Green Ship
---A Theme of Shipbuilding Industry in China

CANSI

28th November 2014

Content

1. The Development of China Shipbuilding Industry

2. Current Challenges

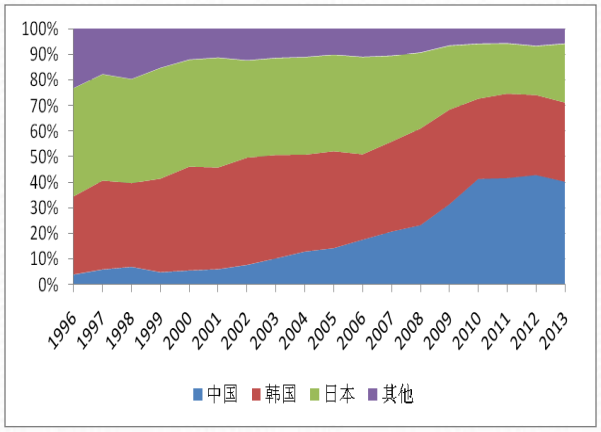
3. Priority of Shipbuilding Industry in China

Content

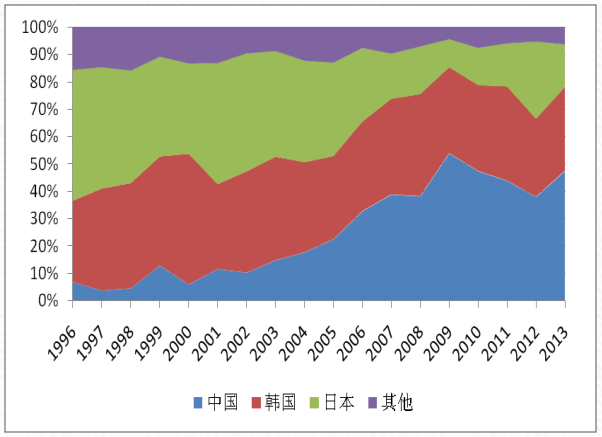
The Development of China Shipbuilding Industry

According to statistics published by CANSI， there were 815 shipbuilding companies in China in 2013, with the completion of 45.34 million DWT, accounting for 41.4%.The total new orders of ships undertook by shipbuilding enterprises in China amounted to 69.84 million DWT (47.9%). The amount of holding orders in Chinese shipbuilding enterprises was 131 million DWT (45.9%)

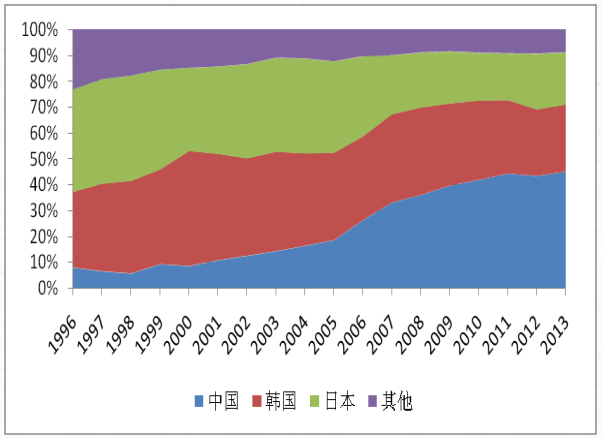
Completion



New Orders



Orderbook

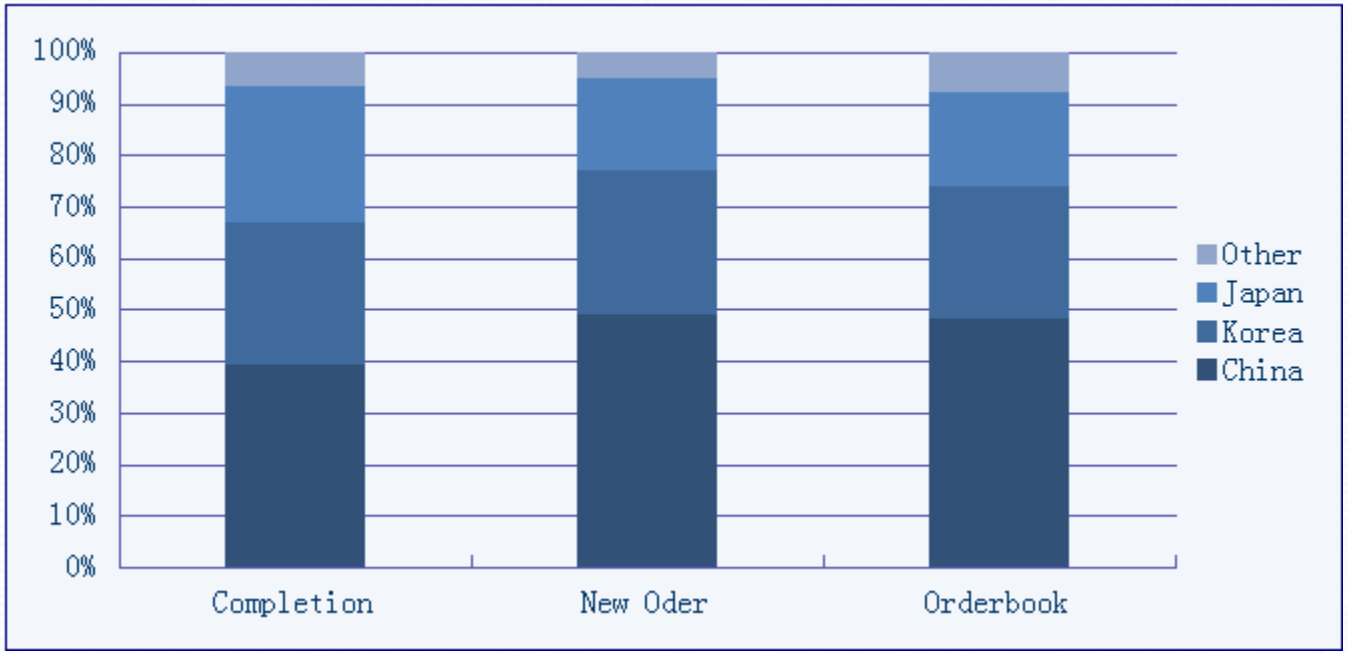


The Development of China Shipbuilding Industry

From January to October of 2014, the completion volume of ships in China was 30.50 million DWT (33.2%) . China received orders of 46.56 million DWT (49.1%) and kept existing orders of 155.48 million DWT (48.1%)

Overview of the Shipbuilding Market

2014.01~10



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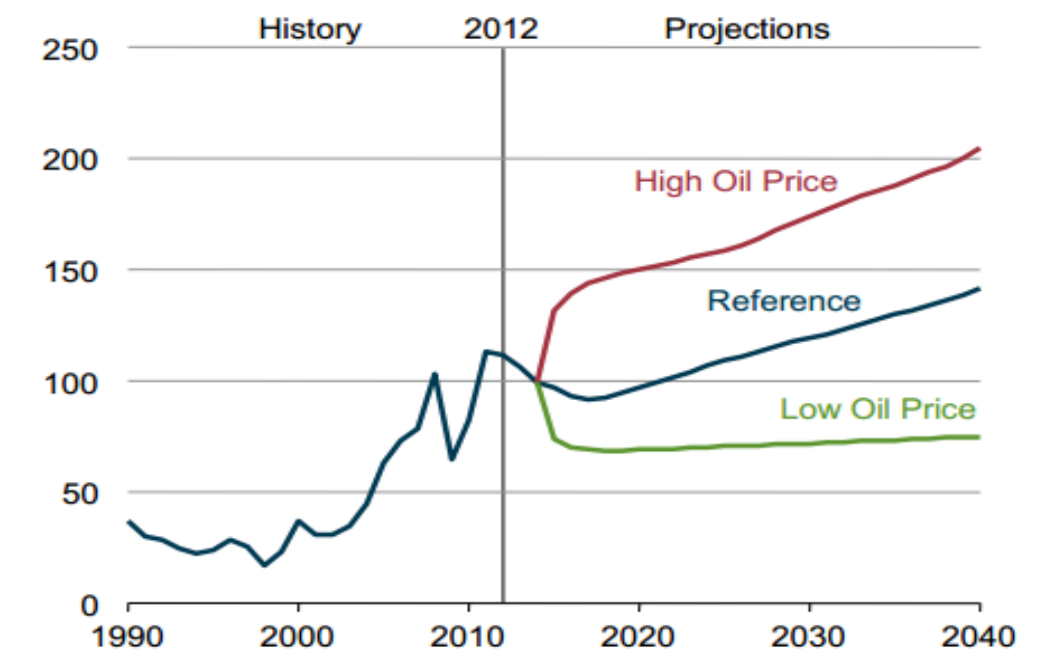
Challenge 1: Cheap oil is the past thing



Source: EIA, International Energy Outlook 2014

- In present, fuel cost accounts for 50% to 70% of the total operating cost.
- In future, the oil price will stay strong, unlikely to decrease in large scale.

Challenge 2: Overcapacity

- The overcapacity coexists in both shipbuilding industry and shipping industry. For the years to come, the demand of ships will remain weak. As a result, China shipbuilding industry and even the global shipbuilding industry at large have to face such an unprecedented challenge.

Challenge 3: Ship emission threatens human life

- The Greenhouse Effect, Ozone Depletion, Acid Rain Spread, Land Desertification, Air Pollution, water pollution, Marine Pollution ...

- The emission of ships are deteriorating those crises, greatly threatening humans.

- A large containership using 3.5% sulfur fuel oil , sailing at 70% of the maximum loading power could emit PM2.5 equivalent to 500 thousand trucks a day.

Challenge 4: IMO Regulations

IMO

SRC

AFS

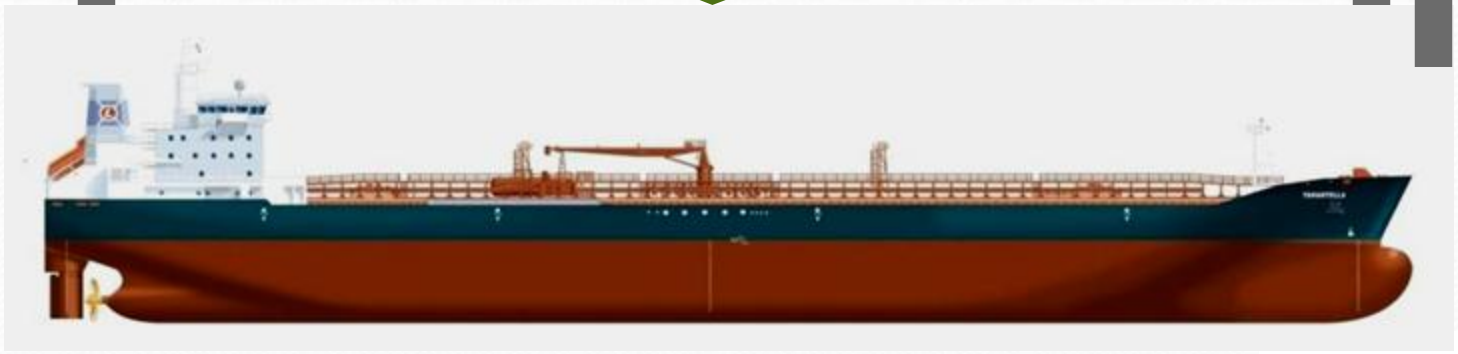
MARPOL

BWM

SOLAS

Harmful Aquatic Organisms in Ballast Water

Hazardous materials



EEDI、EEOI、SEEMP、NOx、SOx、PM/Black Carbon

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Green Ship as the Thematic Guidance

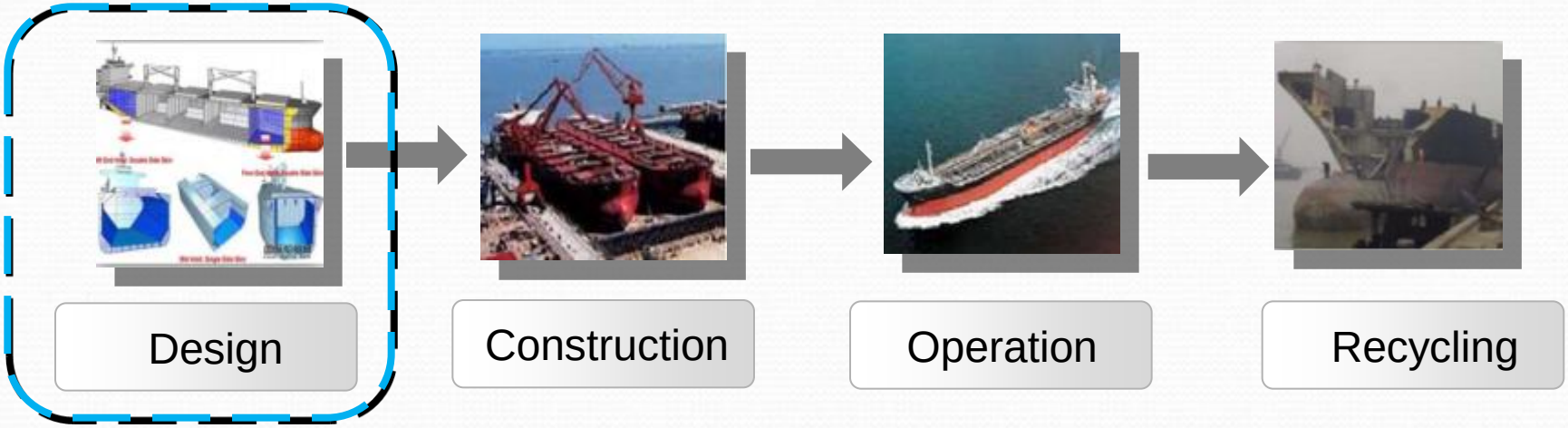
In the context of industrial restructuring of shipping and shipbuilding industry over the next 10 to 20 years, China shipbuilding industry is committed to deepening structural adjustment and taking reforming as motive force to promote the development.

We focus far more on quality, efficiency and cost effectiveness, and persist in the course of efficient, green and sustainable development. Therefore, developing the green ship technology becomes thematic guidance in China.

What is green ship?

The elements of green ship include:

- Environment
- Efficiency
- Human health



How to Make the Ultimate Green Ship

The Chinese shipbuilders pay more attention to technologies on saving the consumption of materials and energy without affecting the quality and navigation safety.

For 2016

Better Hull Line Design

ESD Design

Engine Loading Optimization

Propeller Optimization

MGO (Marine Gas Oil)

EGR and SCR

Coating Selection

For 2020

Pure LNG or Scrubber?

Low Speed for EEDI phase II?

NEW ENVIRONMENTAL REGULATIONS AND TECHNICAL SOLUTIONS

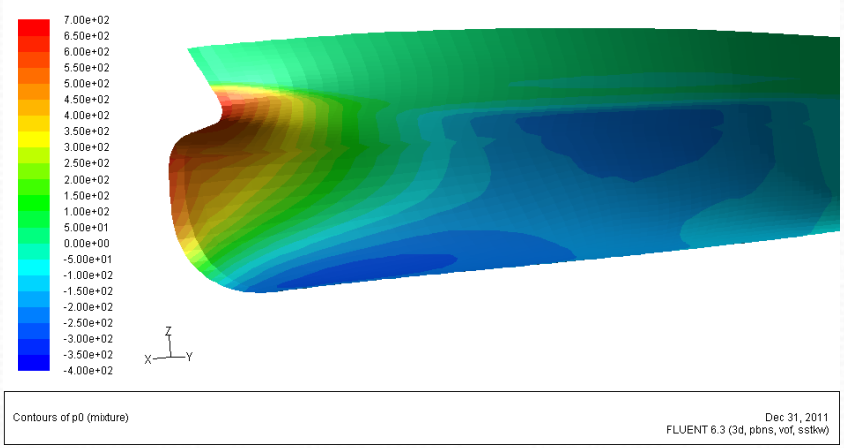
TARGET	APPROACH	TECHNICAL MEASURE	SOx		NOx	CO2		BALLAST WATER
			ECA 0.1%S	GLOBAL 0.5%S	Nox TIER III	EEDI Phase2	ENERGY EFFICIENCY	D-2 Standard
			2015	2020	2016	2020	Always	Upcoming
Energy saving	Hull	Hull shape optimization						
		Energy saving device						
		Large diameter propeller						
		Lightweight optimization						
		Advanced A/F coating						
	Machinery	Reducing installed power(SMCR)						
		"G"type or "X"type M/E						
		Derating/Low RPM						
		Part or low load optimization						
		Waste heat recovery system						
		Auxiliary Systems Optimization						
Environmental protection	Fuel strategy	HFO + LSFO(0.1%S) within ECA						
		LSFO(0.1%S) within ECA + LSFO(0.5%S) in global						
		HFO + SOx scrubber						
		HFO + LNG within ECA						
		Pure LNG as fuel						
	Equipment	Selective catalytic reduction(SCR)						
		Exhaust gas recirculation(EGR)						
		Ballast water treatment system						

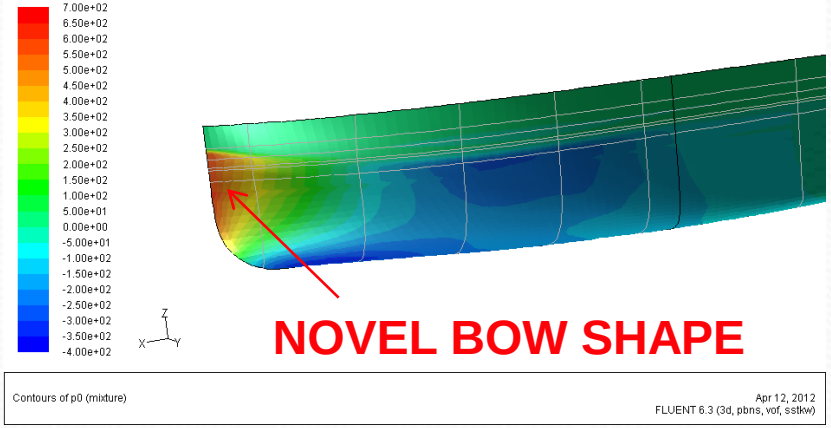
Benefit

Adverse

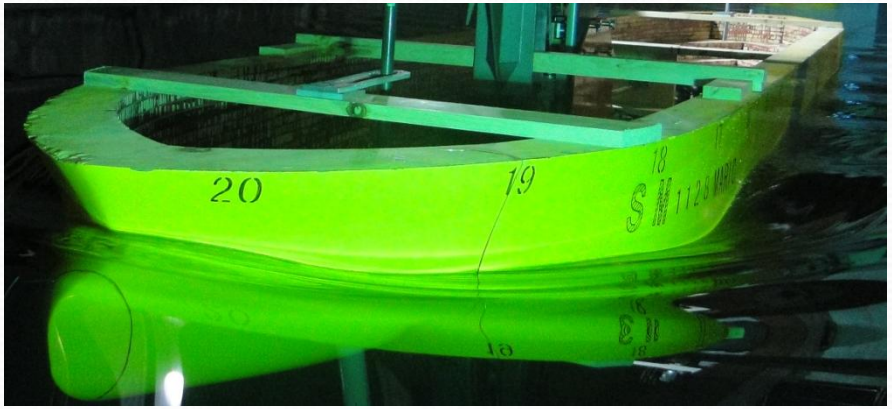
➢ Hull Lines Optimization

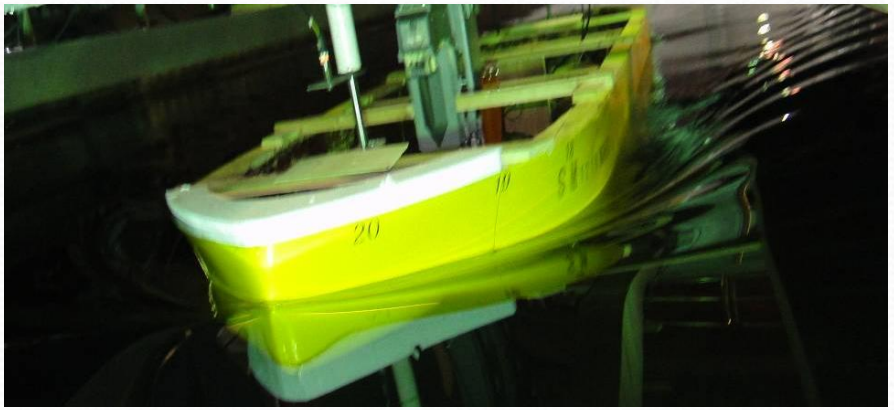
Performance prediction by CFD





Validation by model test





➢ Energy Saving Device

◆Designed by MARIC

DUCT

+

RUDDER FIN

SAVING ENERGY:

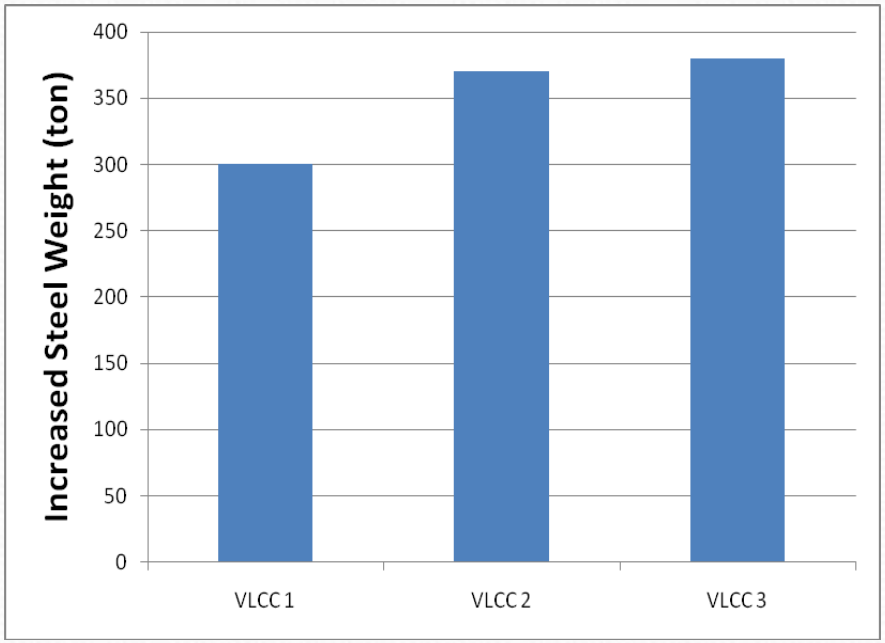
4~6%

◆Manufactured by shipyard

➢ Lightweight Optimization

Harmonized CSR:

1st July 2015, enter into force.



Common Structural Rules for

Bulk Carriers and

Oil Tankers

➢Optimized design:

- Lines and loading condition
- Structural Arrangement
- Scantling optimization
- Detail optimization, especially for anti-fatigue
- Higher tensile steel
- Workmanship

➢ NOx Control

EGR

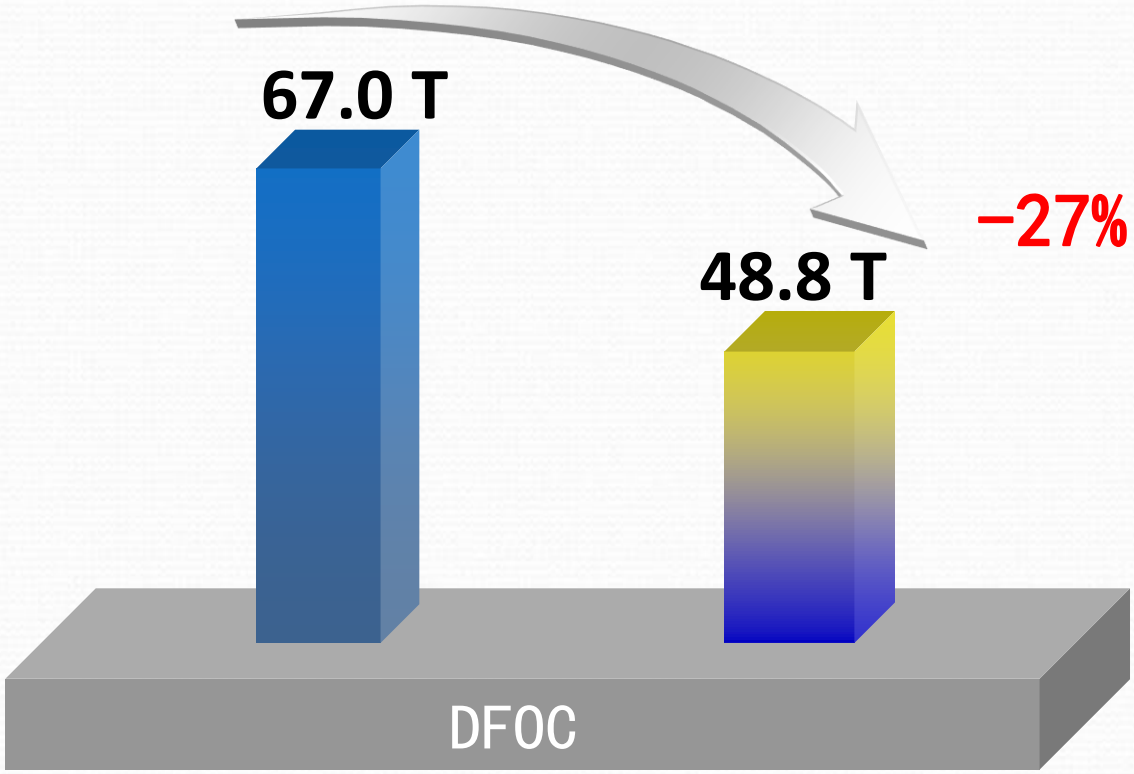
EGR	SCR
Internal engine	After-treatment method
SFOC increased 4g/kwh at 100%MCR 3.5g at 85% 2g at 50%	SFOC increased 0.5g/kwh at 75%-100%MCR 1-2g at low load
5-13kw/MW SMCR	5kw/MW SMCR
Engine aft part arrangement	Engine fore part arrangement
	Ammonia Urea only for MAN
Additional System	Additional System
MAN	MAN WARTSILA
Not available for A.E.	Available for A.E.

SCR

➢ Energy-Saving Design

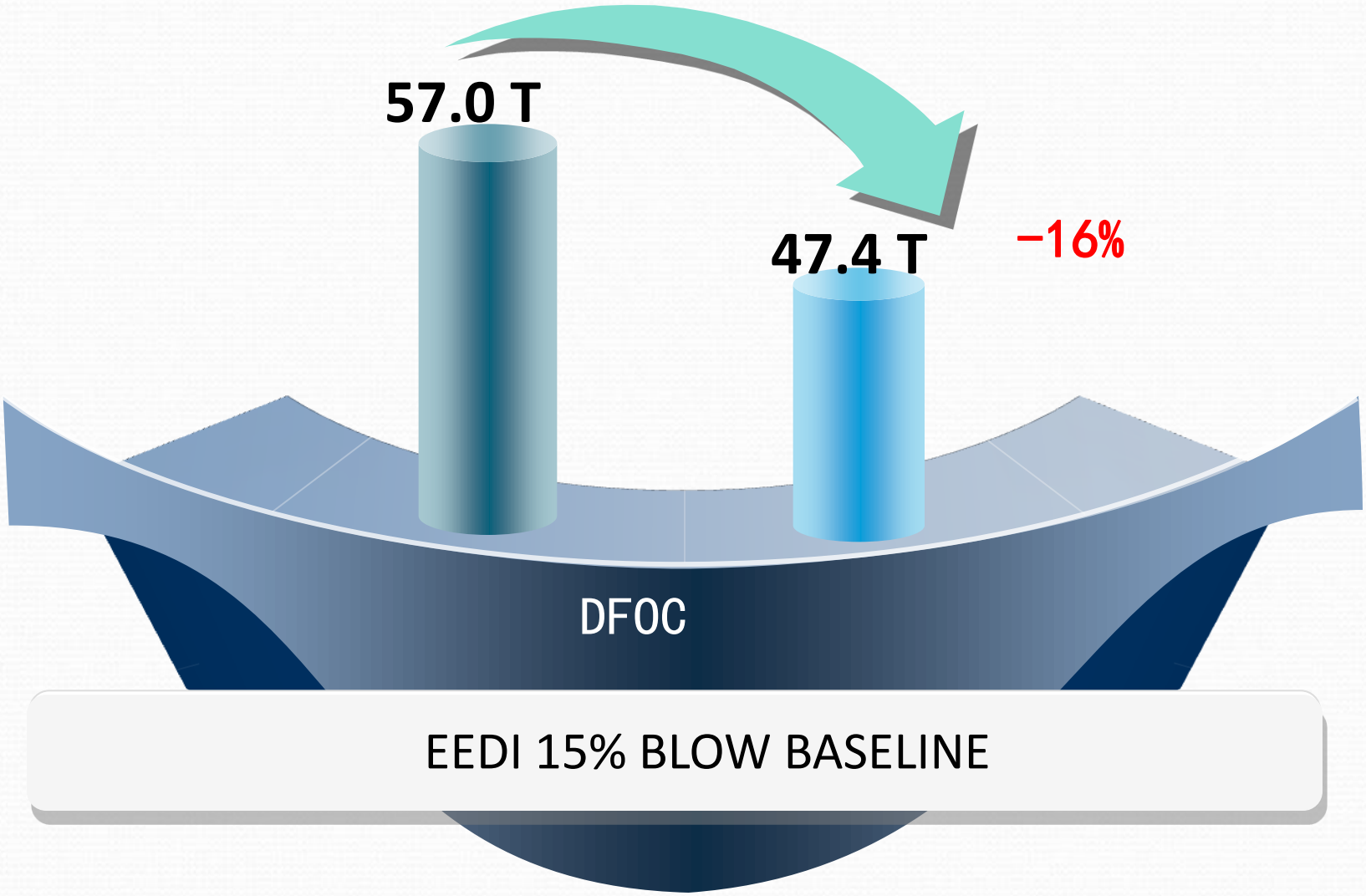
Bulk Carrier

208,000 DWT NEWCASTLE MAX



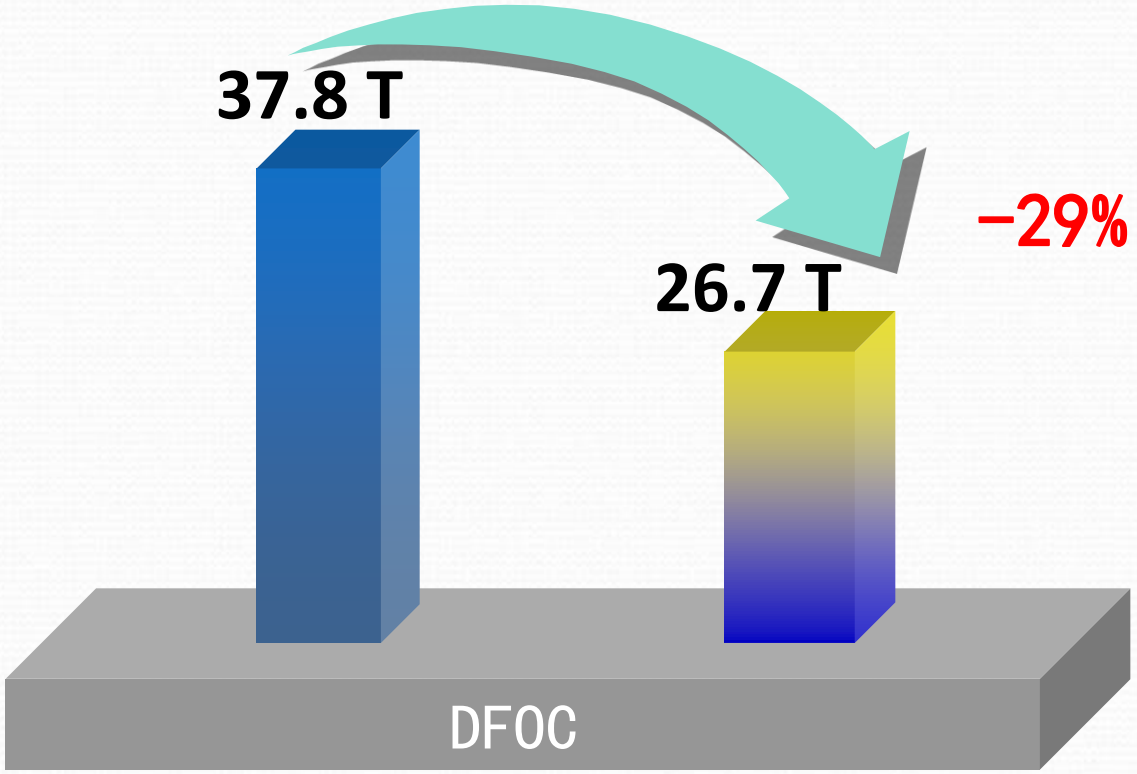
EEDI 21% BELOW BASELINE

180,000 DWT DUNKIRK MAX



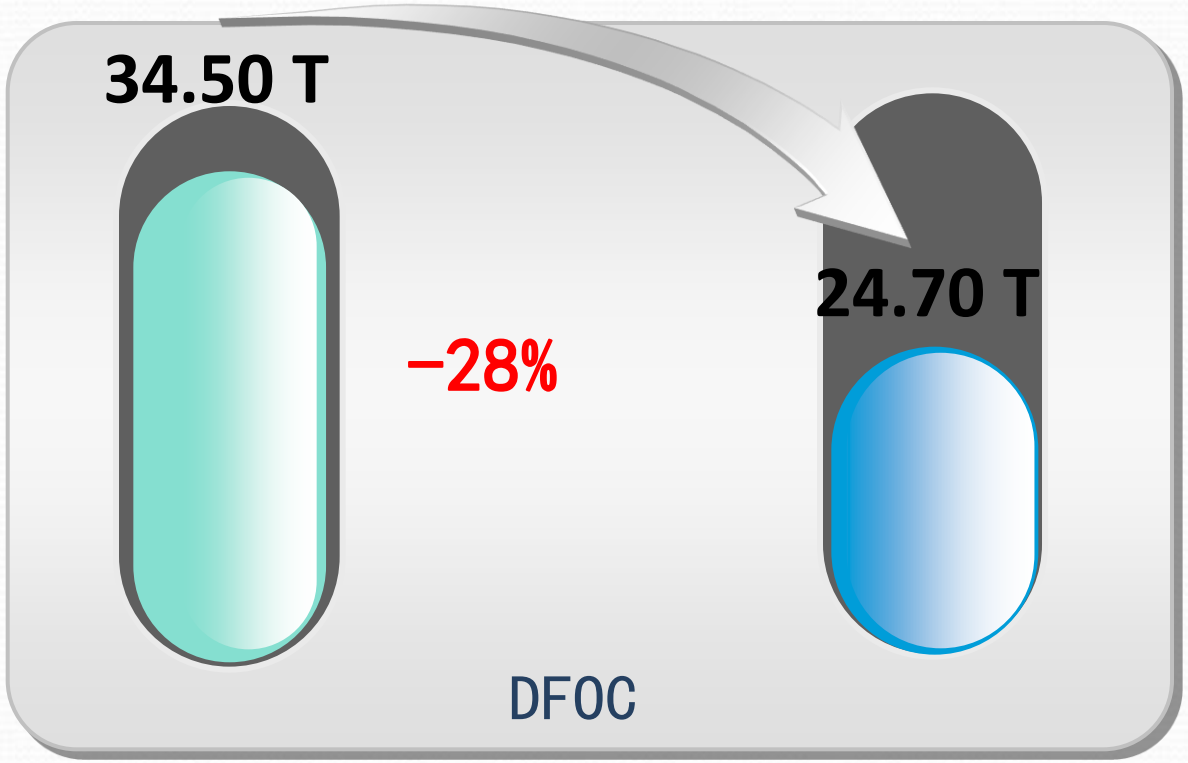
EEDI 15% BLOW BASELINE

82,000 DWT KAMSARMAX



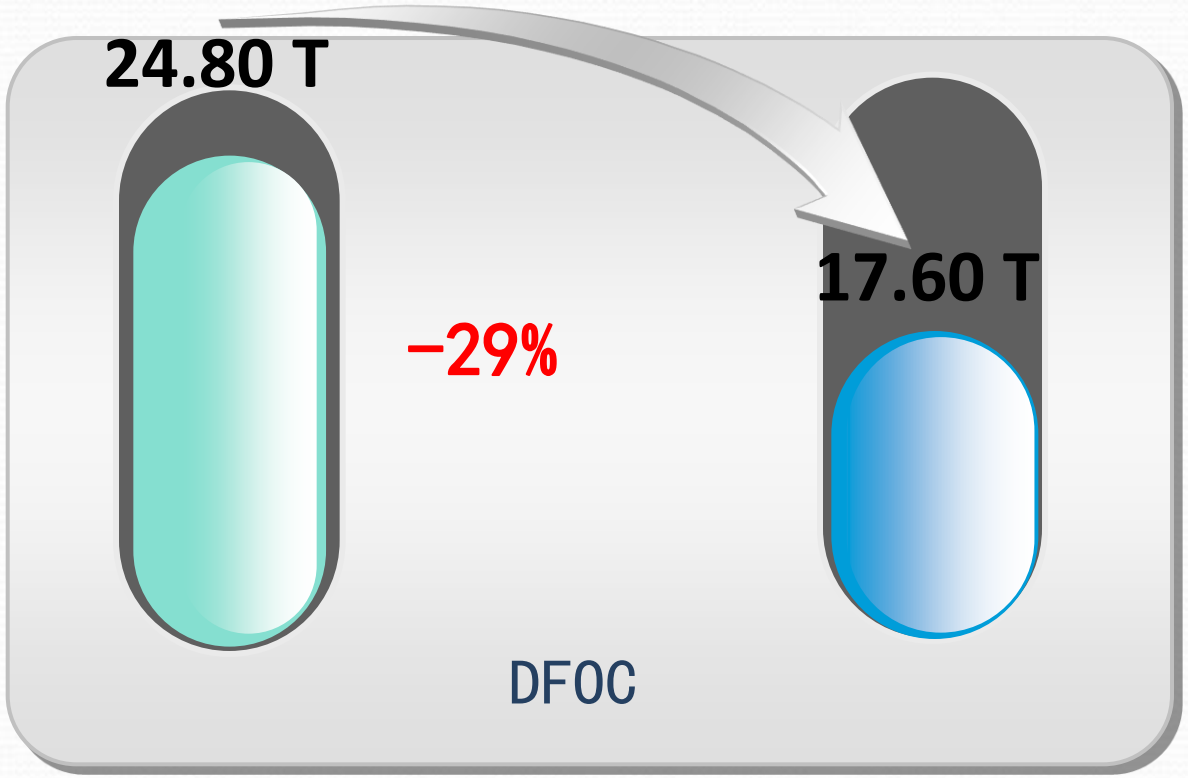
EEDI 13% BELOW BASELINE

64,000 DWT ULTRAMAX



EEDI 18% BELOW BASELINE

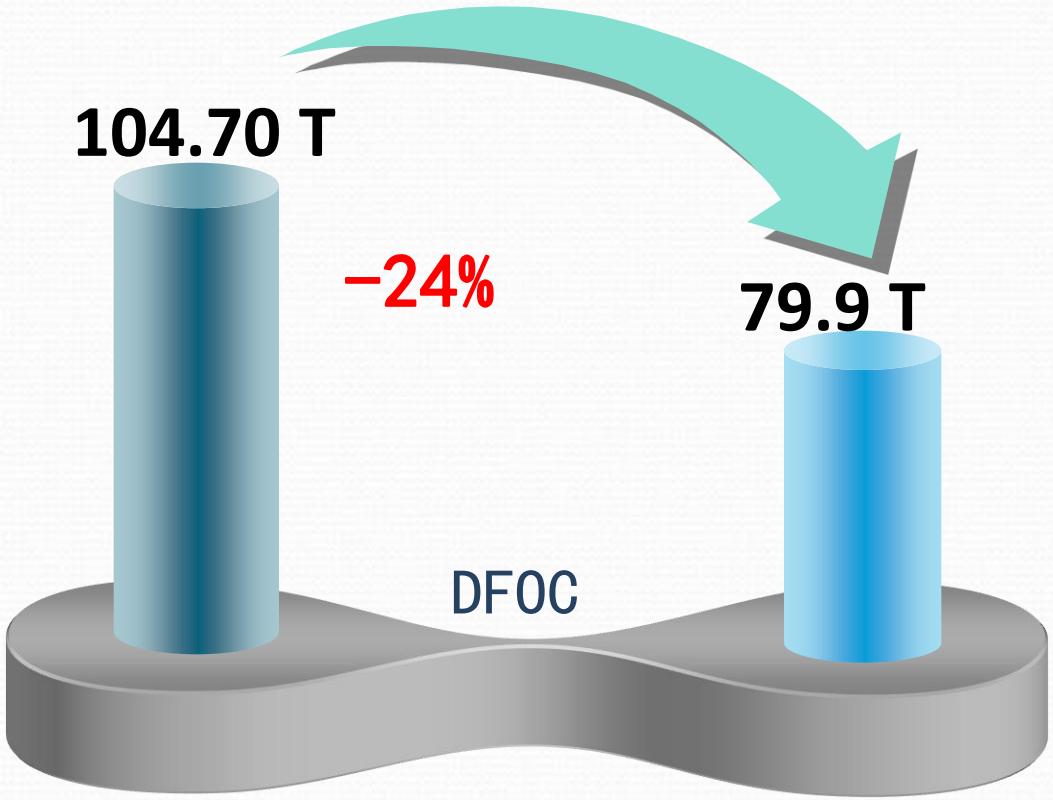
38,000 DWT HANDYSIZE



EEDI 25% BELOW BASELINE

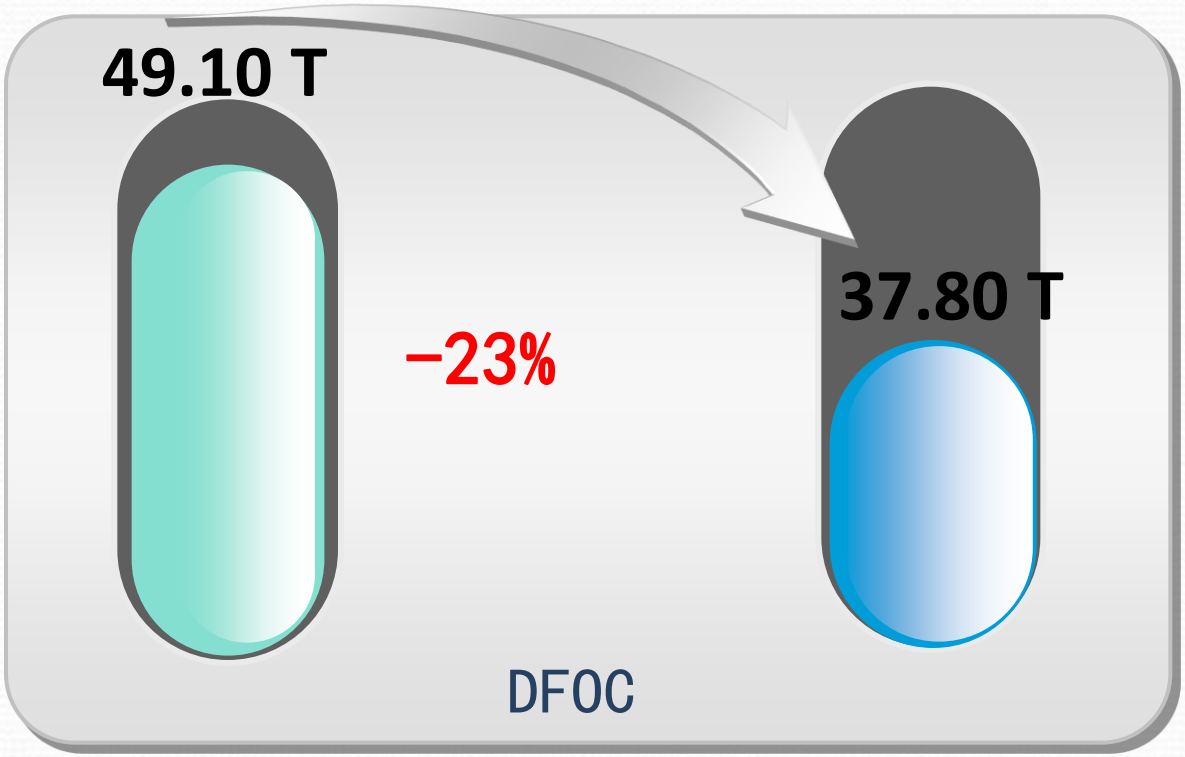
Tanker series

318,000 DWT VLCC



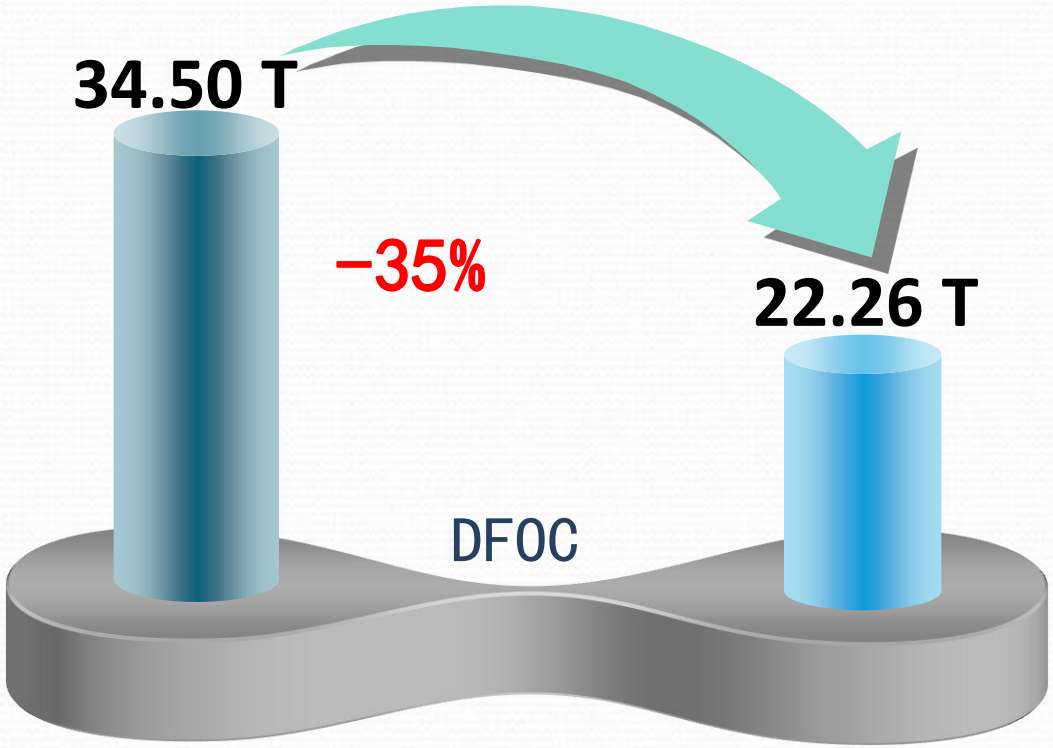
EEDI 20% BELOW BASELINE

113,000 DWT AFRAMAX



EEDI 28% BELOW BASELINE

50,000 DWT CHEMICAL TANKER



EEDI 29% BELOW BASELINE

Container Vessel

MARIC 18,000 TEU CLASS CONTAINER SHIP

MAIN PARTICULARS

Length over all		399.0	m
Length between perp.		382.0	m
Breadth		54.0	m
Depth to main deck		30.2	m
Draught, design		14.5	m
Draught, scantling		16.0	m
Deadweight on Ts		185,000	MT
Air draft		68.0	m
Service Speed	apprx.	23	knots

Class:BV,I+HULL,+MACH,ContainerShip,Unrestricted Navigation,+VERISTAR-HULL,+AUT-UMS, MON-SHAFT,INWATER-SURVEY.SYS-NEQ-1,CPS(WBT),CLEANSHIP(3),AUT-PORT,LASHING,ALP,SDS,FORS

TANK CAPACITIES

Heavy fuel oil	apprx.	15,000	m^3
Marine diesel oil	apprx.	800	m^3
Lubricating oil	apprx.	500	m^3
Fresh water	apprx.	400	m^3
Ballast water	apprx.	48,000	m^3

COMPLEMENT

Crew of 40P + 6 Suez

MAIN ENGINE

MAN B&W Licensee made		11S90ME-C9.2
MCR		63,910 kW/84 RPM
Fixed-pitch propeller		6 Blades

FUEL OIL CONSUMPTION

(L.C.V=10,200kcal/kg)

D.F.O.C at NCR	apprx.	228.6 MT/day
Cruising range	apprx.	33,000 NM

POWER SUPPLY

Diesel Generators	4 x 4,320 kW
Emergency Generator	1 x 500 kW
Turbine generator	none

SIDE THRUSTERS

Bow thruster 2 x 2,000 kW

CARGO HATCH COVER

Type : Steel pontoon type
Stack weight : 90MT/20ft & 160MT/40ft
Panel weight : Max. 45 MT of each panel

Ballast Water Management

Two (2) units BWMT on board.

CONTAINER CAPACITIES

With max. number of Containers

	IMO visibility guidance
On deck	appx.10,378 TEU
In hold	appx. 7,481 TEU
Total	appx.17,859 TEU

Rows max. in holds/on hatches	19 / 21 Rows
Tiers max. in holds/on hatches	11 / 11 Tiers

El. Plugs (for reefer Container)

On deck	1400 FEU
In holds	none
Total	1400 FEU

Homogeneous loading @ 14T/TEU:
abt.12,500 TEU (50% bunkering)
(based on 8ft 6inches, 45% Container V.C.G)

NAVIGATION EQUIPMENT

2 - Radar Plant (ARPA, ECDIS)
2 - ECDIS
1 - Auto Pilot / Gyro compass
2 - GPS, 1 - VDR, 1 - AIS
1 - Echo sounder, 1 - Speed log
1 - GMDSS A3, 1 - Satcom F, SASS

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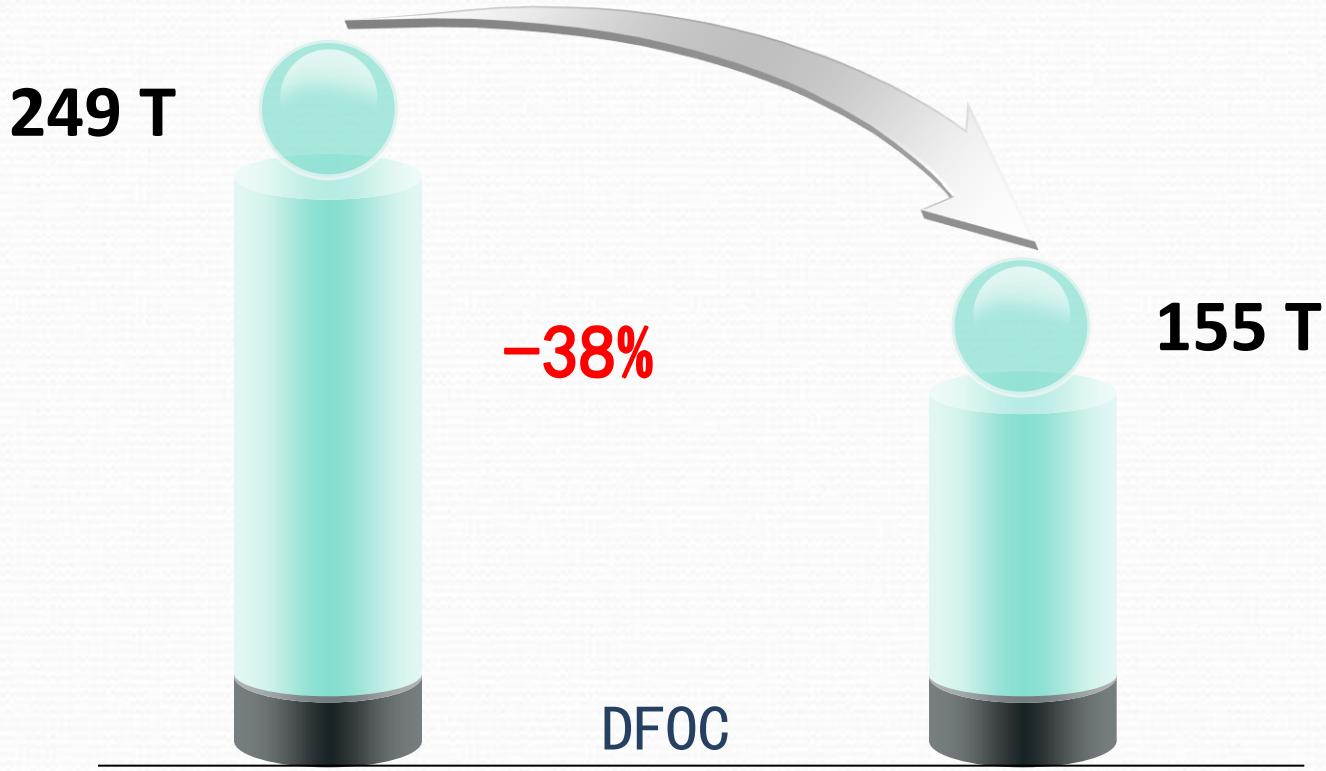
Revision No.	Rev A
Date	2013.11

9400 TEU VLCS



EEDI 40% BELOW BASELINE

2200 TEU CONTAINER VESSEL

EEDI 29% BELOW BASELINE

Conclusion

- Promote tight cooperation on green technology among Asian shipbuilding experts;

- Pay more attention to regulations, standards and rules;

- Work closely with Class and Shipowners;

Thanks