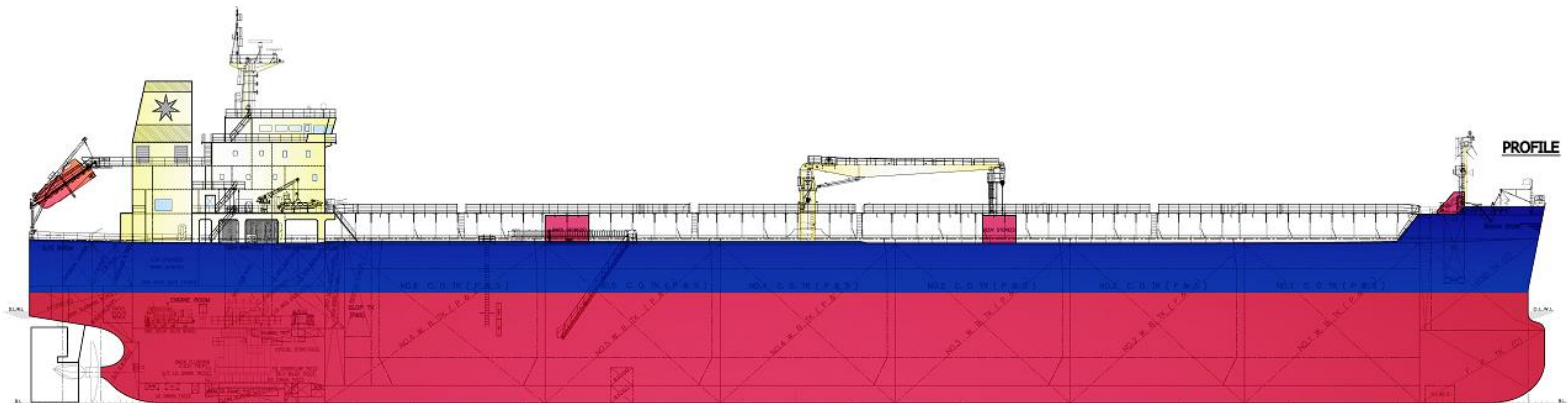




Ship Design & Engineering

Drawing Approval & Construction Supervision



June, 2022

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.

Introduction

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

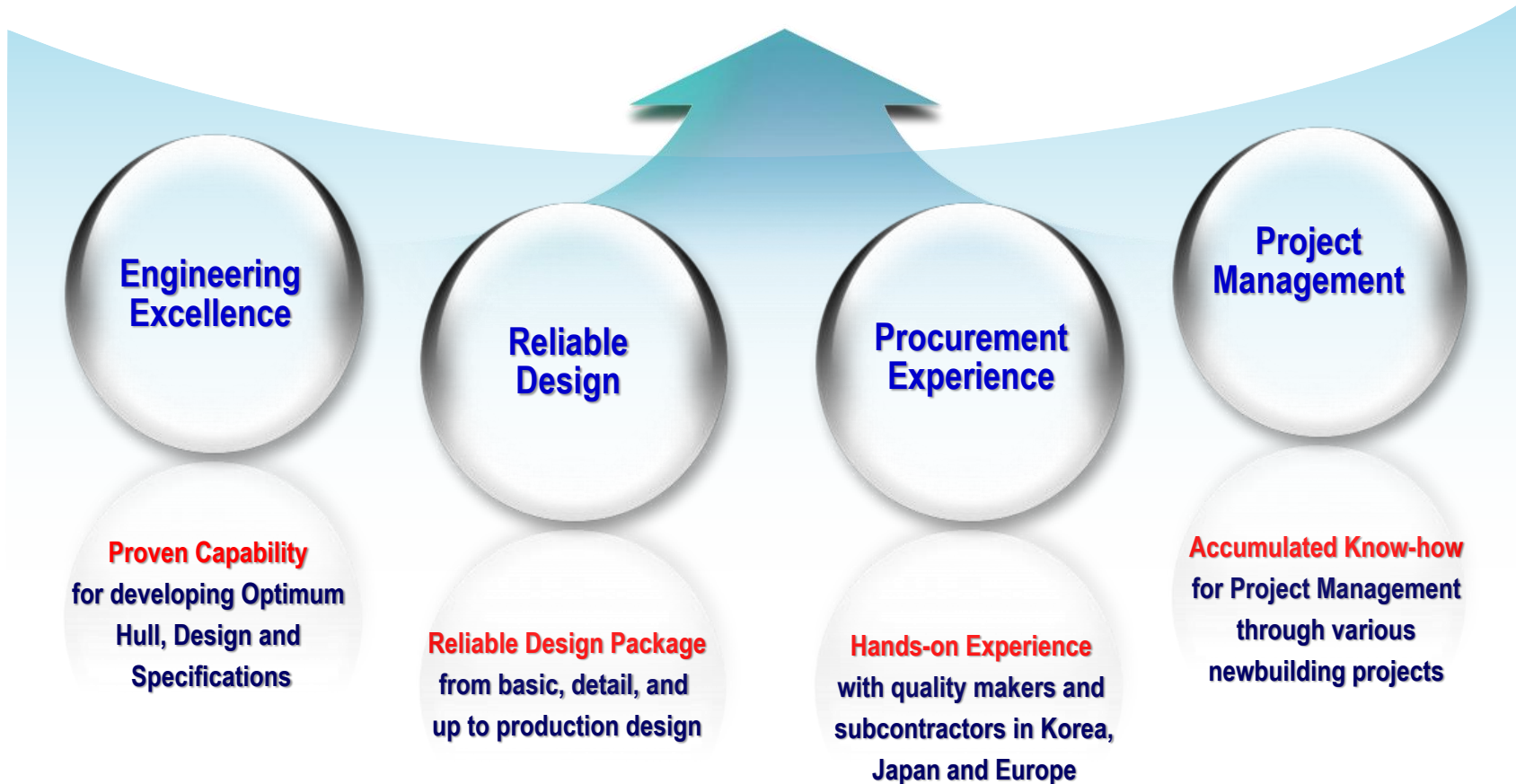
Ship Design & Engineering

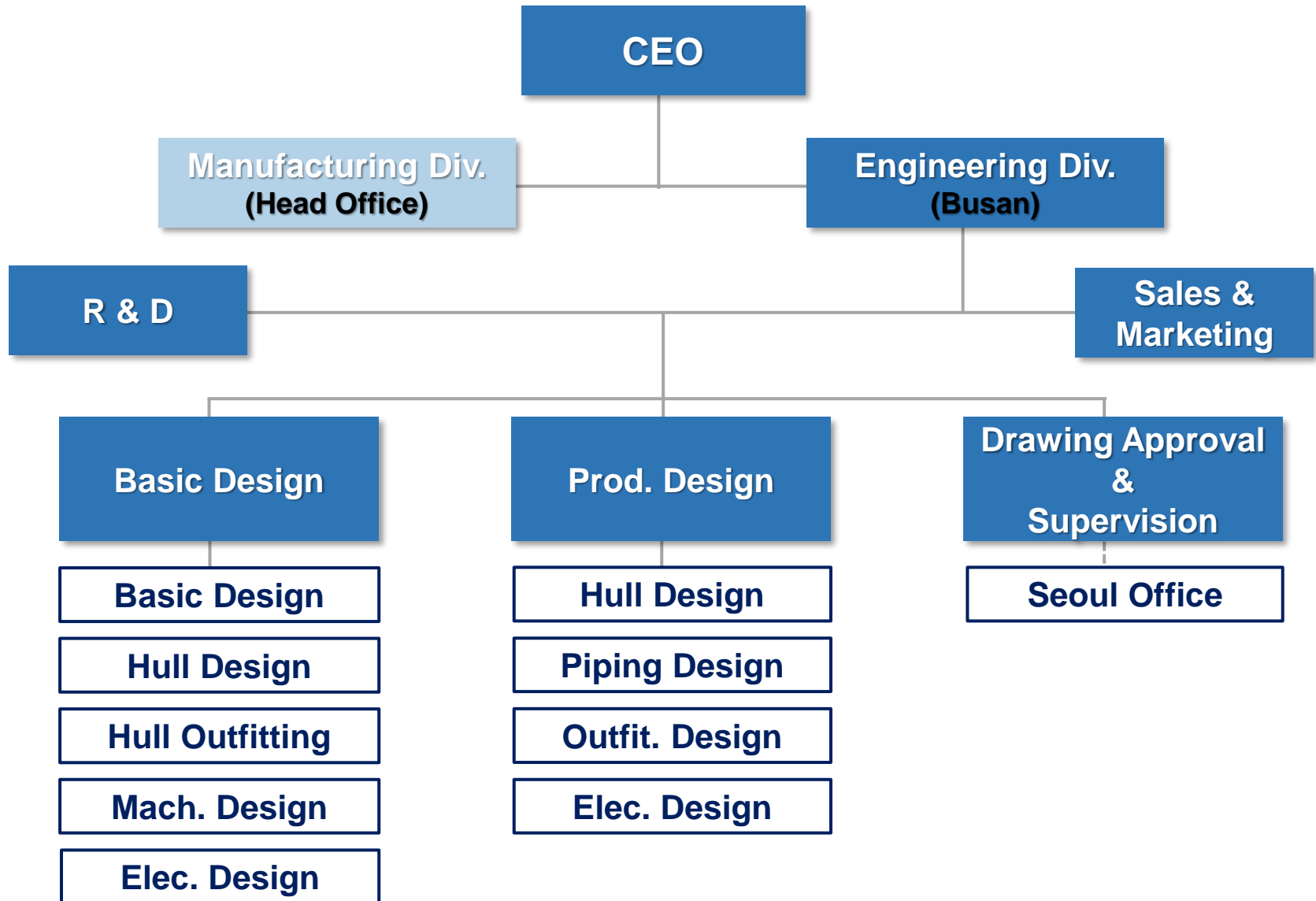
- FEED Engineering
- Basic, Detail Design, Production Design
- Retrofit (BWMS & Scrubber) & Conversion Engineering
- EEXI / CII Consulting
- ESD(Energy Saving Device) Engineering
- LNG Tank & FGSS Engineering & Supply

Drawing Approval Supervision

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

Solution Provider **for High Performance Vessel with Economical Advantage !**





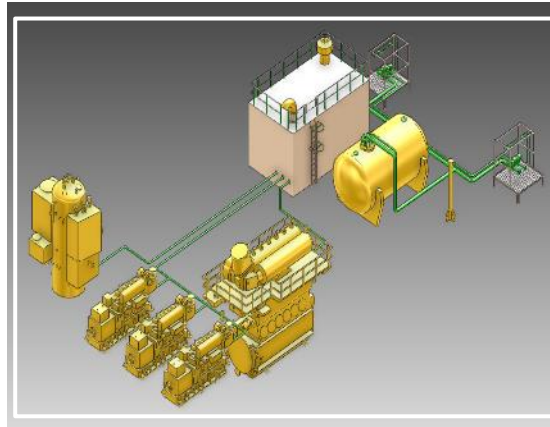
Conventional Vessel

- Tankers
- Bulk Carriers
- Containers
- ROPAX & Passenger Ship
- Special Purpose Ships



Green Vessel

- Small LNG & LPG (2-30K) Carriers
- LNG Tank and FGSS
- Electric / Hybrid Powered Vessels



Retrofit

- Scrubber Retrofit
- BWMS Retrofit
- Conversion
- Supervision



50K MR Tanker for Maersk/SHI

Package Design

Basic & Detail, Production Design
Project Management
Procurement Consulting



19.9K Oil / Chemical Tanker

Basic & Detail Design

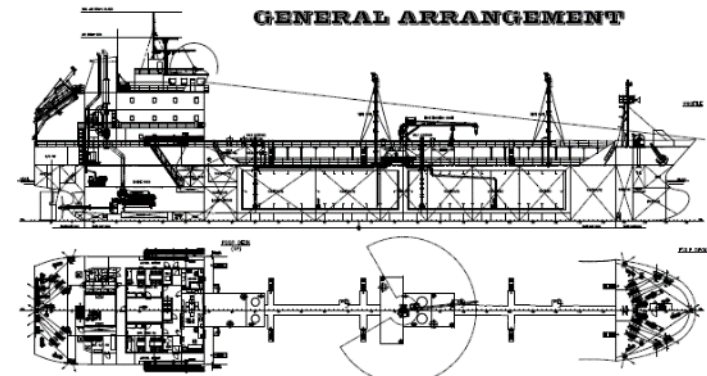
Project Management
Sekwang Heavy Industries Co., Ltd



4.99 Molten Sulfur Tanker

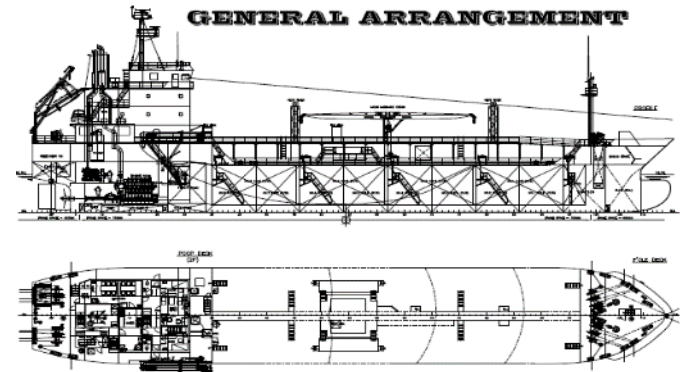
Basic & Detail Design

Project Management
Jiangsu Islands Shipbuilding Industry Co., Ltd.



2.8K DWT OIL/CHEMICAL TANKER (SUS 316 TANK)

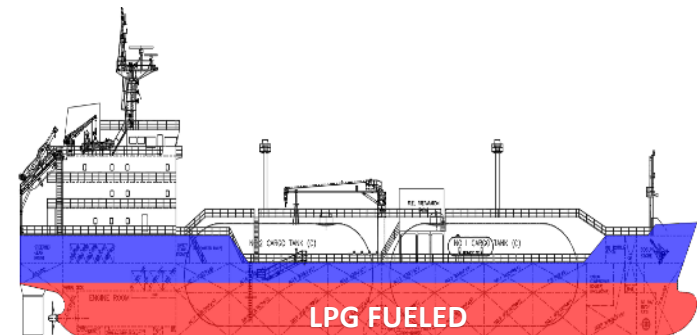
Basic & Detail Design
Nakatani Shipbuilding Co., Ltd.



5K CBM DF LPG Carrier

Package Design

Drawing Approval
Concept Design with
Daehan Shipbuilding & Engineering Co., Ltd.



10K CBM ETHYLENE/LPG/VCM CARRIER

Basic & Detail Design
Sekwang Heavy Industries Co., Ltd.



34K DWT Bulk Carrier

Basic & Detail Design

WonYoung Shipbuilding Co., Ltd.



6.6K DWT Self Unloading Cement Carrier

Basic & Detail Design

INP Heavy Industries Co., Ltd



11K DWT Self Unloading Coal Carrier

Basic & Detail Design

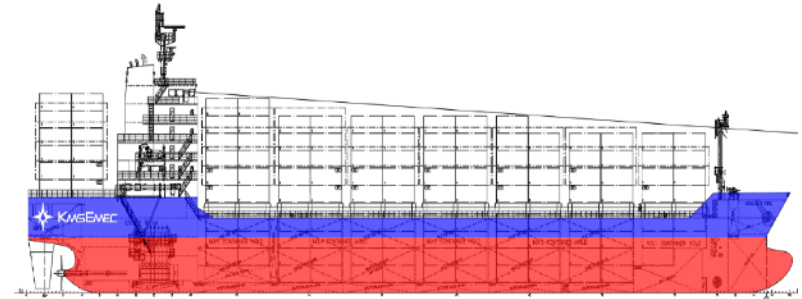
JIANGSU ZHENJIANG / CJ Logistics.,Ltd



1,000 TEU Container

Basic & Detail Design

Daehan Shipbuilding Industry Co., Ltd.



19K DWT Heavy Lift Carrier

Basic & Detail Design

Megaline Co., Ltd



19K DWT Multi-Purpose Carrier

Basic & Detail Design

CSM, Germany



G/T 29,554 Ro-Ro Passenger Ship

Basic Design & Detail Design

Weidong Ferry Co., Ltd.



G/T 32,000 Ropax Ship

Basic Design

Weidong Ferry Co., Ltd.



160m Class Ropax Ship

Basic & Detail Design

Daesun Shipbuilding & Engineering Co., Ltd.



Hybrid Harbor Cleaning Ship

Basic Design

KOEM



B.P 60MT LNG ASD TugBoat

Basic & Detail Design

Heung Hae Shipbuilding Co., Ltd.



Electric Propulsion Harbor Guide Ship

Basic & Detail Design

Haemin Shipbuilding Co., Ltd.

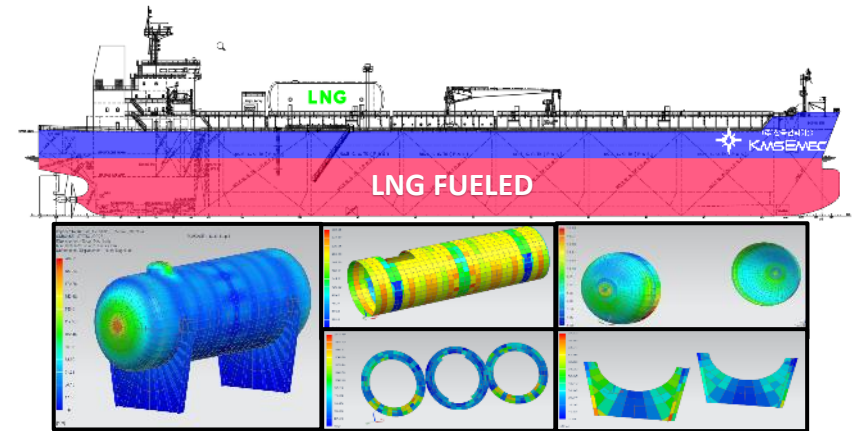


LNG DF 50K MR Tanker

Concept Design

incl. LNG Tank and FGSS

AIP from KR



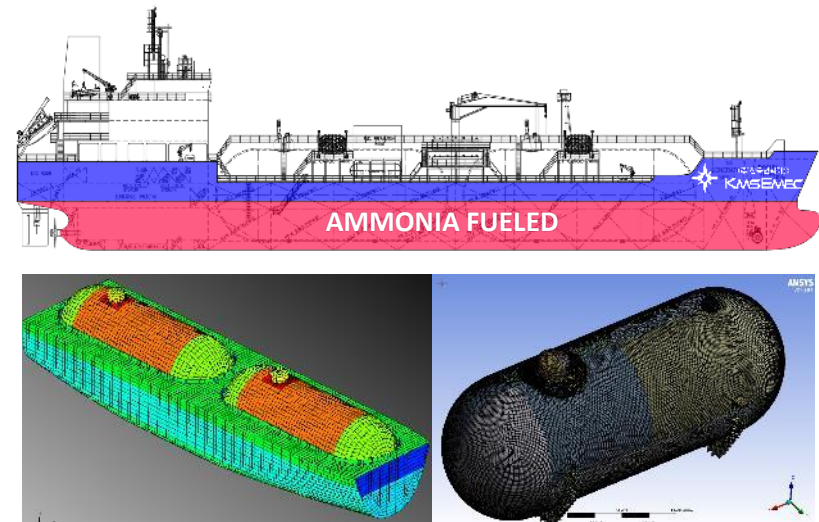
Ammonia DF Ammonia Bunkering Vessel

Concept Design

incl. Cargo Tank and FGSS

AIP & JDP

NAVIG8, MAN ES, KR



Ship Type	Project	Client
Tanker & Gas Carrier	50K DWT Product & Chemical Tanker	SK SM Co., Ltd.
	3,500 CBM LPGC	Sangji Shipping Co., Ltd.
Bulk Carrier	325K DWT VLOC	KLC SM Co., Ltd.
	250K ORE Carrier	POLARIS Shipping Co., Ltd.
	19.5K Self Unloading Coal Carrier	KLC SM Co., Ltd.
Ropax	37,900 G/T Ro-Ro Passenger Ship	Huadong Shipping Corp.
	30,000 G/T Ro-Ro Passenger Ship	Weidong Ferry Co., Ltd.
	25,000 G/T Ro-Ro Passenger Ship	HYDEX
	20,000 (160m) G/T Ro-Ro Passenger Ship	Hanil Express Co., Ltd.
Special Purpose Ship & Tug Boat	5,000 PS Tug Boat	Sunhwa Marine Co., Ltd.
	380 G/T Research Vessel	Korea National Park

Ship Type	Project	Client
Tanker	321K DWT VLCC	Hyundai Ocean Co., Ltd.
	317K DWT VLCC	SK Shipping Co., Ltd.
	105K DWT Aframax Tanker	BP Shipping Co., Ltd.
Bulk Carrier	250K DWT VLOC	SK SM Co., Ltd.
	62K General Cargo Vessel	POS SM Co., Ltd.
	14.5K DWT Bulk Carrier	Shinsung Shipping Co., Ltd.
Gas Carriers & Ropax	174,000 & 180,000 CBM LNG Carrier	SK Shipping Co., Ltd.
	84,000 VLGC & 38,000 LPGC	KSS Shipping Co., Ltd.
	7,300 UNIT Ro-Ro Passenger Ship	Glovis
Containers & MPC	13,100 TEU Container Carrier	Hanjin SM Co., Ltd.
	4,250 TEU Container Carrier	Seaspan Co., Ltd.
Special Purpose Ship	4,500 Disp. Ton Hydrographic survey vessel	South African Navy
	12.7K DWT Block Carrier	TRANS MEGALINE Co., Ltd.

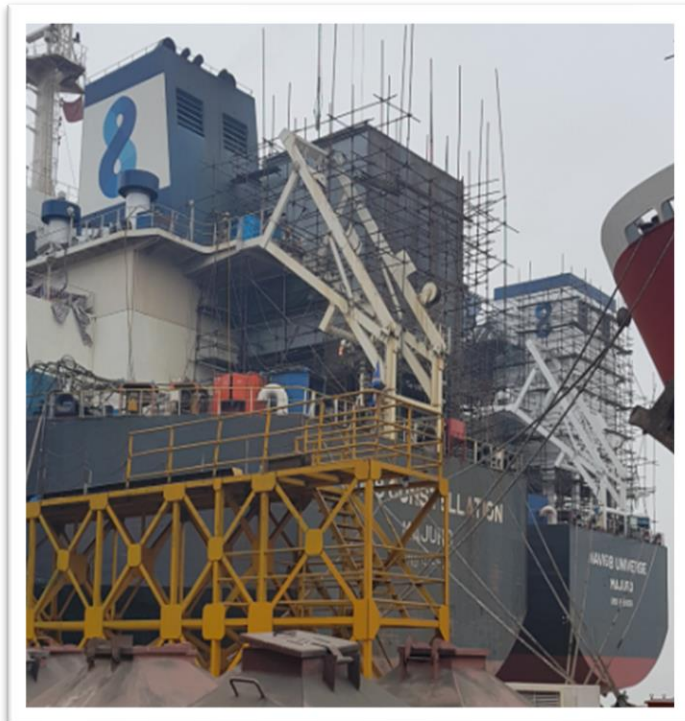
Scrubber

Engineering : Over 60 vessels

(Feed / 3D Scan - Basic & Prod. Design)

Turn-Key : 3 Vessels

(Engineering – Purchase – Installation / Supervision)

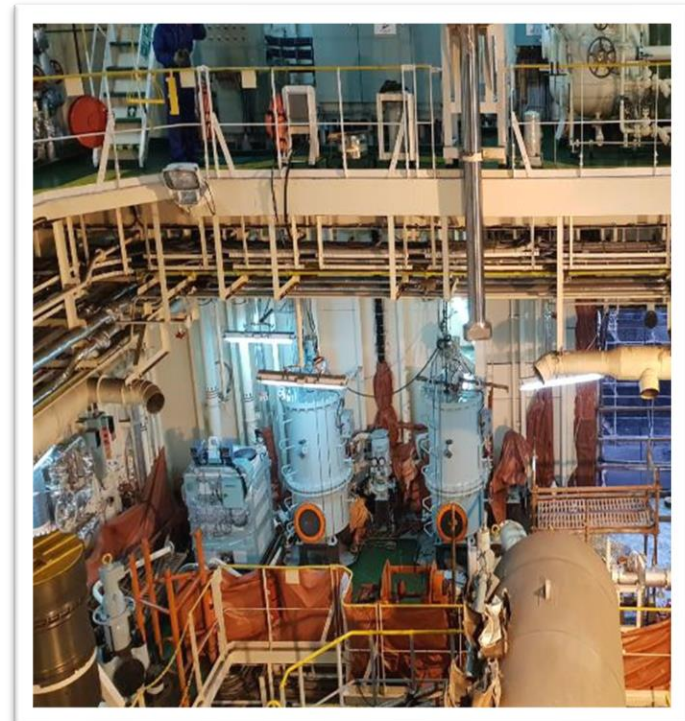


BWTS

Engineering : Over 40 vessels

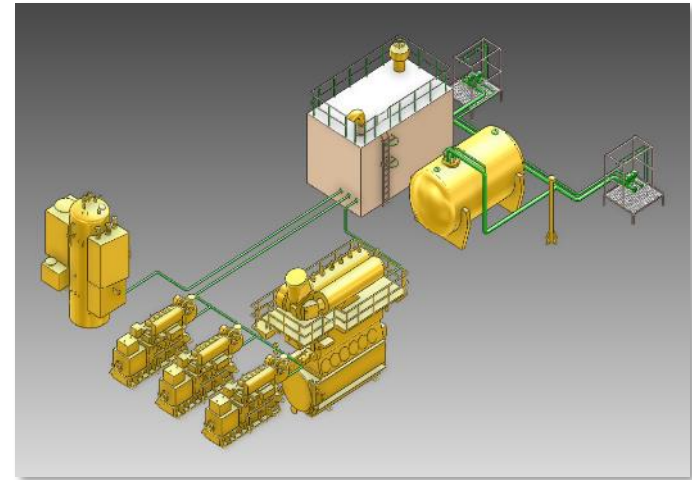
(Feed / 3D Scan - Basic & Prod. Design)

Engineering - Supervision : 4 vessels



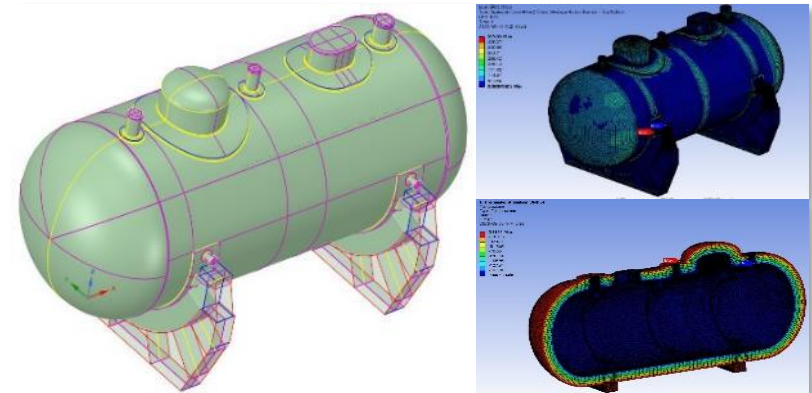
► FGSS

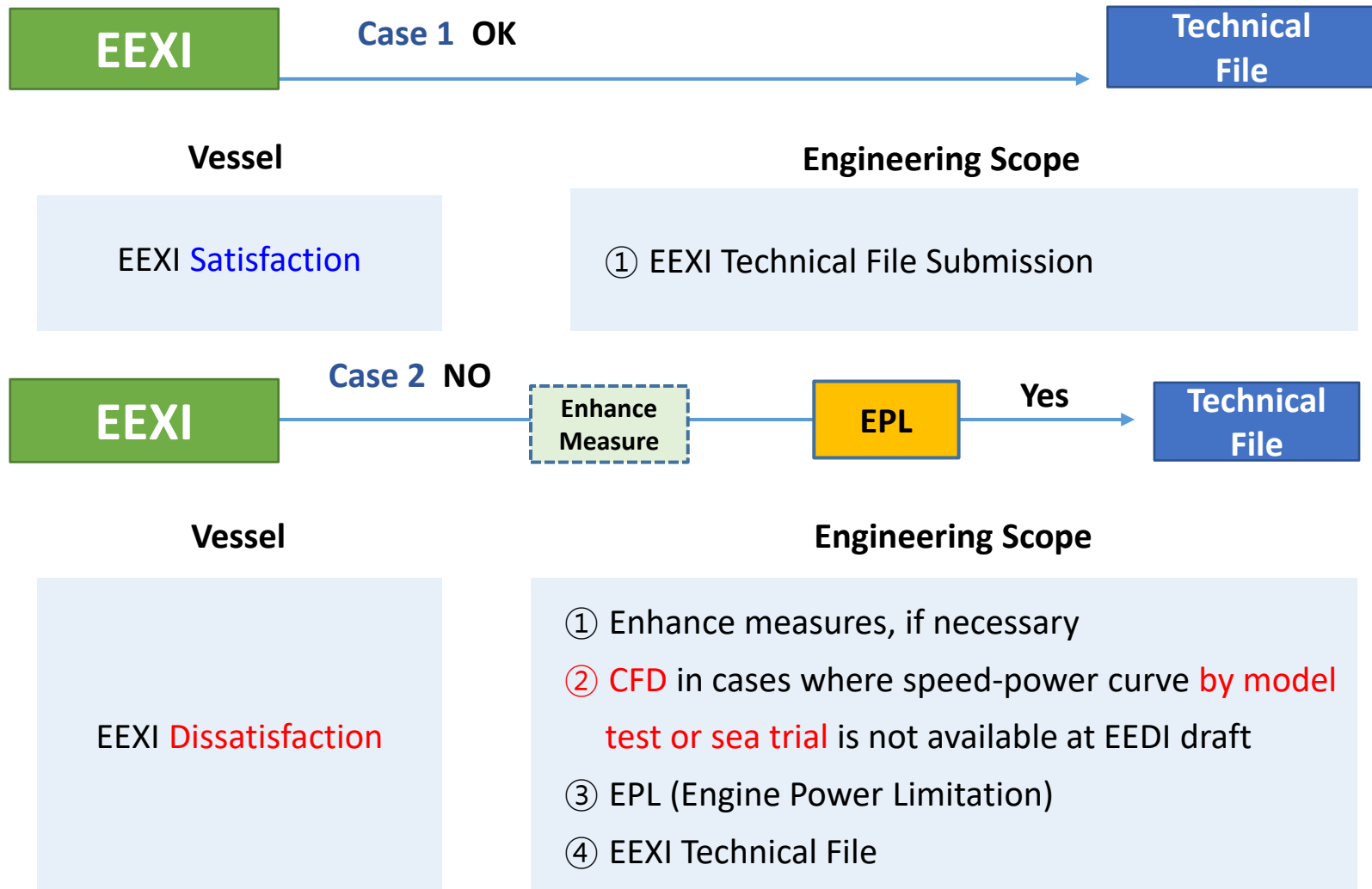
- Total package supplier of FGSS
- Full engineering with customized design available for all engine makers & pressure types
- Compact foot area and easy installation
- Reliable technical assistance & guidance
- Onboard commissioning & Fuel gas trial



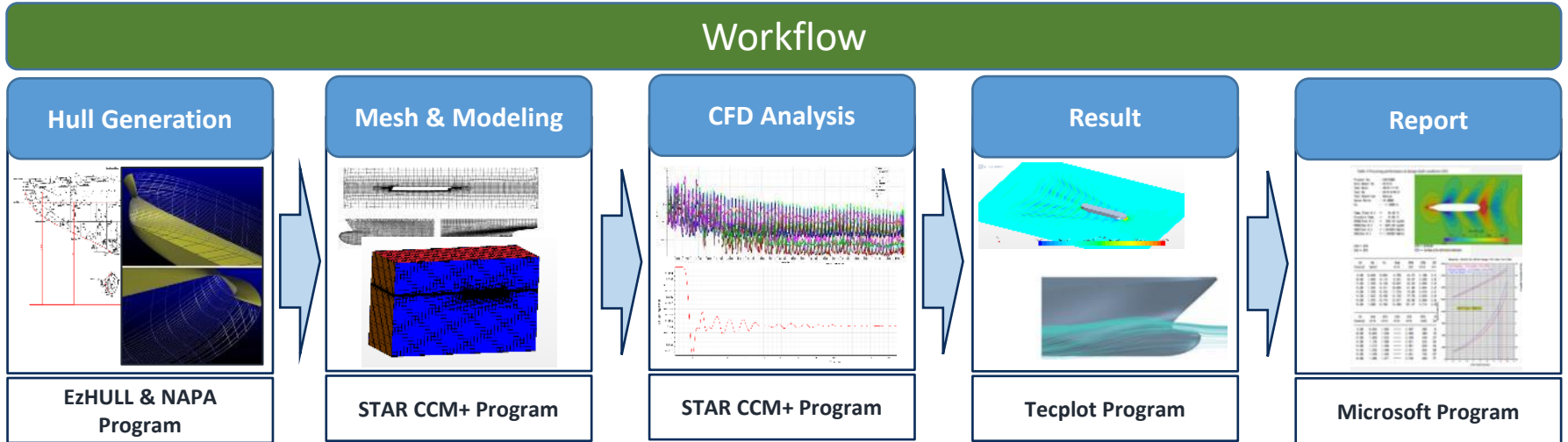
► LNG Fuel Tank

- Reliability of integrally structural safety
- Adequate material to be used according to thermal analysis.
- Optimized design and operation applied to cryogenic LNG fuel tank





Workflow for CFD Analysis [in cases where speed-power curve is not available]



Result of CFD Analysis

Flow Visualization

[Wake contour] [Wave pattern] [Wave profile]

[Streamline] [Pressure distribution]

Speed Power & Curve

Test Conditions		Design	Scale	Design Draft
Scale: 1:1.0		Design: 5.5/5.5	Scale: 1:1.0	Design Draft: 4800

Input Data		Output Data	
Prop Dia	4.81	HP	100.00
Rev	100.00	Q (m³/s)	2.0271
Q (m³/s)	2.0271	Q (m³/s)	100.00
Q (m³/s)	100.00	Q (m³/s)	100.00

Powering Prediction		VIB SHIP	
Target	742.27	1400	2370
Current	68.00	1100	2410
Q (m³/s)	2.02	242	170

[Power prediction] [Speed & Power Curve]

■ Comparison between Model Test Result(or CFD) and Statistical mean by Rule

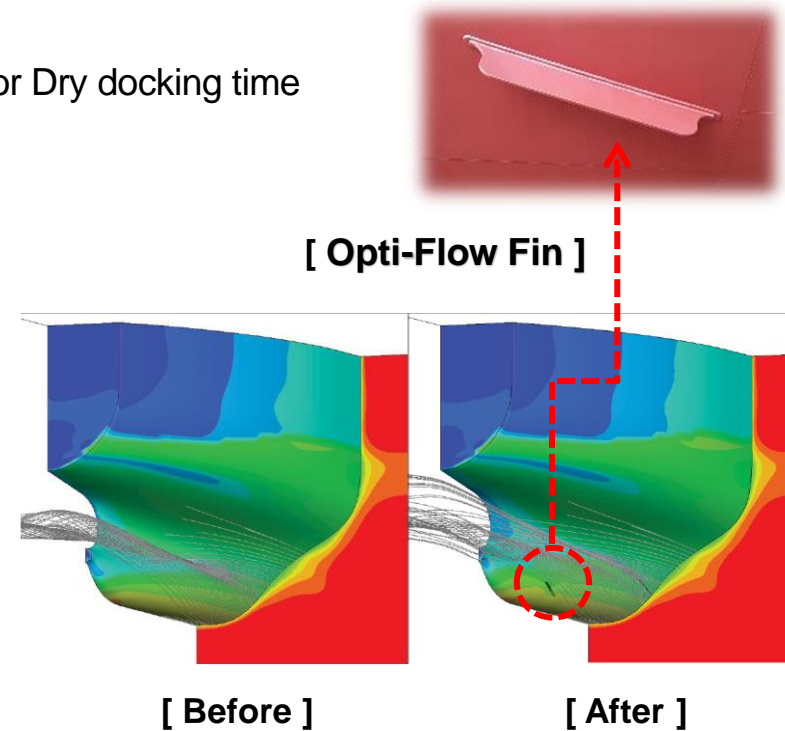
Reference Ship	Built	Speed (Model test or CFD, A)	Speed (Formula, B)	Deviation (A-B)	Attained EEDI Deviation (%)
37K Tanker	2017	14.780	14.196	0.584	4.06
50K MR Tanker	2019	14.020	13.396	0.624	4.46
114K Aframax Tanker	2014	14.300	14.159	0.141	0.99
157K Suezmax Tanker	2013	15.410	15.273	0.137	1.01
300K VLCC	2012	14.500	14.500	0.000	0.00
38K LPG Carrier	2016	15.680	15.280	0.400	2.54
82K BC	2016	13.700	13.700	0.000	0.00
8000TEU Container	2018	24.500	24.141	0.359	1.52

▶ Opti-Flow Fin Retrofit Proposal

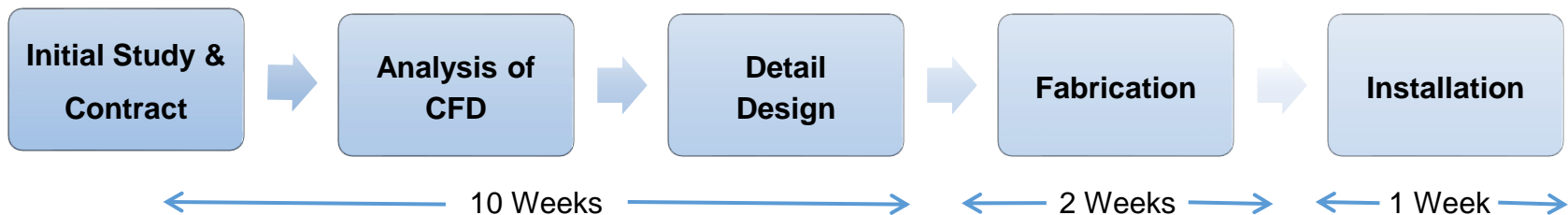
- Simple & Simultaneous work during BWMS Retrofit or Dry docking time
- Guarantee for Energy Saving by CFD Analysis
- Proven effect by Major yards, CFD & Model test

▶ Advantage of ESD

- Cost(Fuel)-saving : abt. 2%
- Reduction Hull Vibration (30%)
- Easy Installation (need dock time : within 7 days)
- No Maintenance



▶ ESD Retrofit Procedure



Energy(Fuel) Saving & Speed Improvement Example

Fuel Saving

180K Cape Bulk Carrier (DFOC = 50Ton/day)

50 [ton/day] x 2% x 500 [\$ /ton] x 220 days

“Cost reduction = 110,000 USD/year”

Speed Improvement

180K Bulk Carrier (built in 2013)

Speed gain of approx. **0.1 Knot** to be expected under EEXI Engine power limitation

Opti-Flow Fin Fuel Saving Expectation

Vessel Type	Opti-Flow Fin (Expectation)	Remark
VLCC over 10 years	Over 2 %	
Cape BC over 10 years	Over 2 %	

Feasibility Report for LNG DF Application on 22K Chemical Tanker

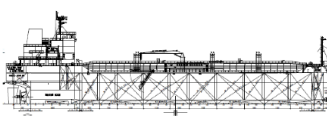
KMSEMEC CO. LTD. KOREA

Feasibility Study Report

22,000 DWT CHEMICAL TANKER


for

Dual Fuel Application



Revision No.: 0 (for preliminary check)
Date: 2021. 10. 05

Total (26) sheets with a



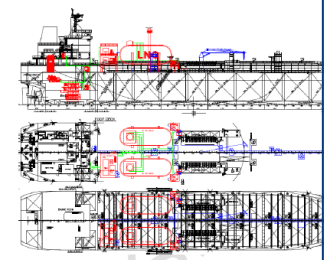
KMSEMEC (주)한국선박기술

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Feasibility Study Report Dual Fuel Application

4. General Arrangement (modified due to the FGSS and LNG tank)

4.1 General Arrangement




Two (2) sets of type-C LNG fuel tanks(700m³) with 6.9m diameter at has been arranged on upper deck and 12.5m away from accommodation install water spray system in accommodation front.

Considering fixed and portable tank cleaning machine and other pip arrangement, LNG fuel tank has been arranged at about 3.5m height fit but it should be adjusted based on actual maker drawings of tank clean

As an alternative 5.3.3.1, IGF Code, the value of f_{EX} should be calculated distance from the ship side at right angles to the centerline at the level load line draught is smaller than B/5, 4.92m. (distance : 2.45m excluding insulation thickness)

Estimated f_{EX} is about 0.0253 and it is complied with 5.3.4, IGF Code below :

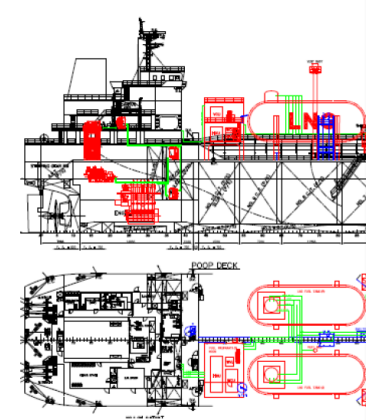



4

Feasibility Study Report Dual Fuel Application

6. Rough Routing of LNG piping

6.1 Piping Route in G.A.





13

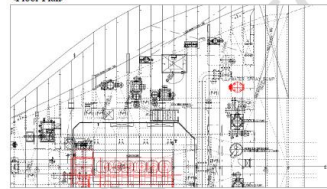
Feasibility Study Report Dual Fuel Application

7. Machinery Arrangement (modified due to the DF)

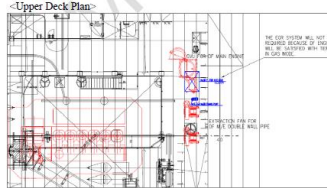
7.1 Study of DF Main Engine Arrangement


- 1) DF equipment
 - WinGD 6X40DF-1.0
 - GVVU for M/E
 - Extraction Fan
 - Water spray pump
- 2) Removal equipment
 - 6UJEC42LSH-Eco-D3-EGR
 - M/E EGR Equipment.

<Floor Plan>



<Upper Deck Plan>

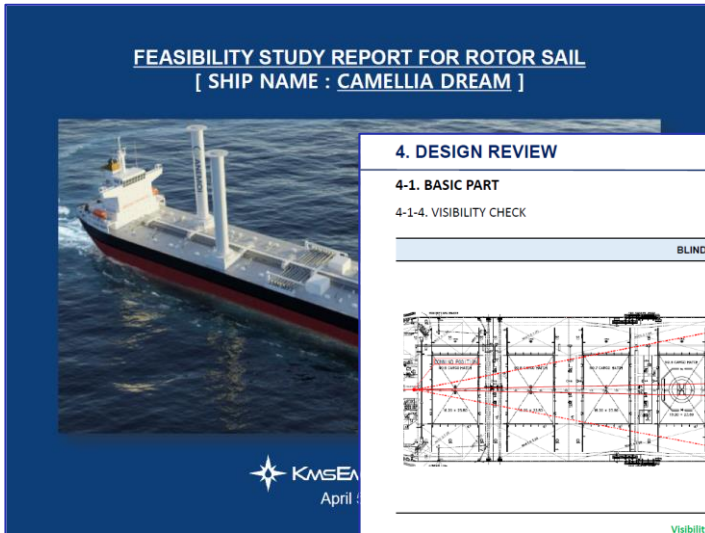




14

- Feasibility Report
- AIP certification
- Retrofit Engineering

Feasibility Report for Rotor Sail on 207K Bulk Carrier



4. DESIGN REVIEW

4-1. BASIC PART

4-1-4. VISIBILITY CHECK

BLIND SECTOR

Visibility

Note :
TOTAL ARC OF BLIND SECTOR (LESS THAN 10 DEGREE) :
TOTAL ARC OF BLIND SECTOR : 2.2° < 20°

4. DESIGN REVIEW

4-2. HULL STRUCTURE PART

4-2-1. SUPPORTING STRUCTURES FOR RAIL SUPPORT & ROTOR FOUNDATION

UPPER DECK

The reinforcement for 2x Rotors (Rotor foundation) be provided under the rail support and the rotor

4. DESIGN REVIEW

4-2. HULL STRUCTURE PART

4-2-2. LOCAL FINITE ELEMENT ANALYSIS FOR SUPPORTING STRUCTURE IN WAY OF ROTOR FOUNDATION

STRESS ANALYSIS
RESULTS OF FINITE ELEMENT ANALYSIS OF STRESS CONTOUR. STRESS CONTOUR. MAXIMUM STRESS: 114.1 MPa, MINIMUM STRESS: 0.0 MPa

a. Preliminary strength analysis:
From the analysis result with the preliminary interface load provided by vendor, it is no need to change the existing structures and it is sufficient to add only the reinforcement under rotor foundation.

b. Construction design stage:
The local strength analysis should be performed again with the actual interface load provided by vendor.

- Feasibility Report
- AIP certification
- Retrofit Engineering

DESIGN	PROGRAM
Lines Development	NAPA
CFD	Star-CCM+
Hull Design (incl. 3D Modeling, Local scantling calculation)	EzHULL
	AVEVA Hull Design
	Nauticus Hull
	KR - Hull Scan
FEM Structural Analysis	ANSYS
	FEMAP W/NASTRAN
	PATRAN / NASTRAN
3D Scanning	AVEVA LFM
	FARO Scene
	Recap Pro
Basic & Detail design	Smart Sketch
	AutoCAD
Production drawing	AVEVA Everything3D
	AVEVA Marine (30 copies)
	Navisworks Simulate



AVEVA



SIEMENS
Ingenuity for life



FARO
SCENE

Design services of about **600 vessels** for different types and class

(From 2001)

Ship Type	No. of vessel
1) Tanker & Gas Carrier	85
2) Dry Cargo Ships	30
3) Container & MPC	18
4) Special Purpose Ships	18
5) ROPAX & Passenger Ship	20
6) Training Ship & Research Ship	26
7) Patrol & Salvage Vessel	30
8) Miscellaneous Small Ships	48
9) Tug Boat & Work Boat	45



10,000 CBM LPGC



G/T 29,554 G/T ROPAX



G/T 8,500 Training Ship

Supervision services for the construction 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	119
7) Special Purpose Ships	13
8) Tug Boat & Work Boat	24



310,000 DWT VLCC

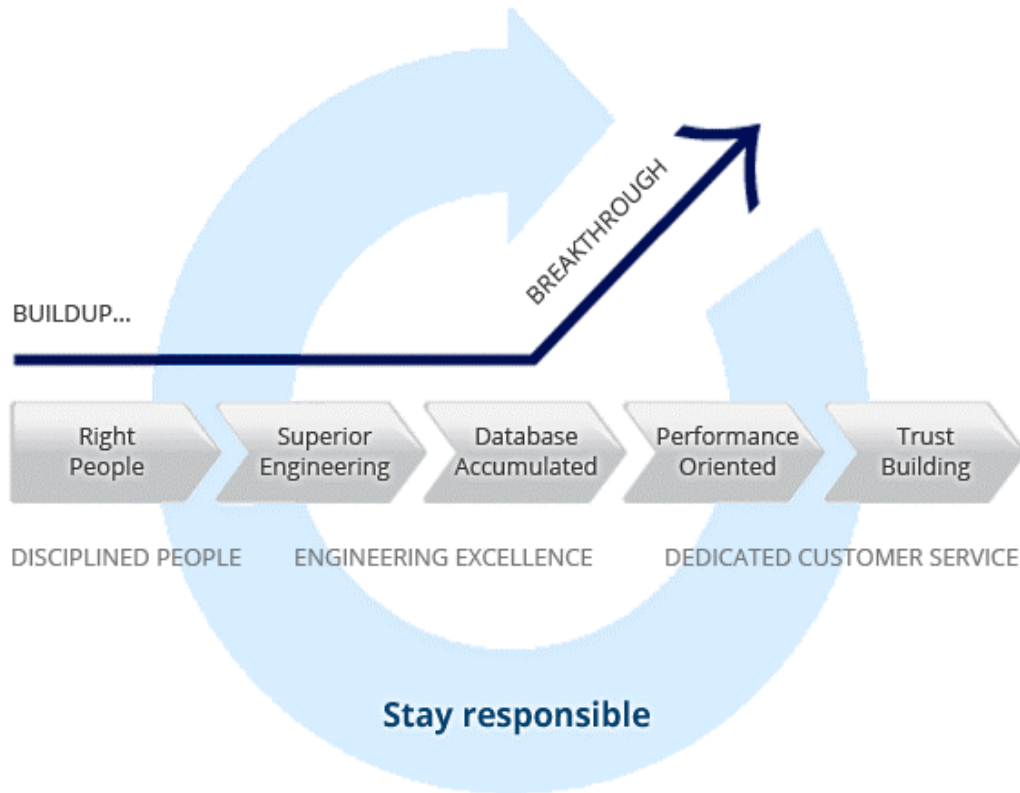


28,000 DWT Bulk Carrier



300 D/T Patrol & Rescue Vessel

KmsEmec Flywheel



Supplying superior design. Dedicated engineering service. Solution providing consulting throughout the period of project.

Catalyzes commitment to and vigorous pursuit of a clear and compelling vision, stimulating higher performance standards.

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Vietnam Office (Detail Design Engineering)

An Tri group, Hung Vuong Ward, Hong Bang district, Hai Phong, Vietnam
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