Making Money in a Tough Market

Metropolitan Hotel, Athens, Tuesday April 8 2014

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Latest Developments in Design and Management of Ships

Panos A. Kourkountis, Technical Director
Andriaki Shipping Co. Ltd

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Andriaki Shipping Co. Ltd

The IOANNIS P. GOULANDRIS (3,153-tons) was built and completed as Yard No.487 by Richardson, Duck & Co., Stockton in June 1897; she was launched as the FOYLEMORE (Official No.106860) on 17 March 1897 for the S.S. Frogmore, Ltd. Liverpool, with W. Johnston & Co., Ltd. as the managers.

Dimensions: 330.5 x 46.1. She was powered by a 3-cylinder triple expansion steam engine.

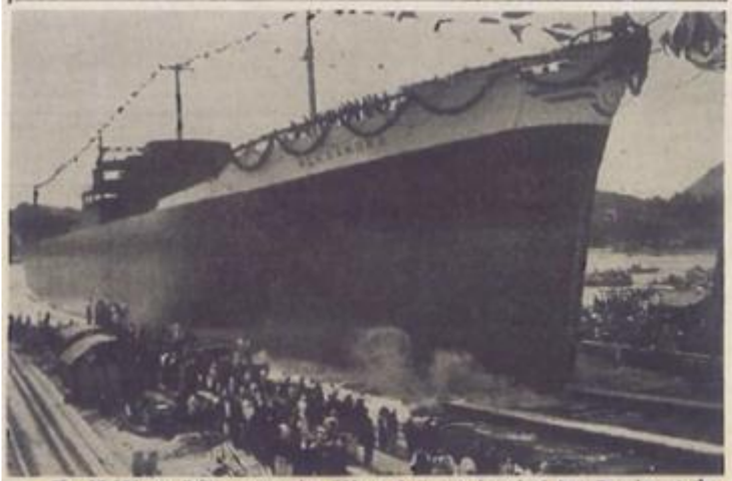
In 1910, she was renamed IOANNIS P. GOULANDRIS by new owners: E. C. Embiricos, Andros and she was managed by John P. Goulandris

In 1914, the owners were John P. Goulandris, Andros.

Andriaki Shipping Co. Ltd

Established in 1953

In April 2014 - 16 vessels: 8 Tankers (2VLCCs, 4Suezmax, 2Panamaxes), 8 Bulkers Kamsarmax



HITACHI LAUNCHES SUPER-TANKER 'ALEXANDRA'

The 33,000 ton D/W super-tanker "Alexandra" was launched last Tuesday at the Innoshima Shipyard of Hitachi Shipbuilding & Engineering, for the Liberian Navigation Corporation. The ship, to be delivered in mid-January of next year, will have a 15,000 SHP turbine and develop a speed of 16 knots. Four other tankers of the same tonnage and type as the "Alexandra" and one 46,000 ton D/W supertanker are also building at the Innoshima yard.

Andriaki Shipping Co. Ltd

PORT STATE CONTROL (2011)

- 17 Inspections
- 2 Observation - **0.12 DPI**
- 0 Detentions

Vetting Inspections (2011)

- 20 Inspections
- 75 Observation – **3.8 DPI**
- 0 Unsuitable

PORT STATE CONTROL (2012)

- 12 Inspections
- 2 Observation - **0.17 DPI**
- 0 Detentions

Vetting Inspections (2012)

- 22 Inspections
- 62 Observation – **2.8 DPI**
- 0 Unsuitable

PORT STATE CONTROL (2013)

- 16 Inspections
- 6 Observation - **0.38 DPI**
- 0 Detentions

Vetting Inspections (2013)

- 22 Inspections
- 77 Observation – **3.3 DPI**
- 0 Unsuitable

PSC DPI = 2.7 (2013 Paris MOU)

OCIMF DPI = 6.47 (Tankers 2013)

DEVELOPMENTS IN SHIPPING INDUSTRY

* --- Changes in Ship Management

* --- Performance monitoring and fuel saving

* ---Evaluation of new technologies and uncertainty. What is working and what is not.

Changes in Shipping Industry

* Competition (overcapacity, new comers, marginal profit)
* The costs (Fuel prices, OPEX)
* Environmental Regulations, ECO mentality
* Energy Saving Technology
* Communication, Automation and Information

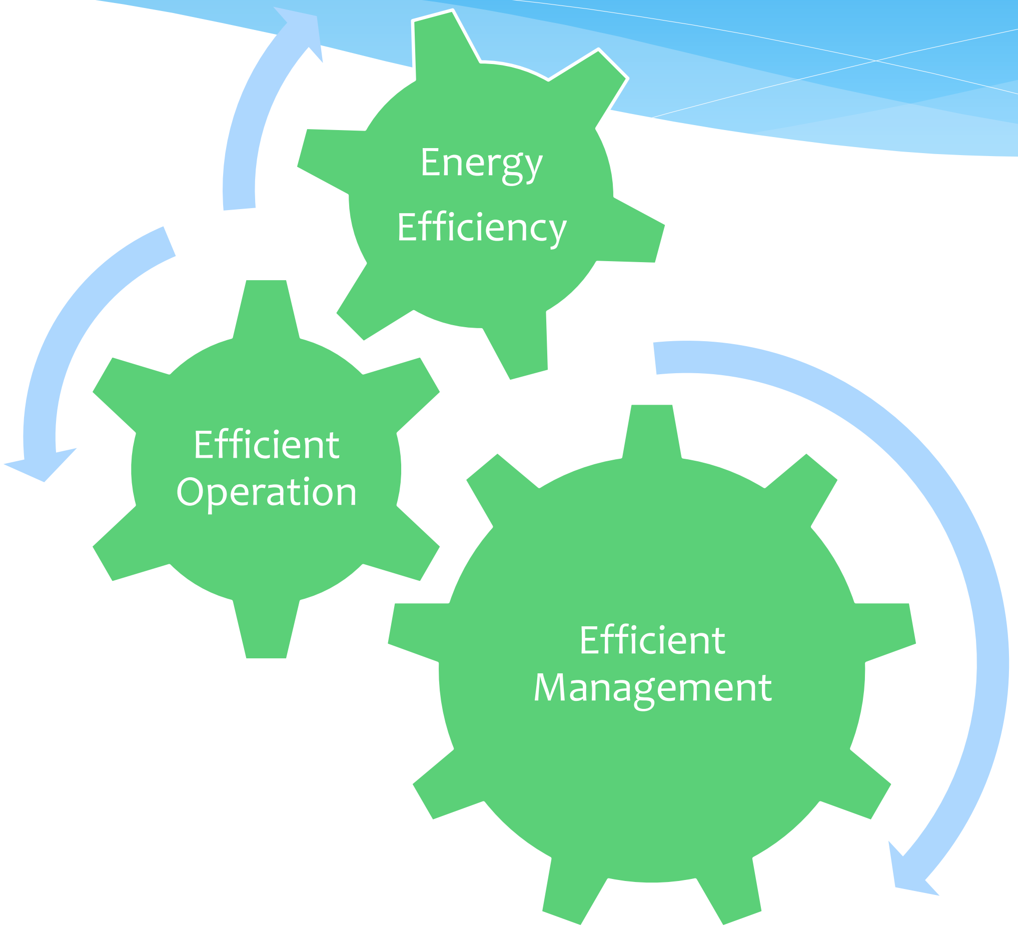
When the wind changes

Decision making people will make the difference in company's performance

Ship Management in a competitive environment

* New Risk Assessment to redefine the procedures.
  * New operational procedures, operational optimization
  * New roles and duties
* Evaluate available solutions and new technology
* Major impact of New Regulation, effective solution for compliance
* Utilize the Information. On line monitoring of the on-board operations
* Use of systems designed to compensate for human performance
* Company's performance- Efficiency

Efficiency
What you put in and what you get



Efficient Management

Measure the efforts and the delivery (cost input / investment and profit, KPIs).

Make the most of the information.

* *Information from the industry:*

Continuous evaluation of the innovations and management tactics

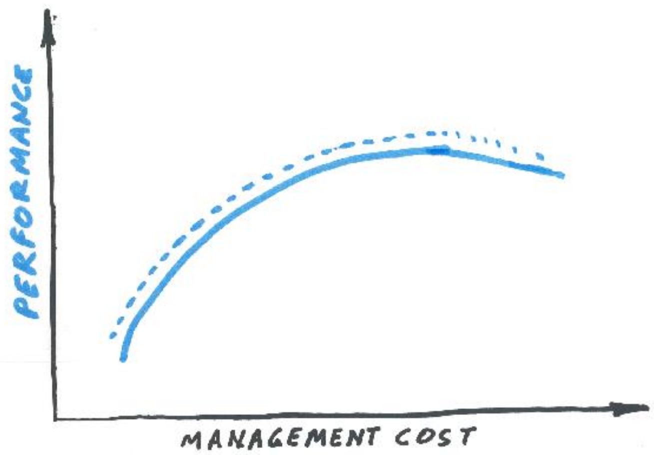
* *Information from the ship:*

Bridge, Cargo Control Room and Engine Control Room data in the office. On line cameras. How far can the involvement of the Office in the daily operation on board go?

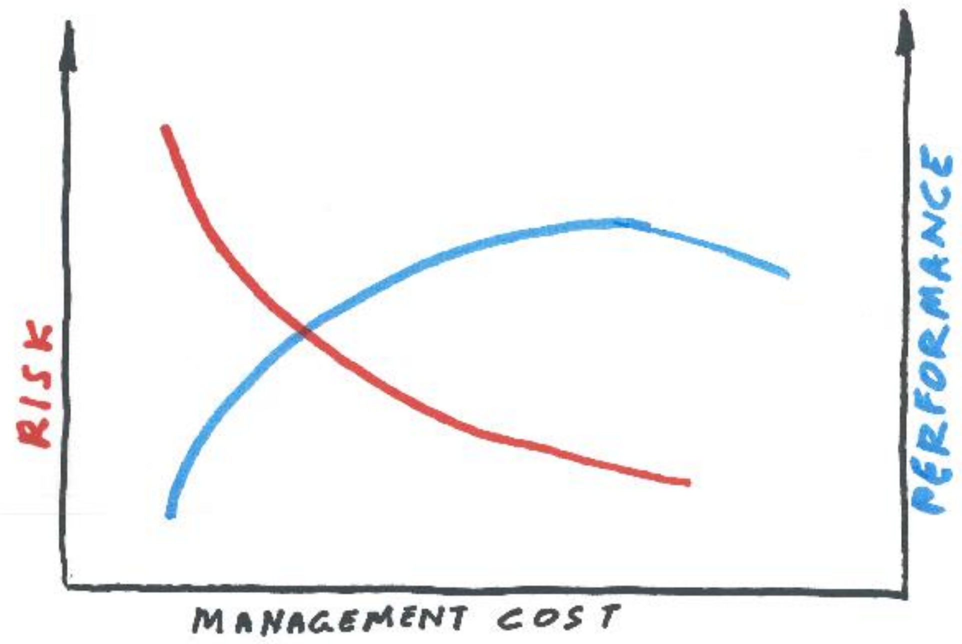
Management tools

The Tools	The costs in USD
Plan maintenance program	10,000-80,000
M.E. performance monitoring	15,000-40,000
Hull performance monitoring	5,000-50,000
Upgraded communication	10,000-30,000
Online monitoring	15,000-80,000
Energy audits	10,000-50,000
Business Intelligence and analysis	5,000-20,000
Forms Management	5,000-30,000
Documents Management	10,000-70,000
Office integration / Management Information System	20,000-150,000

Management
Cost – Risk - Performance



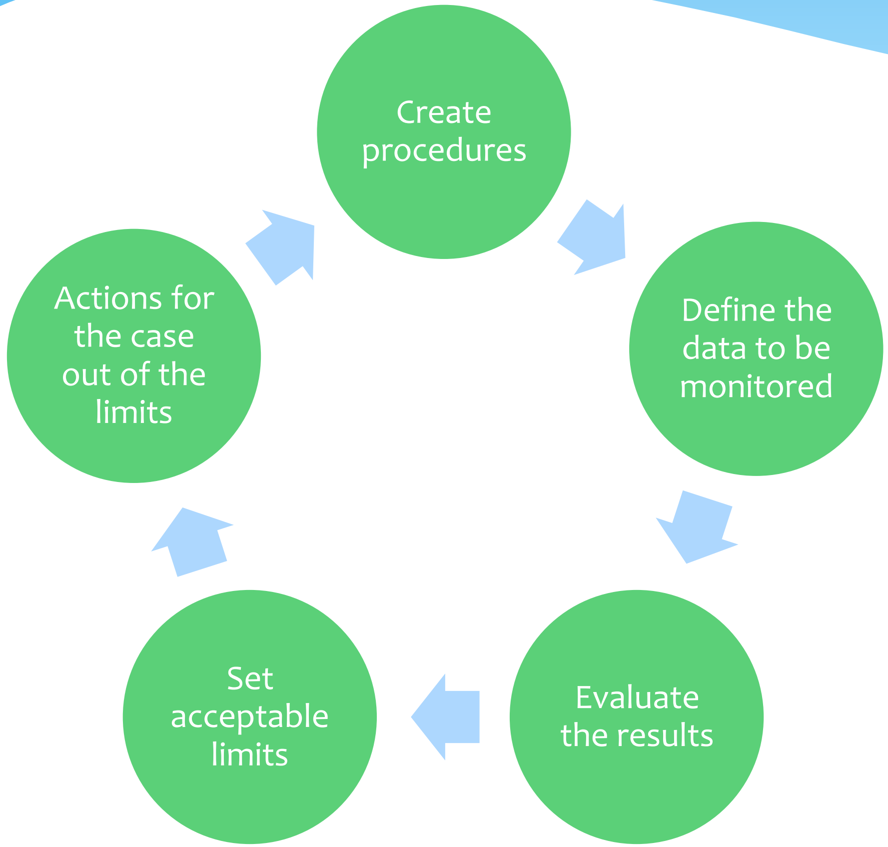
Management
Cost – Risk - Performance



Create the Management System

* Define the specific needs and targets.
* Prepare standardized procedures (simplify procedures).
* Create the roles and define responsibilities
* Evaluate the available tools and computer aids. (On line monitoring systems – performance monitoring system).
* Ask for custom made systems. Trial version or Trial period. Confirm that the system is user friendly, accurate and efficient.
* Monitor results against targets. Quantify the benefit.

Building the system



ECO mentality in Ship operation ECOlogy = ECOnomy

Ship Energy Efficiency

- Efficiency monitoring tools / Performance monitoring
- Ship Energy Audit
- Electrical consumption monitoring
- Weather routine
- Trim optimization program
- Use of low friction coating
- Propeller polishing
- Retrofitting energy saving devices
- Machinery Optimization
- Trip optimization
- Fuel additives
- Fuel flow meters
- Benchmarking

Ship Energy Audit

Through the Energy Audit on one of company's VLCCs the following were assessed:

- Vessel's operational pattern
- Fuel Oil Distribution
- Main Engine Performance
- Hull Performance
- Electric load Pattern
- Diesel Generator(s)
- Electric Motors of E/R Major Pumps & Fans
- Auxiliary Boiler Performance
- Compressed Air system
- Heating Ventilation Air-Condition System
- Accommodation Lighting
- Voltage Unbalance
- Insulation of Various Equipment Located in E/R
- Energy Efficiency Operational Index (EEOI)
- NOx & SOx Emissions

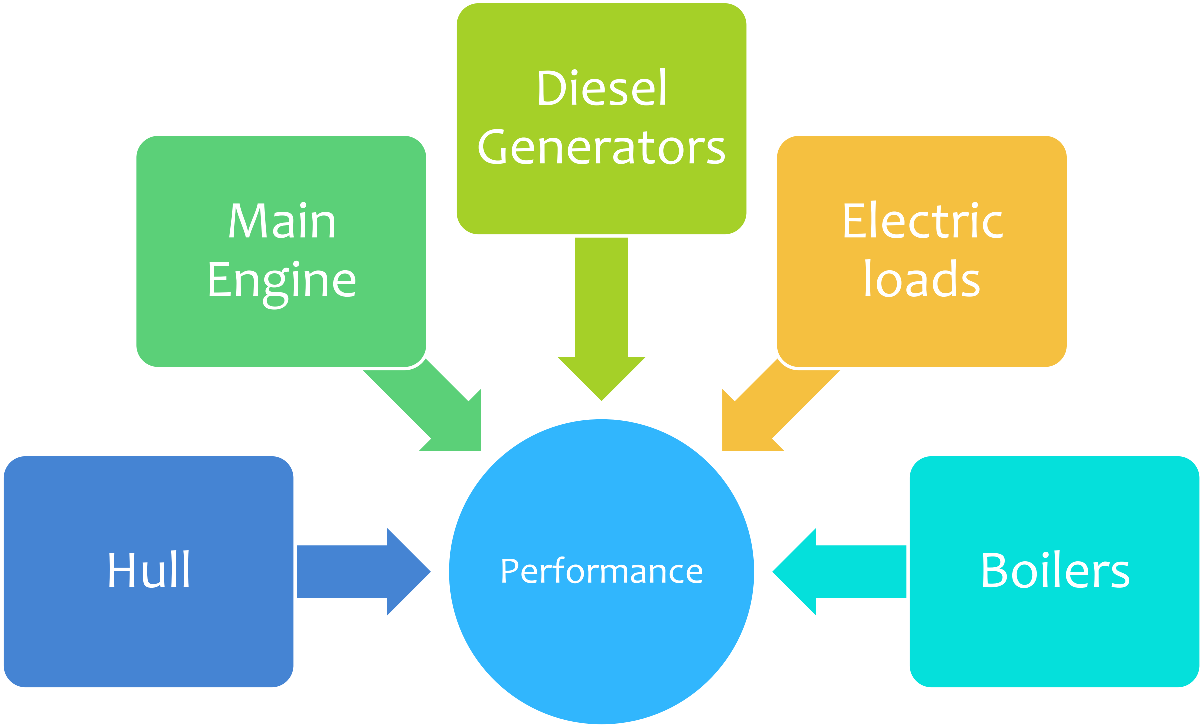
Energy Audit

ESPs	Description	Estimated Fuel Savings (MT/year)	Equivalent CO_2 Reduction (MT/year)	Estimated Benefit (Savings) ($/year)	Estimated Capital Investment ($)	Cost / Benefit	Return of Investment (Months)
ESP-01	Estimated benefit from D/Gs maintenance (Improvement of SFOC)	196.0	610.0	**116,741**	**60,000**	High / High	6
ESP-04	Optimization of A/B exhaust gas temperature	25.8	80.3	**15,375**	**0**	Zero / Medium	0
ESP-09	Minimization of voltage unbalance in motors	15.6	48.5	**9,279**	**3,000**	Low / Medium	4
ESP-03	E/R fan efficient operation management	12.5	38.9	**7,446**	**0**	Zero / Medium	0
ESP-08	Very low occupancy spaces lighting optimisation	11.8	36.8	**7,035**	**0**	Zero / Medium	0
ESP-02	Installation of High Efficiency Motors	4.3	13.5	**2,575**	**4,000**	Low / Low	18
ESP-07	Cabin & Recreation Rooms lighting loads optimisation	4.3	13.2	**2,534**	**0**	Zero / Low	0
ESP-06	Minimization of HVAC system operation during medium ambient temperature conditions	4.1	12.6	**2,419**	**0**	Zero / Low	0
ESP-05	Minimization of compressed air service system leakages	3.7	11.4	**2,205**	**0**	Zero / Low	0

- Total estimated benefit per year: **165,609 $/year**
- Capital Investment: 6**7,000 $/year**

At the time of the audit the maintenance of the D/G in question was already planned.

Performance Monitoring and fuel oil consumption



Main Engine Performance Monitoring

5. CYLINDER AND SUBSYSTEMS PERFORMANCE TABLE

5.1 Cylinder Parameters

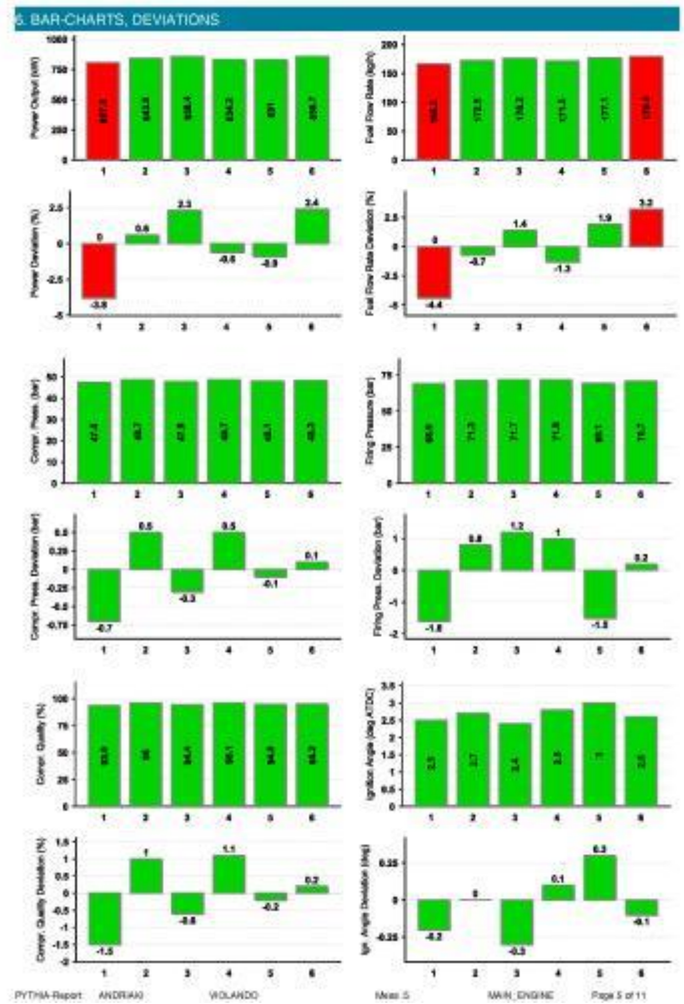
Parameter	Cyl 1	Cyl 2	Cyl 3	Cyl 4	Cyl 5	Cyl 6	MEAN	TOTAL
Brake Power (kW)	807.3	843.8	858.4	834.2	831.0	858.7	838.9	5033.4
bmep (bar)	7.40	7.73	7.86	7.64	7.61	7.87	7.68	-
Fuel Flow Rate (kg/h)	166.2	172.5	176.2	171.5	177.1	179.4	173.8	1043.0
bsfc (g/kWh)	205.9	204.5	205.3	205.6	213.1	209.0	207.2	-
Ignition Angle (deg)	2.5	2.7	2.4	2.8	3.0	2.6	2.7	-
Ignition Delay (deg)	1.4	1.4	1.4	1.3	1.4	1.4	1.4	-
Firing Pressure (bar)	68.9	71.3	71.7	71.6	69.1	70.7	70.5	-
Pfire/Pcomp (-)	1.46	1.48	1.51	1.50	1.46	1.47	1.48	-
Compression (%)	93.6	96.0	94.4	96.1	94.8	95.2	95.0	-
Compression Pressure (bar)	47.5	48.7	47.9	48.7	48.1	48.3	48.2	-
Exhaust Valve Open (deg)	69.0	69.0	71.0	69.0	69.0	69.0	69.3	-

5.2 Injection System Parameters

Injection System	Cyl 1	Cyl 2	Cyl 3	Cyl 4	Cyl 5	Cyl 6	MEAN
Injection Timing (deg)	1.1	1.3	1.0	1.5	1.6	1.2	1.3
Injector Condition (%)	74.0	76.7	75.2	81.2	69.4	71.7	74.7
Fuel Pump Condition (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0

5.3 Inlet and Gas Exchange System

Inlet & Gas Exchange	T/C 1
A/C Condition-DP (%-mmW)	64.9
A/C Condition-Eff (%)	100.0
Compressor Condition (%)	87.8
Exh. Pipe Cond. (%-mmW)	-
Turbine Condition (%)	100.0
Turbine Nozzle Area (%)	99.9



Main Engine Performance Monitoring

7.5 Proposed Cylinder Adjustments

Parameter	1	2	3	4	5	6
Power Output	LOW	OK	OK	OK	OK	OK
Power Output Deviation (%)	-3.8	0.6	2.3	-0.6	-0.9	2.4
Fuelling Rate	LOW	OK	OK	OK	OK	OK
Rack Adjustment (mm)	1.7	0.3	-0.5	0.5	-0.7	-1.2
Firing Pressure	OK	OK	OK	OK	OK	OK
Firing Pressure Deviation (bar)	-1.6	0.8	1.2	1.0	-1.5	0.2
Compression Pressure	OK	OK	OK	OK	OK	OK
Compression Pressure Reduction (%)	-6.4	-4.0	-5.6	-3.9	-5.2	-4.8
Exhaust Valve Opening	OK	OK	OK	OK	OK	OK
Exhaust Valve Opening Adjustment (deg)	0.0	0.0	-2.0	0.0	0.0	0.0

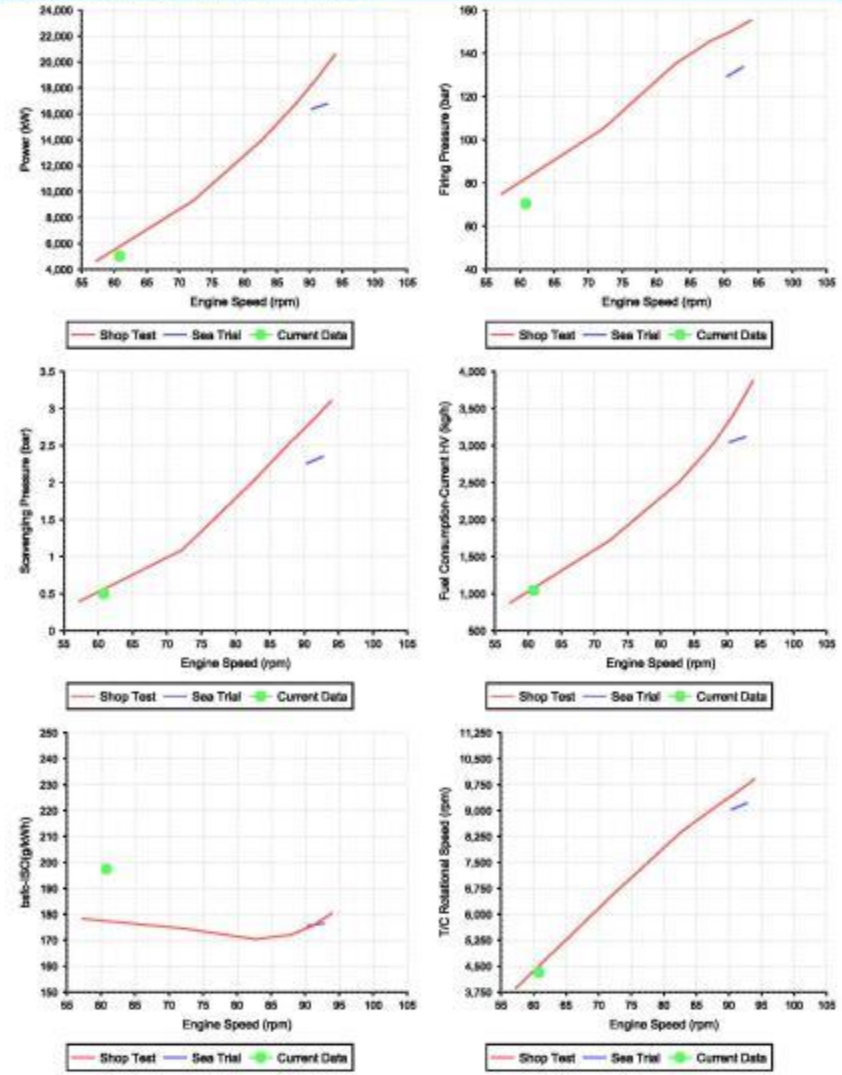
7.6 Injection System Adjustments

INJECTION SYSTEM	1	2	3	4	5	6
Injection Timing	OK	OK	OK	OK	OK	OK
Injection Timing Adjustment	-0.9	-0.7	-1.0	-0.5	-0.4	-0.8
Injector	CHECK	OK	OK	OK	CHECK	CHECK
Fuel Pump	OK	OK	OK	OK	OK	OK

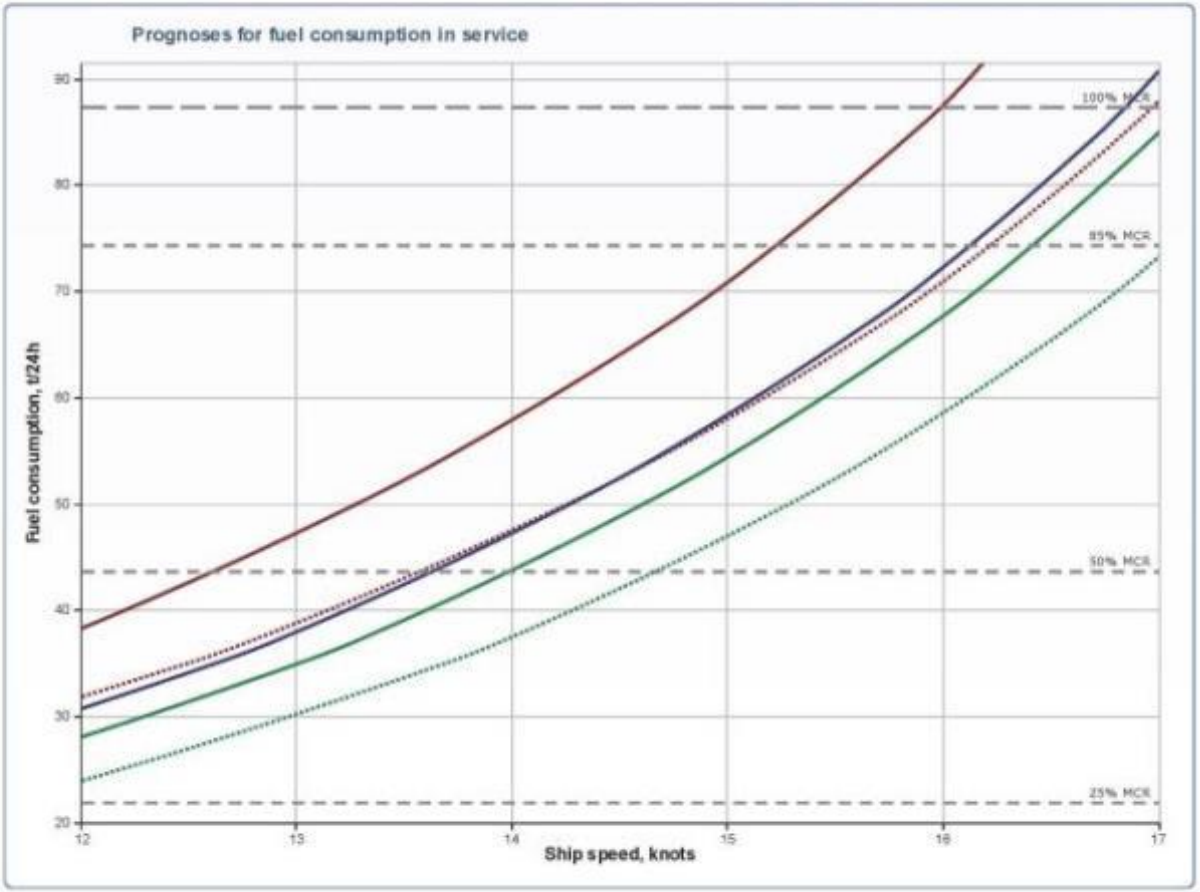
7.7 Proposed Inlet and Exhaust System Adjustments

INLET & EXHAUST SYSTEM	T/C 1
Turbine Condition	OK
Turbine Nozzle Condition	OK
Compressor Condition	OK
Air Cooler Condition Eff.	OK
Air Cooler Condition DP.	CHECK
Exhaust Pipe Condition	N/A

9. COMPARISON TO TRIALS-REFERENCE



Shipowner	Andriaki Shipping Co. Ltd.	**Report No.**	3
Ship	EPHESOS	**Report Date**	2014-03-13



Fuel oil calorific value 40700 kJoule/kg

Legend	Loading Condition	Draft Fore (m)	Draft Aft (m)	Displacement (t)	Added resistance (%)	Weather (%)	Weather (beaufort)
——	Condition 1	16.00	16.00	176,940	23	5	4
····	Condition 1, Trials	16.00	16.00	176,940	0	0	0
——	Mean draft in period	10.36	10.36	109,625	23	5	4
——	Condition 2	6.36	9.25	80,906	23	5	4
····	Condition 2, Trials	6.36	9.25	80,906	0	0	0

Shipowner	Andriaki Shipping Co. Ltd.	**Report No.**	3
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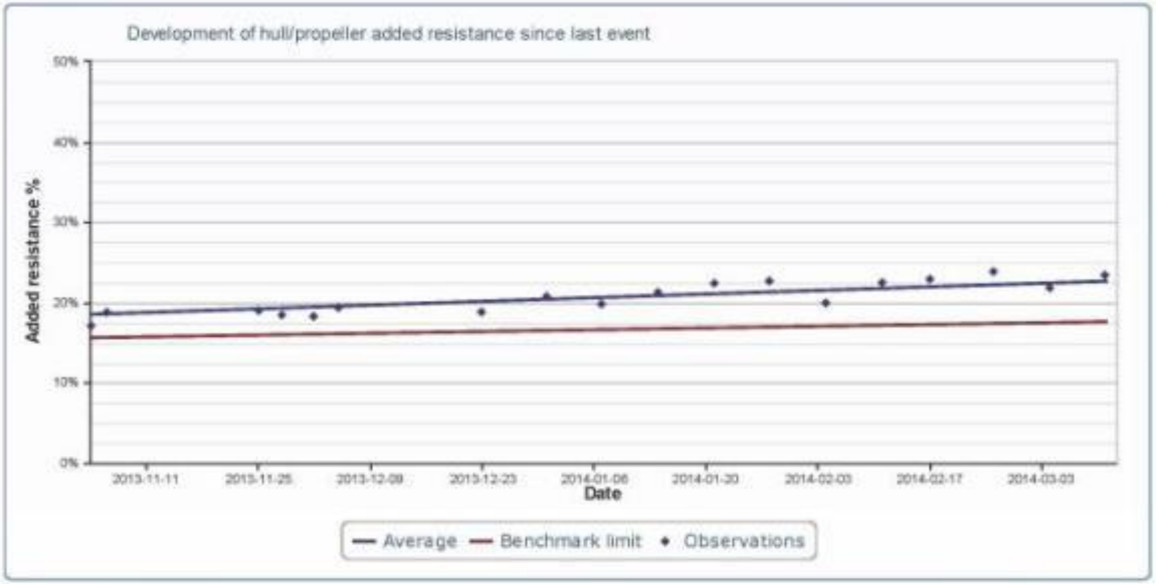

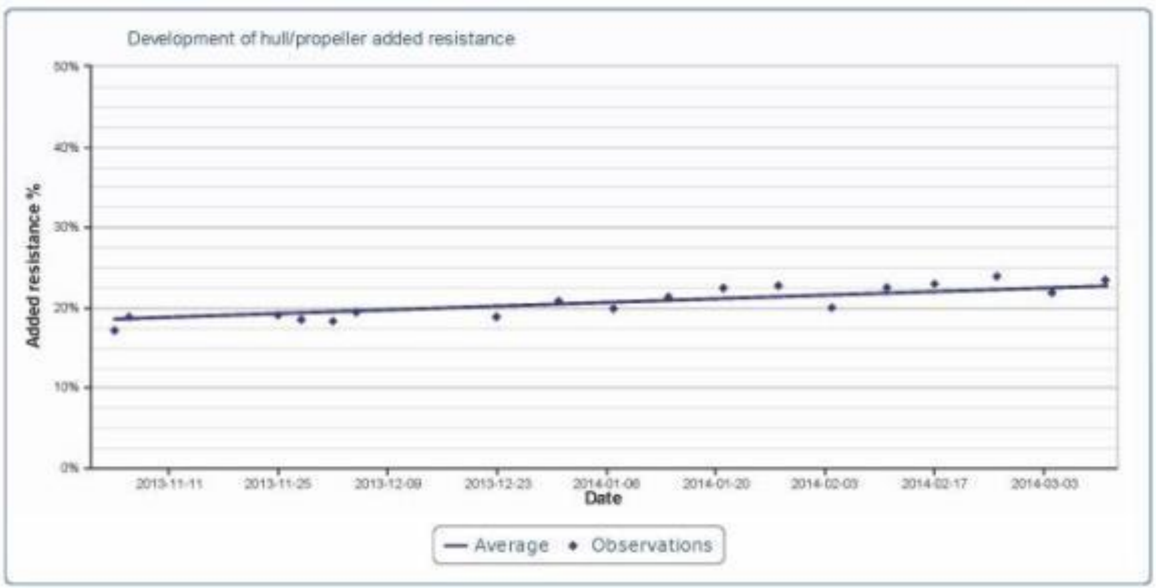

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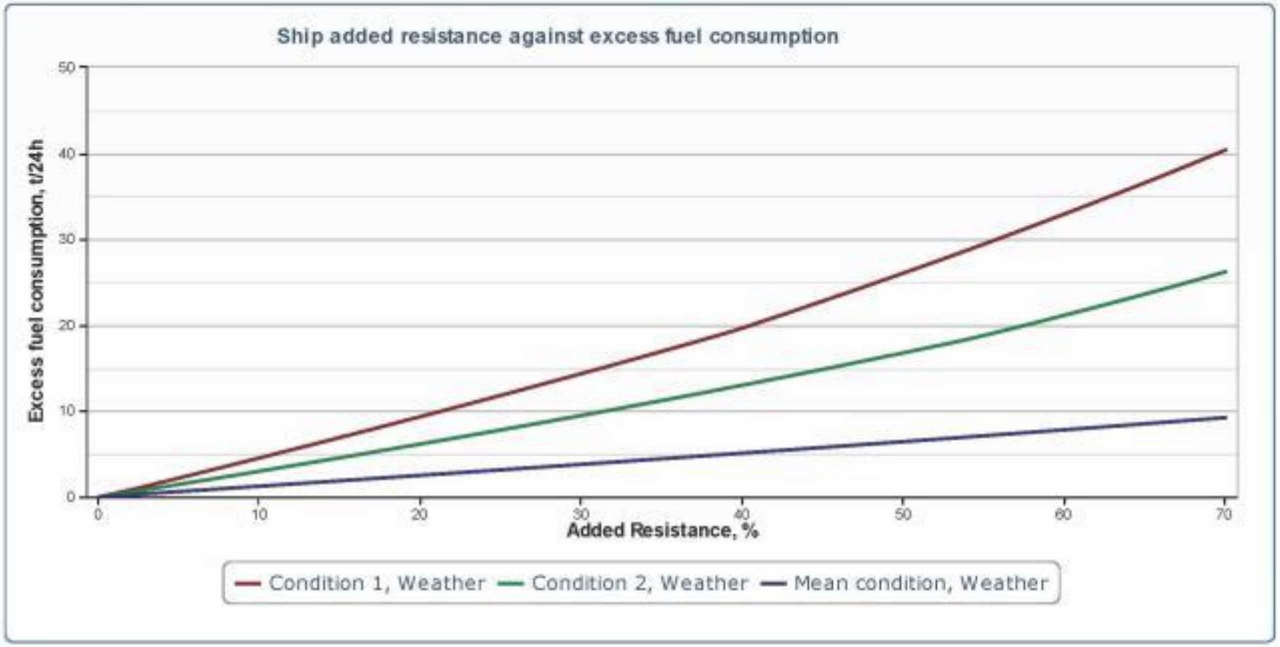


Fuel oil calorific value 40700 kJoule/kg

Legend	Loading Condition	Speed (knots)	Draft Fore (m)	Draft Aft (m)	Displacement (t)	Weather (%)	Weather (beaufort)
— (red)	Condition 1, Weather	15.5	16.00	16.00	176,940	5.0	4
— (green)	Condition 2, Weather	16.5	6.36	9.25	80,906	5.0	4
— (blue)	Mean condition, Weather	10.8	10.36	10.36	109,625	5.0	4

Note: Fuel Consumption shown above is for propulsion only, wastage & auxillery consumption excluded

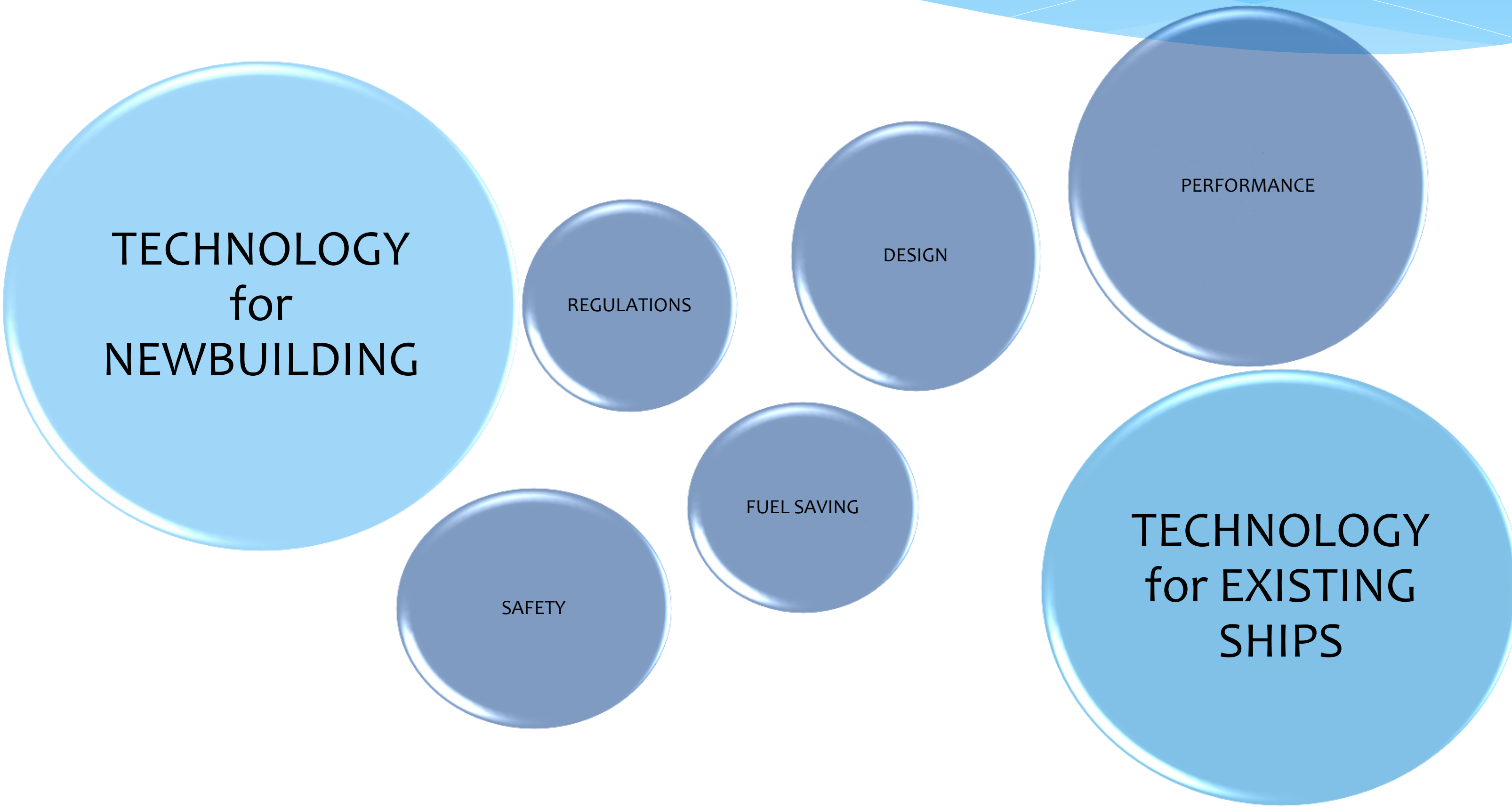
Evaluation

The level of the added resistance is slightly higher than expected. The added resistance is developing at a rate of 1.0% per month. Normally, the developing rate is between 0.5% and 1.5% per month.

Performance monitoring and fuel oil consumption

* Select the systems to be monitored
* Define the reports and the method that data are collected.
* Provide the equipment for accurate monitoring (such as mass flow meters, M.E. performance monitoring system, etc.)
* Create the evaluation method and the acceptable limits.
* Corrective actions – redefine operational procedures (such as how many D/Gs run at every condition, when to operate the boiler, optimum Cyl. Oil feed rate etc.)

NEW TECHNOLOGY IN SHIPPING INDUSTRY



Innovations in Newbuilding

We see:

* Rules optimization? (It seams that the building cost factor has a clear influence)
* Hull optimization
* Hull structure optimization and weight reduction
* Standardized designs of equipment
* New Generation Engines
* Yards competition on reduction of Fuel consumption

We don’t see:

* New concepts
* Revolutionary solutions
* Variation of makers

Yards are not taking risks a lot of technology is not even considered for evaluation

Technology on existing ships

* Designs alterations and retrofittings for cost saving
* Energy saving devices
* Computerized operation and management systems
* New generation antifouling
* M.E. modifications for low load operation
* Waste heat recovery systems
* Automation and remote operations
* Communication systems
* Performance monitoring systems
* Voyage and trim optimization

Technology for

Minimize the Risk

- Safety
- Management system
- Monitoring

Design improvement

- Hull energy saving devices
- New propellers
- Low friction coating
- Automation

Regulations

- Ballast Treatment
- CO_2, SOx, NOx, reduction technology

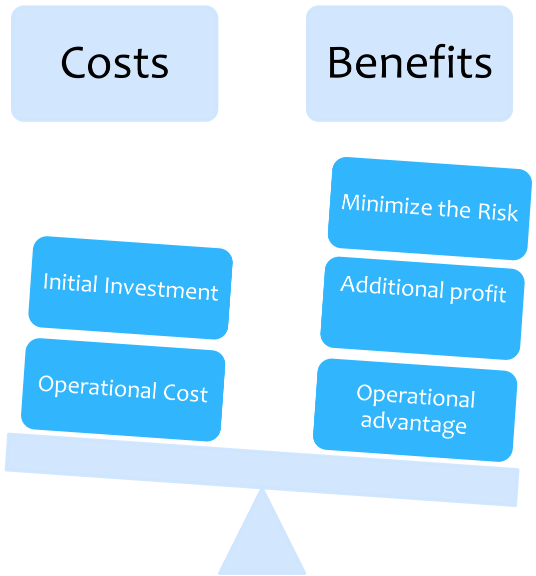
Technology Evaluation

Costs

* Initial investment
  * Initial evaluation
  * Purchasing/ installation cost
  * Trials
  * Off hire
  * Class
* Management Of Changes
  * Changing procedures
  * Changing Drawings
  * Training
* Operation / Maintenance Cost

Benefits and impact

* Saving
* Operational advantage, saving
* Risk reduction (difficult to quantify)



Experience from Technology Applications

When is the correct time for the application?

-Tin free antifouling applied from 1994 (5 years earlier than regulation enforcement)

- Hull Stress Monitoring System since 1995
- 2 ECDIS since 2000 (paper charts is the primary mean)

- Condition monitoring system in 2006

- Slide valves (2012 - slow steaming)

Technology Applications Experience

Early compliance with Tin free antifouling paints

* Adopted in all fleet 5 years before the enforcement of the regulation.
* Cost (20,000-40,000 USD/ship) 40% higher cost than TBT antifouling paint.
* Target to enhance the Environmental awareness of the company.

Results:

- Early compliance with the regulations
- No sealer coat or full blasting requested during rules application (saving similar to initial additional cost)
- 16 ships without problems
- One vessel fouling after 8-10 months

Technology Applications Experience
Hull Stress Monitoring System

* It is company’s best practice and installed on company's newbuildings since 1995.
* (M/T VENETIA was the first ship that received the relevant Class notation)

* Purchasing and installation cost 146,000 USD (in 2011)
* Maintenance cost (calibration) 3,500 USD/5 year

Experience :

- The system does work but very rare case of excessive stresses.
- Alternative means and procedures to minimize the risk of overstress are now available
- Offers a benefit that is difficult to quantify. Company will re-evaluate the policy.

Technology Application Experience

Condition Monitoring System

"Predictive maintenance system" - portable data collector in 2006

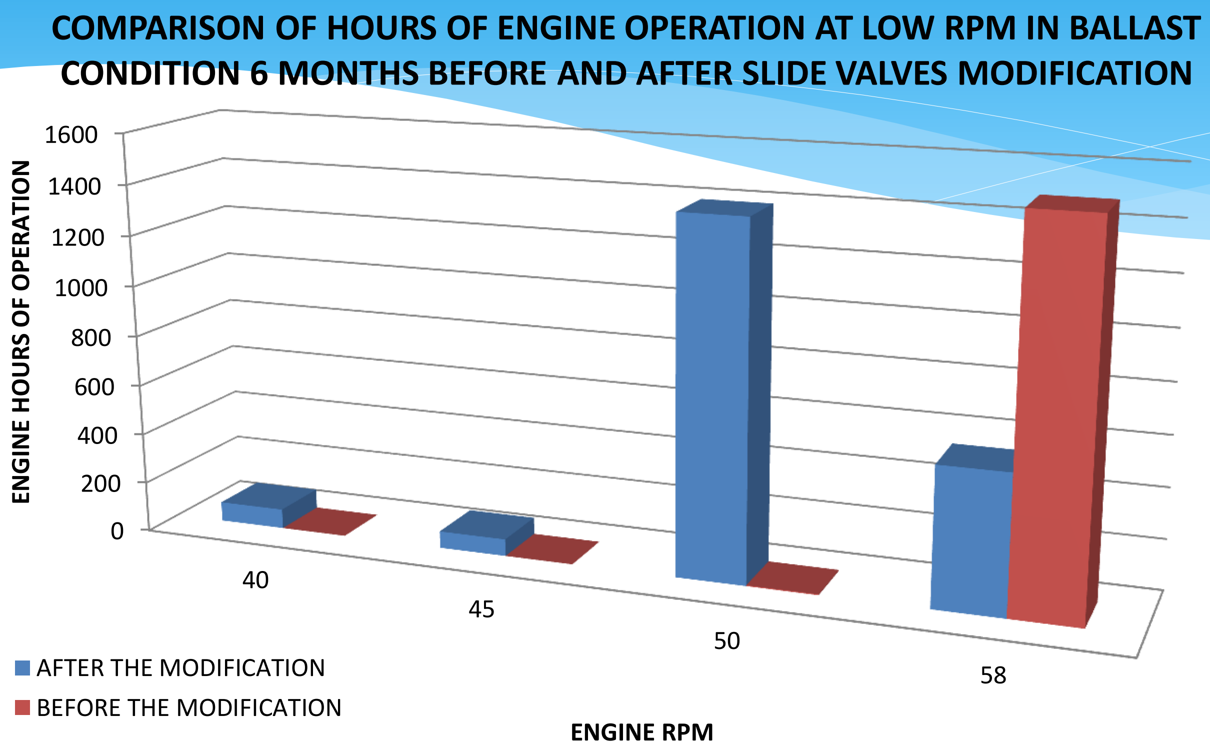
Equipment Purchasing	13,000 USD
Equipment set up	5,000 USD
On board commissioning	10,000 USD
Total Cost	28,000 USD

Experience:

* System was not user friendly
* Some reports were not accurate (possible interference from other equipment)
* In 2008 we discontinued the use
* In 2014 during office audit the Auditor commented "It is recommended that the company should introduce a vibration analysis measuring-trading system"

Technology Application Experience

Slide valve modification on VLCC (June 2012)



Total Cost of the Modification	2013 MILLES TRAVELLED ATBELOW 50 RPM	SAVING MT/ MILLE	FUEL SAVING	SAVING (HFO at 700 USD/TON)
USD		MT/MILLE	MT	USD
108,643	18,792	0.023	432	302,551

When is the right time for the application?

SOONER

Pros

* Ahead the competition (additional profit)
* Gaining experience
* Benefit for Company's reputation

Cons

* A better solution may be available later
* Childhood diseases / reliability
* Higher Uncertainty (Regulations etc.)

LATER

Pros

* Reliability
* The latest version

Cons

* Always behind competition (loss of profit)
* Could be too late

Evaluation of New Technology

Systems under evaluation	Cost in USD	cost for trials (USD)	Likliehood to adopt
Energy saving device (6 systems)	150,000-300,000	150,000-300,000	Low
On line monitoring of the operations (2 products)	40,000	20,000	High
Hull performance evaluation (1 system)	12,000/year	Free	Medium
Computer based Trim optimization (2 systems)	20,000	15,000	High
Main Engine performance(2 system)	15,000- 6,000/year	Free	High
D/G performance (1 system)	15,000-4,000/year	Free	High
Cyl. Oil Condition Monitoring (2 systems)	5,000/year	Free	High
Main engines T/C modifications for slow steaming (1 system)	300,000	300,000	Low
Gas emissions monitoring (2 systems)	50,000	Free- 50,000	Low
Bunkers and on line consumption monitoring (4 systems)	15,000-50,000	15,000-50,000	Medium
Engine Room aux equipment monitoring (1 system)	5,000	5,000	High
Silyl Acrylate antifouling (2 product)	90,000-120,00	90,000	High
Fuel additives (8 products)	30,000/year	15,000	High

Ballast treatment systems

- In 2012, an initial evaluation of 24 systems for retrofitting produced a 200 pages report
- The evaluation is already outdated and must be updated
- Planning 3-d scanning on board and feasibility study for 4 different systems.

Evaluating the alternatives for SOx regulations compliance

Technology related to Sulphur limitations

Options:

•Fuel oil switching: Low sulphur in ECA - High sulphur out of ECA (modifications of all ships of the fleet completed in 2011)

•Conversion to distillate

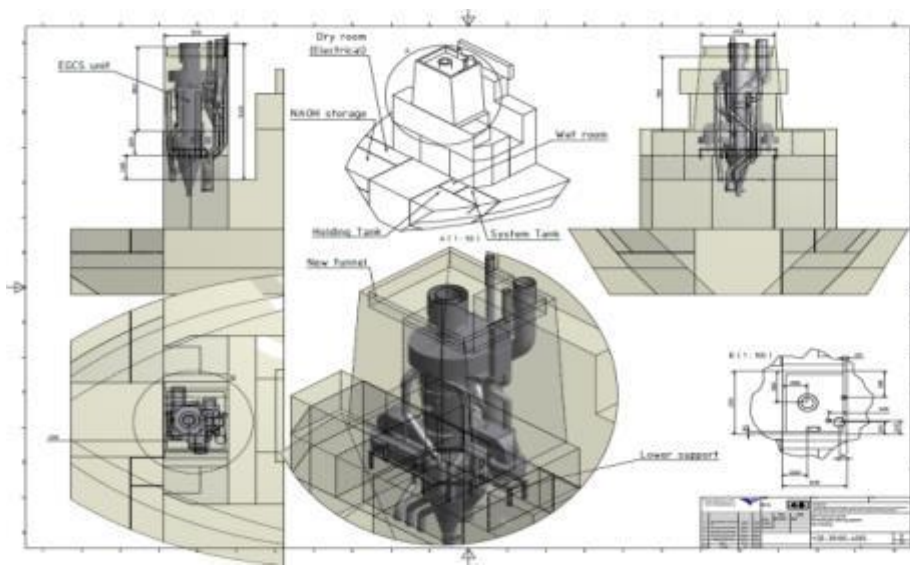
•Conversion to Natural Gas

•Exhaust Gas Cleaning Systems

Exhaust Gas Treatment

Few yards have finished their homework and are able to offer a system as option.

9 systems are under evaluation. Only four makes have provided full details and information, three have provided partial information and two did not provide any information.



Evaluation of Exhaust Gas Cleaning Systems for Suezmax

Statistical data of company's Suezmax built in 2012:

* The ship is systematically operating in the North American ECA zone, totally approx. 20 - 25%, or 73-90 days annually.
* Sailing time inside ECA zones is about 5-10% of total time, or 18-35 days annually [calculated with average speed (of every trip) and about 300 miles maximum sailing distance inside the ECA zone]
* Anchorage and cargo operations' time inside the North American ECA zone was found to be about 15% of the time or 55 days annually.

Evaluation of Exhaust Gas Cleaning Systems for Suezmax

Base line calculation assumptions:

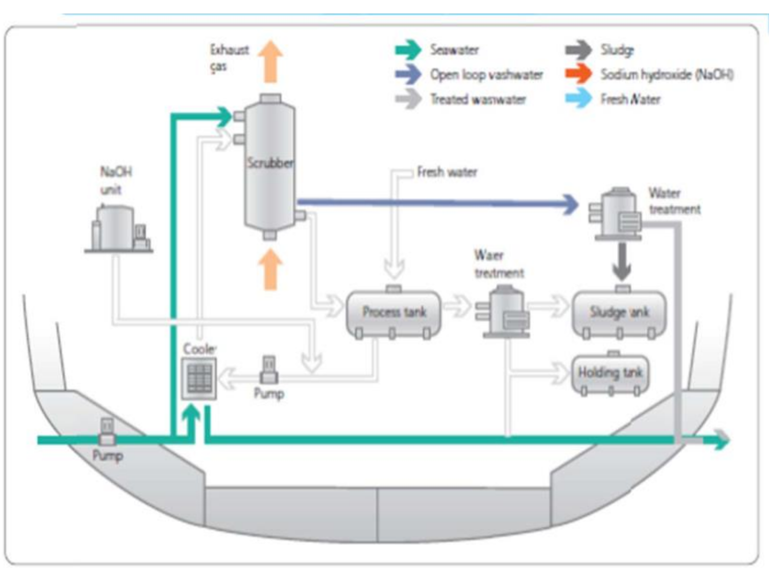
* 36 voyage days annually within existing ECA zones, which can be analyzed as follows:
* 18 voyage days in ballast condition.
* 18 voyage days in laden condition (includes 2 voyage days with cargo heating).
* 55 days annually within existing ECA zones, waiting at anchorage or discharging, which can be analyzed as follows:
* Assuming 7 discharging operations annually, at 85% of capacity, lasting 18 days.
* The remaining 37 days are spent at anchorage, 5 of which include cargo heating.

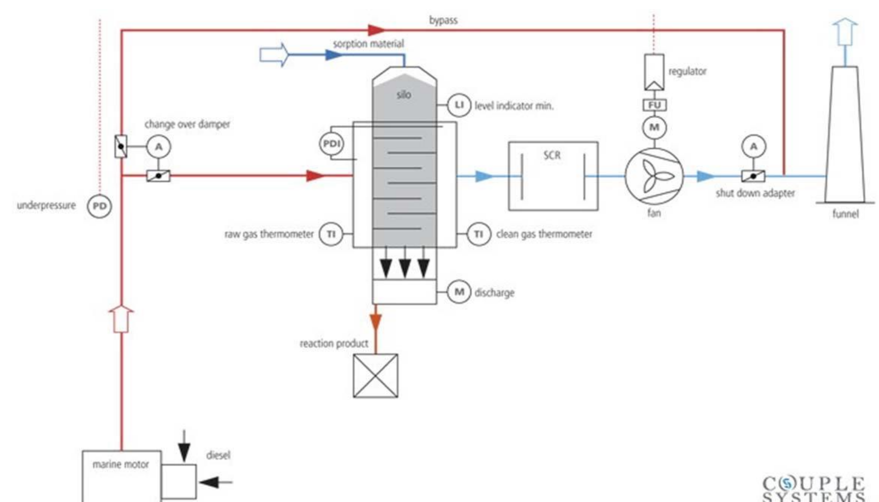
Evaluation of Exhaust Gas Cleaning Systems for Suezmax

VENDOR	OFFER FOR HYBRID SYSTEM (incl. commissioning) USD	REMARKS
AAA	5,772,600	Scrubbers for all operational modes. Exhaust fans and deplume booster heater are excluded.
BBB	5,600,000	Scrubbers for all operational modes. Cooling sea water pumps, fans and heaters are excluded.
CCC	4,402,620	Complete offer. One offer for all operational modes.
DDD OPTION 1	7,047,000	Two scrubbers covering all operational modes. Cooling sea water pumps, fans and heaters are excluded.
DDD OPTION 2	5,980,500	Two scrubbers, M/E and A/B cannot operate simultaneously.
DDD OPTION 3	3,901,500	The scrubber for D/Gs is omitted.
EEE OPTION 1	6,750,000	Scrubbers for all operational modes. Cooling sea water pumps and heat exchanger for closed loop system are excluded.
EEE OPTION 2	4,840,000	Two scrubbers, ME and AB cannot operate simultaneously. Cooling sea water pumps and heat exchanger for closed loop system are excluded.

Evaluation of Exhaust Gas Cleaning Systems for Suezmax

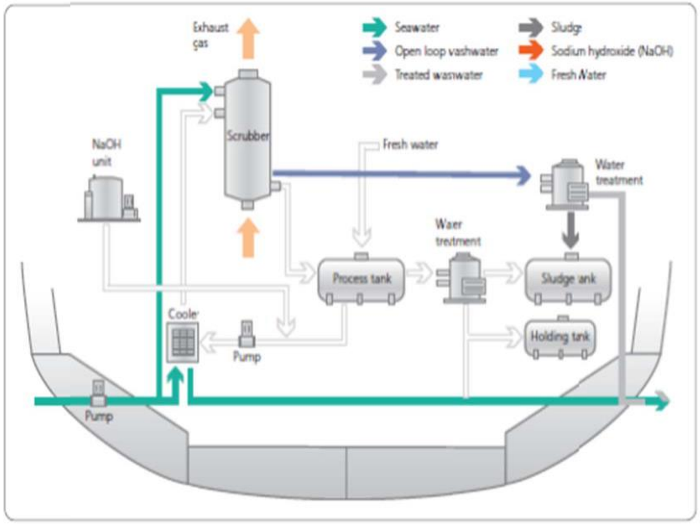
VENDOR:	AAA	BBB	CCC	DDD 1
ACQUISITION COST:	5,772,600	5,600,000	4,402,620	7,047,000
CAPEX:	9,409,338	9,628,000	7,176,271	11,486,610
ANNUAL OPEX:	76,677	153,354	76,677	76,667
ANNUAL MAINTENANCE:	57,726	56,000	44,026	70,470
ANNUAL FUEL SAVINGS:	879,900	879,900	879,900	879,900
PAYBACK PERIOD (YEARS):	**12.6**	**14.4**	**9.5**	**15.7**

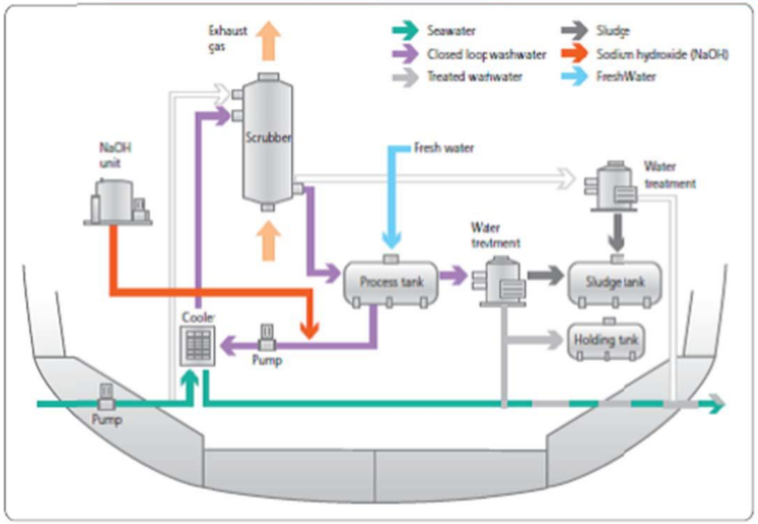




Evaluation of Exhaust Gas Cleaning Systems for Suezmax

VENDOR:	DDD 2	DDD 3	EEE 1	EEE 2
ACQUISITION COST:	5,980,500	3,901,500	6,750,000	4,840,000
CAPEX:	9,748,215	6,359,445	11,002,500	7,889,200
ANNUAL OPEX:	76,667	65,911	76,667	76,667
ANNUAL MAINTENANCE:	59,805	39,015	67,500	48,400
ANNUAL FUEL SAVINGS:	879,900	756,350	879,900	879,900
PAYBACK PERIOD (YEARS):	**13.1**	**9.8**	**15.0**	**10.5**

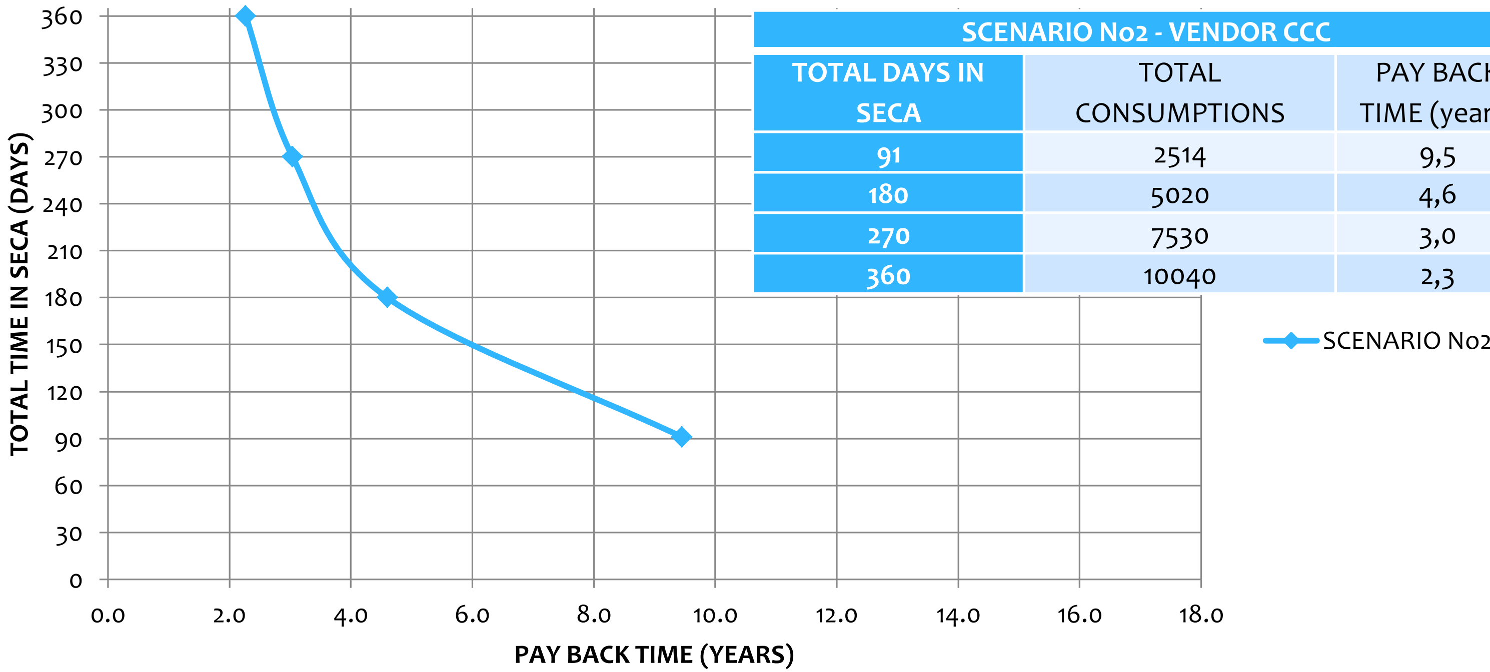




The Uncertainty factor

* Regulations,
  * Applicability from 2020 (or 2025)
  * New ECA zones?
  * Worldwide application of fuel with sulfur content less than 0.5%
* HFO- MGO fuel price difference increase (study based on price difference of USD 350/MT) .
* Fuel / Chemical escalation rate.
* Variable sulfur content (all received data is based on fuel with 3.5% sulfur content).
* Remaining operating life of the vessel
* Damage and consequent repair of the EGCS, including unscheduled repair period.
* Condition of the market
* Fuel consumption volume, operating profile

The ECA-Ship?



SCENARIO No2 - VENDOR CCC		
TOTAL DAYS IN SECA	TOTAL CONSUMPTIONS	PAY BACK TIME (years)
91	2514	9,5
180	5020	4,6
270	7530	3,0
360	10040	2,3

The ECA-ship?

New concept and commercial opportunities

The factors of the uncertainty

- \- High fluctuation of Charter rates
- \- New Regulations
- \- Fuel price and alternatives
- \- Competition

Conclusion

Management systems:

- Systems focused on efficiency: Operational decisions based on techno-economy.
- Persons expertize
- Standardized procedures and use of computer aids
- Monitoring and elaboration of the information

New technology

- One of the major factors in a changing Market
-Don’t copy, evaluate all possible solutions to find the solution that fit the case
-The uncertainty factor
-Financial and Technical risk

Sustainable Shipping

* A combination of financial and technical decisions.

* The best technical decision is the most profitable.

Sustainable Shipping

THANK YOU FOR YOUR ATTENTION