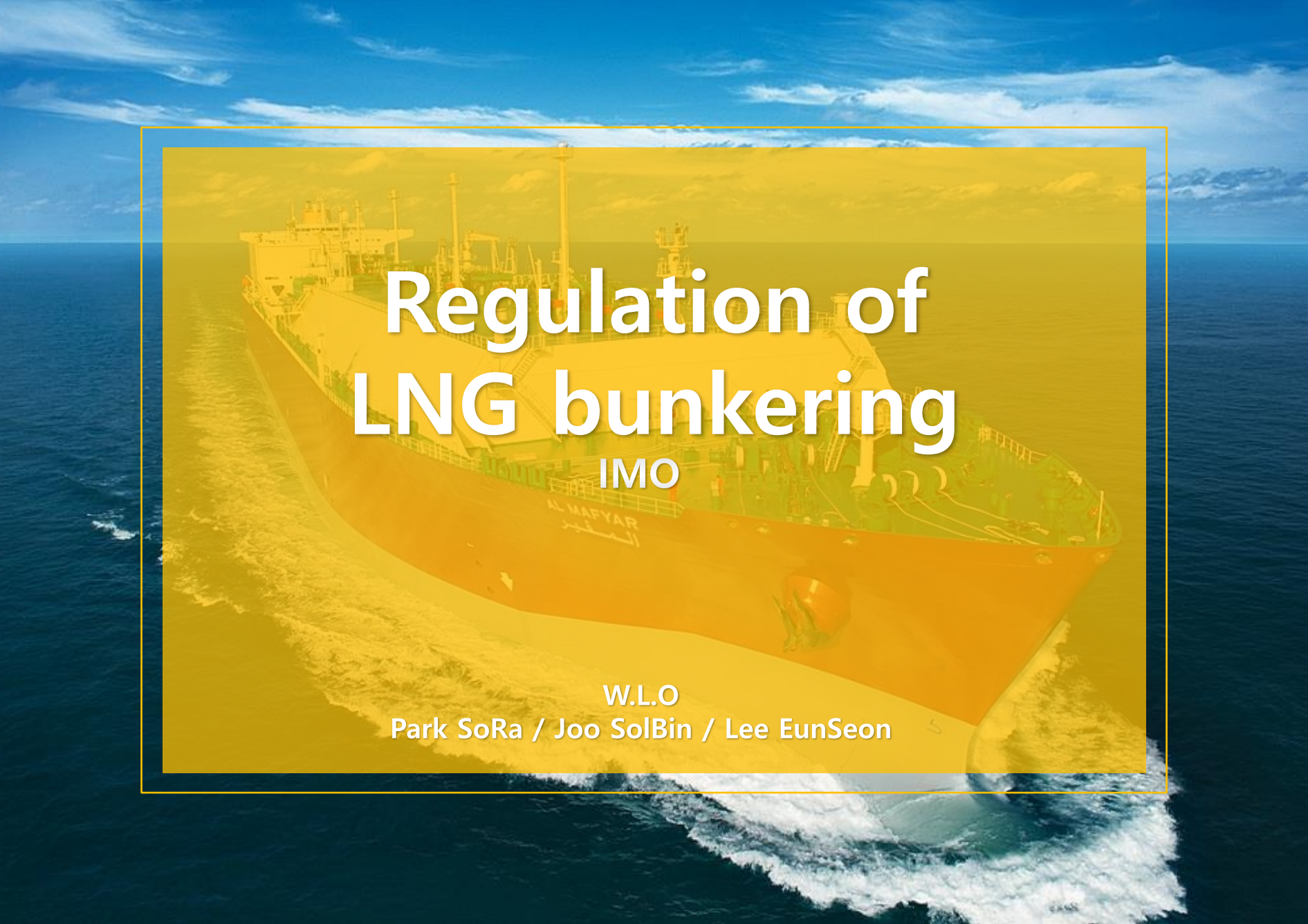
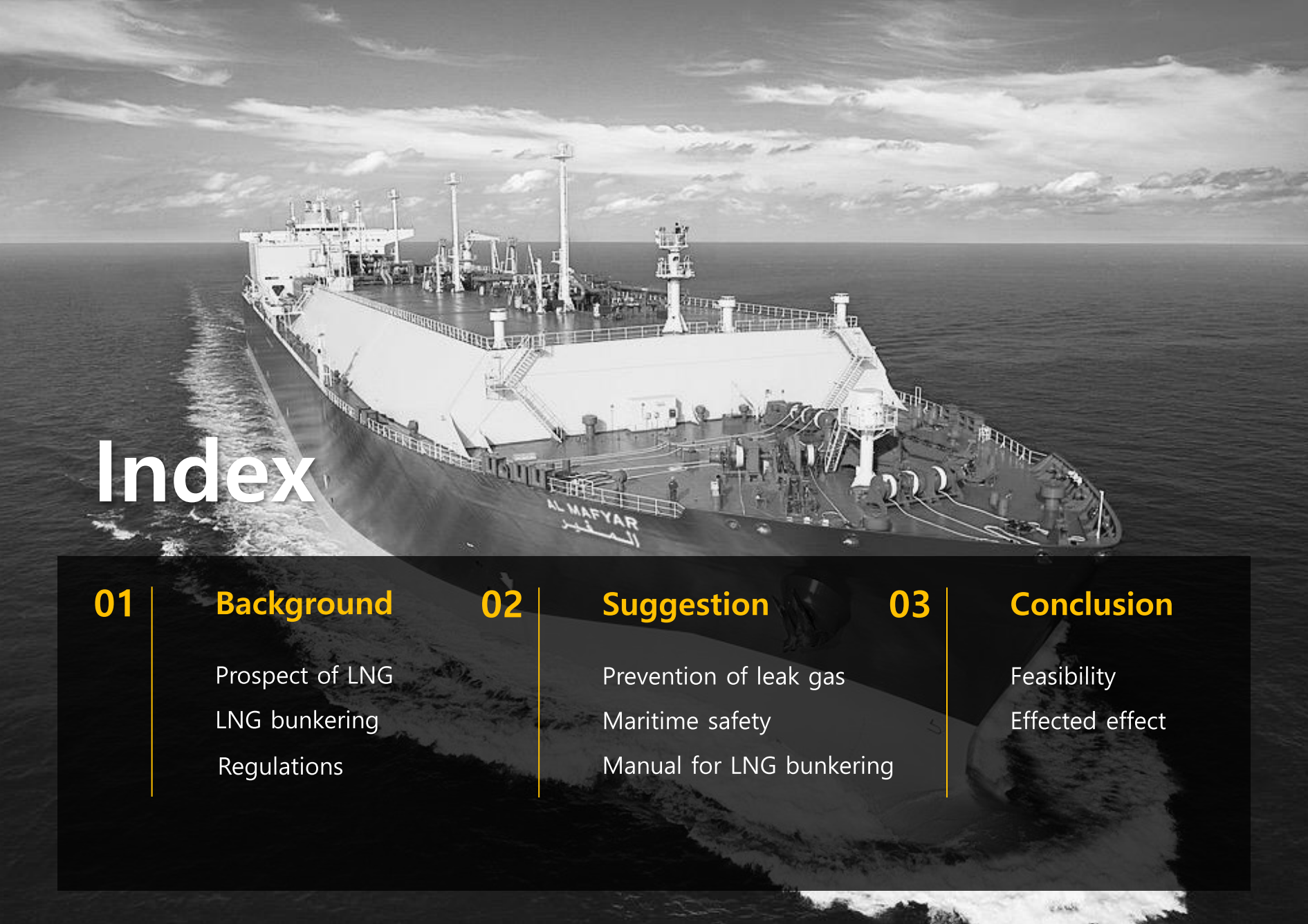


Regulation of LNG bunkering

IMO

W.L.O
Park SoRa / Joo SolBin / Lee EunSeon

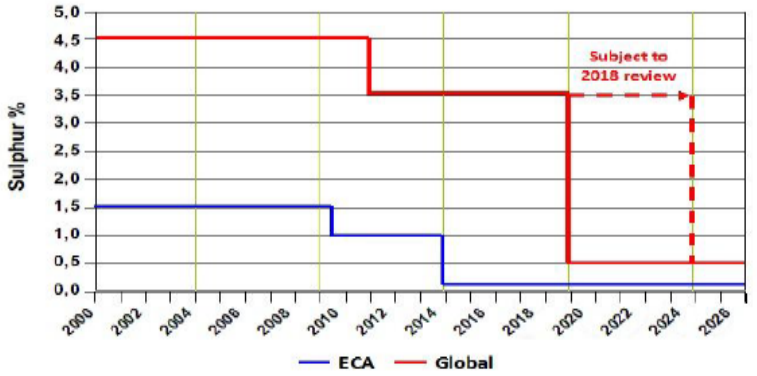


Index

Background

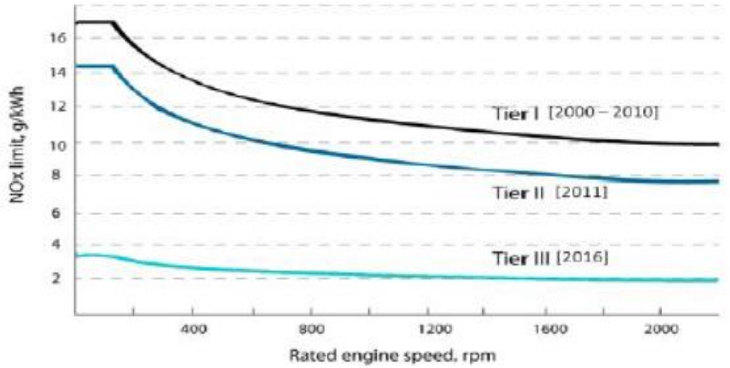
Regulation of Emission

1) NO_x / SO_x



MARPOL Annex VI SOx Emission Limit

Data: tri-zen

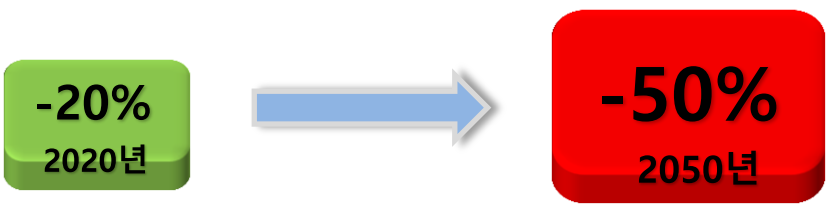


MARPOL Annex VI NOx Emission Limits

Data: tri-zen

IMO future plans for regulation

- The vessel which has been built since January, 2013 should observe EEID regulation
- Emission of greenhouse has



Regulation of Emission

2) ECA (Emission Control Area)

: The region notified to the international maritime Organization by parties to the Convention around the emission control area to prevent, reduce and control the NO_x, SO_x and Particular Matter or all three types of emissions from the ships.

- **Baltic Sea area**
- **North Sea area**
- **North American area**
- **Puerto Rico and US Virgin Islands area**

LNG vs Conventional Oil

1) Environment

Data: DNV

Environmental emissions for alternative concepts for a typical baltic sea cargo ship

- **Sox -100%**
- **Nox -85%**
- **MDO -25%**

2) Economic

LNG price competitiveness

$3 ~ $15

- Increase LNG production
- Shale gas in U.S

Oil price competitiveness

$13 ~ $22

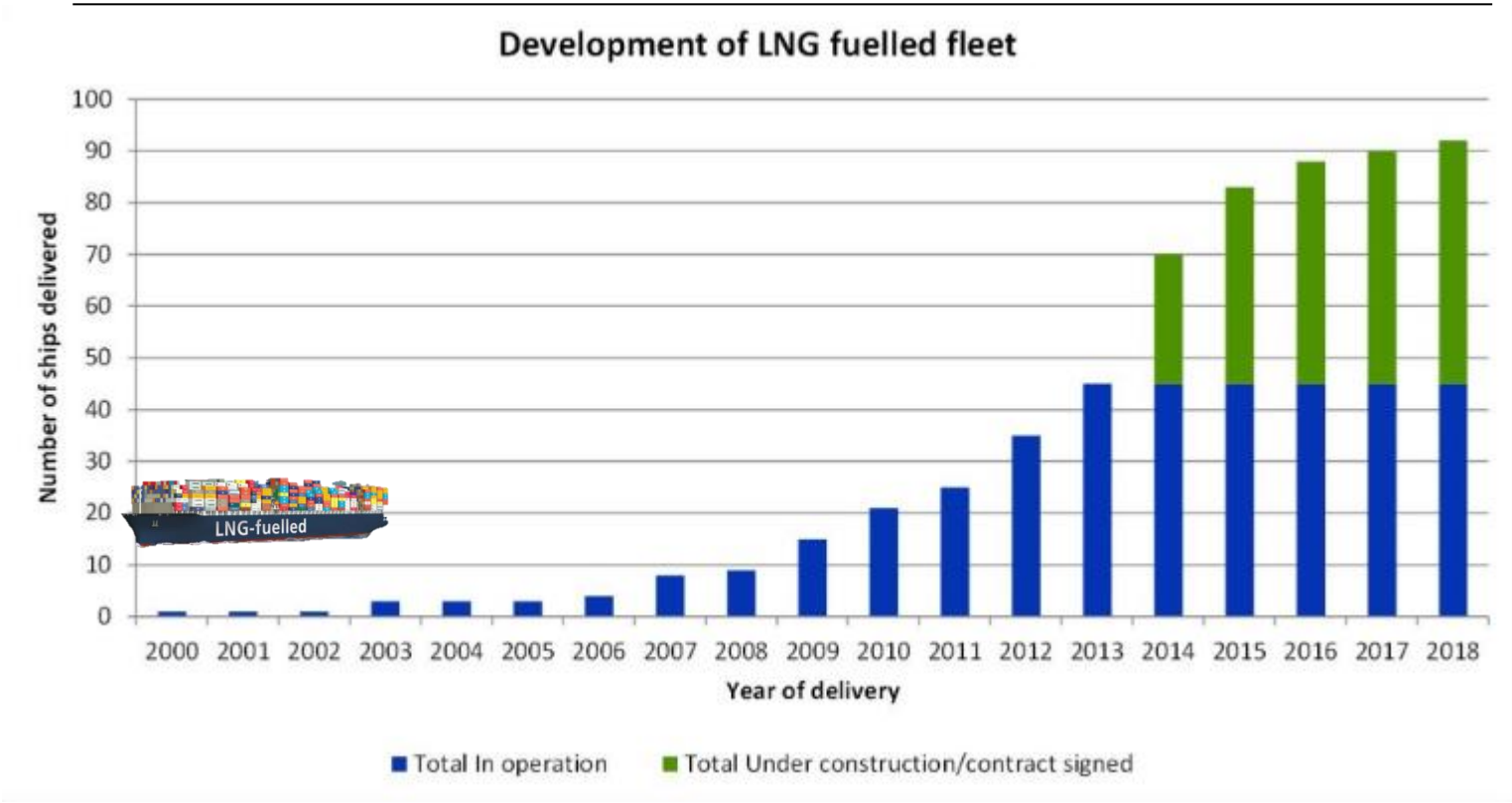
- Decrease Oil production
- Instability of Oil market

Data: KOGAS

LNG propulsion system

Increasing of LNG propulsion system

Data: DNV

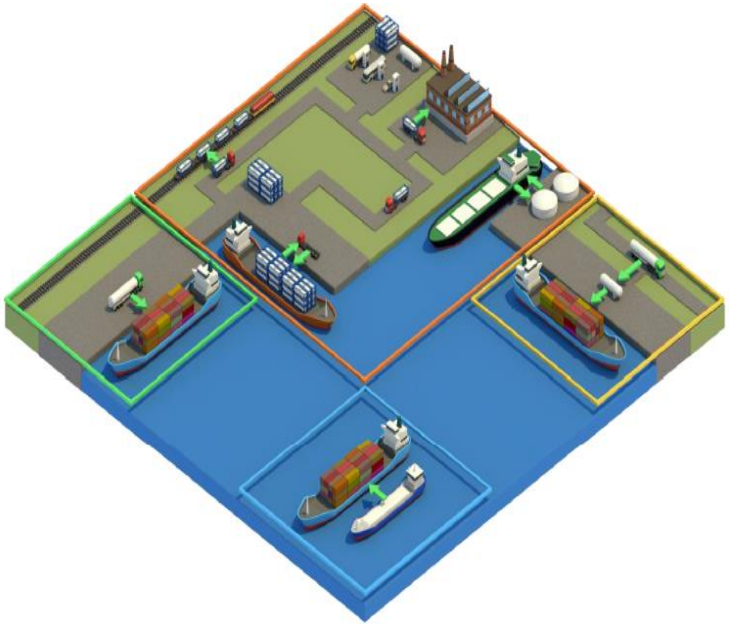


LNG Bunkering

1) Definition

: LNG Bunkering is inclusive of the supply procedure to gas fueled vessel and infrastructure

Bunkering process	Definition
Ship to Ship (STS)	It is the transfer of LNG from one vessel or barge, with LNG as cargo, to another vessel for use as fuel.
Truck to Ship (TTS)	It is the transfer of LNG from a truck's storage tank to a vessel moored to the dock or jetty.
Terminal to Ship	LNG is transferred from a fixed storage tank on land through a cryogenic pipeline with a flexible and piece or hose tank to a vessel moored to a nearby dock or jetty.
Portable Tanks	They can be used as portable fuel storage. They can be driven or lifted on and off a vessel for refueling.

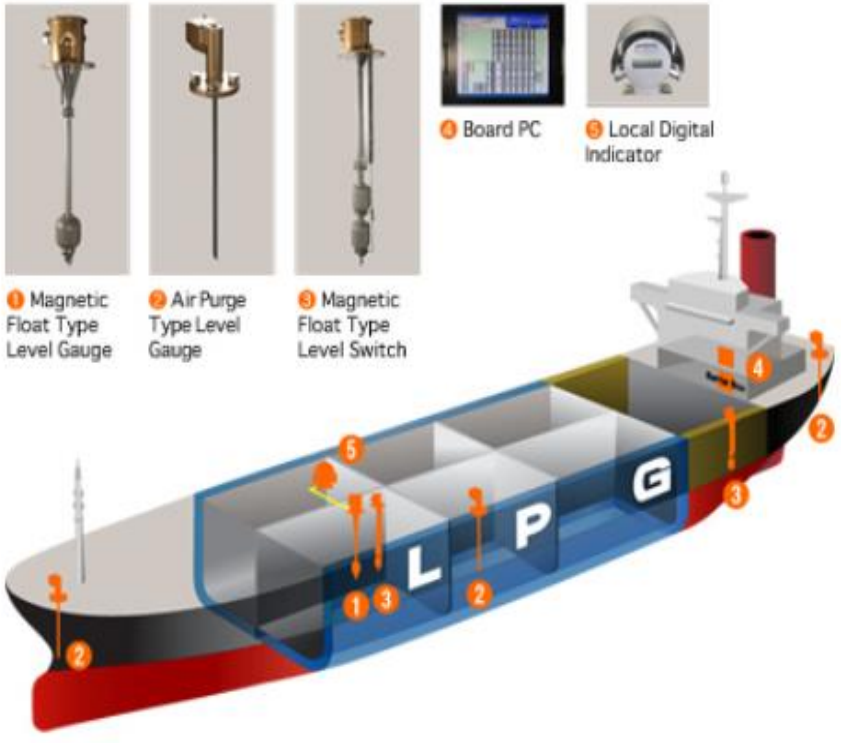


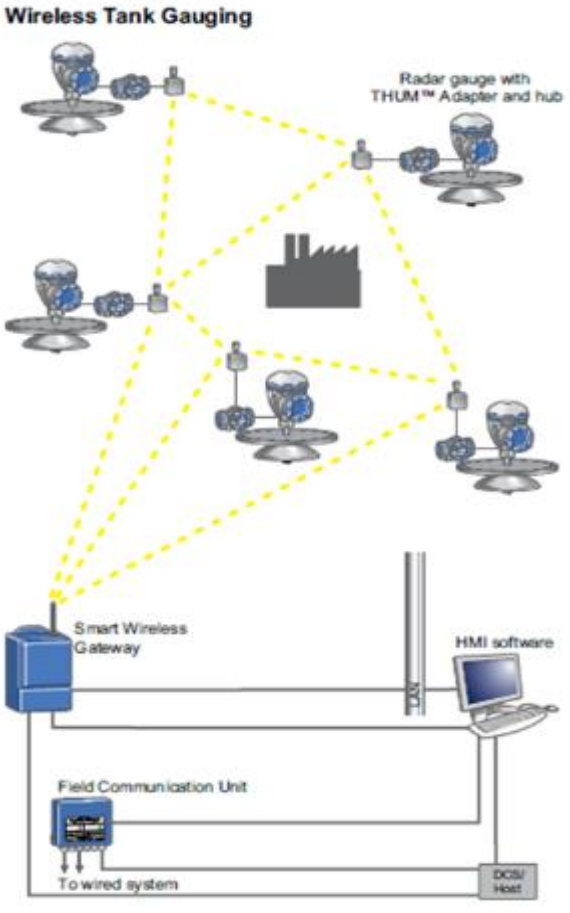
Rules for LNG bunkering

Standards	Name	Theme
ISO	ISO28460	Installation & equipment for liquefied natural gas-ship to shore interface & port operation
	ISO TC 67 WG 10	Guideline for system & installation for supply of LNG as fuel to ships
	ISO 10976	Refrigerated light hydrocarbon fluids. Measurement of cargoes on board LNG carriers
EN	EN 1160	Installation and equipment for liquefied natural gas. General characteristic of liquefied natural gas and cryogenic materials
	EN 1473	Installation and equipment for liquefied natural gas – Design of Onshore installations
	EN 1474-3	Installation and equipment for liquefied natural gas – Design and testing of marine transfer system – Part 3: offshore transfer systems
SIGTTO		LNG ship to ship transfer Guidelines
		ESD Arrangements & linked ship / shore systems for liquefied gas carriers
		LNG transfer Arms and Manifold Draining, Purging and Disconnection Procedure
		LNG STS Transfer guide
		Liquefied gas carriers – Your Personal safety guide
		Liquefied Gas Fire Hazard Management

Suggestion

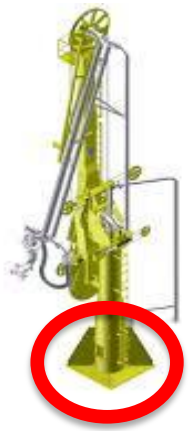
Wireless Tank Gauging

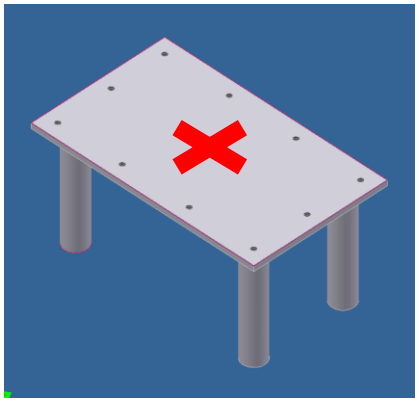


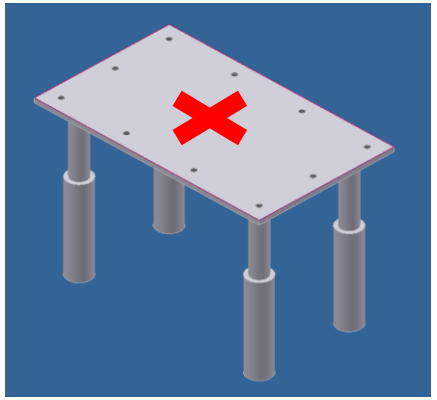


Flexible of Loading arm

1) Controllable height of Loading arm system (Heave motion)



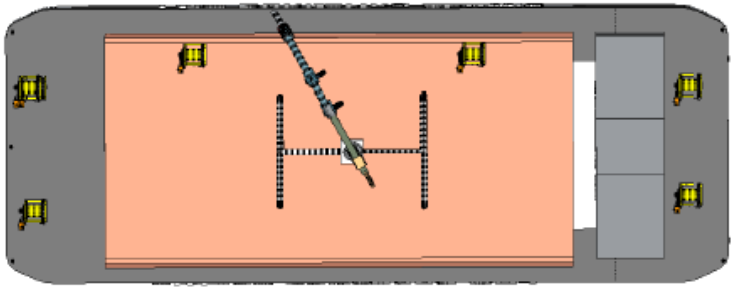


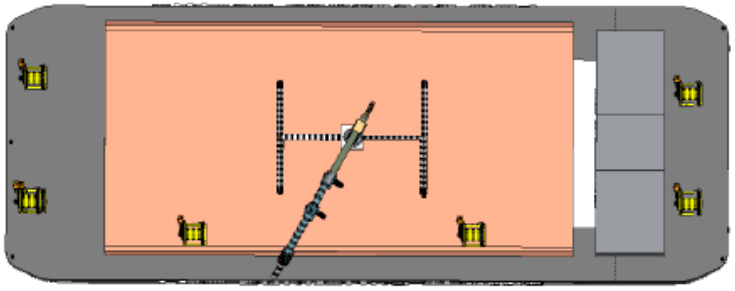


Flexible of Loading arm

2) Rotatable Loading arm system (Surge motion)

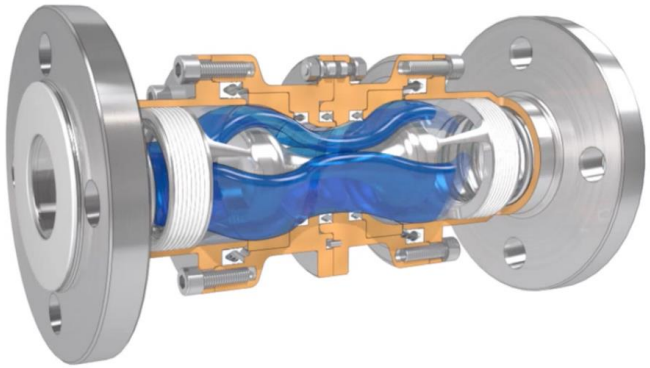
Maximum angle : 270°



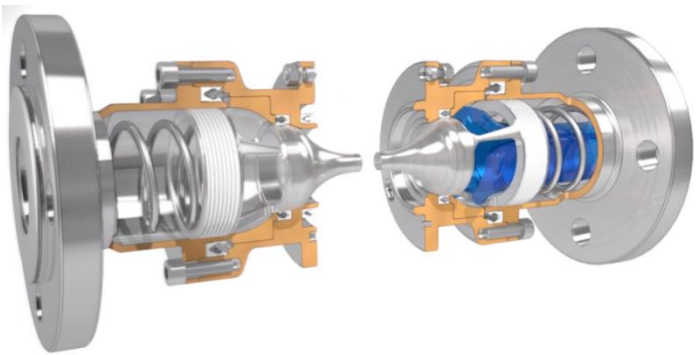


Safety Breakaway Couplings

- Safe function in the temperature range from -196℃ to 60℃ (Cryogenic)
- Controlled separation through breaking pins
- Quick disconnecting by spring



Normal



Emergency

Shooting mooring system

Problems of throwing by workers

- Risk of Fall accident
- Take long time
- Inefficient

Solution

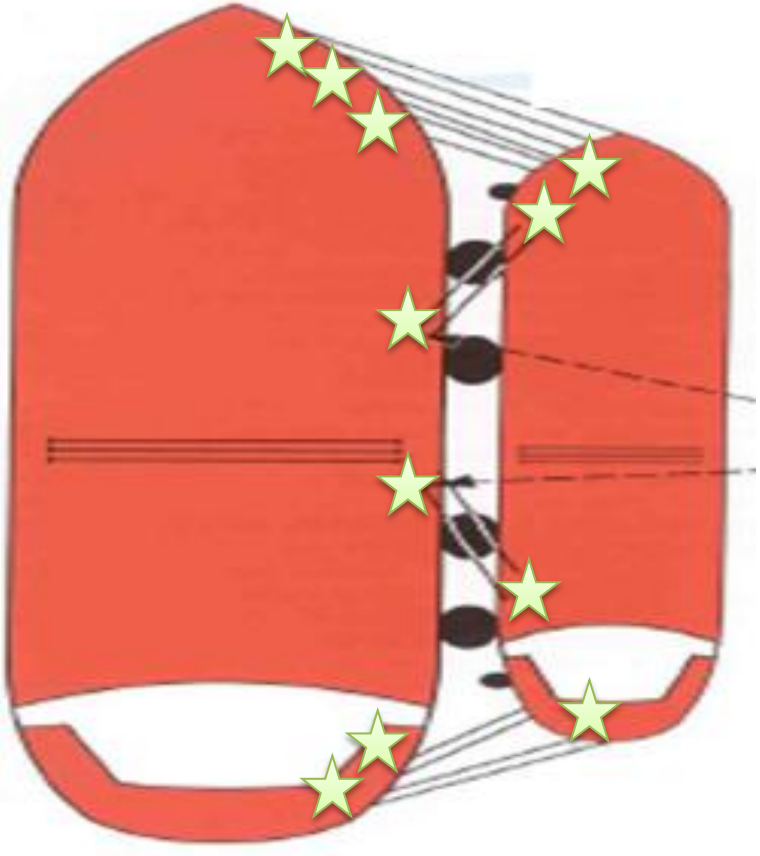
- Shooting mooring line by machine
- Speed and Accuracy
- Easy to control

EFFICIENT & SAFE

W.L.O

Shooting mooring system

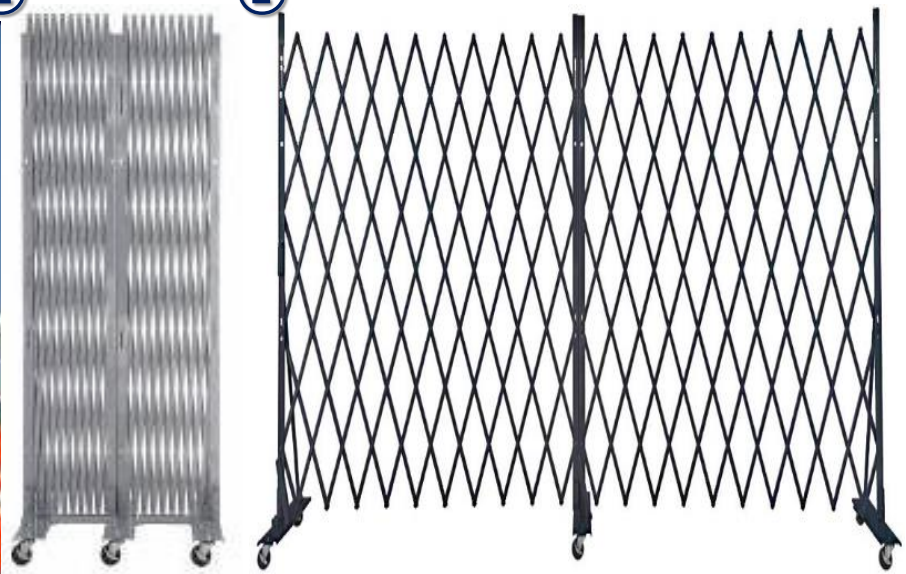
Shape of grabbing device



- Remote-controlled shooting machine
- Automatic grabbing device

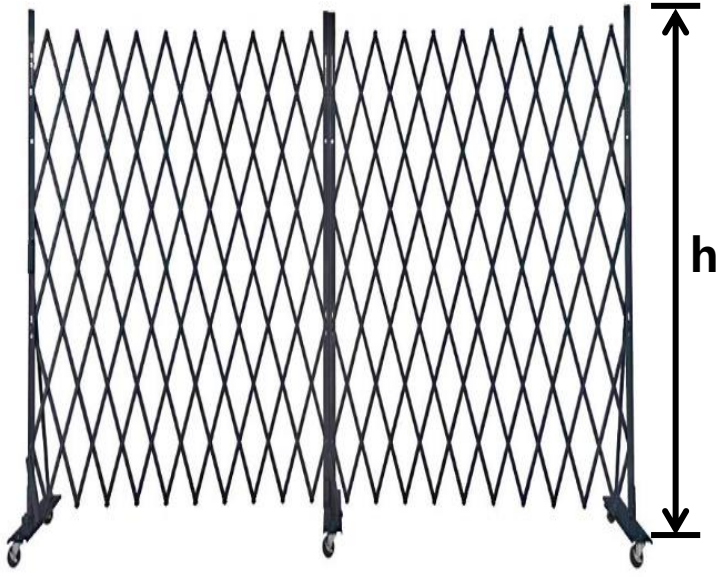
Collapsible Fence

① ②



- An alternative of Safety supporting rope
- Occupy less space by folding
- Easy use and transportation

Collapsible Fence



- **Height (h) : > 90 cm**

*Based on Standard safety handrail

LNG bunkering manuals & checklists

Operational check	Ship	Supplier	Code	Remarks
There is safe access between the receiver and supplier				
The ship is securely moored with fenders in good condition and no possibility of metal to metal contact				
Bunker hoses or arms and vessel lines are in good condition, properly rigged and appropriate for the service intended and pressure tested within a year prior				
The emergency signal and shutdown procedure to be used by the ship				
There is sufficient suitable protective equipment				
Bunker tank contents will be monitored at regular intervals				
Bunker tanks are protected against inadvertent overfilling at all times while any loading operations are in progress				
The gas detection equipment has been properly set for the bunker and is calibrated, tested and inspected and is in good order				

* Example of LNG bunkering checklists

Conclusion

Effected Effect

Suggestion	Effected Effect
Wireless Tank Gauging	- Save on materials costs and labor costs - Save on operation & response time - Contribute to monitor other system efficiently
Flexible of Loading arm	- Widen the range of bunkering area - Overcome risk of Heave, Surge motion and draft gap - Reduce risk of moment by controlling bottom of loading arm
Safety breakaway Coupling	- Prevention of release gas for emergency - Effective method to normal disconnecting
Shooting mooring system	- Save on operation time - Applicable to other mooring system for vessels - Reduce the risk of fall accident - Extend to constructing part
Collapsible fence	- Alternative of Safety supporting rope - Extend to constructing and other vessels to prevent from fall accident

Thank you

WLO