

On Newbuildings...

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This is not the dome of a Gothic cathedral . . .

Table of contents

- Why to contract a newbuilding
- How to contract a newbuilding
- Newbuilding contracts
- Newbuilding specification
- Plan approval
- Newbuilding supervision
- After sales support
- Conclusions
- Appendix



. . . It is reversed bedplate of an ME-GI (dual fuel) Main Engine of a modern LNG carrier, from an artistic perspective

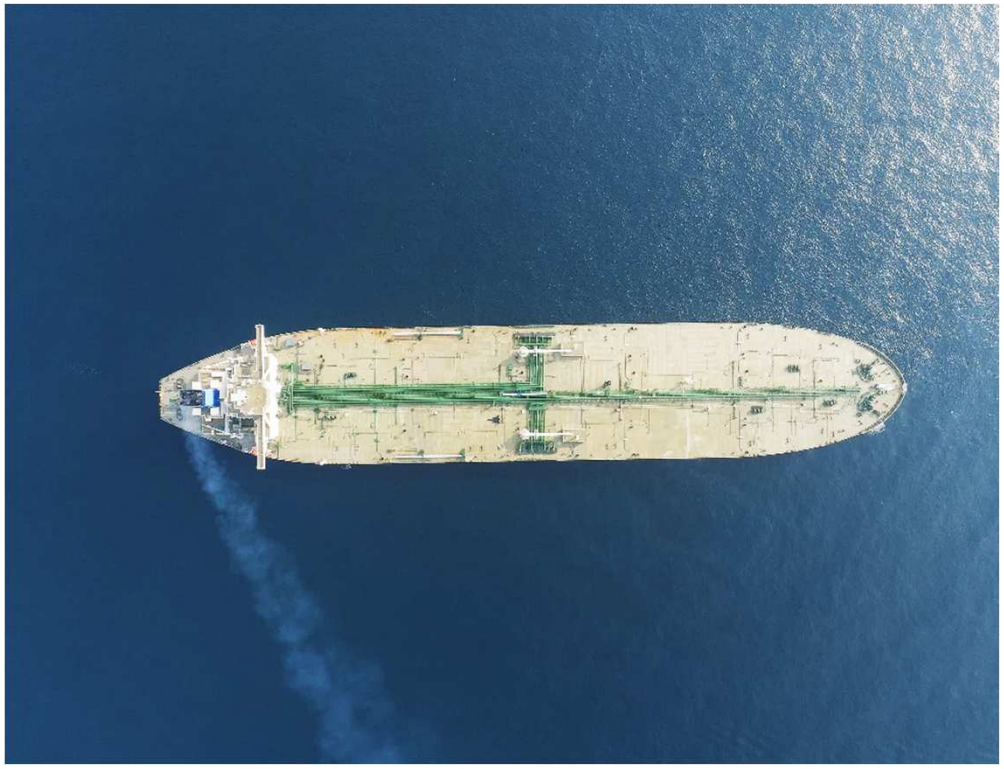
Why to contract a newbuilding ?

- Fleet renewal
- Fixed charter (time or bareboat)
- Opportunistic order (low newbuilding prices, good market prospects)
- Take over a resale
- Take advantage of emerging newbuilding technologies
- An investment in newbuilding may improve the reputation of the company



How to contract a newbuilding

- Through a broker
- Directly with a shipyard
- In-house market research and evaluation
  - Review of outline specifications (up to 55 pages)
  - Price / payment terms
  - Delivery time
- Prepare a comparison between the outline specifications
- Create a shortlist of shipyards
- Sign an LOI with the most attractive yard.



How to contract a newbuilding

- Discuss detailed specifications (approx. 600 pages) and negotiate contract terms.
  - Review of basic drawings and the commercial performance of the ship
    - Speed Vs power curves, model test reports, preliminary M/E SFOC curves
    - General Arrangement, Capacity Plan, Midship Section, Electric Load Analysis, Mooring Arrangement, Steam Balance etc.
  - Review of makers list
  - Choose a Classification Society and a Flag State
  - Additional items based on company's standards
  - Incorporate charterers' requirements and other industry standards (OCIMF, ISO, SIGTTO, ISGOTT etc.)
- Sign the shipbuilding contract.
- Wait for the refund guarantee to be issued.
- Pay the first installment.

Newbuilding contracts

- A standard newbuilding contract of a Korean shipyard consists of 22 Articles and 2 Exhibits. All aspects of the newbuilding construction are specified in detailed and responsibilities between parties are clearly defined.
- Standard forms exists but the detailed terms depend on the negotiable power of the Buyers and/or the brokers.

Article I – Description and Class

- Dimensions and basic characteristics
- Class, Rules and Regulations
- Subcontracting
- Registration

Article II – Contract price and terms payment

- Contract price
- Terms of payment
- Method of payment
- Corporate guarantee

Article III – Adjustment of Contract Price

- Delivery
- Speed
- Fuel Consumption
- Cargo Capacity
- Boil-off rate

Article IV – Approval of plans and inspection during construction

- Approval of plans and drawings
- Inspection
- Liability of Builder
- Progress reports
- HSSE

Newbuilding contracts

Article V – Modifications

- Modification of Specifications
- Change in Class etc.

Article VI – Trials

- Extend of Trials
- Weather Conditions
- How Conducted
- Methods of Acceptance or Rejection

Article VII – Delivery date and delivery

- Time and Place
- When and How Effected
- Documents to be delivered to the BUYER

Article VIII – Delays and extension of time for delivery (FORCE MAJEURE). May become important due to the Covid-19 pandemic.

- Causes of Delay
- Notice of Delay
- Definition of Permissible Delay
- Right to Terminate Contract for Excessive Delay

Article IX – Warranty od Quality

- Guarantee
- Latent Defects
- Notice of Defects
- Remedy of Defects
- Guarantee Engineer

Newbuilding contracts

Article X – Remedies of Buyer

- Notice
- Builders Default
- Refund by Builder

Article XI – Remedies of Builder

- Definition of Default
- Interest and Charges
- Effect of Defaults
- Sale of Vessel

Article XII – Insurance

- Extent of Insurance Coverage

Article XIII – Disputes and Arbitration

- Proceedings
- Entry in court

Article XIV – Rights of Assignment

Article XV – Taxes and Duties

Article XVI – Patents, trademarks, copyrights

Article XVII – Buyer's supplies

Article XVIII – Representatives

Article XIX – Notice and Language

Article XX – Effective date of contract

Article XXI – Interpretation

Article XXII – Business Standards

Exhibit A – Refund Guarantee

Exhibit B – Corporate Guarantee

Newbuilding specification (Suezmax tanker)

GROUP 1 : SHIP GENERAL

GROUP 2 : HULL STRUCTURE AND MATERIAL PROTECTION

GROUP 3 : EQUIPMENT FOR CARGO

GROUP 4 : SHIP EQUIPMENT

GROUP 5 : EQUIPMENT FOR CREW
- **HULL OUTFITTING**
- **ACCOMMODATION**

GROUP 6 : MACHINERY MAIN COMPONENTS

GROUP 7 : SYSTEMS FOR MACHINERY
- **MAIN COMPONENTS**

GROUP 8 : SHIP SYSTEM

GROUP 9 : NAVIGATION, COMMUNICATION, AUTOMATION AND ELECTRICAL SYSTEM



Newbuilding specification (Suezmax tanker)

Chapter 1 – General

- General Particulars
- Classification, Rules and Regulations
- Contractual speed, power and deadweight
- Inspection and testing, trial procedures
- Plans for approval
- Owner supply items

Chapter 2 - Hull

- Hull structure specification
- Coating specification

Chapter 3 – Equipment for cargo

- Cargo pumping system
- Cargo heating system
- Inert gas and tank venting systems
- Tank cleaning system

Chapter 4 – Ship equipment

- Manoeuvering equipment
- Anchoring equipment

Chapter 5A – Equipment for crew

- Lifesaving and loose firefighting equipment
- Traffic fittings
- Cranes and accommodation ladders
- Ventilation

Chapter 5B – Accommodation

- Insulation, ceilings, doors and windows
- Deck covering, stairways etc.
- Furniture
- Catering, refrigerated provision stores
- Elevator
- Air-conditioning
- Sanitatry system

Newbuilding specification (Suezmax tanker)

Chapter 6 – Machinery components

- Main Engine
- Transmission
- Steam generating plans
- Electric power generating plans
- Emission reduction systems

Chapter 7 – System for machinery and main components

- Engine Room piping specification
- Fuel oil system
- Lube oil system
- Cooling water system
- Compressed air system
- Exhaust gas system
- Steam and condensate and feed water system
- Miscellaneous equipment
- Repair and maintenance equipment

Chapter 8 – Ship System

- Ballast system
- Bilge system
- Valve remote control system
- Fire extinguishing system
- Air and sounding system

Chapter 9 – Navigation, communication and electrical systems

- Navigation and searching equipment
- Communication equipment
- Fire detection
- Automation systems for machinery
- Electric power generating plant
- Electrical system
- Lighting equipment

Plan approval



- After the signing of the newbuilding contract the yard submits detailed drawings and supportive calculations to Class and the Buyers head office.
- Buyers has the right to review the drawings and submit comments to the shipyard through a standard form.
- Normally Buyers approve before Class.
- The yard issues final “for construction” drawings considering Buyers and Class comments. The production department proceeds with the construction of the ship based on the final drawings.
- The plan approval procedure can either be sub-contracted to specialized consultants or undertaken in-house by dedicated teams within the technical department.
- In-house plan approval teams have the advantage that they know the company standards and trading requirements. Furthermore, they can implement upgrades based on lessons learned and practical experience gained from real-life problems encountered in the operation of ships.
- The plan approval procedure is essential and must be dealt with appropriate attention to ensure the delivery of a high-quality ship.

Milestones of newbuilding construction

The time from steel cutting up to the delivery of a newbuilding varies depending on the type of the ship, on the backlog and the capacity of the shipyard.

As of July 2020, the top Korean shipyards, have achieved the construction of an 318k DWT VLCC in 9 months.

This is significantly less compared to the first VLCC built in Korea 46 years ago – the Atlantic Baron owned by Livanos - which took Hyundai 2 years and six months to complete.

Milestones of newbuilding construction

Steel Cutting

Cutting, blasting and shop priming of steel plates
Fabrication and assembly of steel blocks.
Pre-outfitting
Shop test of equipment

Keel Laying

Assembly of megablocks and dock erection
Outfitting
Shafting system alignment and installation
Hull coating

Launching

Onboard commissioning of equipment
Dock trials
Deadweight measurement and inclining experiment

Sea Trials

Strength tests
Speed tests
Manoeuvering trials
Cargo trials
Testing of equipment

Delivery

Protocol of delivery
Registration of the ship

Newbuilding supervision

Korean, Chinese and other yards

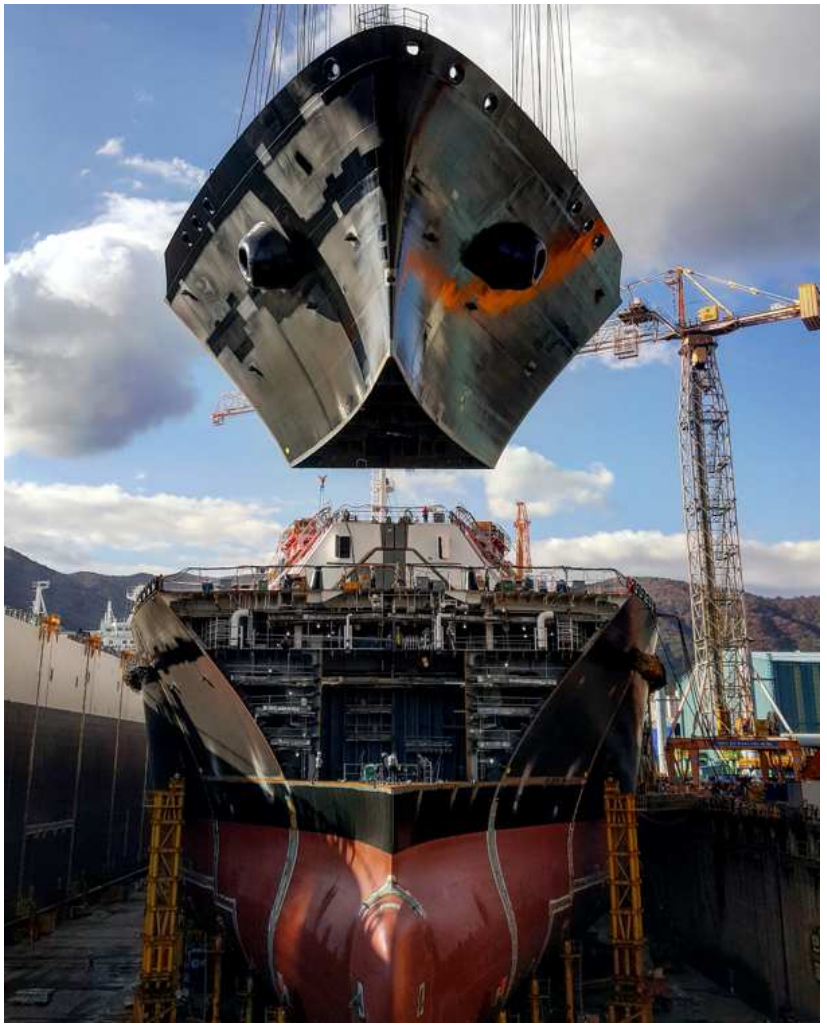
Appoint a site team

Japanese yards

It is common to appoint a single supervisor

Bulk carriers and tankers
4-6 members per ship.
Depending on ship construction overlap.

LNGCs
6-8 members per ship



Newbuilding supervision – Site Office

Options for site team

- Subcontract to a third party
- Subcontract with own site manager
- Subcontract with some of own team members
- Create own site team

An in-house site office can play the role of a “talent development pool” for the next generation of superintendents, managers etc.



Newbuilding supervision – Site Office

A site office would normally consist of the following people/disciplines:

- **Site manager** –Naval architect or ex chief engineer with long experience in newbuilding projects
- **Machinery supervisor –** Ex- chief engineer
- **Coating supervisor** – Naval architect or chemical engineer certified by FROSIO (coating and surface treatment standards)
- **Cargo containment system supervisor** –Naval architect or mechanical/marine engineer.
- **Hull Structure and outfitting supervisor** –Naval architect or mechanical/marine engineer
- **Electronics and automation supervisor** – Electrical engineer
- **HSSE supervisor –** Any engineering degree
- **Site team secretary** – Usually a person who can speak the local language

Some seagoing experience is a strong advantage for site office members.



Newbuilding supervision – Progress Monitoring

The head office and the site office communicate daily throughout the entire construction process.

In the fast-pace world of shipbuilding there will only be limited time for “round-table” discussions and a large number of KPIs.

The head office, the site office and the shipyard are engaged in dynamic discussions during which solutions are given on the spot.

For record keeping purposes, the site team and the shipyard prepare and send to the head office a monthly report describing the construction progress of the newbuildings.

The monthly report consists of a short narrative of the key events, an on-site photo report and KPIs such as:

- Hull structure construction progress
- Painting progress.
- Inspections progress.
- HSSE statistics.
- Inspection plan for the next month.

After sales support

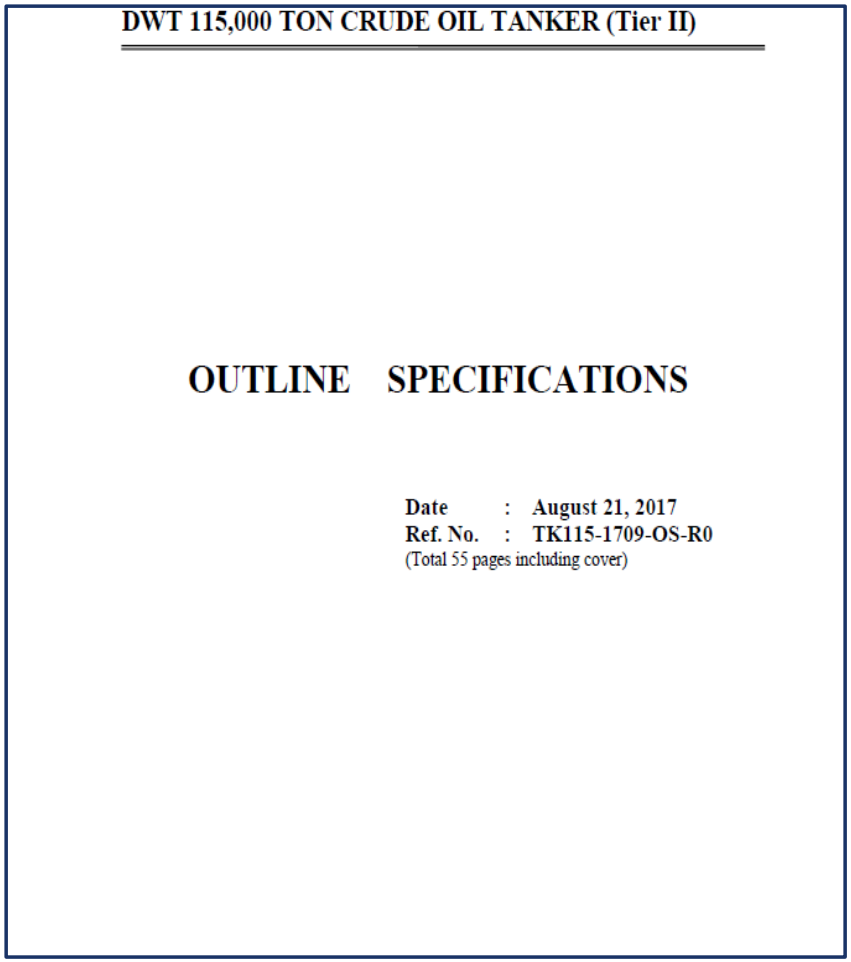
- The shipyard guarantee period varies based on negotiated shipbuilding contract terms.
- For tankers and bulk carriers the guarantee period is usually up to 12 months after the delivery date.
- For LNGCs the guarantee period is usually up to 24 months after the delivery date.
- The yard appoints a person responsible for the after sales support who handles the “guarantee claims” of every delivered ship.
- Guarantee claims are communicated to the yard through a standard form.
- Makers may offer extended guarantees. This is subject to the good relationship and the negotiating power of the buyers.



Conclusions

- The development of solid, long-term relationships between ship management companies and shipyards is recommended.
- Most shipyards, unlike other high-end product manufacturers such as automobile or aircraft builders, are open to discussion with the buyers and would accept to cooperate and learn from their experience. You are not buying a product by taking its key to start the engine.
- In-house site teams can be a “talent pool” for a company willing to capitalize on the experience of the site teams
- In-house plan approval can be the factor for keeping a company involved in regulatory and technological developments.
- Newbuilding projects are not an “exact science” and cannot be fully understood in classrooms or described in university textbooks. Their set-up, monitoring and coordination require multi-disciplinary skills and a “street-smart” “gut feeling” of the shipping industry.

Appendix – Outline Specification (cover page)



DWT 115,000 TON CRUDE OIL TANKER (Tier II)

OUTLINE SPECIFICATIONS

Date : August 21, 2017
Ref. No. : TK115-1709-OS-R0
(Total 55 pages including cover)

Appendix – Yard comparison spreadsheet

	YARD NO1	YARD NO2	YARD NO3	YARD NO4
PAYMENT TERMS	20 10 10 10 50	20 10 10 10 50	10 10 10 10 60	10 10 10 10 60
DWT @ DESIGN DRAFT	144,350 mt @ 16 m	143,400 mt @ 16 m	143,200 mt @ 16m	143,100 mt @ 16m
DWT @ SCANTLING DRAFT	158,050 mt @ 17.5m	156,600 mt @ 17.1m	157,500 mt @ 17.2 m	156,300 mt @ 17,1m
LOA	274.0 m	274.0 m	274 m	274
LBP	269.0 m	266.0 m	264 m	266
BREADTH	48.0 m	48.0 m	48	48
DEPTH	23.2 m	23.7m	23 m	23.7
CARGO TKS CAPACITY	171,300 m3 including SLOP TK	174,000 m3 including SLOP TK	172,000 m3 including slop tanks	174,500 incl SLOP TK
HFO CAPACITY	3,150 m3	3,200 m3	3000 m3	3000 m3
GUARANTEE SPEED	knots at 65% MCR (NCR) with 15% SM (at design	14.5 knots at 68.4% MCR (NCR) with 15% SM (at design draft)	14.5 knots at 70.2% MCR (NCR) with 15% SM	14.5 knots at 68.4% MCR (NCR) with 15% SM
MAIN ENGINE	HYUNDAI MAN B&W 6G70ME-C9.5	HYUNDAI MAN B&W 6G70ME-C9.5	MAN 6G70 MEC9.5	MAN B&W 6G70ME-C10.5 (DERATED)
POWER	MCR 16,120 kW @ 72.7 RPM / NCR 10,480 kW @ 63 RPM	MCR 15,690 kW @ 71.4 RPM / NCR 10,732 kW @ 62.9 RPM	MCR 15,310 KW @ 72 RPM / NCR 10748 KW X 64 RPM	MCR 15690 KW @ 71.4 RPM / NCR 10732 @ 62.9 RPM
DAILY FO CONSUMPTION	38.7 MT @ 65% MCR	39.8 MT @ 68.4% MCR	39.9 MT @ 70.2 % MCR	39.4 MT at 68.4 % MCR
RANGE	29,500 nm	24,000 nm	23,000 nm	22,800
COMPLEMENT	28 + SUEZ	28 + SUEZ	28 + SUEZ	30 + SUEZ
ENERGY SAVING DEVICES	HI - PSD	HI - PSD	MEWIS DUCT	RUDDER BULB
CLASS	KR	ABS	NK	ABS
FLAG	Panama or Liberia	Panama	Liberia	BAHAMAS
NOX REDUCTION TECHNOLOGY	HPSCR for M/E and LPSCR for DG (MGO 0.1% SULPHUR)	EGR for M/E and LPSCR for DG (MGO 0.1% SULPHUR)	HPSCR for M/E and LPSCR for DG (MGO 0.1% SULPHUR)	EGR FOR M/E LPSCR FOR DG (MGO 0.1% SULPHUR)
SOX REDUCTION TECHNOLOGY	OPTIONAL SOX SCRUBBER	OPTIONAL SOX SCRUBBER	OPTIONAL SOX SCRUBBER	OPTIONAL SOX SCRUBBER
MESQAC 17	COMPLIANT	COMPLIANT	COMPLIANT	COMPLIANT
HULL GENERAL				
FATIGUE LIFE	AS PER CLASS	AS PER CLASS	AS PER CLASS	AS PER H5427
HIGH TENSILE STEEL	NOT SPECIFIED	NOT SPECIFIED	NOT SPECIFIED	APPROX. 65%
PAINT WEATHER DECK PRIMER	2 X EPOXY ANTI CORROSIVE (TOTAL 200 mic)	2 X EPOXY ANTI CORROSIVE (TOTAL 200 mic	2 X EPOXY ANTI CORROSIVE (TOTAL 225 mic)	1 x EPOXY ANTI-CORROSIVE + 1 x EPOXY TIE COAT + Poly urethane finish (TOTAL 310 mic)
BALLAST TANKS COATING	2 x EPOXY ANTI-CORROSIVE (Total 320 mic)	2 x EPOXY ANTI-CORROSIVE (Total 320 mic)	2 x EPOXY ANTI-CORROSIVE (Total 320 mic)	2 x EPOXY ANTI-CORROSIVE (TOTAL 320 mic)

Appendix – Yard comparison spreadsheet

BALLAST TANKS COATING	2 x EPOXY ANTI-CORROSIVE (Total 320 mic)	2 x EPOXY ANTI-CORROSIVE (Total 320 mic)	2 x EPOXY ANTI-CORROSIVE (Total 320 mic)	2 x EPOXY ANTI-CORROSIVE (TOTAL 320 mic)
CARGO TANKS COATING	2 x EPOXY ANTI-CORROSIVE (Total 320 mic DECK & BOTTOM)	XY ANTI-CORROSIVE (Total 320 mic DECK & B	x EPOXY ANTI-CORROSIVE (Total 320 mic DECK & BOTTO	2 x EPOXY ANTI-CORROSIVE TOTAL 320 mic (DECK & BOTTOM)
SLOP TANKS COATING	2 x EPOXY ANTI-CORROSIVE (Total 320 mic)	2 x EPOXY ANTI-CORROSIVE (Total 320 mic)	2 x EPOXY ANTI-CORROSIVE (Total 320 mic)	2 x EPOXY ANTI-CORROSIVE TOTAL 320 mic
ANODES FOR CARGO TKS	YES	NO	NO	NO
ANODES FOR BALLAST TKS	YES	YES	YES	YES
HULL A/F	Tin free self-polishing anti-fouling	Tin free self-polishing anti-fouling	Tin free self-polishing anti-fouling	Tin free self-polishing anti-fouling
CARGO EQUIPMENT				
MAX. CARGO LOAD RATE	16000 M3/HR	16200 m3/hr	NOT SPECIFIED	NOT SPECIFIED
CARGO DISCHARGE MAX RATE	12,000 m3/h	10,500 m3/h	12,000 m3/h	12,000 m3/h
CARGO PUMP CAPACITY	3 X 4000 m3/h, 135 m head SINGLE STAGE STEAM DRIVEN	3 X 3500 m3/h, 135 m head SINGLE STAGE STEAM DRIVEN	3 x 4000 m3/hr 135 mTH	3x 4,000 m3/h, 135 m head SINGLE STAGE STEAM DRIVEN
CARGO STRIPPING EDUCTOR	1 X 400 m3/h	1 X 670 m3/h	1 x 500 m3/hr	1 x 650 m3/h
CARGO STRIPPING PUMP	1 x 300 m3/h	1 x 250 m3/h	1 x 300 m3/hr	300 m3/h
CARGO VALVE SEATS	NBR	NBR	NBRr	RUBBER (NBR)
HEATING COILS	CARGO AND SLOP TKS	CARGO AND SLOP TKS	CARGO AND SLOP TKS	CARGO AND SLOPS TKS
HEATING CONDITION	44C TO 66C WITHIN 96 HOURS SLOP TANKS (S): 98% TANK VOLUME FROM 44C TO 66C WITHIN 24 HOURS	CARGO TANKS & SLOP TANK (S): 98% TANK VOLUME FROM 44 TO 66 IN 96 HRS SLOP TANK (P): 98% TANK VOLUME FROM	WITHIN 96 HOURS SLOP TANKS (S): 98% TANK VOLUME FROM 44C TO 66C WITHIN 24 HOURS	CARGO TANKS & SLOP TANK (S): 98% TANK VOLUME FROM 44 TO 66 IN 96 HRS SLOP TANK (P): 98% TANK VOLUME FROM 44 TO 66 IN
IG CAPACITY	15,000 m3/h	13,200 m3/h	15,000 m3/h	15,000 m3/h
IG BLOWER	1x 100%, 1x50%	2 x 100%	1x 100%, 1x50%	3 x 50%
IG GENERATOR	NO	NO	NO	NO
BALLAST TANKS PORTABLE PIPE FOR GAS FREEING.	YES	YES	YES	YES
CARGO TANK TEMP.	2 SENSORS PER TANK	2 SENSORS PER TANK		3 SENSORS PER TANK
TANK CLEANING HEATER	NOT SPECIFIED	YES	NOT SPECIFIEDr	YES
SHIP EQUIPMENT				
SPARE ANCHOR	NO	NO	NO	YES
ANCHOR CHAIN DIAMETER	97MM GRADE 3	GRADE 3	GRADE 3	100MM (GRADE 3)
DECK MACHINERY	ELECTRO-HYDRAULIC DRIVEN (HIGH PRESSURE)	ELECTRO-HYDRAULIC DRIVEN (HIGH PRESSURE)	ELECTRO-HYDRAULIC DRIVEN (HIGH PRESSURE)	ELECTRO-HYDRAULIC DRIVEN, LOW PRESSURE TYPE
THRUSTERS	NO	NO	NO	NO
HULL OUTFITTING				
LIFESAVING	x TOTALLY ENCLOSED LIFEBOAT, 28 PERSON	TOTALLY ENCLOSED LIFEBOAT, 28 PERSO	2 x TOTALLY ENCLOSED LIFEBOAT, 28 PERSONS	2 x TOTALLY ENCLOSED LIFEBOAT, 36 PERSONS
HOSE HANDLING CRANES	2 X 20 TON SWL	2 X 15 TON SWL	2 X 15 TON SWL	2 x 20 TON SWL (HOISTING 10 m/min)
PROVISION CRANES	1 X 8 TON SWL + 1 X 2 TON SWL	1 X 6 TON SWL + 1 X 1 TON SWL	1 X 6 TON SWL + 1 X 2 TON SWL	1 x 8 TON SWL + 1 x 3 TON SWL (HOISTING 10 m/min)
FREEZING & REFR. CHAMBERS	70 m3	70 m3	60 m3	70 m3
ELEVATOR	NO	NO	NO	YES
A/C SYSTEM SUMMER	OUTSIDE: 35C, 70% RH INSIDE: 27C, 50% RH	OUTSIDE: 35C, 70% RH INSIDE: 27C, 50% RH	OUTSIDE: 35C, 70% RH INSIDE: 27C, 50% RH	OUTSIDE: 40C, 60%RH INSIDE: 25C, 50%RH
AIR HANDLERS	2 X 50%	1X100%	NOT SPECIFIED	1 x 100%
CONDENSING UNIT	2 X 50%	2 X 50%	NOT SPECIFIED	2 x 60%
WHEELHOUSE PACKAGE TYPE	NOT SPECIFIED	NO	NO	YES
GRAY WATER TANK	YES	YES	YES	YES

Page 1

Appendix – Yard comparison spreadsheet

MACHINERY				
M/E	HYUNDAI MAN B&W 6G70ME-C9.5 (Derated)-HPSCR	MAN B&W 6G70ME-C9.5 (Derated)- HPSCR	MAN 6G70ME-C9.5 (Derated) - HPSCR	MAN B&W 6G70ME-C10.5 (Derated) EGR BYPASS MATCHING
T/C	HYUNDAI MHI MET TYPE	NOT SPECIFIED	1 TC HIGH EFFICIENCY	2 X MET TYPE
STERN TUBE AFT SEAL	4 X SEALS AIR GUARD	4 X SEALS AIR GUARD	4 X SEALS AIR GUARD	4 x SEALS, AIR GUARD
STERN TUBE BEARING	WHITE METAL	4 X SEALS AIR GUARD	4 X SEALS AIR GUARD	WHITE METAL
AUX. BOILER	2 X 35,000 kg/h	2 X 30,000 kg/h	2 X 35,000 kg/h	2 x 35,000 kg/h
EXHAUST GAS ECONOMIZER	YES (1 x 700 kg/h at NCR)	NO	NO	YES (M/E EXHAUST GAS)
COMPOSITE BOILER	NOT SPECIFIED	YES (oil fired: 1,500 kg/hr, exhaust: 1,200 kg/hr at NCR)	YES (oil fired: 2,000 kg/hr, exhaust: 7000 kg/hr at NCR)	OIL FIRED SECTION: 1,300 kg/h EXHAUST GAS SECTION: BY USING D/Gs
AUX. ENGINES	3 X 1020 Kw (HIMSEN)	3 X 1150 Kw (HIMSEN)	3 x 1100 KW	1 x 1,220 kW + 2 x 1,078 Kw
EMERGENCY D/G	200 Kw	270 KW	270 KW	300 kW
E/R CRANE	OVERHEAD TYPE	OVERHEAD TYPE	OVERHEAD	1 x 8 TON SWL
INCINERATOR CAPACITY	485,000 kcal / h	700,000 kcal/hr	320,000 KCAL/hr	1,290,000 kcal/h
BILGE WATER SEPARATOR	YES	YES	YES	5 m3/h
SYSTEM FOR MACHINERY				
CENTRAL COOLING	YES	YES	YES	YES
MAIN SEA WATER PUMPS	3 X 50 %	2 X 50 %		3 x 50%
MAIN SEA WATER PUMPS FREQUENCY CONVERTER	NO	NO	NO	YES
VACUUM CONDENSER PUMP	1 x 50% COMBINED WITH MAIN CSW	1z 50% COMBINED WITH MAIN CSW, 1 x 50% vacuum condenser	2 X 100 %	1 x 100%
CENTRAL FW COOLERS	2 X 50%	2 X 50%	2 X 50%	2 x 70%
HFO PURIFIER	2	2	2	2 x 3,500 l/h
MAIN LO COOLER	1 X 100 %	1 X 100 %	1 X 100 %	1 x 100%
LO PURIFIER	2 for M/E	2 for M/E	2 for M/E	2 x 3,000 l/h + 1 x 600 l/h FOR D/G
MAIN AIR COMPRESSORS	2	2	2	2 x 285 x 30 (Nm3/h x bar g)
SERVICE AIR COMPRESSOR	1	1	1	1 x 200 x 8 (Nm3/h x bar g)
CONTROL AIR COMPRESSOR	1	1	NO	1 x 200 x 8 (Nm3/h x bar g)
CONTROL AIR DRYER	1	1	NO	2 x 200 m3/h
CONTROL AIR RESERVOIR	1	1	NO	1 x 2 x 8 (m3 x bar g)
SOOT COLLECTING TANK	-	-	NOT SPECIFIED	YES
FEED WATER PUMPS FOR AUX. BOILER	2	2	2	3 x 45 x 220 (Nm3/h x bar g)
BOILER WATER CIRC. PUMPS	2	2	2	2 x 11 x 35 (Nm3/h x bar g)
ATMOSPHERIC CONDENSER	1	1	1	YES (1) FW COOLED
FW GENERATOR CAPACITY	25 TONS / DAY	30 TONS / DAY	25 TONS/DAY	35 TONS/DAY
E/R FANS FREQUENCY CONVERTERS	NO	NO	NO	YES
SHIP SYSTEM				
BALLAST PUMPS	2 X 2000 m3/h	2 X 2000 m3/h	2 X 2000 m3/h	2 x 2,500 m3/h
BALLAST STRIPPING EDUCTOR	1 X 400 m3/h	1 X 350 m3/h	1 X 400 m3/hr	2 x 250 m3/h
BALLAST MAIN LINE	1	2	1	2
BALLAST WATER TREATMENT SYSTEM	YES ELECTROLYSIS	YES ELECTROLYSIS	NOT SPECIFIED	YES (NK-03)


THANK YOU!