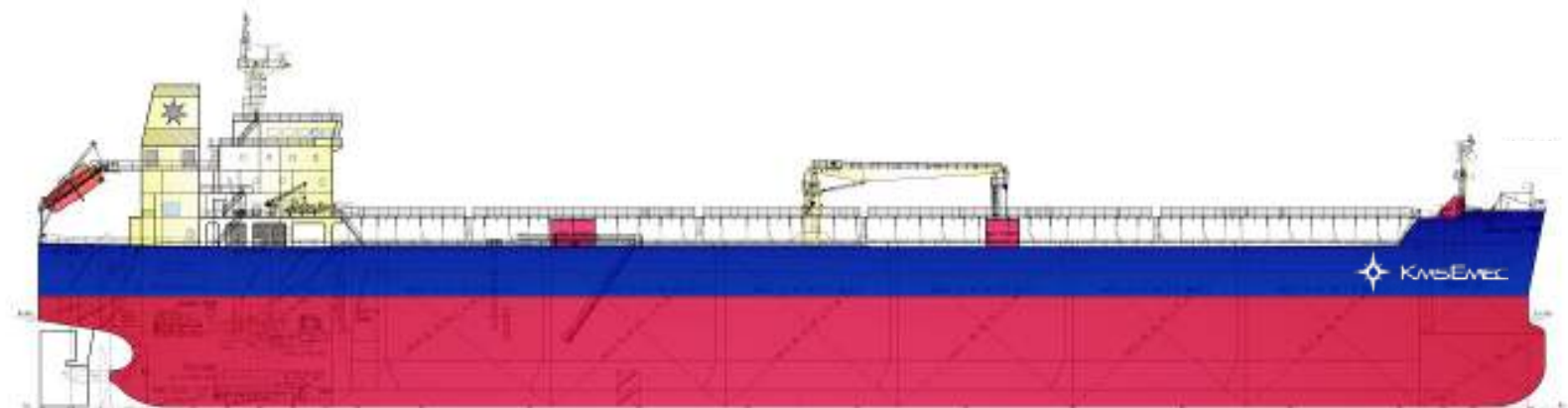


Pathways to sustainable MR tanker Technologies for Pre-Net Zero Era



Your Reliable Engineering Partner in Korea

Be the trustable and reliable engineering partner for our customers, ship owners, shipyards and partners, to get the project done as it was determined by supplying superior design, dedicated engineering services, and solution providing consulting throughout the period of project.

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▶ Mission and Vision



- **Bridge**

Between Shipowners & Companies Association Members & Shipyards

- **Cooperation & Collaboration**

Encouraging mutually beneficial and sustainable business activities

- **Global Network**

Shipbuilding and marine equipment throughout the world

- **Local Support**

Based on the establishment of overseas workstations

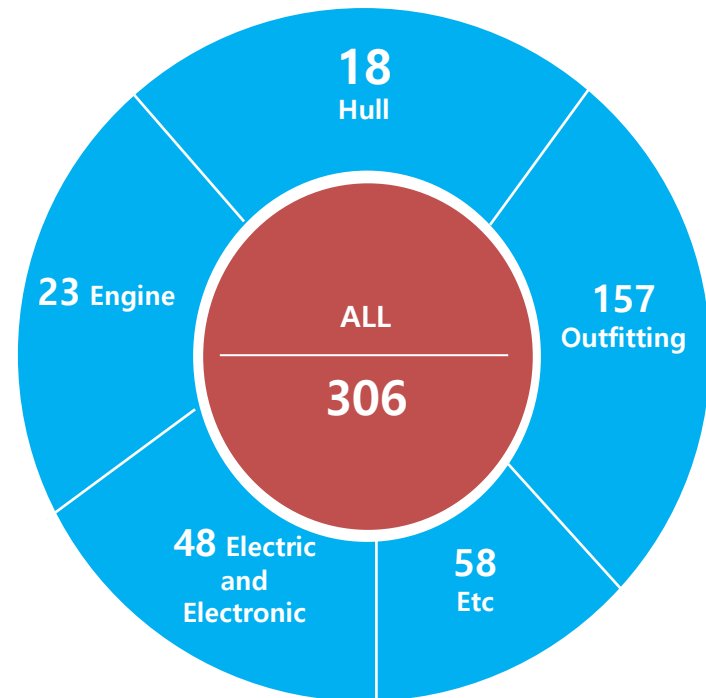
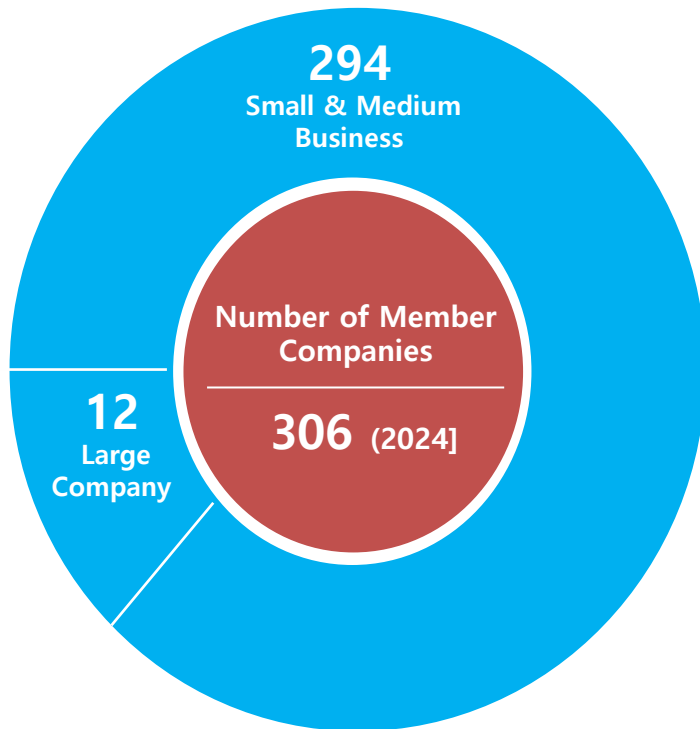


▶ Mission

Location



▶ Member Companies



Introduction

- Establishment of KMS in 1971 and EMEC in 2010
- KMS and EMEC merged in 2020
- Total about 130 experienced engineers

Ship Design & Engineering

- FEED Engineering
- Basic, Detail Design, Production Design
- Retrofit (BWMS & Scrubber) & Conversion Engineering
- EEXI / CII Consulting
- ESD(Energy Saving Device) Engineering
- LNG Tank & FGSS Engineering & Supply

Drawing Approval Supervision

- Drawing Approval
- Construction Supervision & Technical Consulting
- Retrofit Supervision, Inspection, & Installation

Design references of over **600 vessels** for different types and class

(From 2001)

Ship Type	No. of vessel
1) Tanker & Gas Carrier	94
2) Dry Cargo Ships	33
3) Container & MPC	23
4) Special Purpose Ships	29
5) ROPAX & Passenger Ship	20
6) Training Ship & Research Ship	30
7) Patrol & Salvage Vessel	33
8) Miscellaneous Small Ships	47
9) Tug Boat & Work Boat	51



50K MR Tanker



1,000 TEU Container



34K DWT Bulk Carrier

Supervision references for the newbuilding of about **700 Vessels**

(From 2001)

Ship Type	No. of vessel
1) Tanker	85
2) Gas Carrier	37
3) Dry Cargo Ships	121
4) Container & MPC	58
5) ROPAX & Passenger Ship	21
6) Patrol & Salvage Vessel	120
7) Special Purpose Ships	18
8) Tug Boat & Work Boat	24



Heating Coil



< Bare Type Heating Coil >



< Drum Type Heating Coil >



< Square Type Heating Coil >

GRVE Pipe



< Sox Scrubber Drain Line >



< Ballast Line >



< GRVE Lining Steel Pipe >



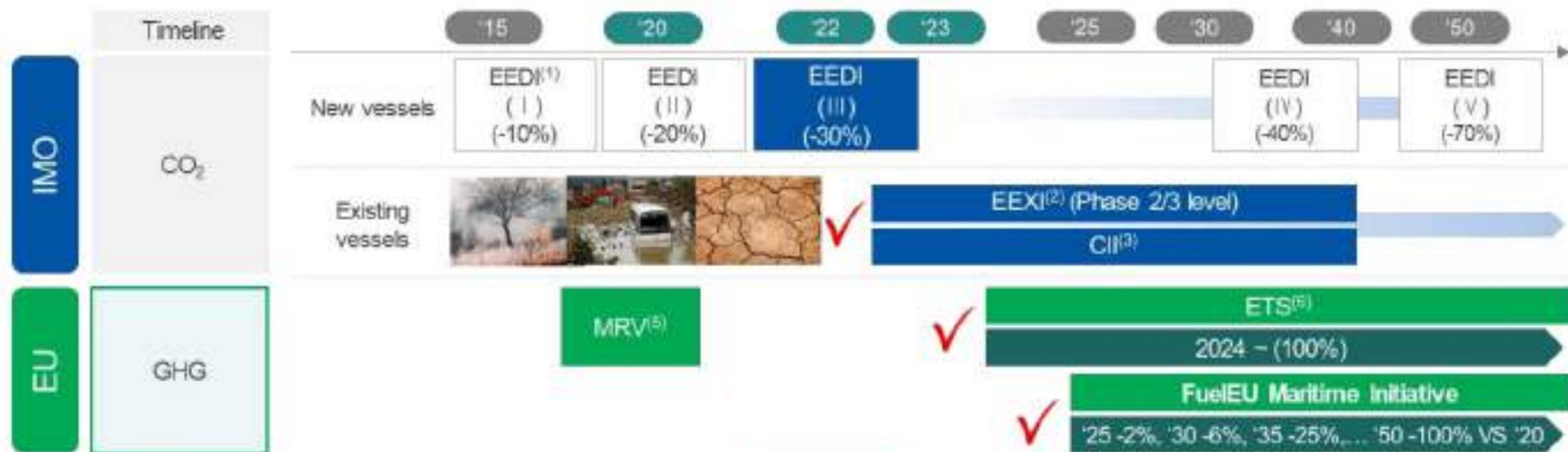
< GRVE Strainer >

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IMO

MEPC 78 on 6th June 2022

- Review and strengthen the IMO Initial Strategy on the reduction of GHG emissions from shipping
- Considering adoption GFS⁽⁷⁾, ETS, GHG Levy (proposals for mid-term measures)

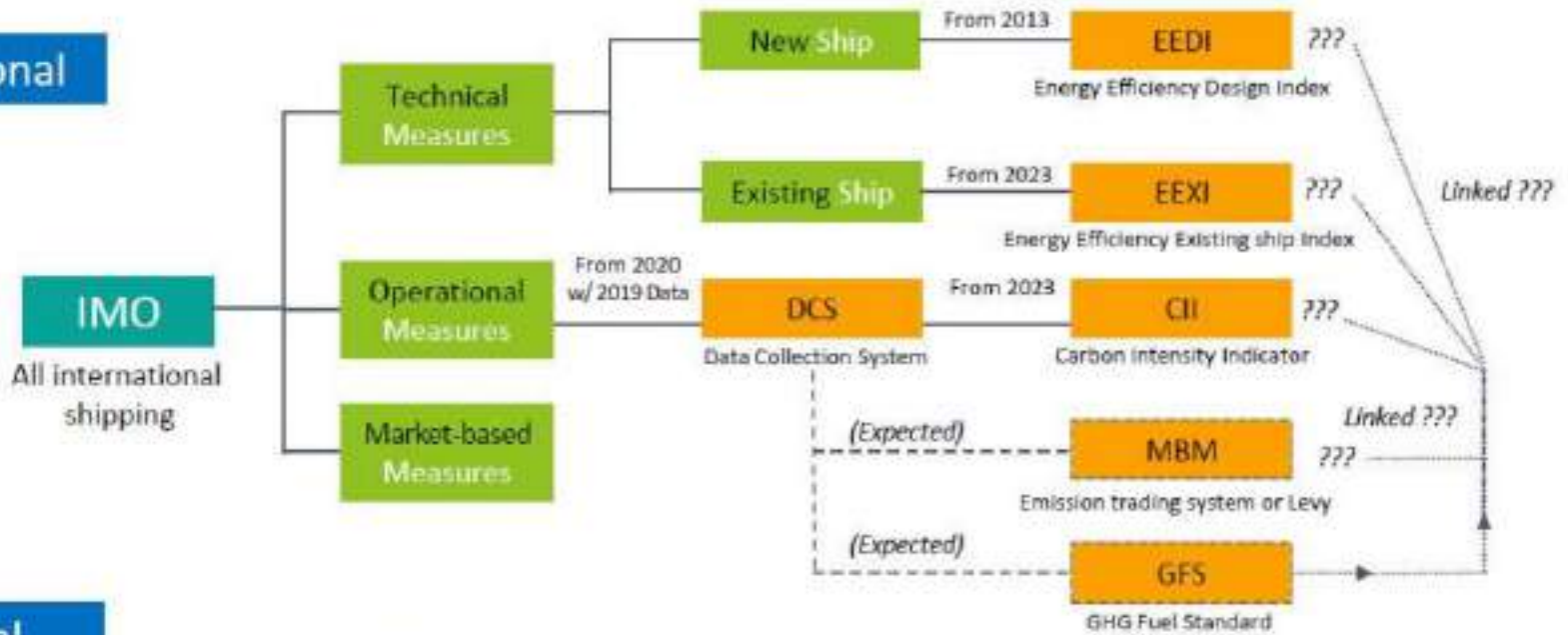
EU

EU Council “Fit for 55” on 22th June 2022

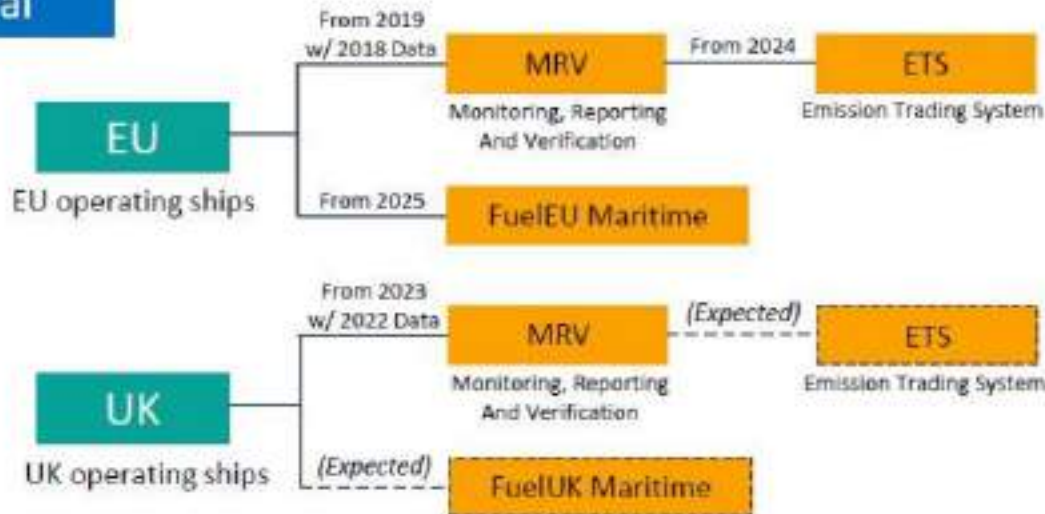
- Including maritime shipping emissions within the scope of ETS
- FuelEU Maritime Initiative
- End free allowances on CBAM⁽⁸⁾ from 2036

International/Regional regulations to cut GHG emissions

International



Regional

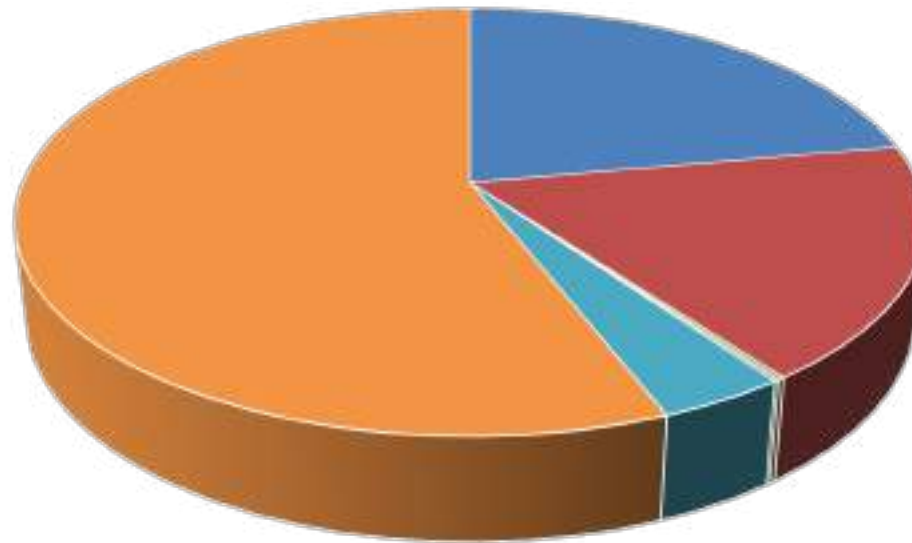


Energy efficiency is key to remaining competitive

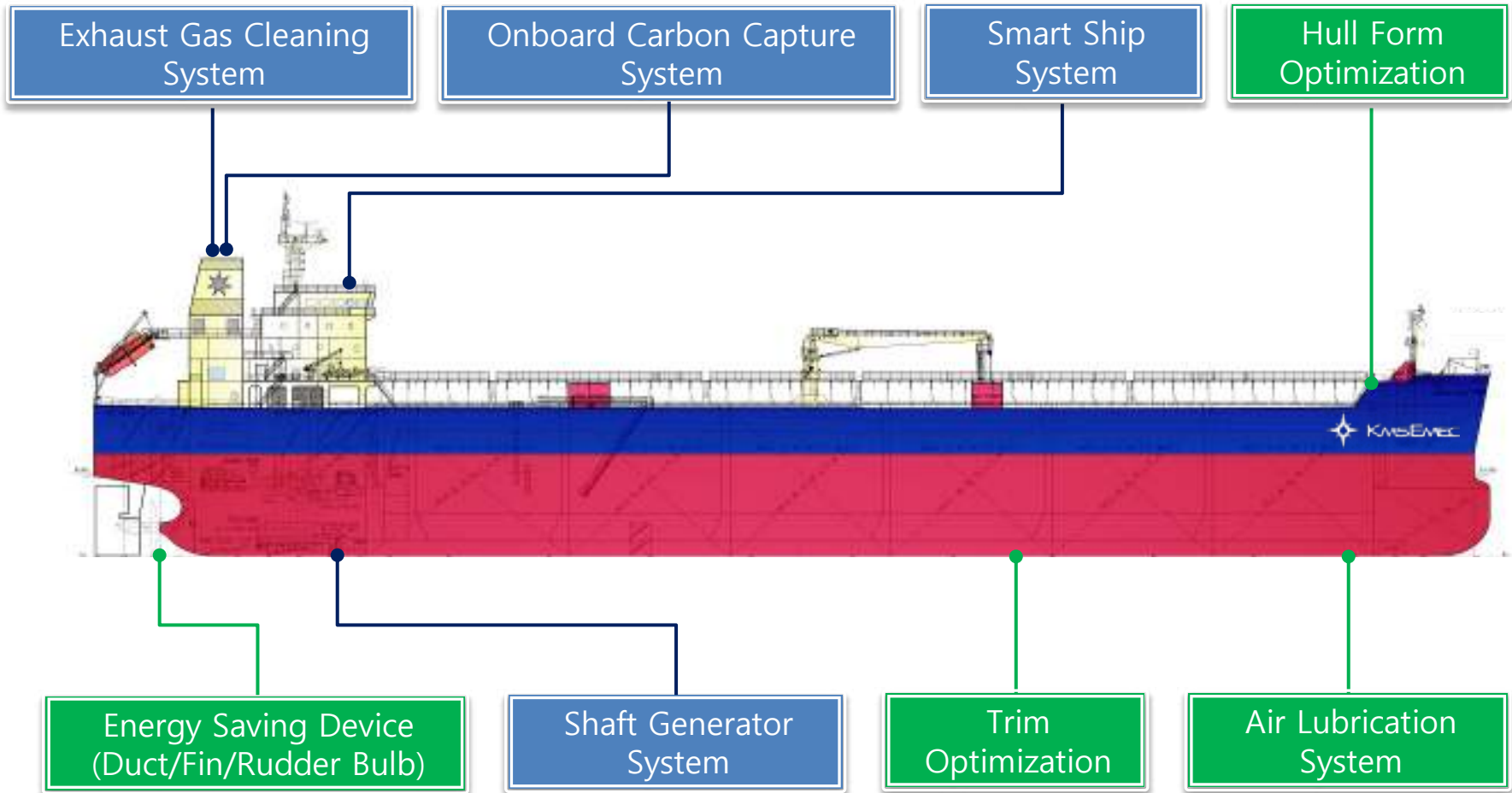


- Consideration should be given to **energy-saving devices and greenhouse gas reduction measures**, such as OCCS, shaft generators, AMP, smart ship systems, and voyage optimization, not only in newbuilding but also in retrofitting to comply with international/regional environmental regulations.
- Even for ships using alternative fuels, prioritizing energy efficiency is essential for reducing operational expenses, especially given the high price of fuel.

Fitted on Ship



- ESTs-Propeller Ducts
- ESTs-Rudder Bulbs
- ESTs-Rotor
- ESTs-Wind kits & rigid sails
- ESTs-Air Lubrication systems
- Scrubber

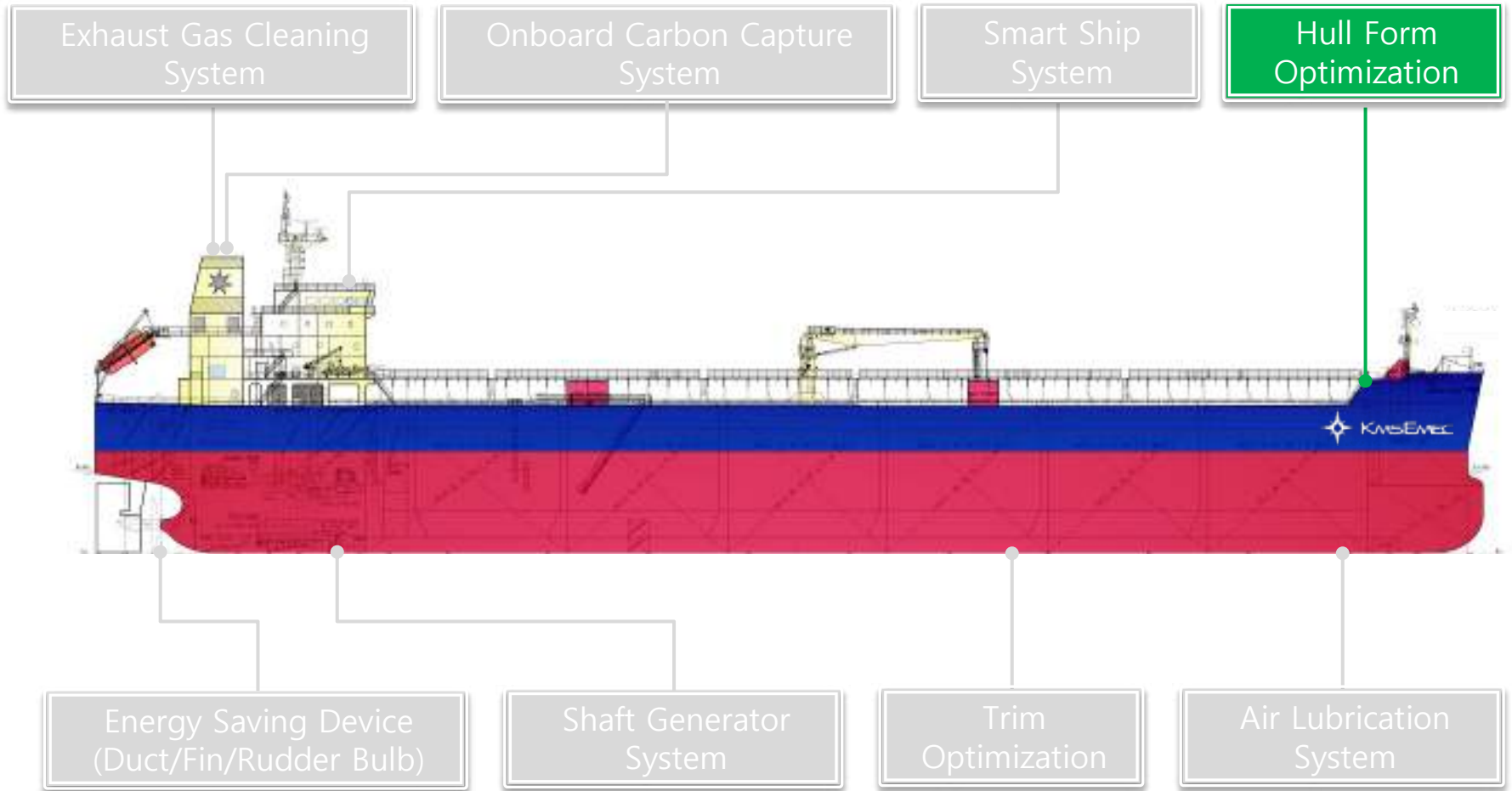


01 Company Overview

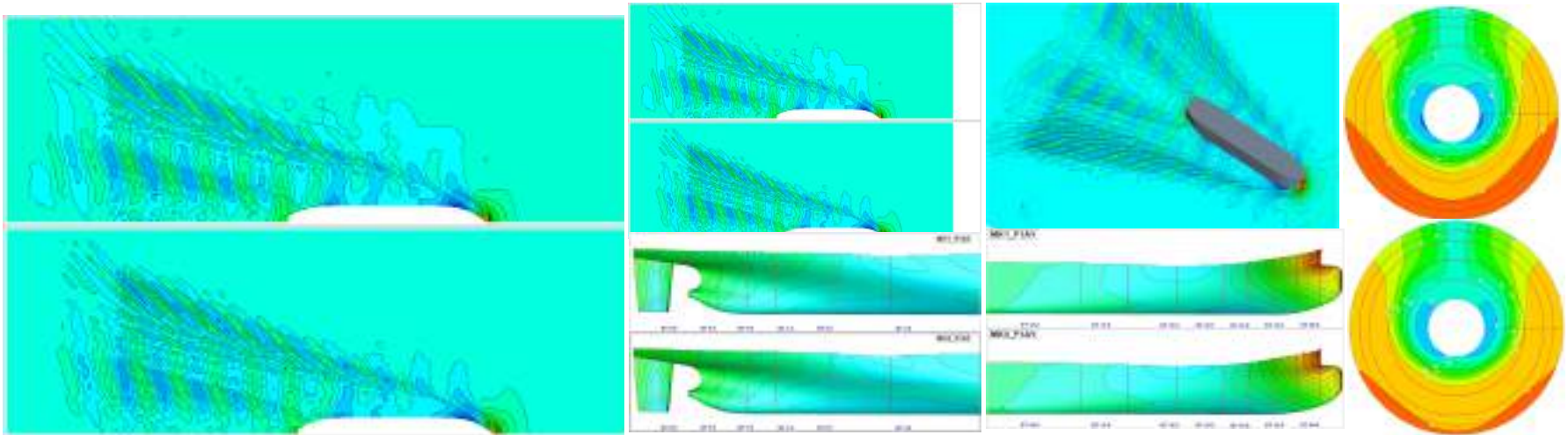
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□ Hull Form Development by Computer Fluid Dynamics (CFD)

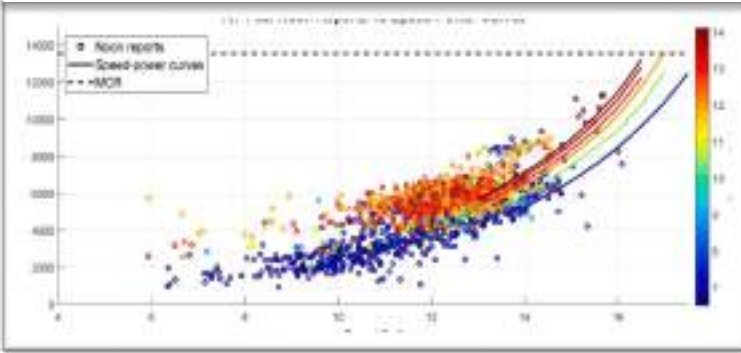


Optimization at design draft

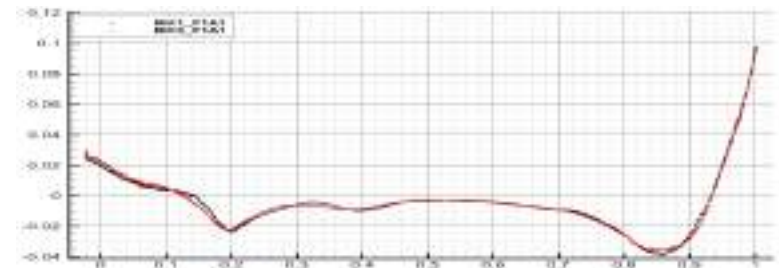
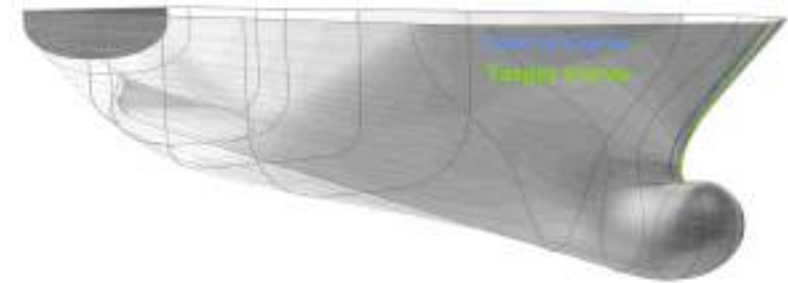


➔
CII
EU ETS

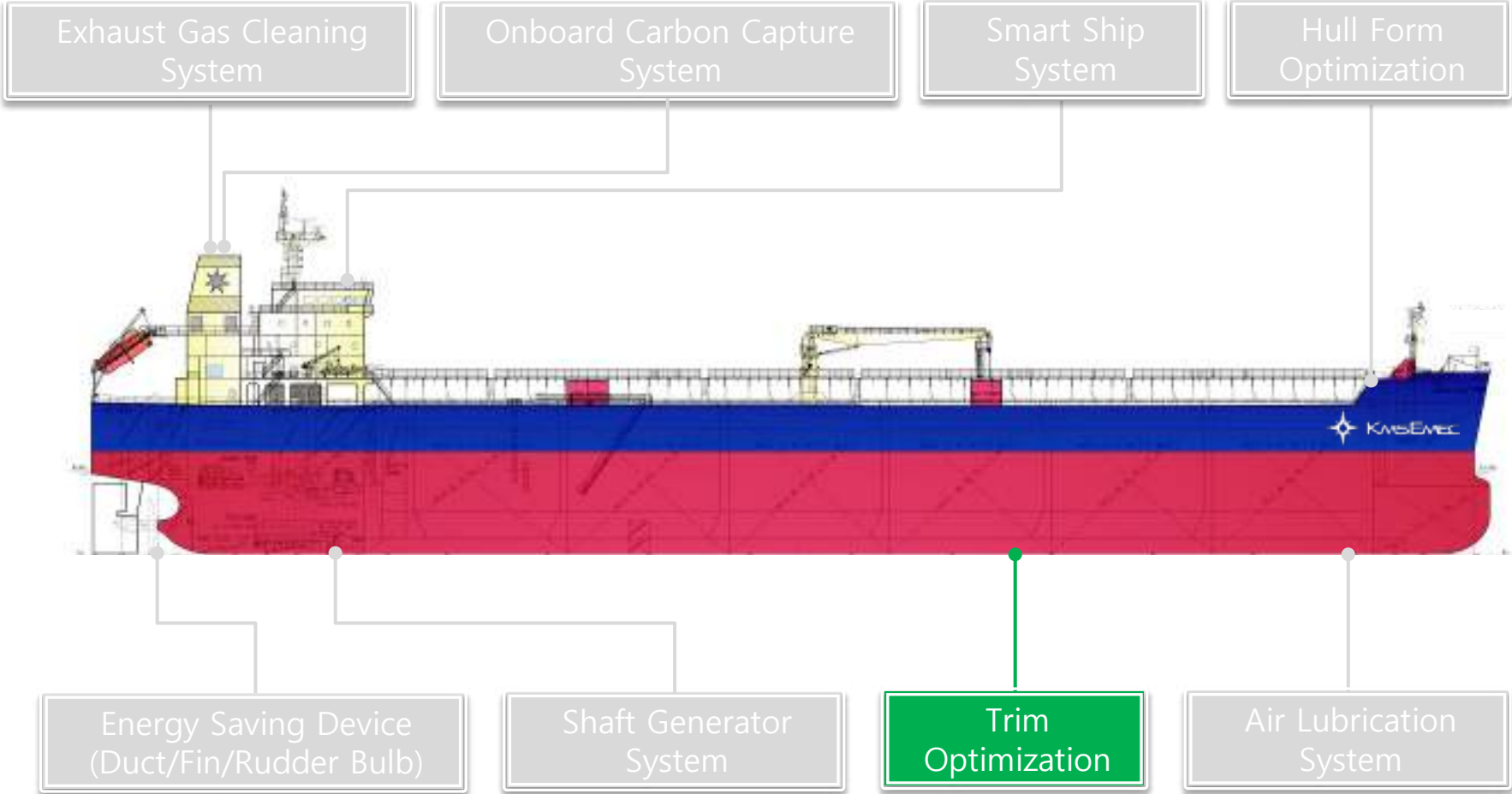
Optimization considering operational profile

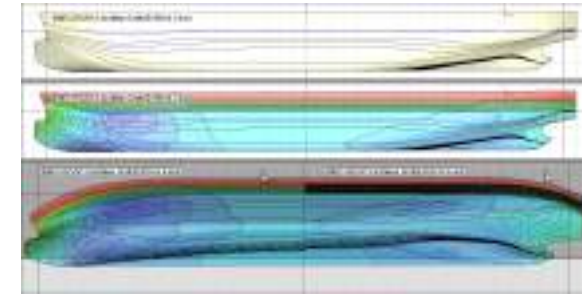
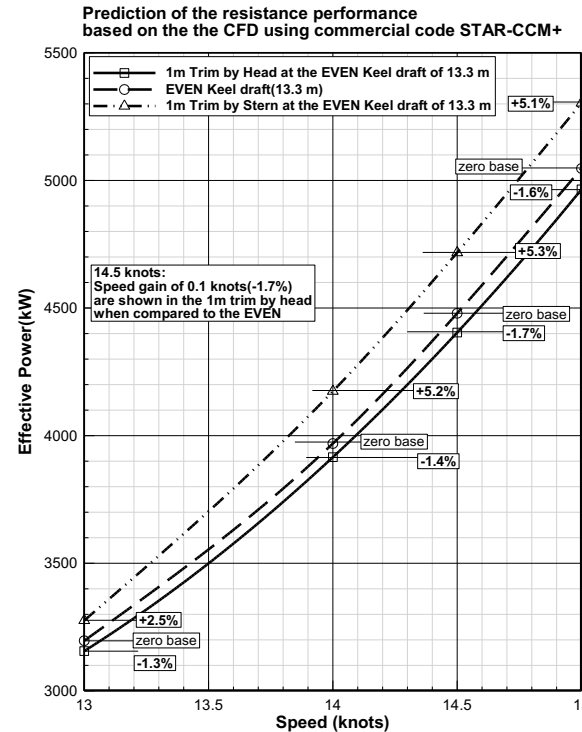
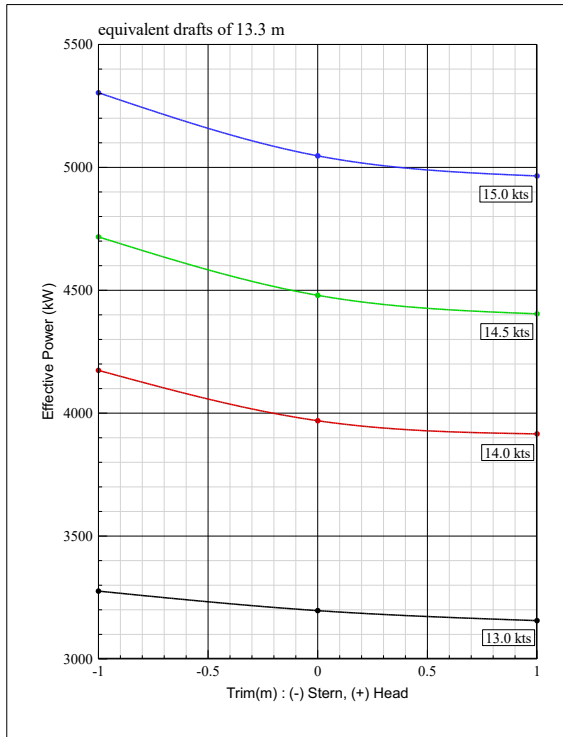


- **Abt. 6% power reduction through Hull Form Optimization**

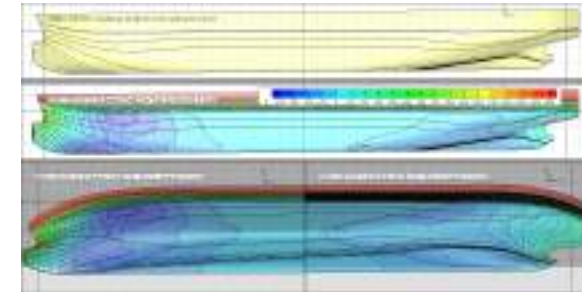


- **Bow optimization or Bow retrofit also take into consideration based on the operation profile.**
- **Propeller optimization or Propeller retrofit is one of the trends for slow steaming or EPL ships.**



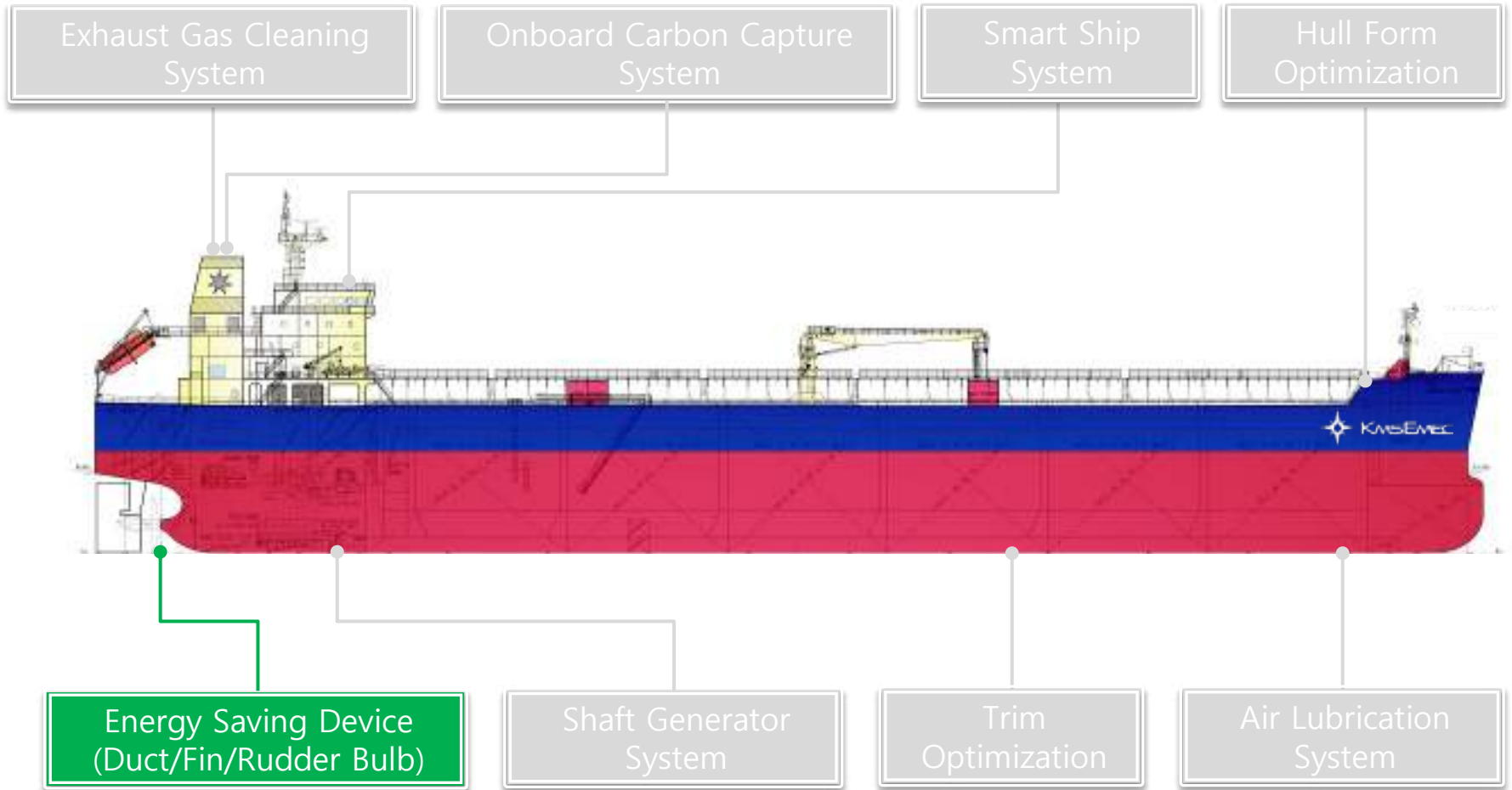


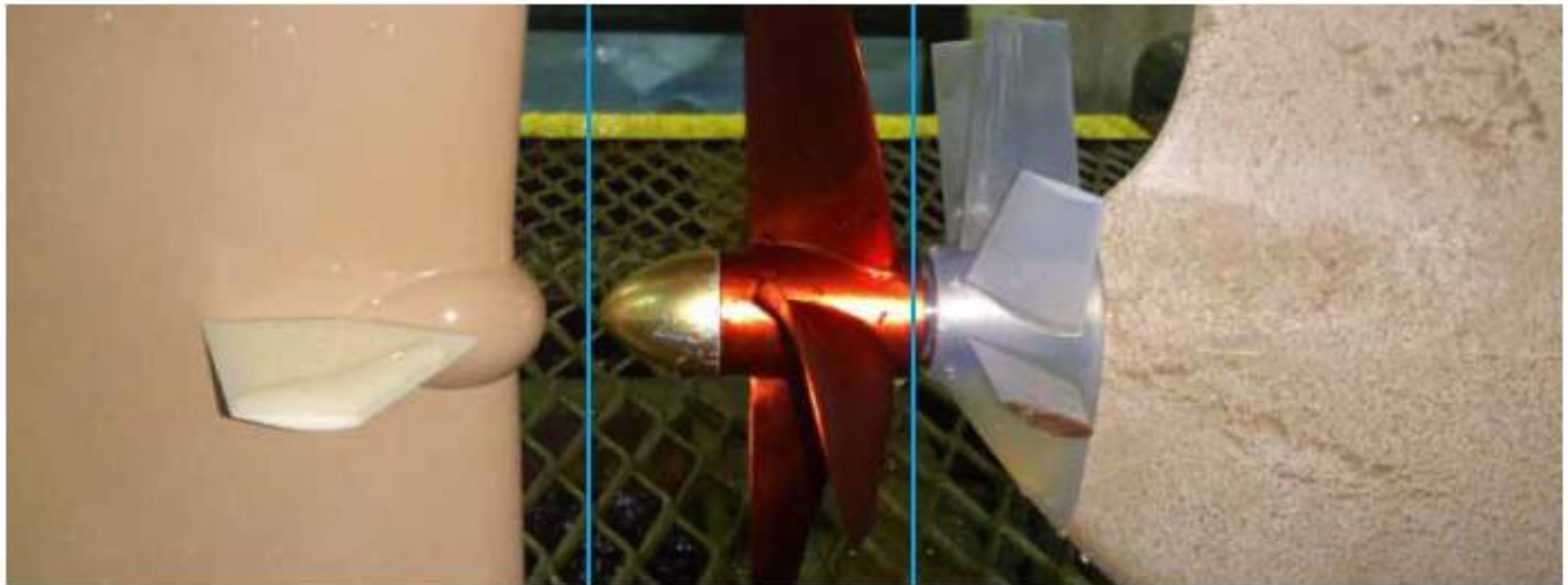
Even Keel



1m trim by head

- **Abt. 1.5% power reduction on 1m trim by head condition at scantling draft**
- **Comparison of resistance performance by trim at each draft and speed to be carried out and provide operational information to reduce fuel cost**





Zone3

- Rudder Bulb
- Rudder Fin
- Gate Rudder
- Twisted Rudder

Zone2

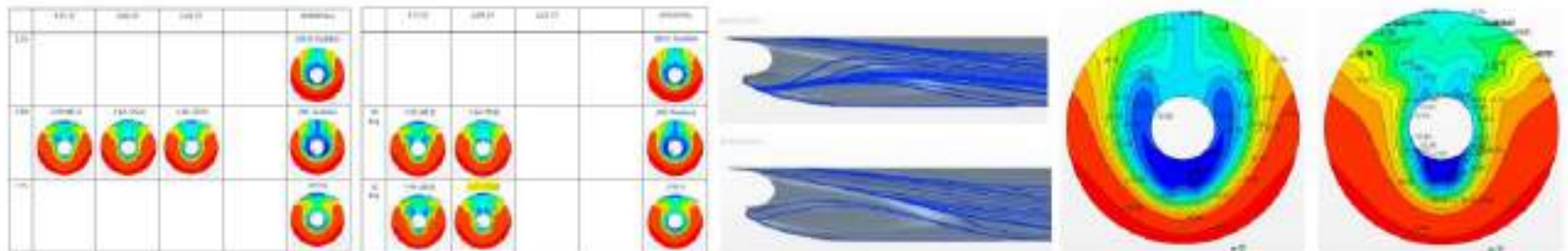
- Propeller Boss Cap Fin
- Hub Vortex Free Cap
- S-fin
- Hub Vortex Absorbed Fin
- Propeller Nozzle
- High-efficiency Propeller

Zone1

- Mewis Duct
- Pre Swirl Stator
- Eco-Stator/Eco-Nozzle
- SAVER Fin / Hi-FIN
- Wake Equalizing Duct
- EnergoFlow
- Pre-shrouded Vane

□ Energy Saving Effect for MR Tanker

	Estimated effect	Price (relative)	Photo
Mewis Duct with RB (Becker Marine System)	3~4% (cancellation 2.5%)	100 (incl. model test)	
Wake Equalizing Duct (Schneekluth Hydrodynamik)	3~5%	57.2	
Fin + Rudder Bulb (KMSEMEC)	2~2.5%	30.5	



□ Maximum power savings by investigation of SVA

- Twisted Rudder	up to 1,4 %
Costa-Bulb with Twisted Rudders	up to 3,7 %
Costa-Bulb with Conventional Rudders	up to 3,5 %
Boss Cap Fins	up to 3,2 %
Propeller Redesign	up to 14 %
Wake Equalising Duct	up to 4,8 %
Becker Mewis Duct®	up to 10 %
Bulbous Bow Retro-fit	up to 21 %

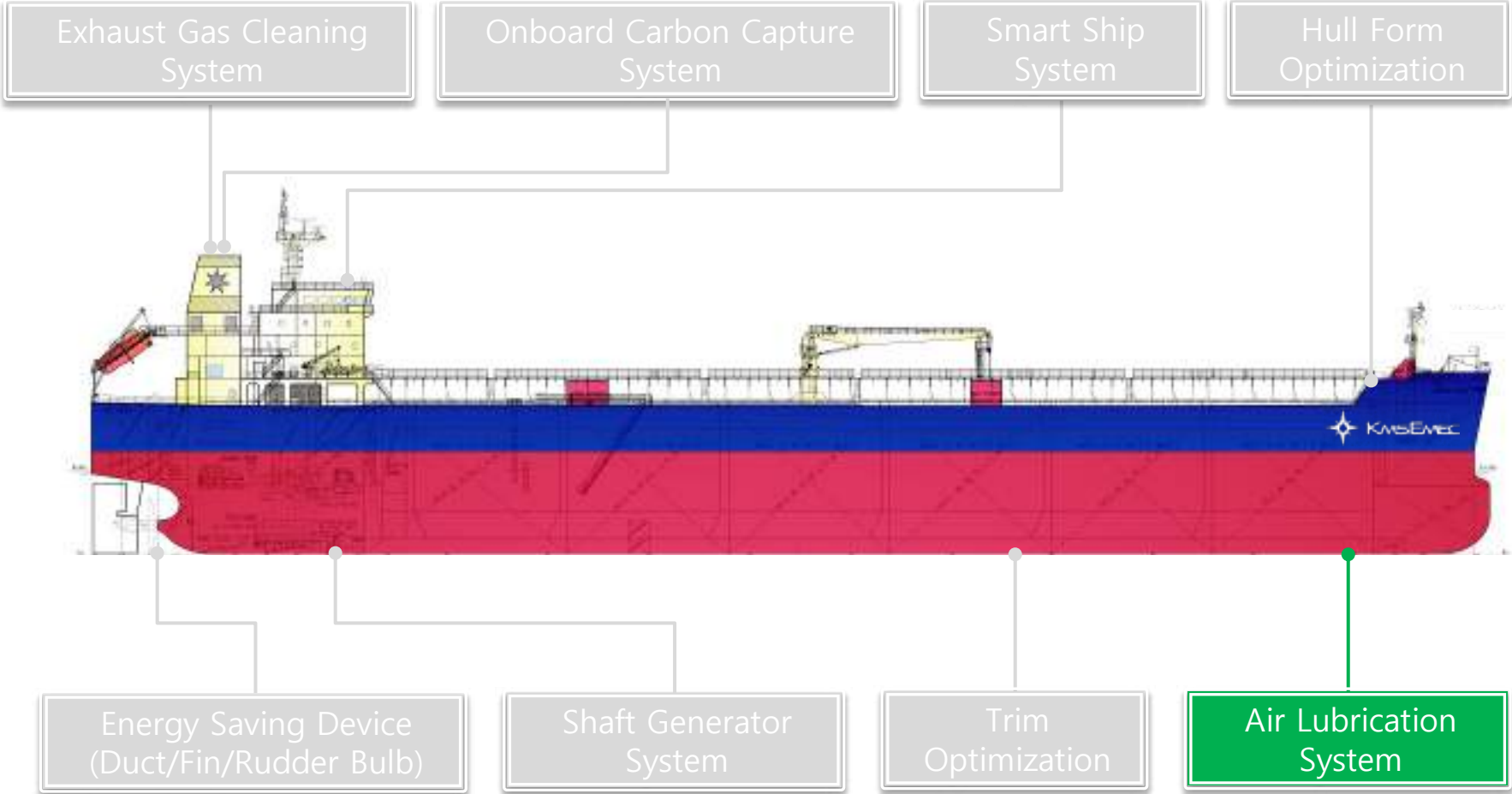
* Note :

[SOURCE : SVA]

This is just for reference and based on the limited investigation.

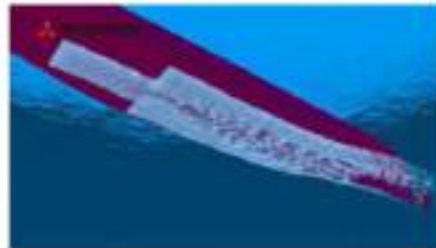
Energy saving effect are determined based on various characteristics unique to each vessel.



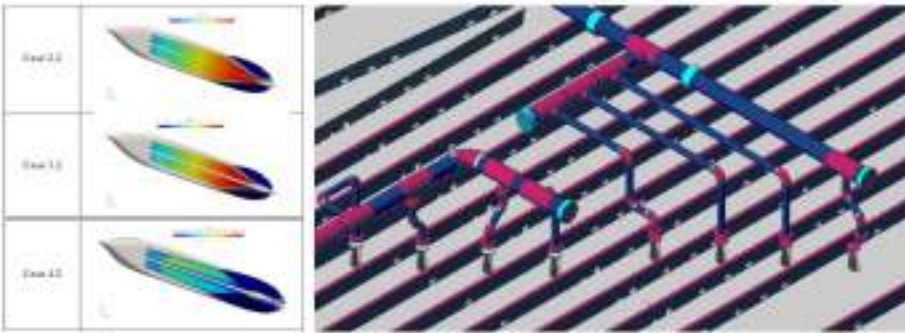




- Air lubrication reduces the **frictional resistance** of a ship's hull by creating a carpet of bubbles on the full flat bottom of a vessel's hull.
- ALS is effective to Gas Carrier especially for shallow draft vessels.

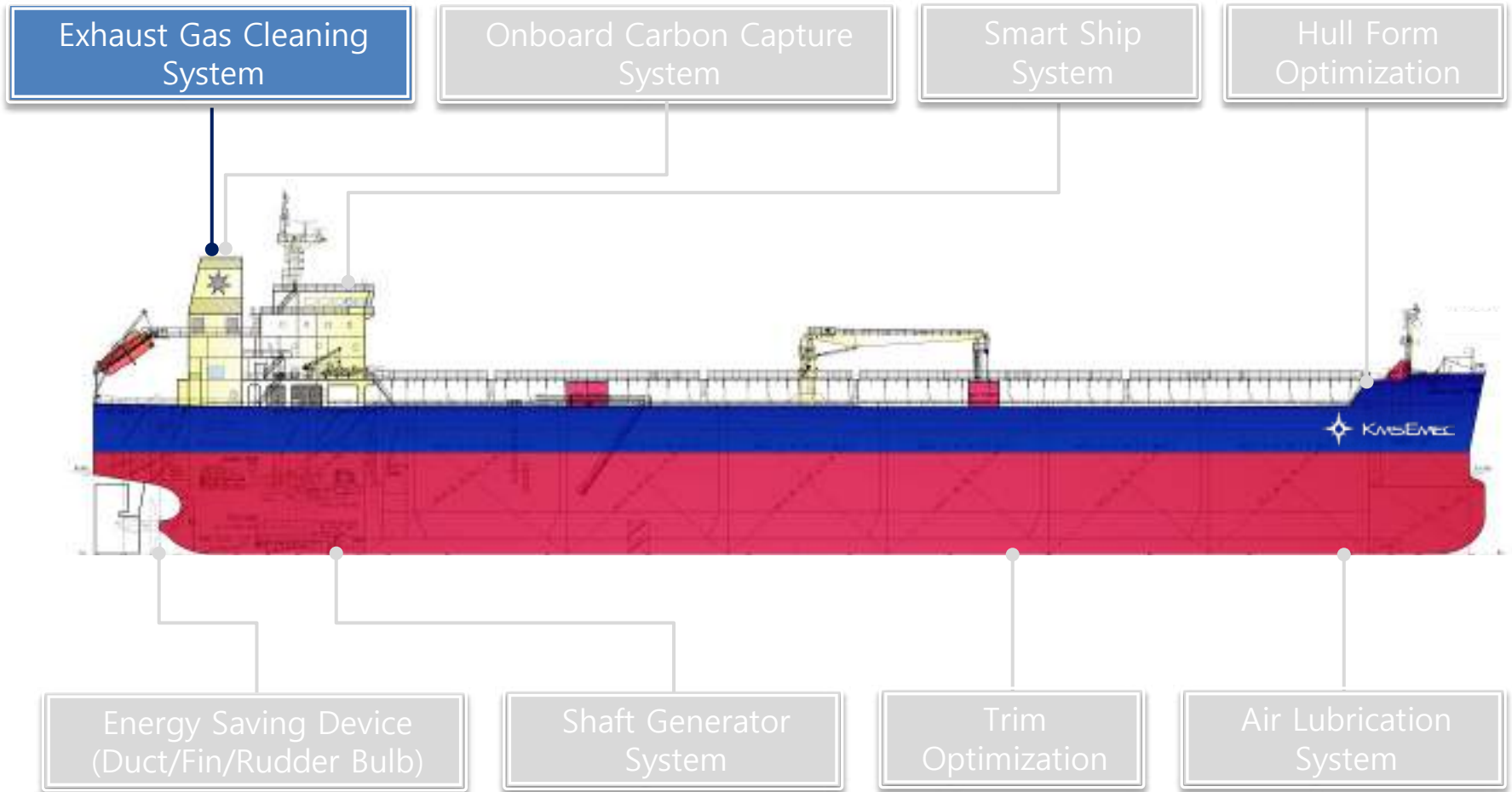


- ❑ For MR tanker, abt. 4~8% net power saving at design draft during sea trial.
- ❑ Abt. 0~2% net power saving at scantling draft.
- ❑ Abt. 6~10% net power saving at ballast draft.



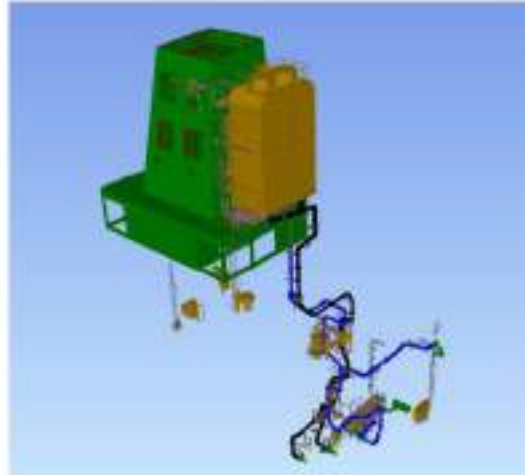
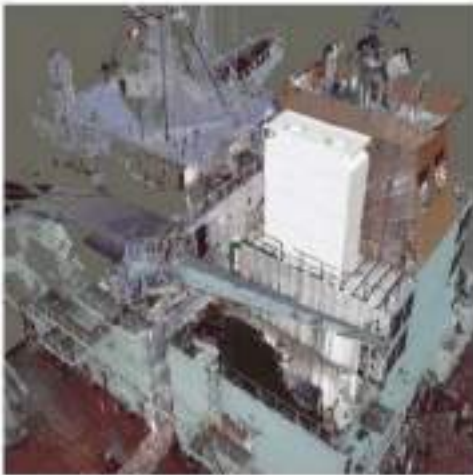
Speed (knot)	TOTAL RESISTANCE						SLS AIR THROUGHput						SLS FUEL					
	Design required (kWh/100t)	Design required (kWh/100t)	Design with SLS	Design required (kWh/100t)	Design with SLS	Design with SLS	Design required (kWh/100t)	Design with SLS	Design required (kWh/100t)	Design with SLS	Design required (kWh/100t)	Design with SLS	Design required (kWh/100t)	Design with SLS	Design required (kWh/100t)	Design with SLS		
10																		
11.5	13.5	10.5	10.0	1.0	1.0	0.00	100	100	100	100	100	100	100	100	100	100		
13	15.5	12.5	12.0	1.0	1.0	0.05	150	150	150	150	150	150	150	150	150	150		
14.5	17.5	14.5	14.0	1.0	1.0	0.10	200	200	200	200	200	200	200	200	200	200		
16	19.5	16.5	16.0	1.0	1.0	0.15	250	250	250	250	250	250	250	250	250	250		
17.5	21.5	18.5	18.0	1.0	1.0	0.20	300	300	300	300	300	300	300	300	300	300		
19	23.5	20.5	20.0	1.0	1.0	0.25	350	350	350	350	350	350	350	350	350	350		

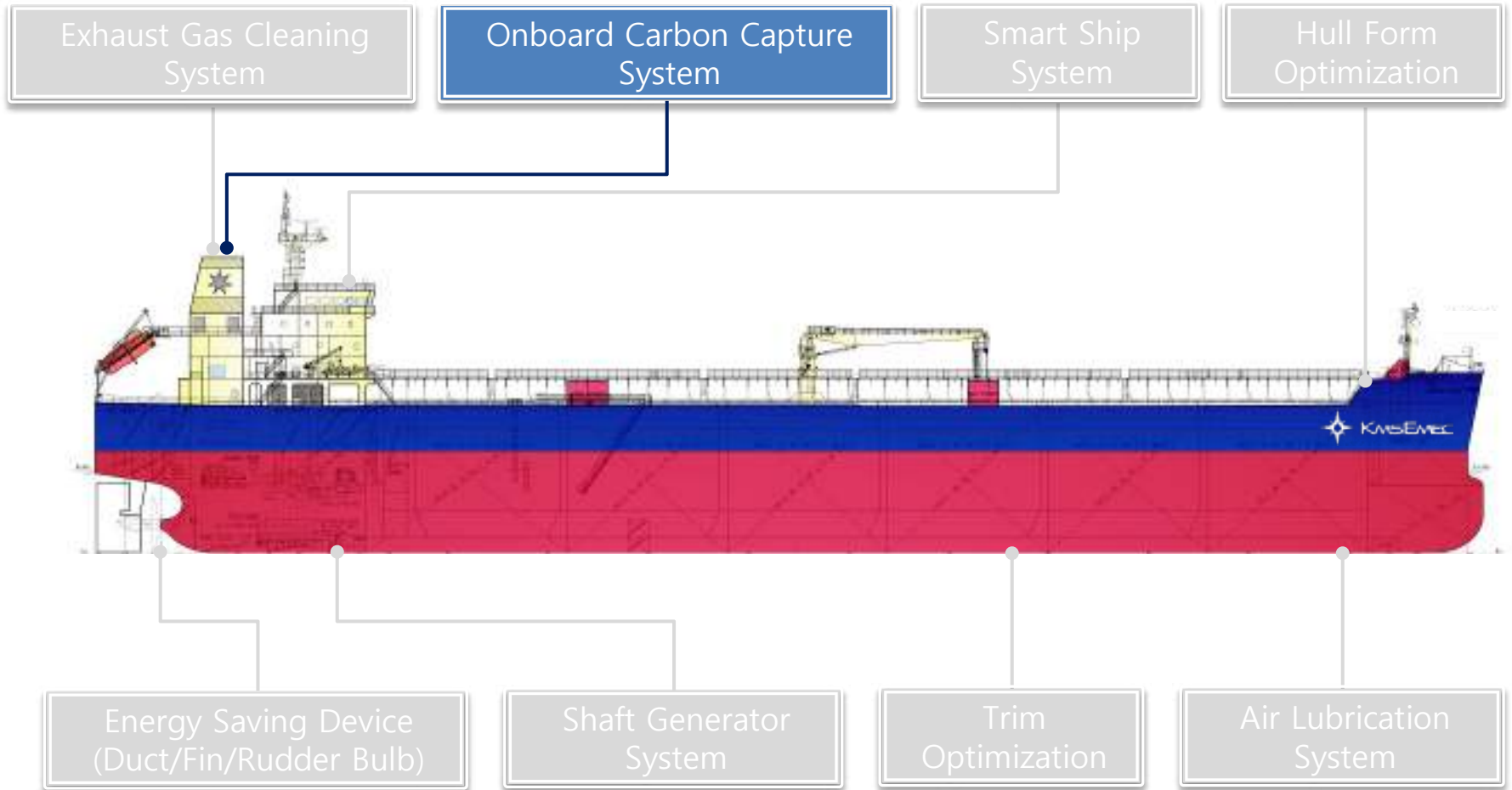




EGCS Engineering Reference.

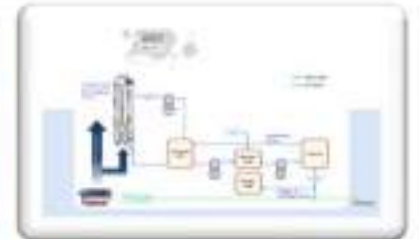
- Over 70 Project of EGCS retrofit engineering.
- Over 150 Vessels has been installed the EGCS by KmsEmec retrofit engineering.
- Over 350 Vessels has been installed KmsEmec's wash water drain GRVE pipe.

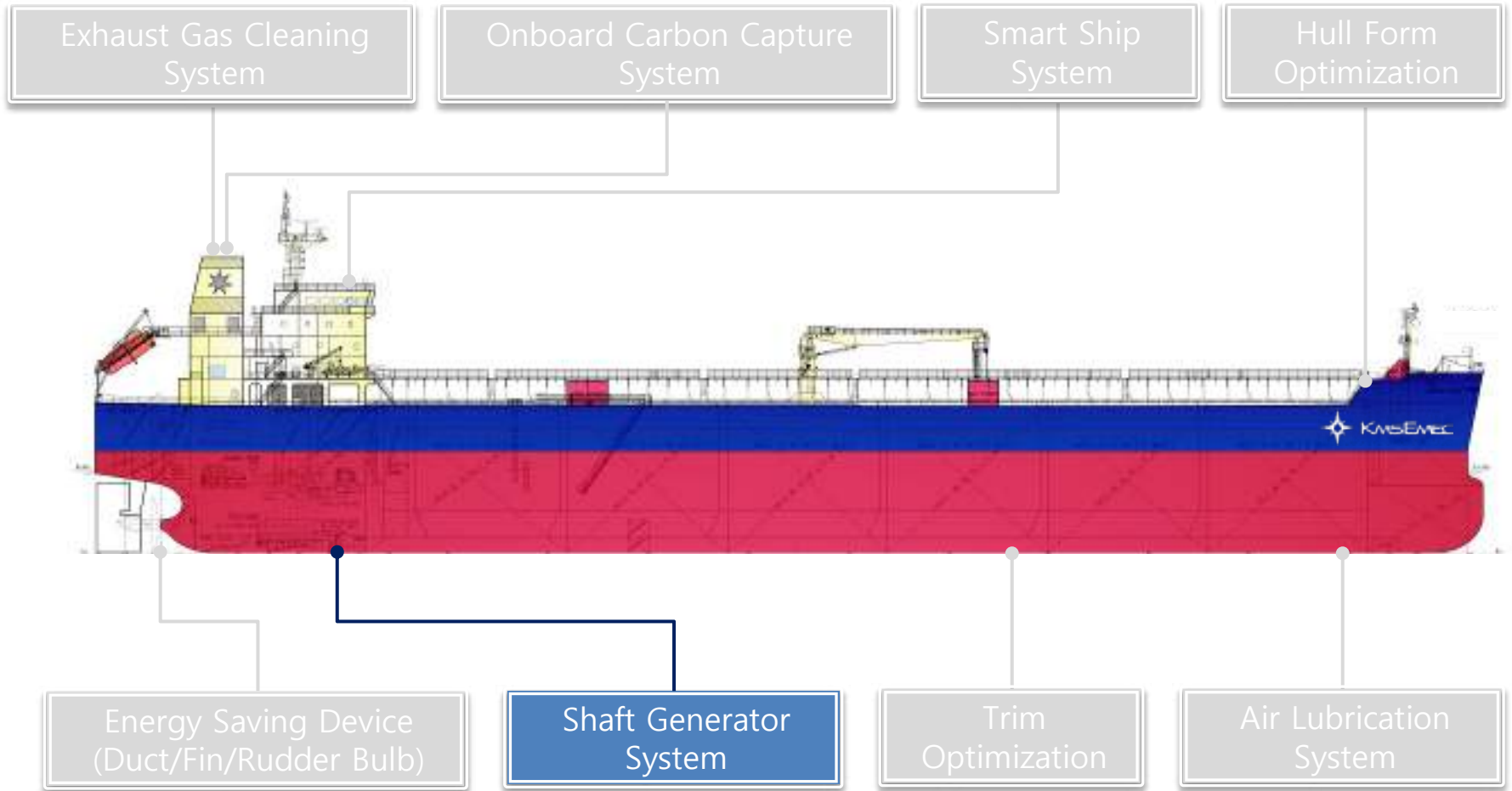




□ What is OCCS?

An onboard carbon capture system (OCCS) is a technology that removes carbon dioxide (CO₂) emissions from ships before they are released into the atmosphere. OCCS can be used with fossil fuels, e-fuels, and derivatives from organic carbon-containing sources. It can also be used in combination with energy efficiency and alternative fuels.





- **Fuel efficiency**

Reduce fuel consumption and costs by converting a ship's rotational energy into electrical energy

- **Emissions reduction & EEDI/EEXI improvement**

- **Maintenance costs**

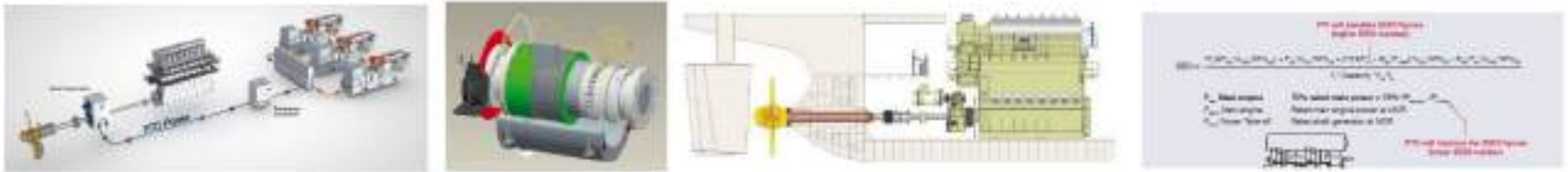
Reduce maintenance and lubrication costs compared to diesel generator sets

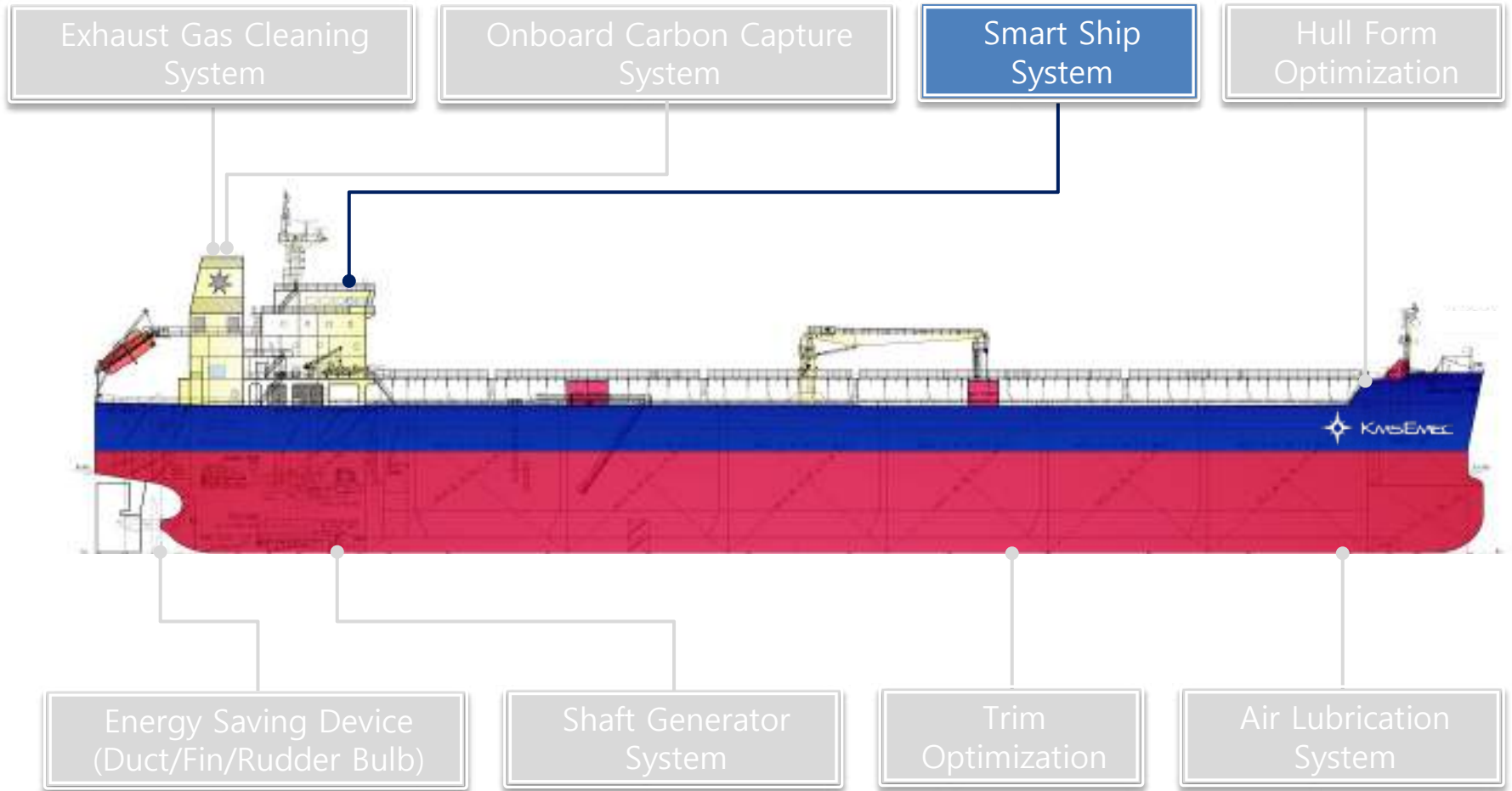
- **Noise levels**

Shaft generators can be quieter than other onboard power generation systems.

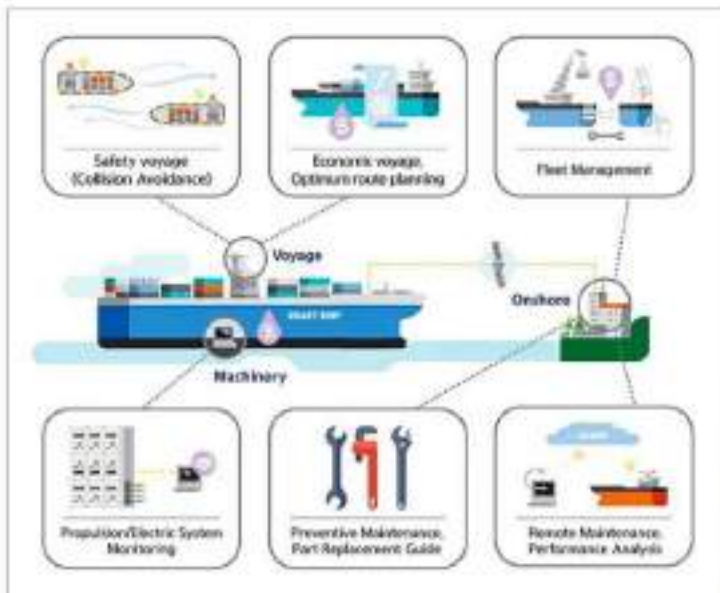
- **Slow-speed applications**

Permanent magnet (PM) machines in shaft generators are more efficient at lower operational speeds.





- ❑ **Navigation, Equipment Operation and Management System**
- ❑ **Route/Voyage Optimization**
- ❑ **Ship Performance Monitoring**
- ❑ **24/7 Smart Care Service System**
- ❑ **Voyage Report/Machinery Analysis Report**
- ❑ **Equipment Status & Performance Analysis**
- ❑ **Maintenance & Spare Part Management**
- ❑ **Data Collecting and Transmission/GHG Regulations**



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- **Prioritizing energy efficiency is paramount for adhering to international and/or regional regulations and fostering sustainable shipping practices.**
- **Selecting and implementing suitable GHG emission reduction measures for each ship among options like ESD, OCCS, EGCS, Shaft Generator, Smart Ship System, Wind Assisted Propulsion Systems, Alternative Maritime Power System, Waste Heat Recovery System, LED lighting, VFD, Battery, Fuel Cell, Alternative Fuel, etc., is essential and crucial.**



TOP 5 ZERO EMISSION SHIPS

Thank You!



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