



Environmental Management Review 2020

*Environmental
management review for
Elbana di Navigazione
Spa*

*PIOMBINO 19th
January 2021*

THINK GREEN

Shipping plays a key role in facilitating global trade, economic development and global prosperity. In **Elbana di Navigazione**, we believe shipping is about creating real and long-lasting opportunities and we advocate a balanced, sustainable approach to our business.

Moving goods by sea is the most energy efficient and environmental mode of transportation. While we acknowledge that our energy consumption and emissions as a Shipping Company is significant, we aim to make energy transportation even more sustainable by complying with all applicable rules and regulations and also adopting innovative measures.

Although marine transportation is quite energy-efficient in terms of ton*mile performance compared to others modes of transportation, shipping is now facing a new reality: media, politicians and the public are increasingly focusing on environmental issues. International shipping reduced its total CO2 emissions by more than 10% between 2007 and 2012. There is, nevertheless, a clear expectation from governments for shipping to do even more, therefore the industry will continue on its current trajectory of achieving ever increasing carbon efficiency. Carbon emissions which contribute to global warming are in the spotlight in particular, and the public, the media and regulators are demanding action. Rules and regulations covering environmental issues will become stricter in the next years, Sulphur content of the fuel oil used by ships has been reduced to 0.50% m/m (mass/mass) on 1st January 2020. Furthermore, Ballast Water Convention which entered into force on 08 September 2017, has been postponed until 08 September 2020, due to the difficulties encountered into ship's design.



What is ELBANA DI NAVIGAZIONE doing?

Times of change are often times of opportunities. Rather than just waiting for new regulations to come into force, we believe that a proactive approach is the best alternative; thus, we are looking for opportunities, developing and implementing effective and practical alternatives, and working with other interested parties to influence regulations with real-world knowledge and experience.

We are committed to sustainable development and protection of the environment. Not only are we fully cognizant of the environmental aspects and impacts of our operations but we also face all challenges in a positive and systematic way. We believe that implementing environmental improvements for short- and long-term gains may very well produce good return on investment.

We recognize that the impact of greenhouse gas (GHG) emissions on society and ecosystems is significant and justifies taking action. We believe that, although shipping is by far the most environmental-friendly and energy-efficient mode of transport, immediate action has to be taken to further improve its environmental footprint. Shipping will also have to take its share of the climate change burden. This will only be possible if all shipping companies are committed in continually reducing the environmental impact of all ship related operations.

Our approach to environmental care is based on disciplined management system, coupled with rigorous economic and technical analysis to identify the most effective approach. Before we begin any new activity, we conduct an extensive environmental assessment, with results integrated into project decision making.

The ultimate goal is through strong leadership, the Company to promote the concept of safety and environmental excellence at all levels within our organization. This concept is achieved by generating continuous sustainable improvement in Safety and Environmental management processes. We will continue to strive for excellence in environmental performance through the implementation of our IMS.

A. INPUT

A.1. Status of action from previous management reviews

The previous management review dated 30th January 2020, and agreed.

A.2. Changes in:

External and internal issues that are relevant to environmental management system

External issues related to IMO regulation have been taken into consideration for each of the environmental program, where applicable.

Presently no internal issues have been highlighted.

Needs and expectations of interested parties, including compliance obligations

The top management confirms its intention to continue to obey to the ISO 14001:2015 standard, by complying with Marpol requirements relevant to the vessels and the national requirements which may be applied to the company office site.

Environmental aspects

Environmental aspects and programs are considered of each step of this management review

Risks and opportunities

Risk and opportunities have been evaluated into the attached Environmental Management Report (ENV – 001)

A.3. Environmental objectives achieved

At the time of the management review, the company has set into environmental management report the objectives in reduction of environmental emissions

A.4. Company's environmental performances

1. Nonconformances and corrective actions
2. Monitoring and measurement result
3. Fulfillment of its compliance obligations
4. Audit result

No NCR and / or no observations related to the Company's EMS for the year 2020, has been raised in the reporting period during inspections, audits by Flag Administrations, Vessels' Class Societies and internal/external audits.

No.	Decision / Action	Responsible(s)	Due date
1.	New regulations to be discussed during Environmental Management Review Meetings	DPA	Continuous

A.5. Adequacy of resources

Management has evaluated that presently there are adequate resources both ashore and onboard to satisfy environmental standard (refer to ISM & ISO annual management review carried out on 10 January 2020)

A.6. Communication(s) from external interested parties, including complaints

No deficiencies concerning matters related to IMS were identified during PSC and / or Flag Inspections.

No complaints or letters of protest were received from any customer related to our Company's Environmental Performance.

A.7. Opportunities to continual improvement

The management has decided to follow for the year 2021 the international regulations as opportunities for a continual improvement

The Company implements a reporting system for collecting the required data from all vessels and quarterly calculation of the **Energy Efficiency Operational Indicator (EEOI)** (gr CO₂ / tonne-mile) per vessel. A Rolling Average EEOI is

being calculated in accordance with IMO MEPC.1/Circ.684 "Guidelines for Voluntary Use of the Ship EEOI", by using the following formula:

$$\text{Average EEOI} = \frac{\sum_i \sum_j (FC_{ij} \times C_{Fj})}{\sum_i (m_{\text{cargo},i} \times D_i)}$$

Where:

- j is the fuel type;
- i is the voyage number;
- FC_{ij} is the mass of consumed fuel j at voyage i (metric tonnes);
- C_{Fj} is a non-dimensional conversion factor between fuel j consumption and CO₂ emission (both measured in grams) based on carbon content. The value of C_F is given in the Table below;
- $m_{\text{cargo},i}$ is the cargo mass carried during voyage i (metric tonnes); and
- D_i is the distance in nautical miles corresponding to the cargo carried during voyage i.

Fuel Mass to CO₂ Mass Conversion Factors (C_F)

Type of fuel	Reference	Carbon Content	C_F (t-CO ₂ /t-Fuel)
Diesel / Gas Oil	ISO 8217 Grades DMX through DMC	0.875	3.206000
Light Fuel Oil (LFO)	ISO 8217 Grades RMA through RMD	0.86	3.151040
Heavy Fuel Oil (HFO)	ISO 8217 Grades RME through RMK	0.85	3.114400

The Company also implements a reporting system for collecting the required data from all vessels and quarterly calculation of the SO_x Index (gr SO_x / tonne-mile) per vessel. A Rolling Average SO_x Index is being calculated in accordance with the following formula:

$$\text{SOxI} = \frac{\sum_{i=1}^n \sum_{x=1}^k (FC_{i,x} \times S_{i,x})}{\sum_{i=1}^n (m_{\text{cargo},i} \times D_i)}$$

Where:

- $S_{i,x}$ is the weighted average of % sulphur content of fuel type x
- x is the fuel type;
- i is the voyage number;
- $FC_{i,x}$ is the mass of consumed fuel x during voyage i [metric tonnes];
- $m_{\text{cargo},i}$ is the carried cargo mass during voyage i [metric tonnes]; and
- D_i is the distance in nautical miles corresponding to the voyage i

Finally, we implement a reporting system for collecting the required data from all vessels and quarterly calculation of the NO_x Index (gr NO_x / tonne-mile) per vessel. A Rolling Average NO_x Index is being calculated in accordance with the following formula:

$$\text{NOxI} = \frac{\sum_{i=1}^n (H_{ME,i} \times P_{ME,i} \times E_{ME,i})}{\sum_{i=1}^n (m_{\text{cargo},i} \times D_i)}$$

Where:

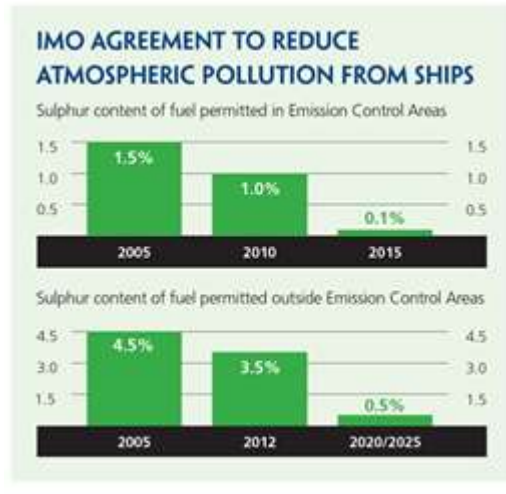
- i is the voyage number;
- $H_{ME,i}$ is the main engine's operating hours during voyage i;
- $P_{ME,i}$ is the main engine's power for average RPM during the voyage i;
- $E_{ME,i}$ is the certified NO_x emissions per KWh for given RPM for the main engine during voyage i;
- $m_{\text{cargo},i}$ is the cargo mass carried during voyage i (metric tonnes); and
- D_i is the distance in nautical miles corresponding to the cargo carried during voyage i.

The Environmental Programs established, implemented and maintained by the Company are here documented. The progress made in the implementation of each program is set out below.

ENVIRONMENTAL PROGRAM 1 (EP-1)
ENHANCEMENT OF ENERGY EFFICIENCY AND REDUCTION OF GHG EMISSIONS
Objective: Enhance the onboard energy conservation and efficiency and reduce GHG emissions
OVERALL COMPLETION DEADLINE : 31-12-2024

ACTIVITY DESCRIPTION

The shipping industry has achieved significant increases in energy efficiency, mainly through enhancements in the efficiency of marine engines and propulsion systems as well as improved hull design. Larger ships and more rational utilization of vessels have also contributed to reducing the amount of energy needed to transport a given unit of cargo. Air emissions, such as CO₂, SO_x, HxCx, NO_x, PM (Particulate Matters), etc. contribute to global warming, acid rain, rising levels of ground ozone affecting ecosystems and human health. The reduced (in 2015) fuel sulphur standard of 0.1 % fuel sulphur (1,000 ppm) is expected to reduce particulate matter and sulphur oxides (SO_x) emissions by more than 85% from today's levels. In 2020, however – unless IMO decides to postpone – an additional global cap will also apply, so that the maximum permitted sulphur content in fuel, in all waters outside of ECAs, will be reduced to 0.5%.



As an alternative to lower sulphur fuel ship operators may choose to equip their vessels with exhaust gas cleaning devices ("scrubbers"). The owners / operators who are unable to obtain compliant fuel are required to submit an electronic fuel oil non-availability report (FONAR). Electronic Fuel Oil Non-Availability Disclosure Portal Instructions can be found at: <http://goo.gl/POUgZm> or www.epa.gov/otaq/oceanvessels.htm

MONITORING

Ongoing Action: Calculate and monitor the IMO Energy Efficiency Operation Index (EEOI) per vessel and for the fleet (average) in line with IMO MEPC.1/Circ. 684.

Responsible Person: DPA / Technical Superintendent
Assisted by / In cooperation with: Technical Assistant / Masters / C/Es

Comments: The Company implements a reporting system for collecting the required data from all vessels and quarterly calculation of the **Energy Efficiency Operational Indicator (EEOI)** (gr CO₂ / tonne-mile) per vessel. A Rolling Average EEOI is being calculated in accordance with IMO MEPC.1/Circ.684 "Guidelines for Voluntary Use of the Ship EEOI", by using the following formula:

1

$$\text{Average EEOI} = \frac{\sum_i \sum_j (FC_{ij} \times C_{Fj})}{\sum_i (m_{\text{cargo},i} \times D_i)}$$

Where:
j is the fuel type;
i is the voyage number;
FC_{ij} is the mass of consumed fuel *j* at voyage *i* (metric tonnes);
C_{Fj} is a non-dimensional conversion factor between fuel *j* consumption and CO₂ emission (both measured in grams) based on carbon content;
m_{cargo,i} is the cargo mass carried during voyage *i* (metric tonnes); and
D_i is the distance in nautical miles corresponding to the cargo carried during voyage *i*.

2	<p>Ongoing Action: Calculate and monitor the SOx Index (SOxI) per vessel and for the fleet (average).</p> <p>Responsible Person: DPA / Technical Manager Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: The Company implements a reporting system for collecting the required data from all vessels and quarterly calculation of the SOx Index (gr SOx / tonne-mile) per vessel. A Rolling Average SOx Index is being calculated in accordance with the following formula:</p> $SOxI = \frac{\sum_{i=1}^n \sum_{x=1}^k (FC_{i,x} \times S_{i,x})}{\sum_{i=1}^n (m_{cargo,i} \times D_i)}$ <p>Where: S_{i,x} is the weighted average of % sulphur content of fuel type x x is the fuel type; i is the voyage number; FC_{i,x} is the mass of consumed fuel x during voyage i [metric tonnes]; m_{cargo,i} is the carried cargo mass during voyage i [metric tonnes]; and D_i is the distance in nautical miles corresponding to the voyage i</p>
3	<p>Ongoing Action: Calculate and monitor the NOx Index (NOxI) per vessel and for the fleet (average).</p> <p>Responsible Person: DPA / Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: The Company implements a reporting system for collecting the required data from all vessels and quarterly calculation of the NOx Index (gr NOx / tonne-mile) per vessel. A Rolling Average NOx Index is being calculated in accordance with the following formula:</p> $NOxI = \frac{\sum_{i=1}^n (H_{ME,i} \times P_{ME,i} \times E_{ME,i})}{\sum_{i=1}^n (m_{cargo,i} \times D_i)}$ <p>Where: i is the voyage number; H_{ME,i} is the main engine's operating hours during voyage i; P_{ME,i} is the main engine's power for average RPM during the voyage i; E_{ME,i} is the certified NOx emissions per kWh for given RPM for the main engine during voyage i; m_{cargo,i} is the cargo mass carried during voyage i (metric tonnes); and D_i is the distance in nautical miles corresponding to the cargo carried during voyage i.</p>
PHASE II – MID TERM ACTIONS (DUE DATE: 31-12-2021)	
1	<p>Incorporate in the Company's Training Plan a training course for the responsible shore and sea staff on "Ship Energy Conservation / Efficiency" to share knowledge gained in the industry and to enhance awareness on energy conservation.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: A "Ship Energy Conservation / Efficiency" training course will be carried out to shore staff and part of Senior Officers in order to improve energy awareness.</p>
2	<p>Efficient operation and maintenance of machinery, FO systems, T/C plant, etc. as per makers' instructions and PMS. Monitor main and auxiliary engine and boiler performance and optimize vessel performance to avoid excess FO consumption, whilst staying within the parameters of the C/P's requirements for speed and ETA.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: Superintendents and Senior Officers have been instructed for monitoring efficient operation and maintenance of vessels machinery.</p>
3	<p>Use of fuels containing a lower amount of higher carbon molecules (i.e. cleaner fuels, alternative fuels).</p> <p>Responsible Person: Commercial department and technical department Assisted by / In cooperation with: - Comments: -</p>

4	<p>Consider installation of electronically controlled main engines in new-buildings - review relevant technologies.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: Electronically controlled main engines result in lower part load FO consumption, lower emissions and "low emission modes". A team of skilled engineers from our Technical Dept. will check specifications for Electronically controlled main engines.</p>
5	<p>Consider installation of hydrodynamic improvement devices (HIDs) that improve the hull / propeller efficiency in new-buildings - review and assess available technologies.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: A team of skilled engineers from our Technical Dept. will check specifications available HIDs.</p>
6	<p>Consider installation of M/E sequential combination turbochargers in new-buildings - review relevant technologies.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: By installing the sequential turbo-charging system, the engine is able to run from idle to medium load with only one turbocharger and up to a rated load with an additional, 2nd turbocharger. The cumulative advantage of this is a wider performance map and important benefits in specific fuel oil consumption that can reach up to 6 gr/kWh reduction as per maker's reports. There are different combinations available for installation by changing the TC capacity ratio, as the capacity ratio between Large and Small turbochargers effects on the amount of fuel oil consumption reduction. A team of skilled engineers from our Technical Dept. will check specifications for M/E sequential combination turbochargers.</p>
7	<p>Consider installation of engine performance monitoring software and hardware (KYMA, etc.) in new-buildings - review available technologies.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: Engine performance monitoring through e.g. KYMA Diesel Analyzer for measuring cylinder and fuel injection pressure on diesel engines can be used for tuning of engine balance and ignition timing, check of cylinder overload and wear, as well as for maintenance planning.</p>
8	<p>Conduct market research on "weather routing" programs and assess their effectiveness. Develop a procedure for the implementation of a "weather routing" program on selected fleet vessel(s). Monitor implementation with the aim of deciding follow-up targets.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: In recent years, the Master's duties have become more and more complex with new regulations, security concerns and paperwork. This gives them less opportunity to allocate enough time to thoroughly evaluate all routing options and come up with the optimum route. With the high price of fuel today, every extra hour at sea can be very costly. Before supplying our vessels with such onboard automation, we will conduct market research to ensure that the available systems meet our requirements in terms of usability and efficiency. The market research results will be assessed against our requirements and a relevant decision will be taken. The aims of this task are:</p> <ul style="list-style-type: none"> Voyage Optimization Program to improve overall voyage efficiency. Speed selection optimization, taking into account physical & commercial factors. Optimized route planning to avoid high storm or wave frequency. Optimizing auto-pilot function by increasing variable control elements e.g. steady rudder & minimum rudder angle depending on draft, speed and weather conditions. <p>The "weather routing" program:</p> <ul style="list-style-type: none"> provides both text/graphic forecast information along the vessel's intended route using extended range forecasts and climatological data; suggests alternative/more fuel-efficient routes taking into account prevailing weather conditions

9	<p>Assess relevant technologies and consider installation of Alpha Lubricators to new-buildings.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: Alpha Lubricator is a high-pressure electronically controlled lubricator that injects the cylinder LO into the cylinder at the exact position and time where the effect is optimal, which is not always possible with the conventional lubricators. The aim is to reduce the cylinder LO dosage, while at the same time to maintain a satisfactory piston ring/liner wear rate. Alpha Lubricator enables a precise filling of cylinder oil at an optimum timing by electronic control and can reduce the consumption of cylinder LO by 30% annually, compared with conventional mechanical type oil lubricator. It contributes not only to reduce the running cost of the ship but also to decrease the exhaust emission (PM) of the engine. Furthermore, by decreasing the filling amount of cylinder oil, this lubricator can decrease the additive agent residue (ash, etc.) in the cylinder oil, which eventually decrease the dirt in the exhaust gas passage and scavenging chamber, and therefore the maintenance period of peripheral devices such as exhaust valve, turbocharger, exhaust gas heat economizer can also be advantageously extended.</p>
10	<p>Assess relevant technologies and consider installation of fuel slide valves to new-buildings to reduce NOx emissions.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: Fuel valves of sliding type are designed to reduce the volume of the fuel that remains in the fuel injection nozzle when the valve is closed. They are also equipped with a specially designed injection nozzle that optimizes the distribution of the fuel throughout the combustion process, avoids high temperature peaks and thereby reduces the generation of NOx. In addition, the slide fuel valves optimize the combustion of the fuel and ensure a cleaner engine. The consequential reduction of the HC emissions and of Particulate Matters (PM) results in less smoke formation. The engine also benefits from reduced fouling of piston top-land and exhaust gas boiler and this gives an excellent condition of the exhaust valve duct. It must be noted that average NOx emissions are declining as we build new ships with an improved emission profile.</p>
11	<p>Carry out hull and/or propeller cleaning, if practicable and cost-effective.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: Fuel costs represent over half of a ship's operating costs. In terms of energy loss, hull and propeller roughness significantly affect fuel consumption. The savings obviously depend on the condition of the propeller and hull before the work is carried out. Propeller polishing on a well-maintained ship will reduce the fuel consumption by 1-3%. Another benefit of a polished propeller/ hull is the reduced load on the main engine. This results in less wear and maintenance, even when staying within the load limits of the engine. Systems operating ensure the regular inspection of ships hulls allowing for cleaning, if and when required, both in water and in DD. Underwater cleaning will be treated on a case-by-case basis, depending on each vessel's slip calculations. It must be noted that the areas that allow underwater cleaning are lessening especially around the NW European and USA waters.</p>
12	<p>Consider implementation of the "slow steaming" concept. Make use of the most economical speed when practical. Reduce speed in heavy weather to avoid excess pounding and FO consumption. Optimize the water ballast amount taken.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: Slow steaming simply means running at a slower speed. This is a hot trend in shipping, as it can not only significantly cut carbon emissions but it also reduces consumption and fuel costs. We are already in the process to evaluate this concept and assess in real situation its pros and cons. All ships not on Time Charter shall be instructed to perform ballast length at most economical speed. Masters/Chief Engineers instructed accordingly through Circular. Company's Supts have been instructed also in order to provide necessary advice to Masters/Chief Engineers, when necessary. Any deviation to the above has to be approved by the Office.</p>

PHASE III – LONG TERM ACTIONS (DUE DATE: 31-12-2024)

1	<p>Set a target for fuel quality with a sulphur percentage less than the maximum allowable as per MARPOL Annex VI. Use of high-quality fuels, when possible (high thermo genetic power, low sulphur, low water).</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: Low sulphur marine fuels (LSFO) are used when our vessels enter ECAs and other SOx controlled areas established by national/regional legislation. By carrying out independent FO analysis, we monitor closely the sulphur content of the bunkers used with the aim of ensuring compliance with the set international and national sulphur limits.</p> <p>Taking into account the vessels trading patterns, a requirement for fuel quality with a sulphur percentage less than the max. allowable as per MARPOL Annex VI will be set. It must be noted that the 2012 global average sulphur content was 2.51% (IMO/MEPC 61/4/1) and the 3-year (2007-2009) rolling average of residual fuel oils supplied for use onboard ships was 2.38% m/m.</p> <p>Instructions will be also issued to Company's responsible department and the managed fleet on selecting/approving high quality fuels when possible.</p>
2	<p>Consider the application of new generation hull coatings to improve smoothness and hydrodynamic performance and reduce friction and fuel consumption.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: Hull coatings play a key role in ensuring optimal hydrodynamics of the hull and ship. The preservation of hull smoothness can represent significant fuel savings but comparing this figure to the fuel penalties involved when the hull becomes rough from physical or biological fouling, the potential fuel savings become much more. For these reasons the Company considers to implement a market research on various types of coatings.</p>
3	<p>As an alternative to propeller polishing, consider the application of new generation propeller coating to improve smoothness and hydrodynamic performance of propeller and reduce friction and fuel consumption.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: A research with propeller coating using silicone-based material shall be considered.</p>
4	<p>Routinely arrange spares and supplies in a planned manner to minimize freight movements.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: Relevant instructions will be issued to Purchasing department and the managed fleet. Spares and supplies are requested and supplied to the vessels in a systematic planned manner.</p>
5	<p>An energy audit to be considered to be carried out onboard one of our vessels.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: The Energy Audits assess the energy performance of the ship and all machinery and operational management practices. Objectives of the Energy Audit are to:</p> <ul style="list-style-type: none"> Assess energy efficiency of vessel's operational pattern and shipboard energy consumers. Assess energy efficiency and conservation level of crew practices. Identify equipment, processes and procedures with an Energy Saving Potential (ESP). Assess the feasibility and benefit of each ESP. <p>Tasks include:</p> <ul style="list-style-type: none"> Entering into a shipboard energy audit contract with a consulting company. Selection of ship. Acquisition of all necessary information for the identification of ESPs. <p>The Energy Audit will include the following:</p> <ul style="list-style-type: none"> Analysis of the acquired information. Shipboard energy audit and measurements. Analysis of measurements and assessment of technical and financial feasibility of ESPs. Identification of the final set of ESPs. Amendments to energy efficiency and conservation related procedures according to the identified ESPs / energy audit outcome. Results of the energy audit and related training material to be communicated to the fleet.

6	<p>Install low energy consumption bulbs/ lamps.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: -</p>
7	<p>Request from ship-builders to consider design changes that would enhance the energy efficiency of the new-buildings.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant / Masters / C/Es. Comments: The Company will invite ship-builders to consider a number of areas/design changes with the aim of improving the energy efficiency of the new-built vessels.</p>
8	<p>All new buildings to obtain (where practicable) Environmental Notation/Green Award. If a ship holds the Green Award certificate, it implies that the ship's performance goes beyond that required by the industry's standards.</p> <p>Such a ship scores high not in one, but in multiple categories: e.g. crew training, operational and safety management, environmental measures, maintenance, technical arrangements, etc.</p> <p>The aim of the Green Award scheme is that it brings together high-quality ships and maritime service providers and ports that want to improve safety, attract quality ships and reduce environmental and safety risks. In fact, Green Award acts as the platform for the industry cooperation. Green Award incentive providers (ports and maritime service providers) award ships the highest safety and quality standards of which are confirmed by the Green Award certificate, with various benefits such as discounts on the port dues, products and services.</p> <p>Responsible Person: HSE Department Assisted by / In cooperation with: - Comments: Green Award shows corporate social responsibility and environmental awareness. The holders are receiving many incentives from the industry stakeholders, like ports and maritime service providers. After certification the Company shall have benefits like:</p> <ul style="list-style-type: none"> • Discount on port dues • Charter preference • Lower costs / Lower insurance premiums • Acceptation by PSC / vetting inspections • Quality more visible / Better image • Motivation and pride of crew <p>The Company shall consider to obtain Green Award certification.</p>

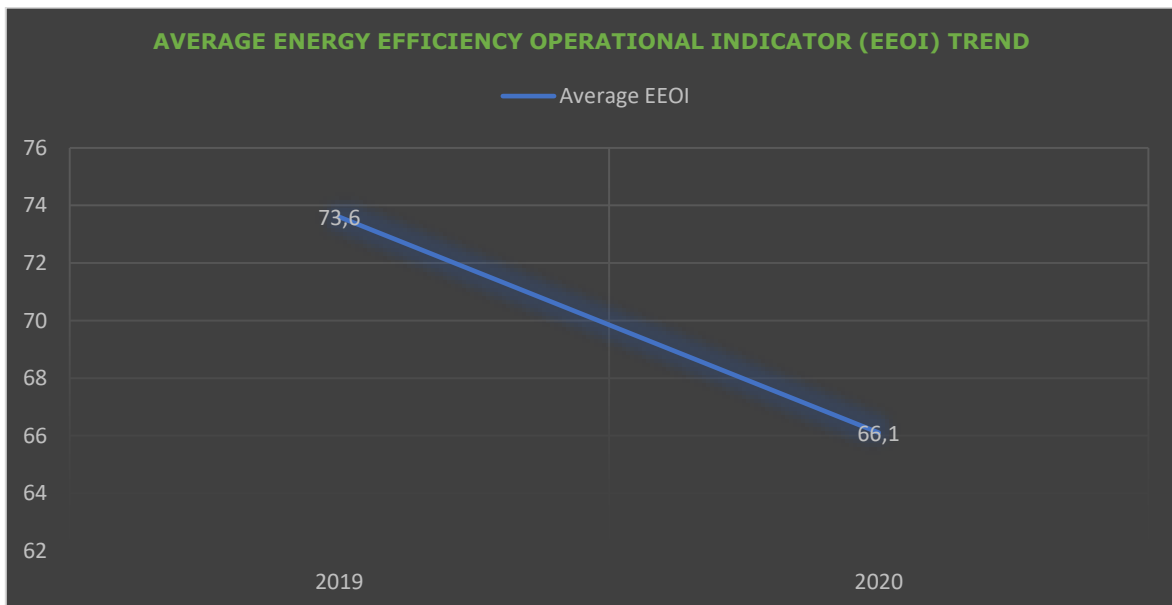
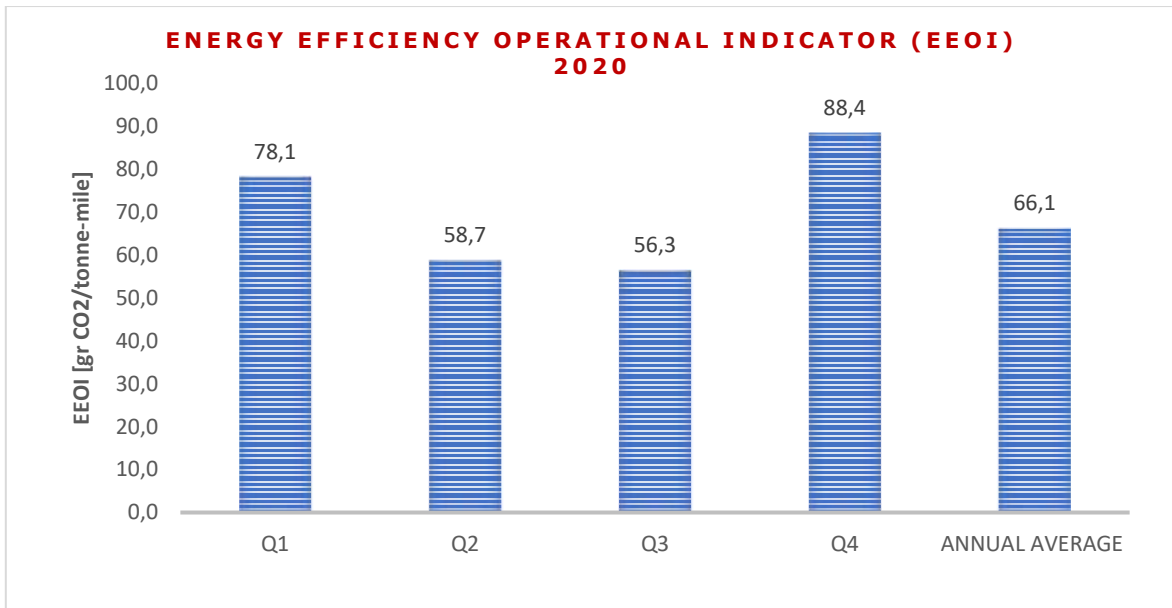
FLEET ENERGY PERFORMANCE ANALYSIS / BENCHMARKING

1. CO₂ Emissions (EEOI – gr CO₂ / tonne-mile)

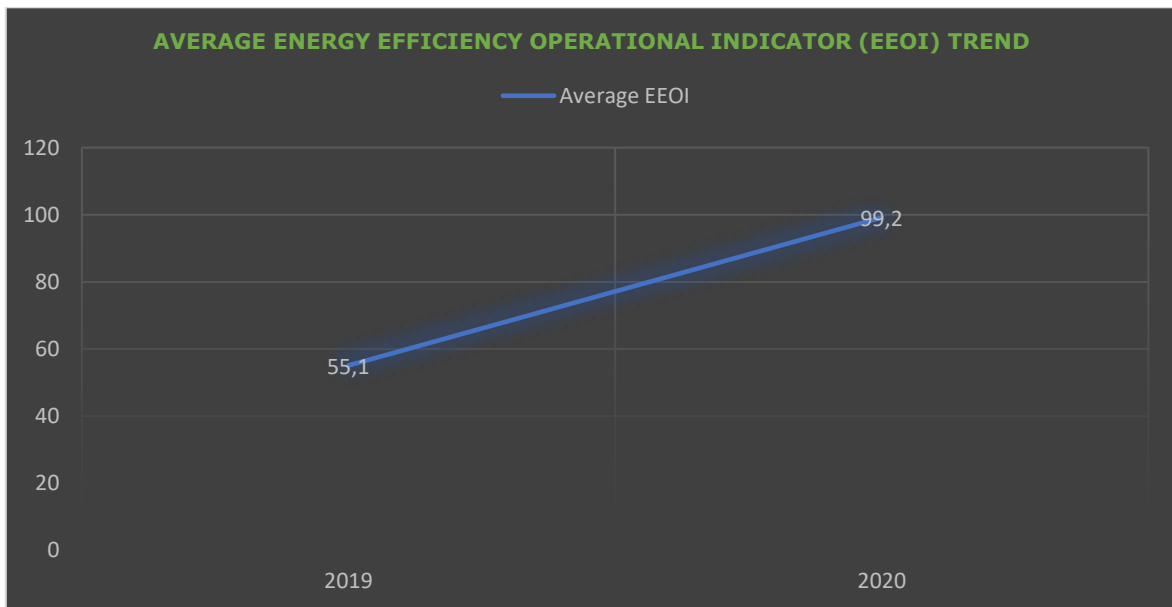
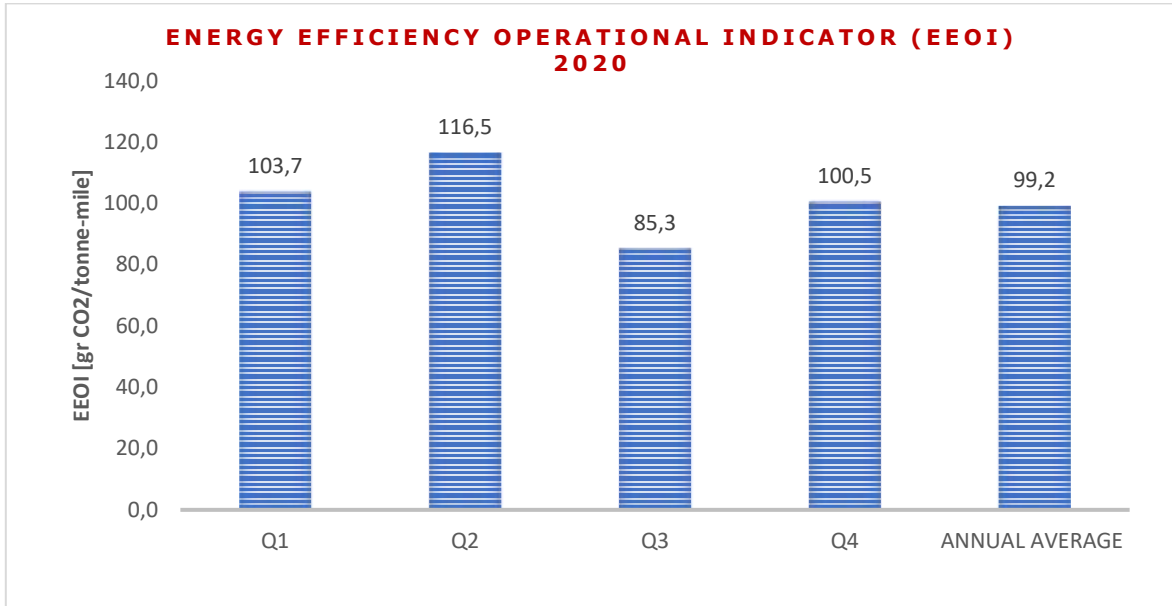
Chemical / Oil Tankers (3-5)x1000 DWT

Falesia had the **worst** performance, having the highest annual average ratio of CO₂ emission: EEOI of 99,2gr CO₂ / tonne-mile. **Alessandro F** had the **best** performance, with the lowest annual average value of emission EEOI of 66,1 gr CO₂ / tonne-mile.

Alessandro F



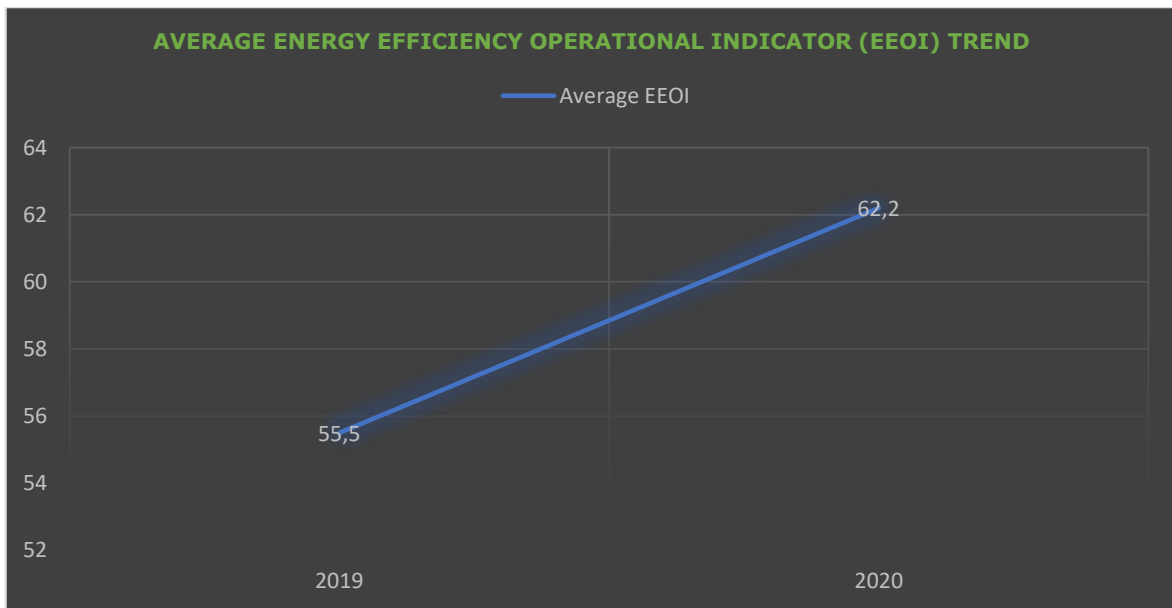
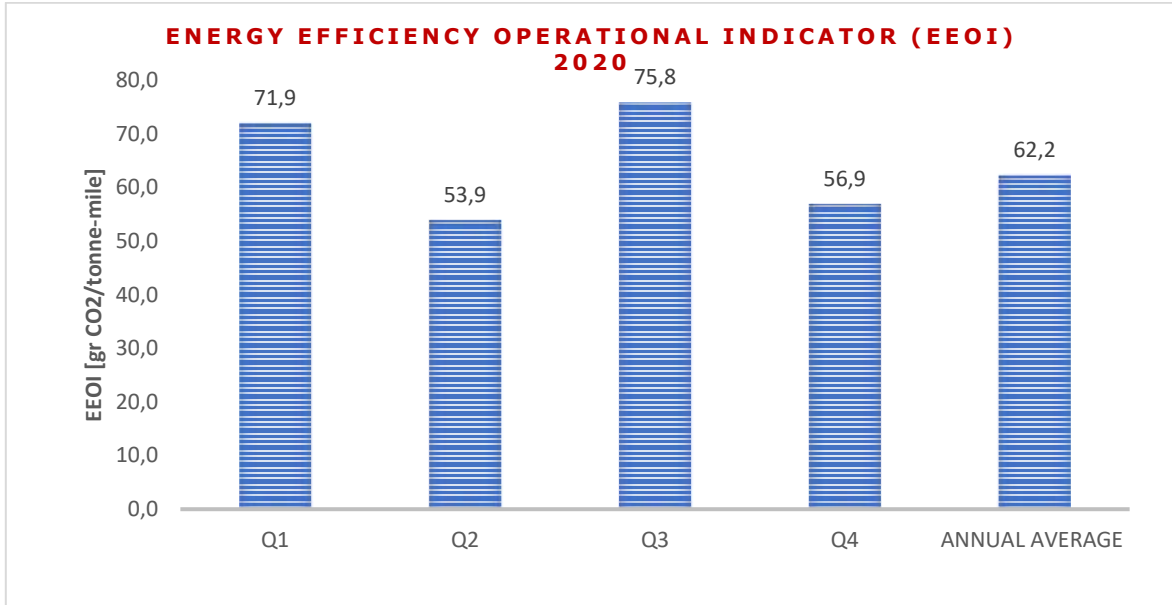
Falesia



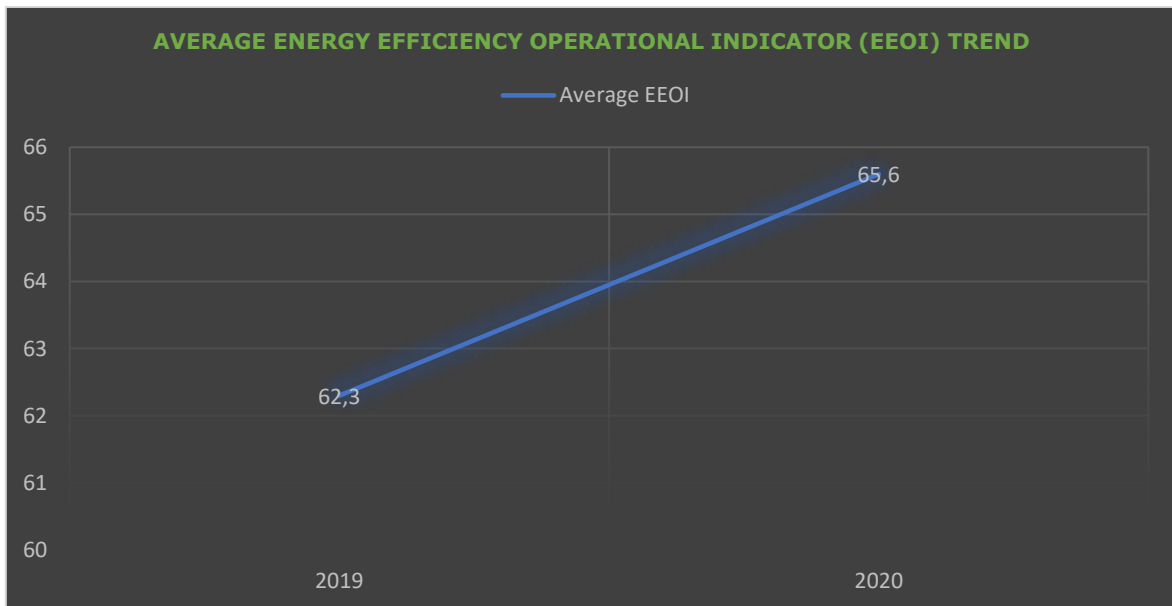
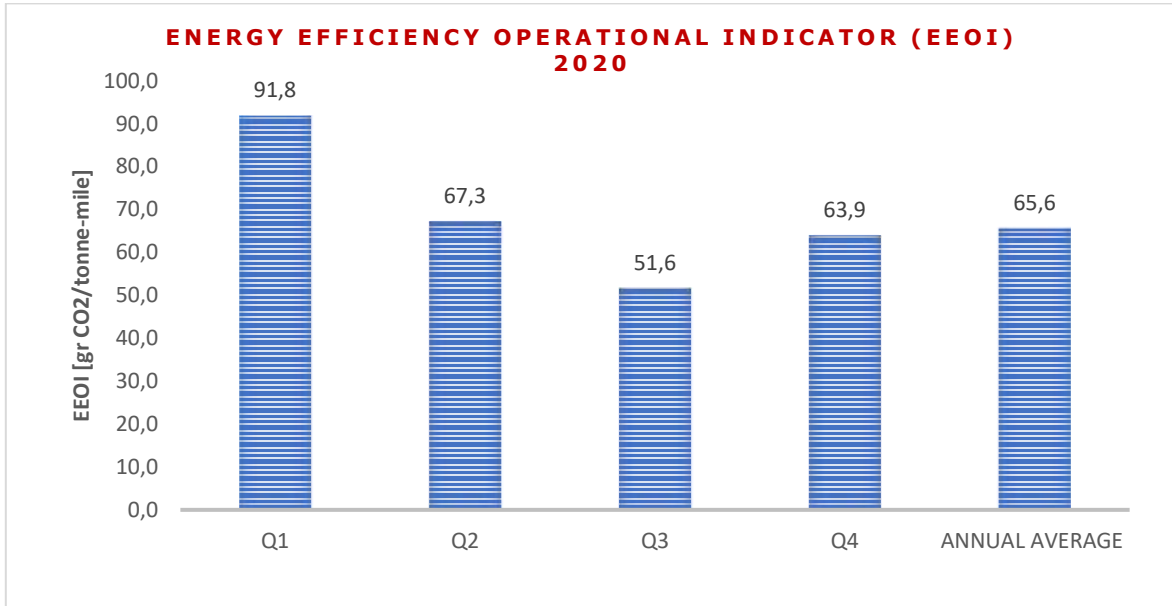
Chemical / Oil Tankers (7 - 10)x1000 DWT

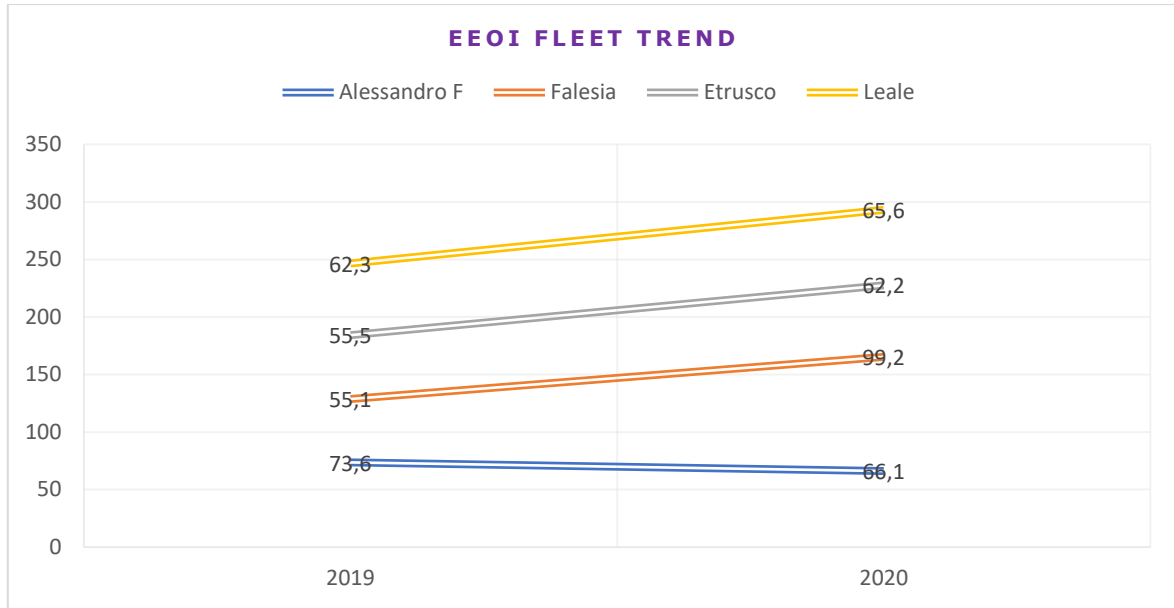
Leale had the **worst** performance, having the highest average EEOI – 65.6 gr CO₂ / tonne-mile. **Etrusco** had the **best** performance having the lowest average EEOI–62,2 gr CO₂ / tonne-mile.

Etrusco



Leale





Variations 2019 -2020

Alessandro F: -10,1%
 Falesia: +80,5%
 Etrusco: +12,1%
 Leale: +5.1%

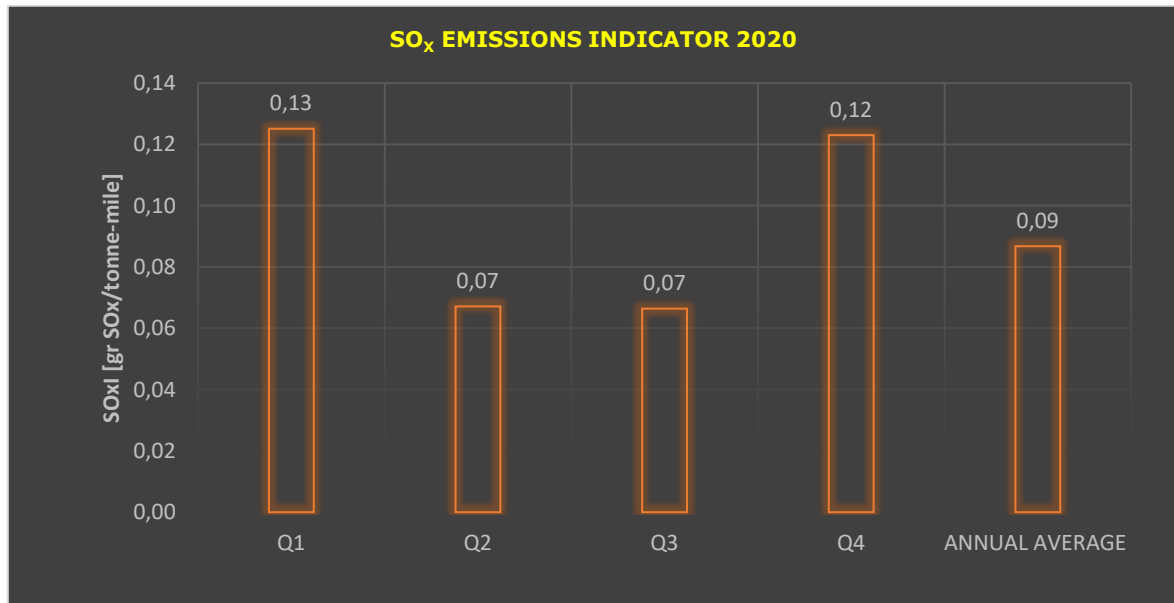
2. SOx Emissions (SO_xI – gr SO_x / tonne-mile)

It shall be highlighted that benchmark with the previous year in relation of SOx average emissions cannot be done due to the fact that during year 2019 HFO in use was with a Sulphur content up to 3.5%.

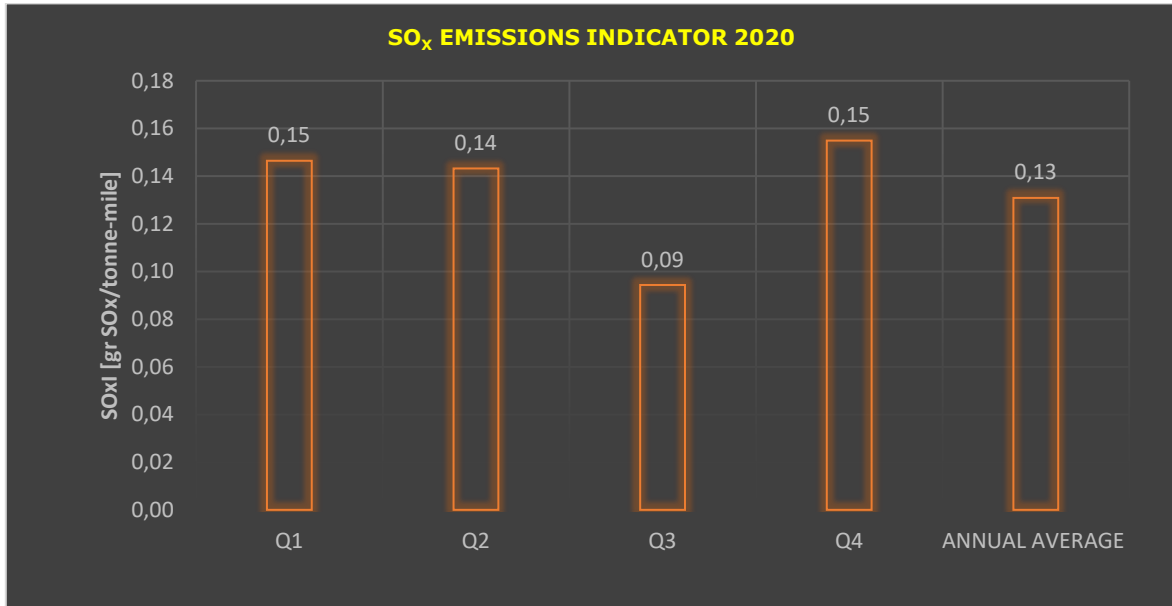
Chemical / Oil Tankers (3 - 5)x1000 DWT

Falesia had the **worst** performance, having the highest annual average ratio of SO_x emission: of 0,13 gr SO_x / tonne-mile. **Alessandro F** had the **best** performance, with the lowest average value of SO_x emission 0,13 gr SO_x / tonne-mile. The performance of the subject vessels in terms of SO_x emissions over the entire period is provided in the graph below:

Alessandro F



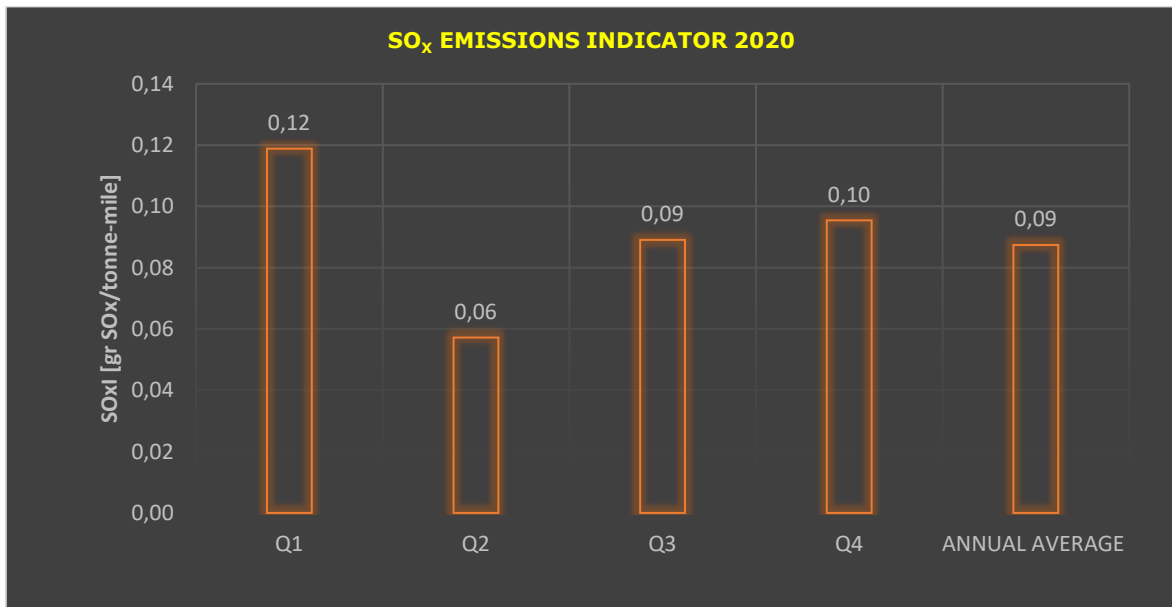
Falesia



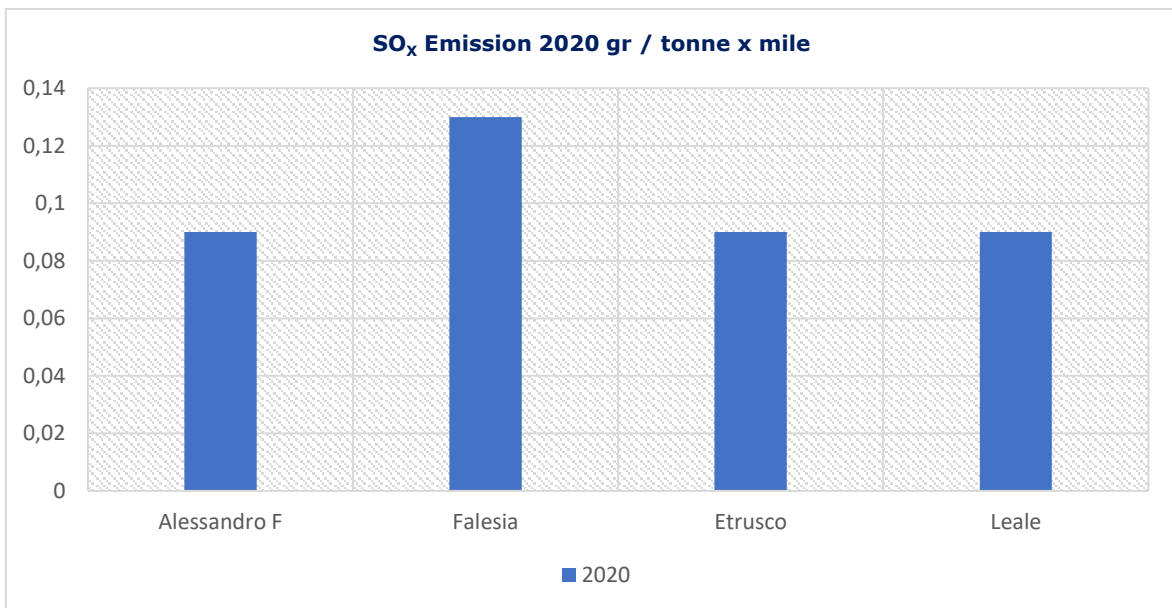
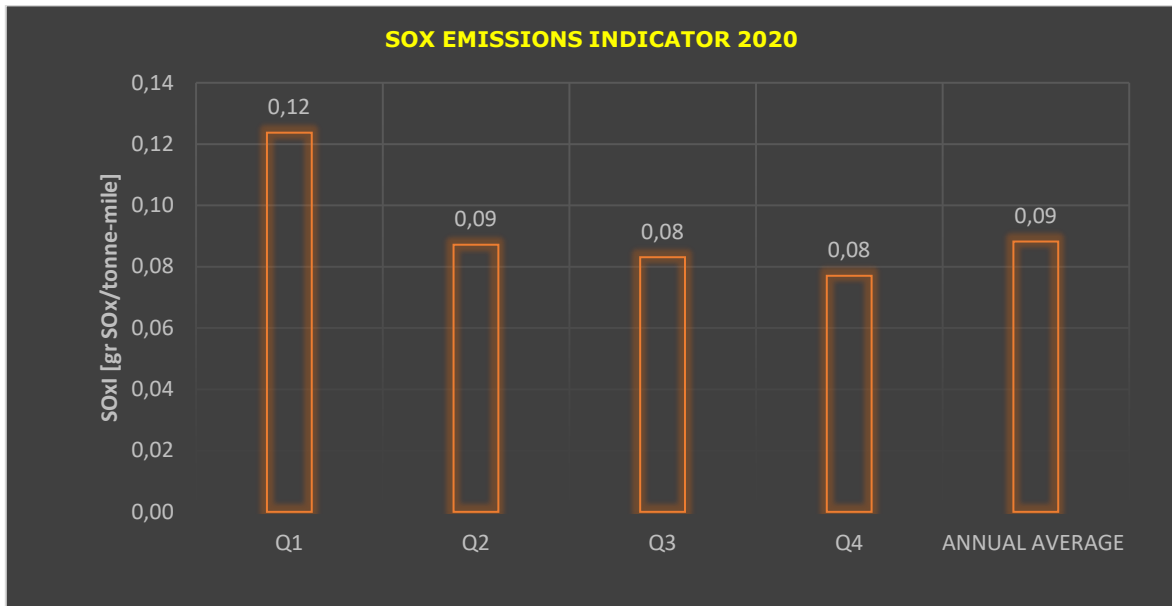
Chemical / Oil Tankers (7-10)x1000 DWT

Both vessels had the same final average performance in SO_x emissions of 0,09 gSO_x / tonne-mile.

Etrusco



Leale

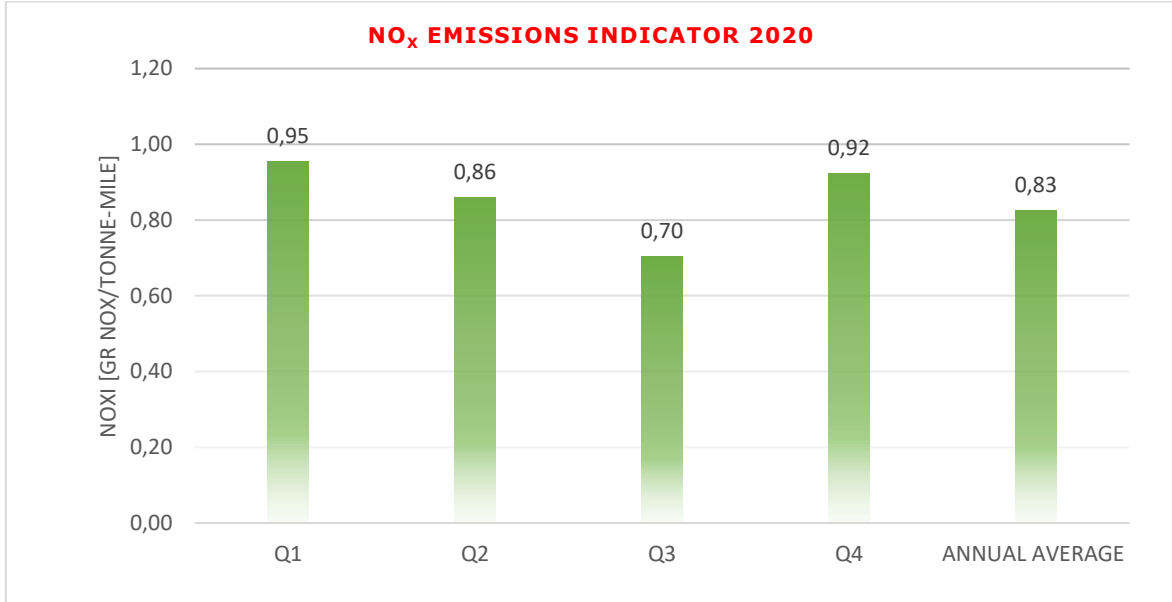


3. NO_x Emissions (NO_xI – gr NO_x / tonne-mile)

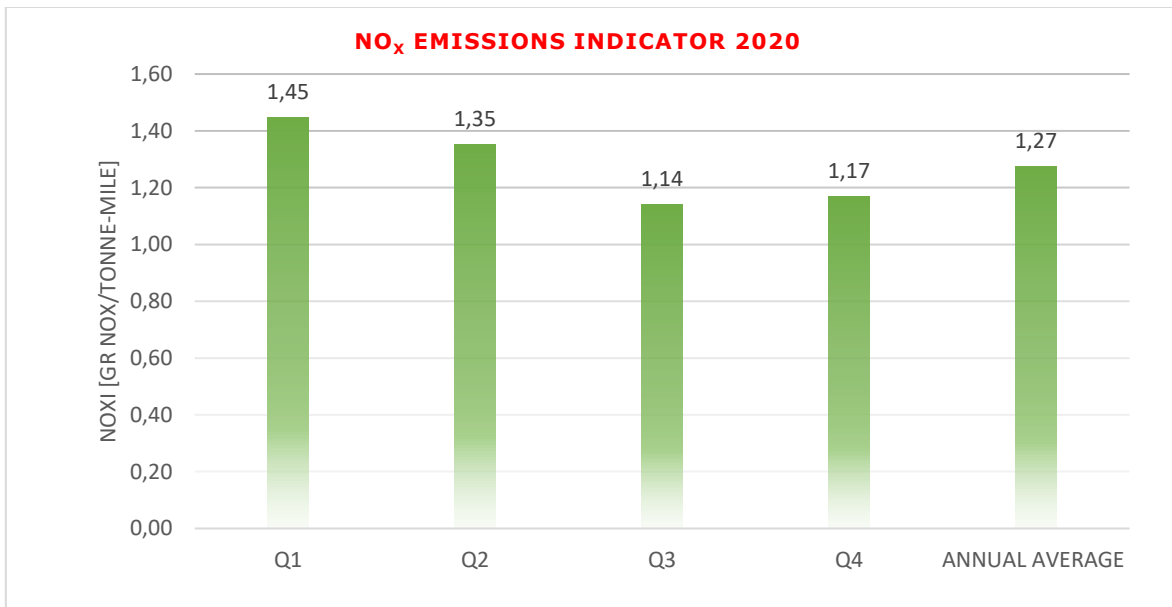
Chemical / Oil Tankers (3 – 5)x1000 DWT

Falesia had a **worst** performance of 1,27gr NO_x / tonne-mile. **Alessandro F** had the **best** performance, with the lowest average value of SO_x emission 0,83 gr NO_x / tonne-mile.

Alessandro F



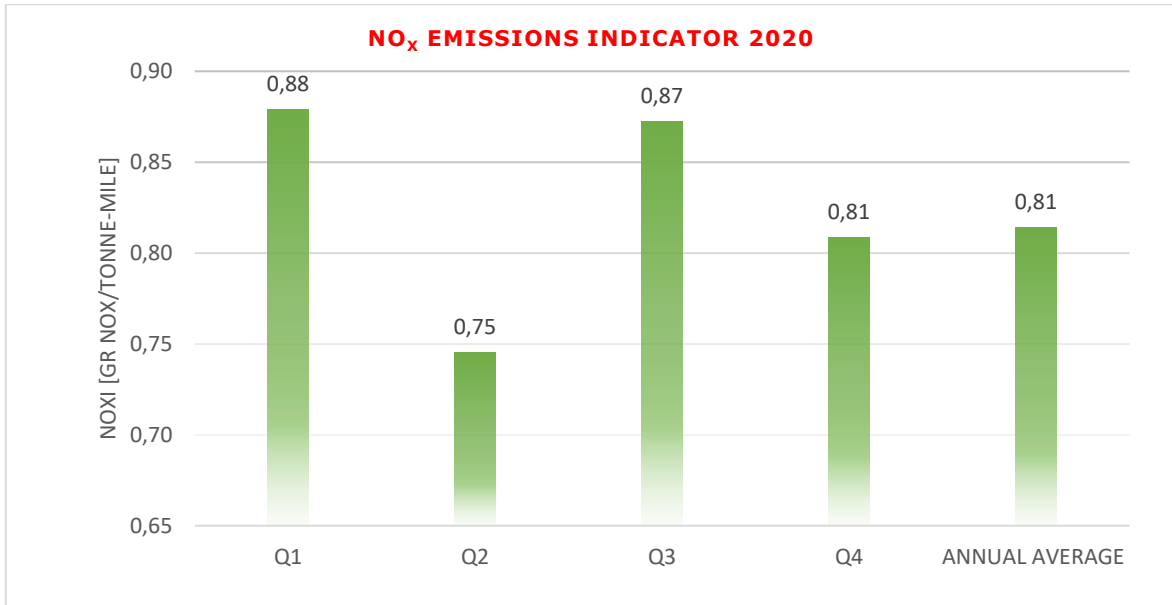
Falesia



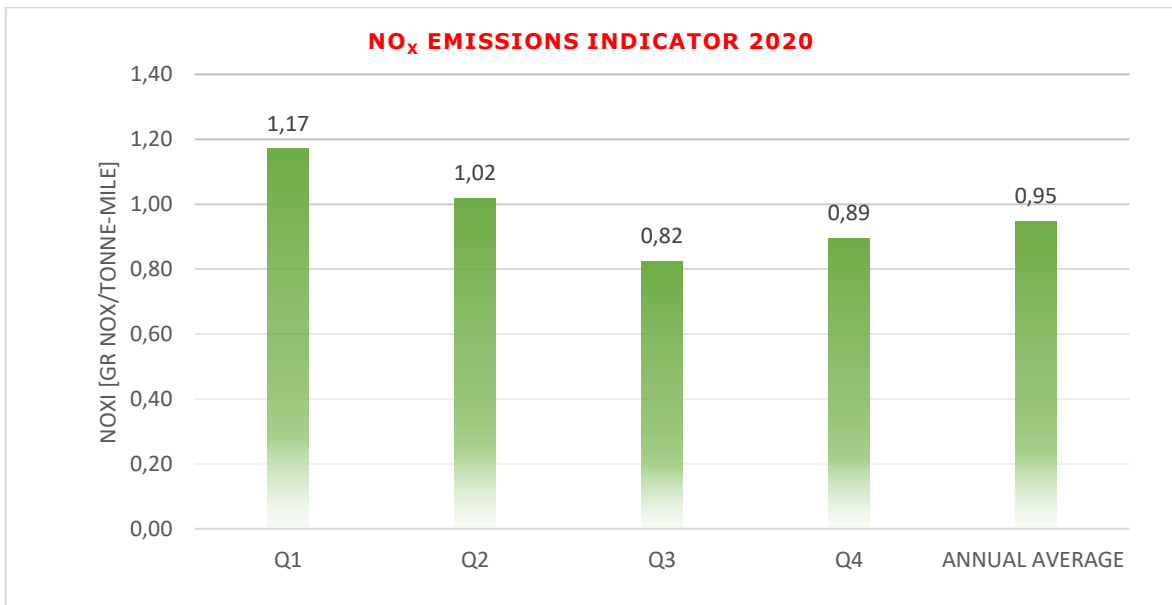
Chemical / Oil Tankers (7-10)x1000 DWT

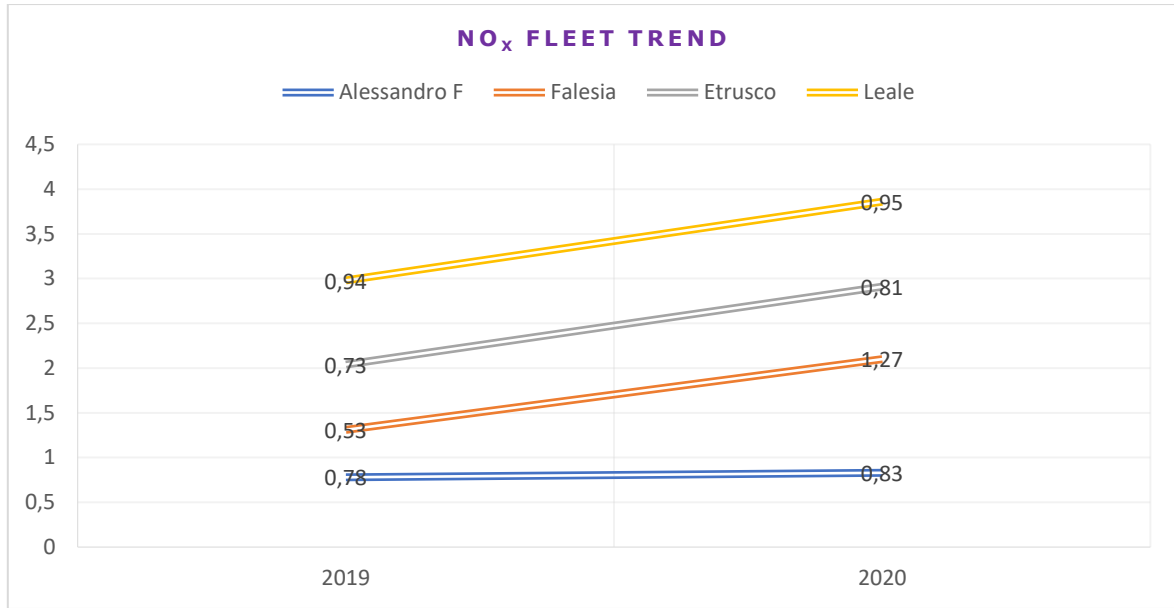
Leale had a **worst** performance of 0,81 gr NO_x / tonne-mile. **Etrusco** had the **best** performance, with the lowest average value of SO_x emission 0,81 gr NO_x / tonne-mile.

Etrusco



Leale





Variations 2019 – 2020

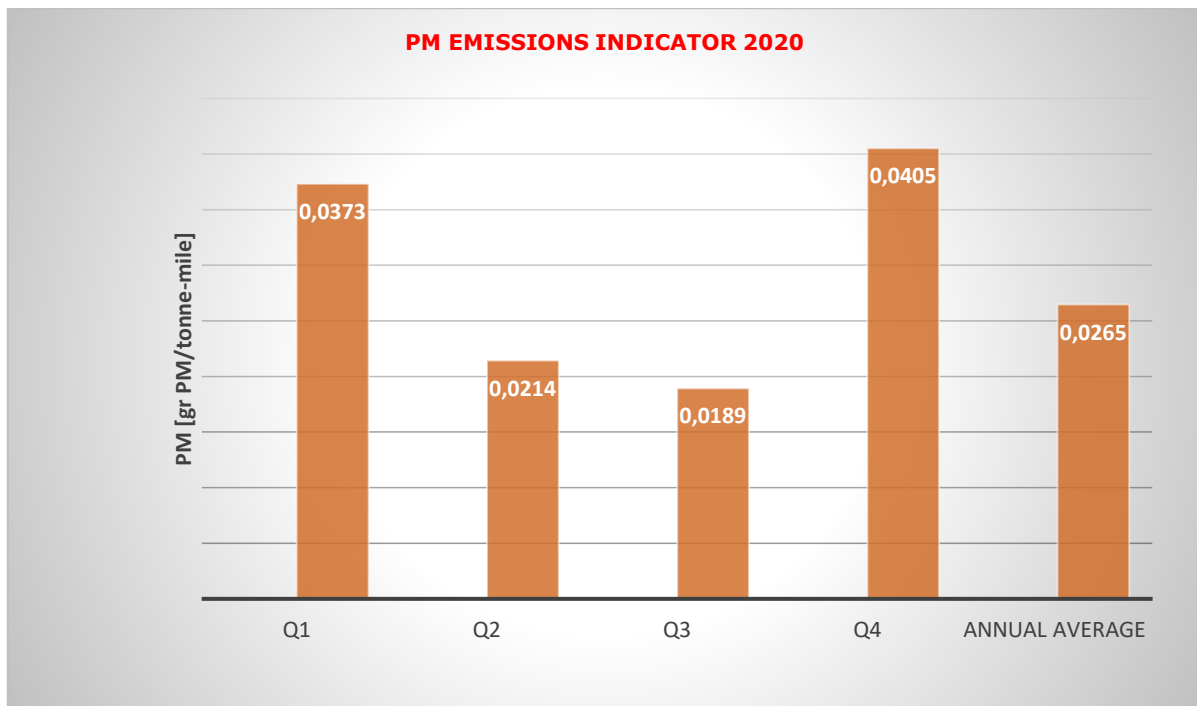
Alessandro F: +6,4%
 Falesia: +139.6%
 Etrusco: +10,9%
 Leale: +1,0%

4. Particulate Matter Emissions (gr PM / tonne-mile)

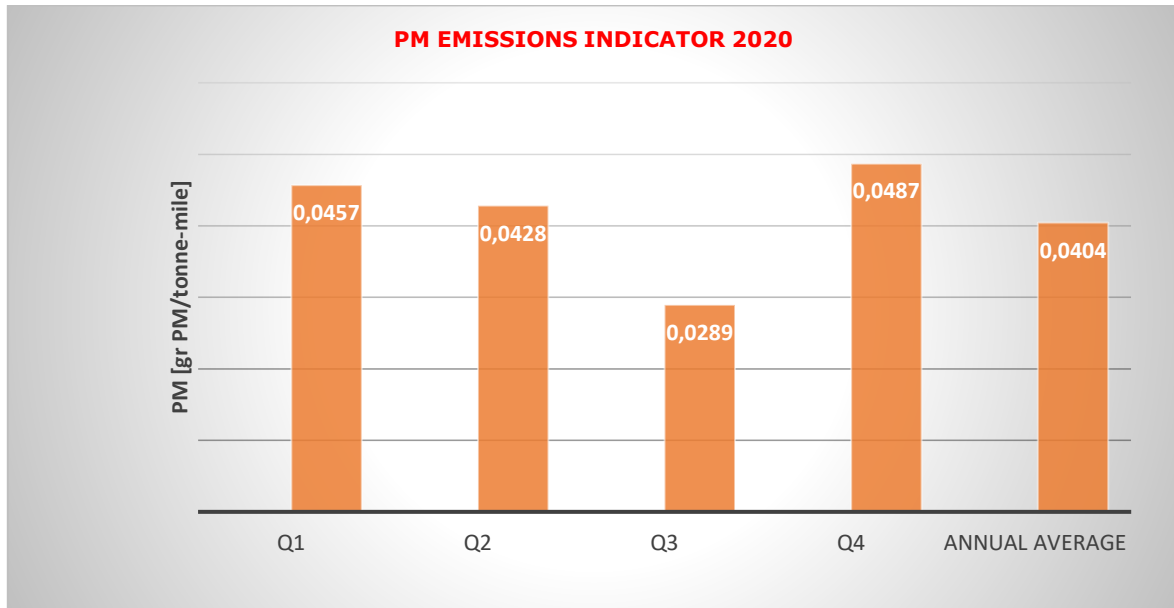
Chemical / Oil Tankers (3 – 5)x1000 DWT

Falesia had a **worst** performance of PM emission 0,0404 gr PM / tonne-mile. **Alessandro F** had the **best** performance, with the lowest average value of PM emission 0,0265 gr PM / tonne-mile.

Alessandro F



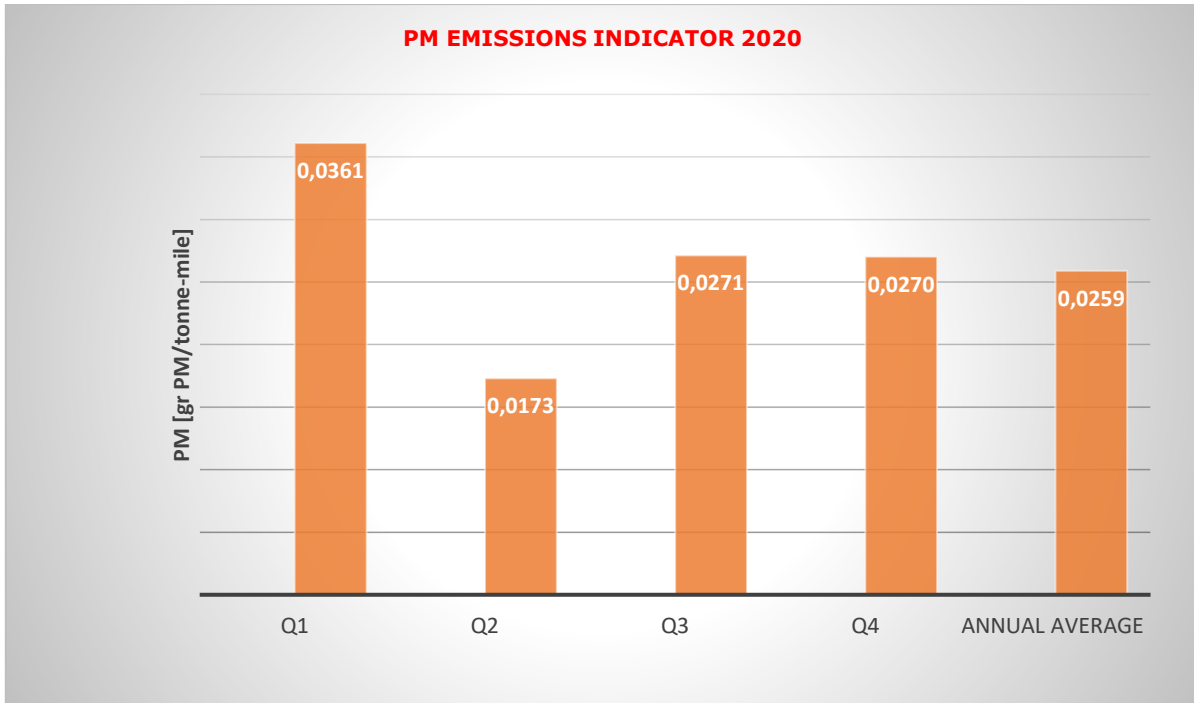
Falesia



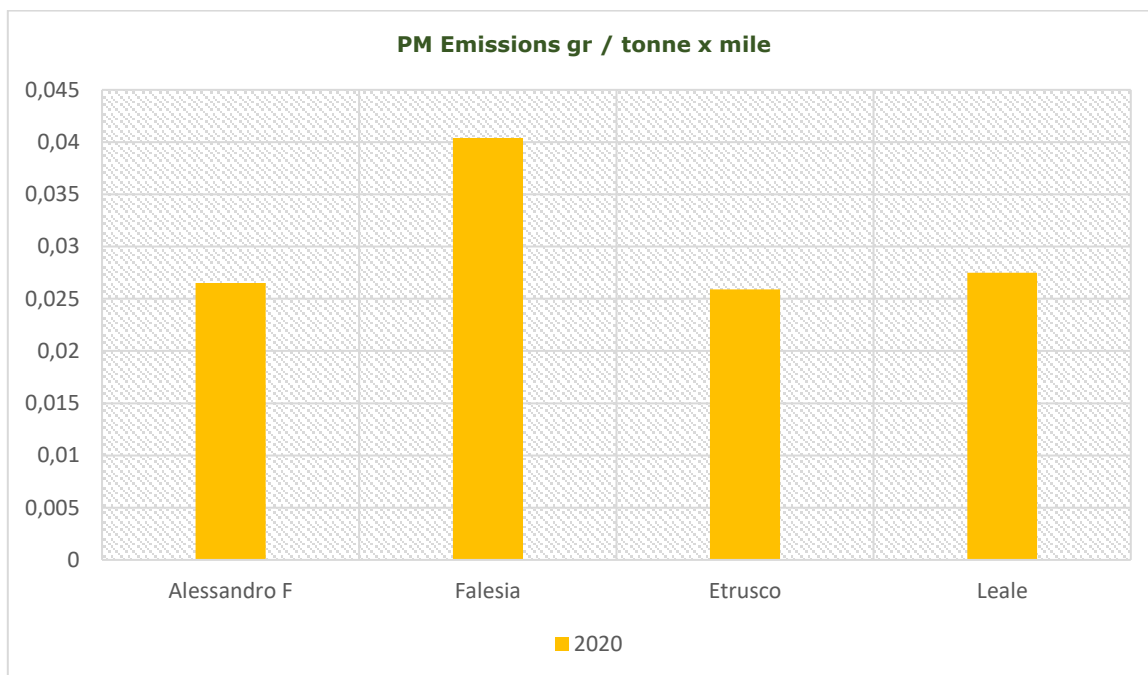
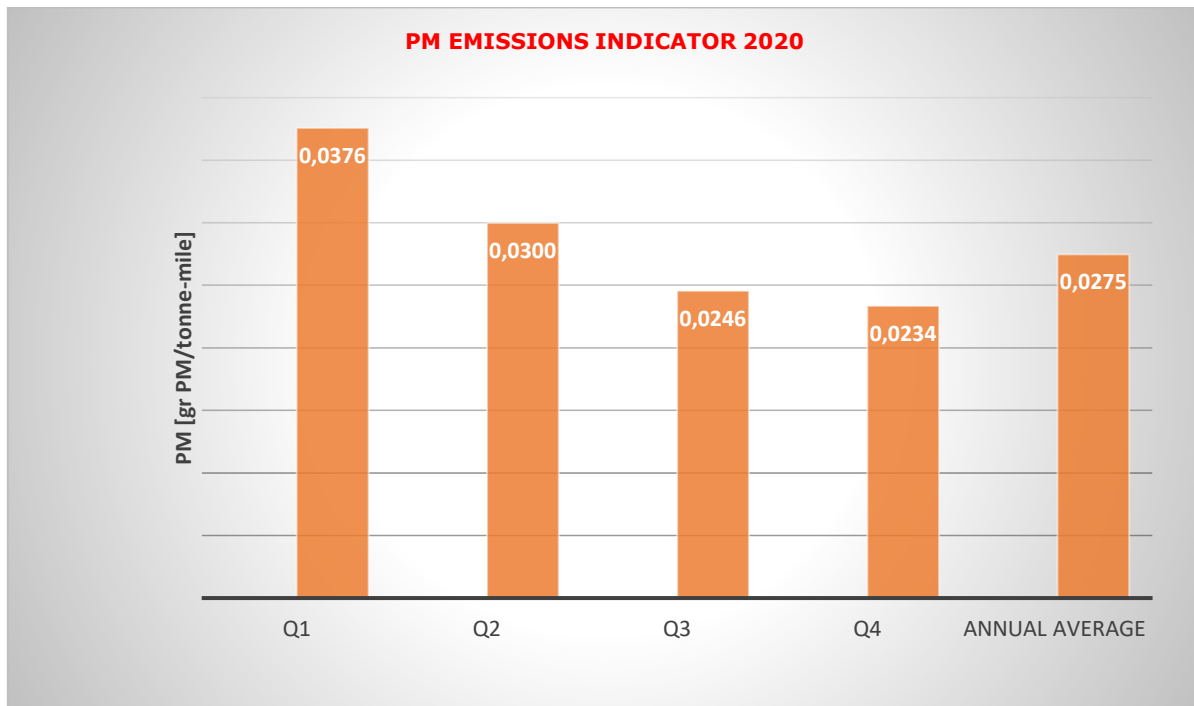
Chemical / Oil Tankers (7 - 10)x1000 DWT

Leale had a **worst** performance of PM emission 0,0275 gr PM / tonne-mile. **Etrusco** had the **best** performance, with the lowest average value of PM emission 0,0259 gr PM / tonne-mile.

Etrusco



Leale



ENVIRONMENTAL PROGRAM 2 (EP-2)

GARBAGE MANAGEMENT

Objective: Monitor type/quantities of garbage onboard - continually reduce environmental impact.

COMPLETION DEADLINE : 31-12-2024

ACTIVITY DESCRIPTION

Activity: Garbage generation and handling onboard the vessels. Garbage includes all kinds of food, domestic and operational waste, excluding fresh fish, generated during normal operation of vessel and liable to be disposed off, continuously or periodically.

Environmental aspect: Discharge of garbage into the sea, air emissions during garbage incineration.

Legal Basis

- MARPOL Annex V as amended by Res. MEPC.277(70) taking into account the Res. MEPC.295(71) ("2017 Guidelines")
- MEPC.1/Circ.834/Rev.1
- ISO 21070 standard (related to Management of Shipboard Garbage).
- Directive 2000/59/EC (of the European Parliament and of the Council of 27/11/2000 on port reception facilities for ship-generated waste and cargo residues) which is amended by Dir.2002/84/EC, Directive 2007/71/EC and Reg. (EC) No 1137/2008.

The Directive enhances the availability and use of port reception facilities for ship-generated waste and cargo residues. It also sets out a regime of enforcement, including a system for inspections and for exchange of information. Masters of ships bound for an EU port are required to notify certain information, in particular:

- the date and the last port in which ship-generated waste was delivered;
- the types and amounts of waste and residues to be delivered and/or remaining on board and the percentage of maximum storage capacity.

Ship-generated waste must be delivered to a port reception authority before leaving an EU port, unless the Master can prove that the vessel has sufficient dedicated storage capacity to reach the intended port of delivery. Even in this case, an EU country can still require ships to deliver their waste before leaving the port if it has reasonable grounds to believe that the intended port does not have adequate facilities or the intended port is not known, and therefore there is a risk that the waste will be deposited at sea.

Environmental impact: Marine debris (or litter) has been a growing concern around the world since it poses a serious threat to wildlife, habitat and human health and safety, and threatens wildlife, primarily through entanglement and ingestion. Plastic has become the most common material since the beginning of the 20th century and modern life is unthinkable without it.

Dozens of millions of tonnes of plastic debris end up floating in world oceans broken into microplastic, the so-called plastic soup. Microplastics are found in the most remote parts of our oceans. Entanglement of turtles by floating plastic bags, sea mammals and birds that die from eating plastic debris and ghost fishing through derelict fishing gear produce shocking pictures. Moreover, plastic is not inert and chemical additives, some of them endocrine disruptors, can migrate into body tissue and enter the food chain.

The massive pollution of world oceans with plastic debris is therefore emerging as a global challenge that requires a global response.

Heavy metals are also produced during incineration. The generation of these dioxins can be controlled by reducing the extent of incomplete combustion and the remaining ash, which contains heavy metals and other hazardous substances, should be disposed in port.

Minimization and management of ship-generated residues/waste

Although not a direct requirement of MARPOL, minimizing the residue/waste generated onboard ships represents an environmental best practice, and should be considered in a ship's waste management practices. The most effective way of reducing ship generated residue/waste is to reduce materials that become waste at the source.

Onboard waste management will assist in minimizing ship generated waste. Further information on shipboard garbage handling and storage procedures and minimizing the amount of potential garbage is provided in the IMO "Guidelines for the Implementation of Annex V of MARPOL". Information with regard to on board management of garbage is also included in the Garbage Management Plan. Ship's crews need to understand the correct use of, and entries to the Garbage Record Book. This will help to ensure that any management system implemented can be easily monitored and audited.

If space permits, on-board waste management plans should take into account the possibility of being able to recycle certain garbage types. The segregation of garbage according to MARPOL Annex V (e.g. plastics; floating dunnage; lining; or packing material; ground-down products; paper products, rags glass, metal, bottles, crockery, food waste; incinerator ash, etc.) should also allow for the delivery of garbage in certain recyclable categories.

To facilitate the landing of recyclable residues/waste, we shall consider establishing contracts with the facilities on ports that are visited on a regular basis. This will fulfil both the need to use a reputable supplier and facilitate the discharge of segregated waste ashore on each port visit. Where reception facilities for segregated and/or recyclable

wastes are not provided in a port, Masters are encouraged to request that such facilities are developed in conjunction with the recycling capability of the locality or region. Furthermore, there are currently technological solutions that could be implemented to ensure that waste is no longer discharged at sea, i.e.:

Expired Pyrotechnics: Special care should be taken when landing expired or out-of-date pyrotechnics to port reception facilities. Expired or out-of-date pyrotechnics is safety hazard and they shall be properly disposed of. However, it is increasingly difficult to land used pyrotechnics ashore. While certain countries and regions will accept expired pyrotechnics, other ports and countries may refuse. As such, the first step is to draw up a list of ports that will or will not accept expired pyrotechnics. The following options are considered in case the port reception facility does not accept the expired pyrotechnics:

- Return out-of-date pyrotechnics to supplier, directly or via the local representative. This can be facilitated at the purchasing stage. When ordering new pyrotechnics an agreement should be made with the supplier to accept the expired ones for disposal or recycling.
- Request a life raft service station to accept any of the ship's out-of-date pyrotechnics when life rafts are being sent ashore for servicing. Many life raft service stations deal with the disposal of the expired pyrotechnics on a regular basis and have arrangements locally to do this.
- Contact the local Coastguard or Police who may be able to arrange disposal through a military establishment.

If pyrotechnics cannot be sent ashore immediately, then they should be kept on-board (clearly marked as 'out-of-date') until landed ashore. Upon disposal ashore it is important to obtain a receipt/certificate which states that the pyrotechnic has been landed ashore for safe destruction.

PHASE II – MID TERM ACTIONS (DUE DATE: 31-12-2021)

1	<p>Promote the use of the IMO format for reporting alleged inadequacies of port reception facilities.</p> <p>Responsible Person: Technical Assistant / Operations Manager Assisted by / In cooperation with: Masters / C/Es.</p> <p>Comments: Masters and Company's Operators should check with local agents, port authorities, harbour masters or reception facility providers for port specific requirements prior to arrival, in order to plan for and accommodate any special handling requirements for that particular port, including any additional segregation that may need to take place onboard well in advance of arrival. This information should be taken into consideration in voyage planning.</p> <p>IMO PRF Database, accessible online through the GISIS web site, can be a good source of information about the reception facilities available at ports worldwide. Providing advance notification to reception facility of the type and quantity of MARPOL residues/waste on board and the type and quantity intended to be delivered will greatly assist the reception facility operator in receiving the materials, while minimizing any delay to vessel's normal port operation. General recommended practice is to provide at least 24 hours' notice, although specific port facilities requirements may vary. If a ship visits a port on a regular basis, a standing arrangement with the PRF may prove to be most efficient. Masters are recommended to use the standardized Advance Notification Form, as developed by the IMO.</p> <p>The IMO form for reporting alleged inadequacies of port reception facilities has been communicated to all fleet vessels. All vessels will be required to complete this form for reporting alleged inadequacies of PRF. Completed reports should be forwarded to Flag Administration, who will in turn notify both the Port State and IMO. Information on port reception facilities and reported alleged inadequacies is provided on GISIS database https://gisis.imo.org/Public/PRF/Default.aspx</p>
2	<p>Minimize packaging from ship stores e.g. by establishing an agreement with the supplier to accept the return of the packaging upon delivery, or to reduce the amount of packaging.</p> <p>Responsible Person: Technical Assistant / Operations Manager Assisted by / In cooperation with: Masters / C/Es.</p> <p>Comments: Developing an agreement with the suppliers and manufacturers is not only important for more general waste categories such as plastics, but essential for other wastes such as time expired pyrotechnics, used ropes, tails and wires, time expired medicines and batteries. The supplier and/or maker should be able to provide the specialist facilities for treatment or disposal of these products.</p>
3	<p>No plastics should be burned in the Incinerator i.e. Polyvinyl Chlorides (PVC) - even if the Incinerator is IMO Type approved.</p> <p>Responsible Person: Technical Department / HSSE Department Assisted by / In cooperation with: Masters / C/Es.</p> <p>Comments:</p>
4	<p>When inviting quotations for a new product, request offers from several suppliers and choose, as far as practicable and without endangering the vessel's safety performance, that with the lowest environmental impact.</p> <p>Responsible Person: Technical Department Assisted by / In cooperation with: -</p> <p>Comments: Relevant instructions have been provided to Purchasing Dept.</p>

PHASE III – LONG TERM ACTIONS (DUE DATE: 31-12-2024)

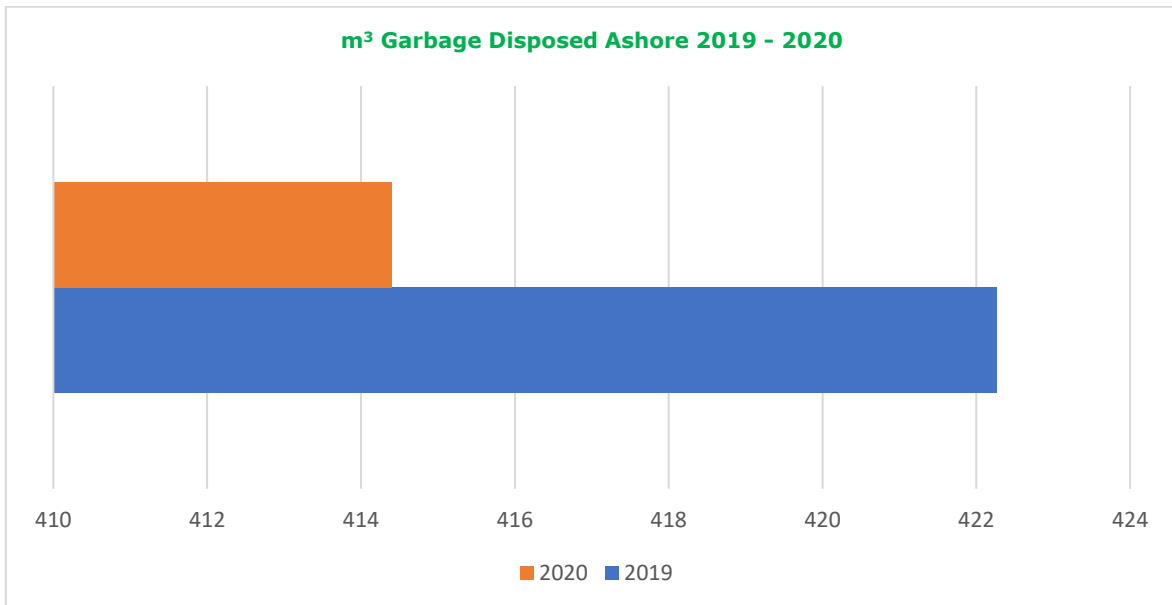
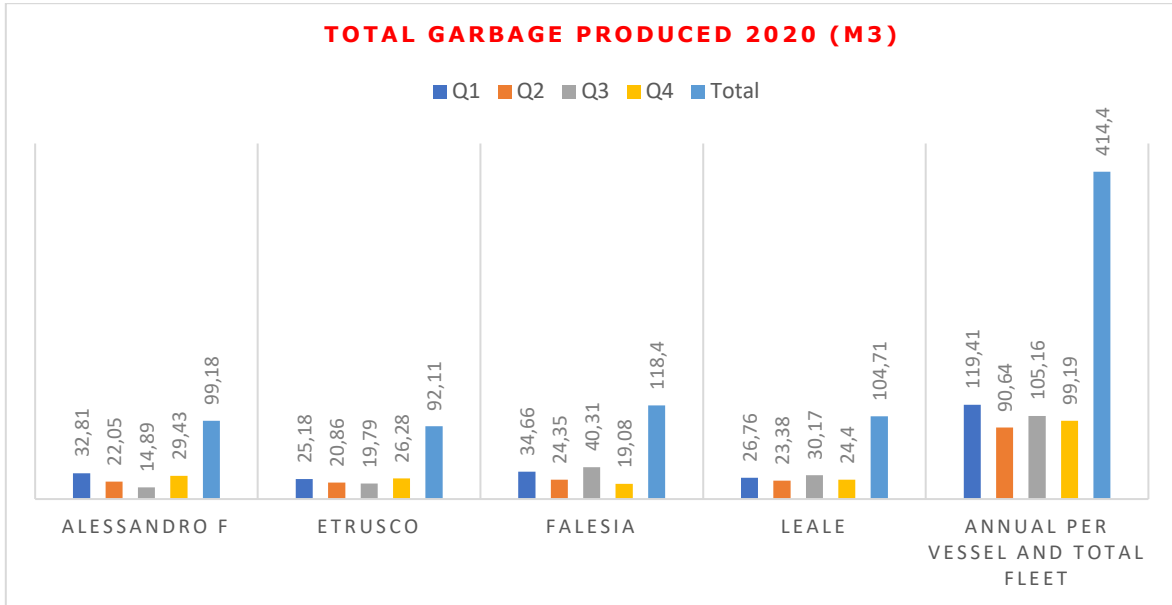
1	<p>The Company will consider to supply all vessels with Garbage Compactors or Waste Compressors.</p> <p>Responsible Person: Technical Assistant / Operations Manager Assisted by / In cooperation with: Masters / C/Es.</p> <p>Comments: Waste Compressors reduce the volume of garbage so that it can be stored onboard before being offloaded to shore facilities. This can be done by simply squeezing and breaking down waste, followed by the process of compression. Compressing and storage of waste is an effective technical solution to dealing with the rubbish being thrown overboard.</p> <p>Compactors make garbage easier to store, to transfer to Shore Reception Facilities and to dispose of at sea when discharge limitations permit. Most garbage can be compacted to some degree; the exceptions include ungrounded plastics, fiber and paper board, bulky cargo containers and thick metal items. If grinding machines are used prior to compaction, the compaction ratio can be increased and the storage space decreased. Careful investigation of the appropriate compaction machine should be undertaken, based on the type and volume of material that will be compacted, as not all compactor require grinding. The Purchasing Dpt. shall investigate supplying the appropriate type of compactors to all vessels.</p>
2	<p>Promote the re-use or disposal of empty paint, lubricating, hydraulic oil & empty chemical drums in Port Reception Facilities (PRF).</p> <p>Responsible Person: HSSE Department Assisted by / In cooperation with: -</p> <p>Comments: Empty spray or normal paint and chemical cans should be stored with the other garbage for delivery to shore facilities. Spray paint cans containing any remaining product should be used following the safety directions on the label. If the spray paint can does not work or the product is unusable, the can should be stored for delivery to shore facilities. Spent solvent should not be dispose at sea. Liquid paint, solvent or clean-up waste should not be disposed in garbage cans. Paint disposed of this way can contaminate the marine environment.</p>
3	<p>With the aim of minimizing the garbage generation onboard, the following actions can be taken:</p> <ol style="list-style-type: none"> When purchasing products, ask suppliers as far as practicable (and in addition to the ordinary products) to quote for environmentally friendly ones. A standardized message to be included in purchase orders that states the promotion of environmentally friendly packaging, based on which the vendors will be asked to confirm their compliance with said standard. Ask suppliers for packing material to be recyclable, to reduce cardboard and plastic packaging and to ensure that packaging is kept to a safe minimum. <p>Quotation PROTECTION OF THE ENVIRONMENT- PLASTIC MINIMIZATION</p> <p><i>"Our Company is certified as per ISO 14001 and is committed to the protection of the environment and the promotion of practices that minimize any adverse environmental impact. Therefore, we have a strong preference to suppliers who apply environmentally-friendly practices aiming to waste minimization. We encourage our suppliers to select packaging materials other than plastic where practical options exist. They are also requested to provide eco-labelled packaged goods which will be free from asbestos and to accept back the packaging and the empty drums of products provided. All products supplied should be as far as possible packaged in conformance to 94/62/EEC Directive (amended by Dir.2004/12/EC and Dir. (EU)2015/720) concerning packaging and package waste. We give preference to products that are designed for long life, are reusable or recyclable, and are made and packaged with minimum material. OR Our Company is certified as per ISO 14001 and we consider it a moral responsibility to ensure a healthy environment for future generations, requesting the following, if applicable:</i></p> <ul style="list-style-type: none"> <i>Suppliers have a responsibility to comply with all statutory and regional requirements regarding HSSE protection and we expect from them to ensure that packaging, especially plastics are kept to a safe minimum in order to reduce waste;</i> <i>Preferably recyclable packaging and / or recycled material should be used. Wherever possible, unavoidable packaging materials (i.e. wooden pallets, plastic shrink wrap) shall be collected and removed upon delivery from the vessel by the supplier;</i> <i>We expect the ISPM No 15 (United Nations Regulation of wood packaging material in international trade) with respect to quarantine requirements on wood packaging material (WPM) to be complied with;</i> <i>Further to SOLAS Reg. II-1/3-5, kindly ensure that items ordered do not contain asbestos;</i> <i>Aerosols should be those that use environmentally friendly propellants.</i> <p>Responsible Person: HSSE Department Assisted by / In cooperation with:</p>

2.1. Garbage Management (m³)

- Garbage Produced and disposed ashore

The total Garbage produced of all the fleet vessels is 414.40 m³. In accordance with Marpol regulation all garbage was disposed ashore.

↓ KPI Achieved reduction of 1,86% compared to 2019



	ELBANA DI NAVIGAZIONE S.P.A.	HSSE Department
	ENVIRONMENTAL MANAGEMENT MANUAL Environmental Management Review Report	

Document may not to be disclosed to any third party without the prior approval of the management.

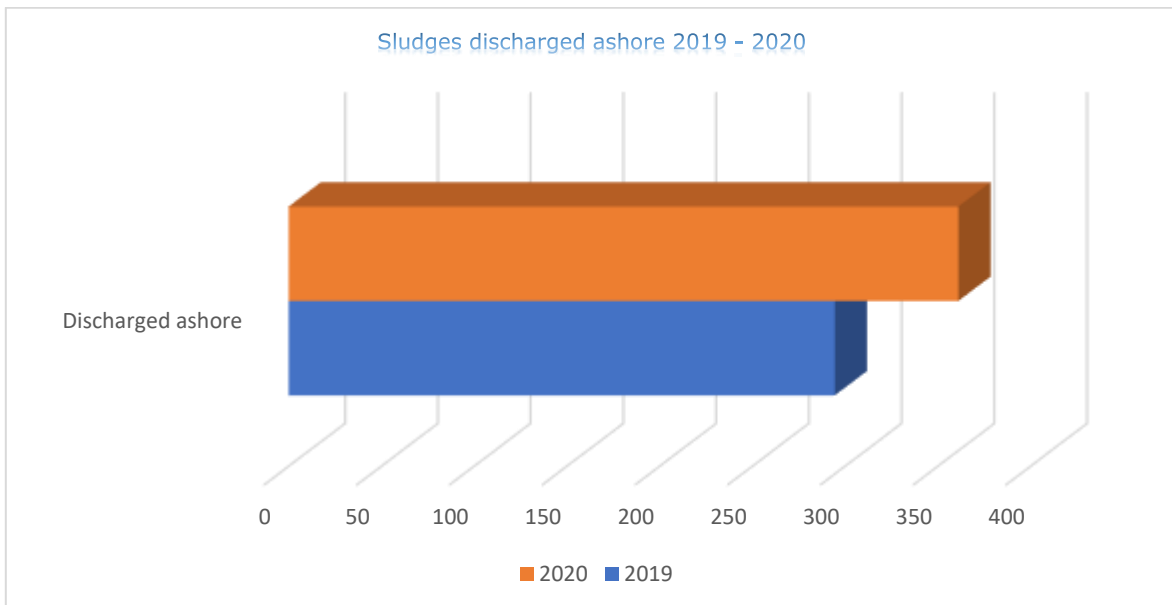
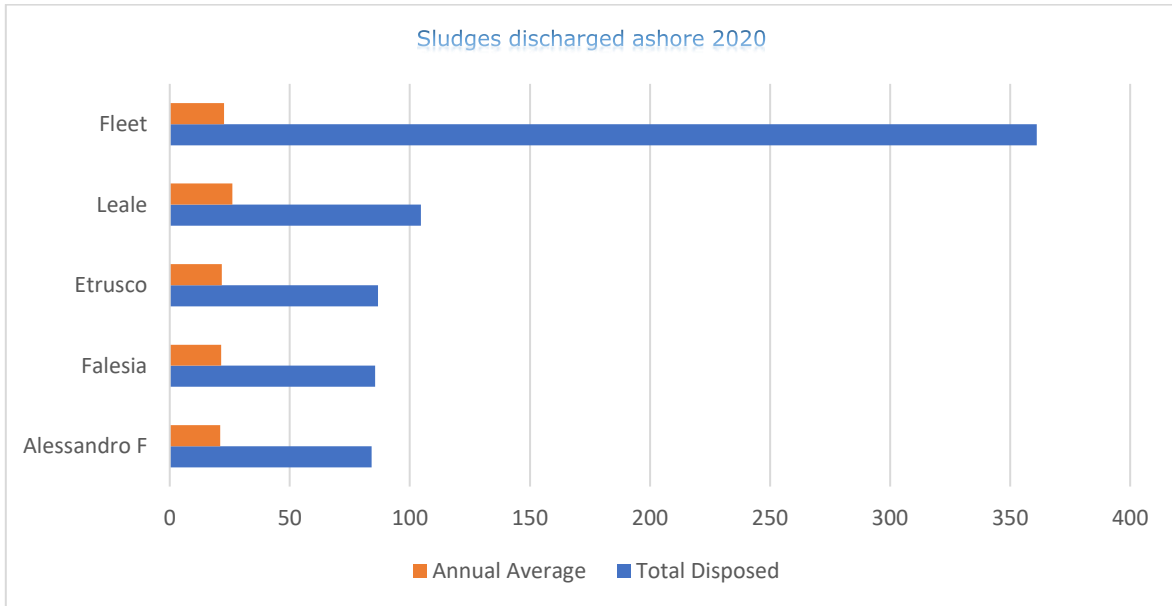
ENVIRONMENTAL PROGRAM 3 (EP-3)	
HANDLING OF OILY BILGE WATER /SLUDGES GENERATED IN MACHINERY SPACES- STERN TUBE OIL-INERT GAS EFFLUENT DISCHARGE	
Objective: Continual improvement of the efficiency and effectiveness of the onboard systems and practices for handling of oily bilge water / oily residues (sludge) / Stern Tube Lube Oil /Inert Gas Effluent Discharge	
COMPLETION DEADLINE : 31-12-2024	
ACTION DESCRIPTION	
<p>Increased familiarity with the ship's engine room treatment systems coupled with the crew's training in oily waste management will assist in reducing the amount of waste produced and improve the overall onboard management of oily waste. The future use of the Integrated Bilge Water Treatment System (IBTS) will facilitate segregation of oily waste, allowing for the storage of oily sludge, oil-water mixtures and clean water separately.</p> <p>Ship's crew also need to understand the correct use of, and entries to, the Oil Record Book. This will help to easy monitoring and auditing.</p>	
PHASE II – MID TERM ACTIONS (DUE DATE: 31-12-2021)	
1	<p>Encourage discharge sludge and oily waters to shore facilities. Preparation of a ship specific Sludge / Bilge Management Plan.</p> <p>Responsible Person: Technical Assistant / DPA Assisted by / In cooperation with: Masters / C/Os Comments:</p>
2	<p>Crew's training in oily waste management and Oil Record Book recording.</p> <p>Responsible Person: Technical Assistant / DPA Assisted by / In cooperation with: Masters / C/Os Comments: A seminar to be conducted to E/R Officers of all managed vessels; the continual improvement of efficiency and effectiveness of handling the oily bilge water and oily residues is our aim.</p>
PHASE III – LONG TERM ACTIONS (DUE DATE: 31-12-2024)	
1	<p>Consider the introduction of bilge primary tank and clean drain tank concepts according to MEPC.1/Circ.642 in the new building specifications.</p> <p>Responsible Person: Technical Assistant / DPA Assisted by / In cooperation with: Masters / C/Os</p>
2	<p>Consider installation of a high capacity incinerator to new-buildings.</p> <p>Responsible Person: Operations Director Assisted by / In cooperation with: Marine Supt, Masters</p>
3	<p>Proper maintenance of OWS and ODME.</p> <p>Responsible Person: Technical Department Assisted by / In cooperation with: - Comments: Maintenance of OWS and ODME (critical equipment) shall be always conducted as per Company's PMS.</p>
4	<p>An estimated 4.6 to 28.6 million litres of stern tube lubricants enter the sea each year and biodegradable oils are already part of the regulatory framework. These oils minimise environmental impact, present no particular toxic hazards, minimise mechanical failures and extend equipment life. Gradual replacement of conventional Lub oils to biodegradable lubricants is under process to our fleet.</p> <p>Responsible Person: Technical Department Assisted by / In cooperation with: - Comments: We will also conduct a market research in order to gradually replace conventional stern tube and bow thruster oils to Synthetic biodegradable lubricants in all managed vessels.</p>
5	<p>Additives to Fuel Oil produced by vegetable components deliver reduced friction, increased viscosity, improved viscosity index, resistance to corrosion and oxidation, aging or contamination. They also provide additional lubricity and reduce emissions.</p> <p>Responsible Person: Technical Department Assisted by / In cooperation with: - Comments: The advantages of vegetable fuel additives are reduction of sludge waste, slower degradation of mechanical performance, maximum energy potential, solution of fuel related problems before, during and after combustion and minimization of emissions. The Company after an extended market research considers using a specific liquid as an additive to Fuel Oil prior consumption by M/E and Aux/Es in order to improve the quality of the Fuel Oil.</p>

3.1. Sludge Management (m³)

- Sludge Discharged

The total sludge disposed ashore for all the fleet vessels was 361,05m³. **Leale** had the highest quantity of 104,65 m³ of sludge discharged (Max average 26,1 m³). **Alessandro F** had the lowest quantity of 84,1 m³ of sludge disposed ashore (Max average 21,03 m³). The reduction of sludge disposed ashore compared with 2019, could be connected to:

- New Sulphur limits imposed since 1st January 2020 may have led to a better fuel quality
- The discouraged practice to mix fuels from two different supply following to Sulphur cap 0.5% regulations

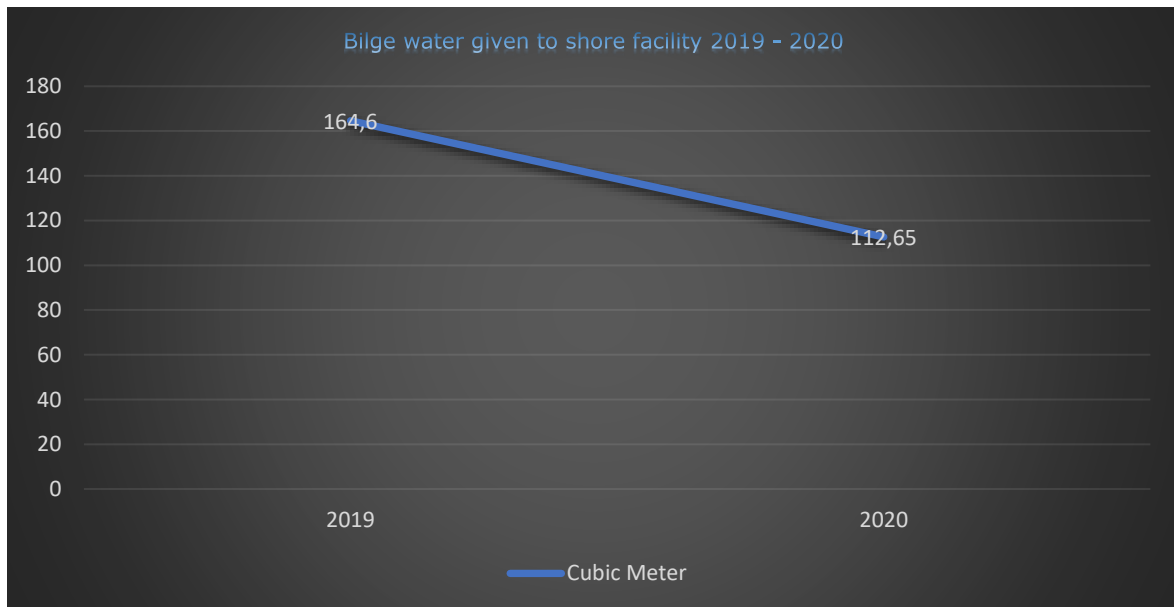
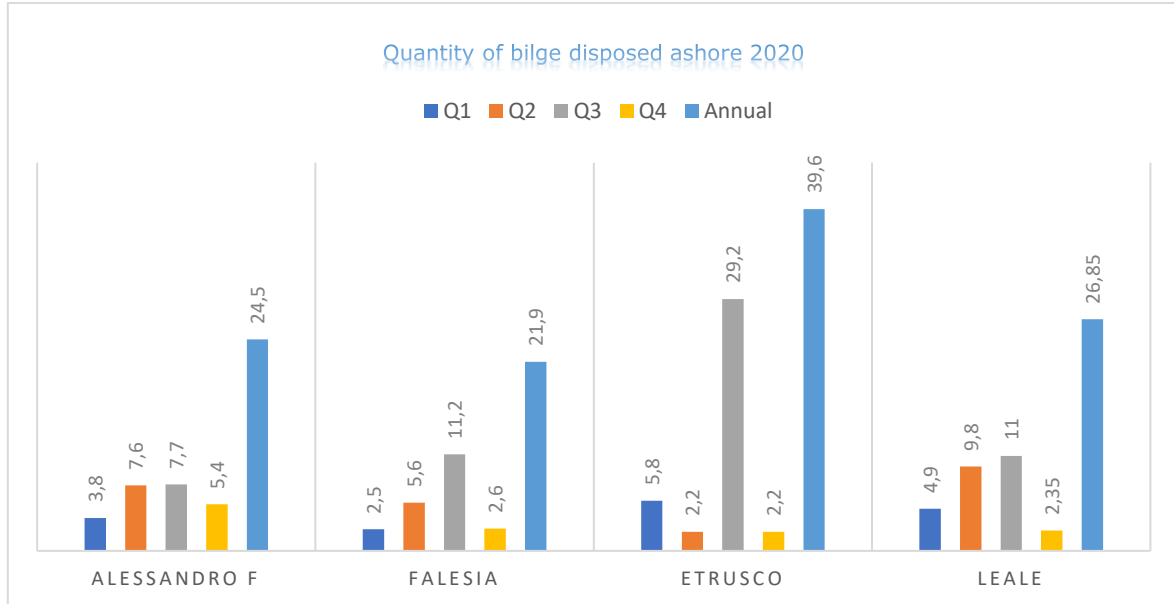


Variations 2019 – 2020: +22,6%

- Bilge water discharged ashore

The total bilge water discharged ashore by all the fleet vessels was 112,65 m³. **Etrusco** discharged a total quantity over the year of 39,6 m³. **Falesia** discharged ashore a total quantity of 21,9 m³.

It must be taken into consideration that Spain introduced in the past years the so called Marpol tax, where it is requested to discharge ashore bilges and sludge at a convenient cost, so that vessels are encouraged to discharge ashore the above productions.



Variations 2019 – 2020: -31,6%

ENVIRONMENTAL PROGRAM 4 (EP-4)
SEWAGE AND GREY-WATER DISCHARGES

Objective: Continual improvement of the efficiency and effectiveness of the onboard systems and practices for handling of sewage and grey water discharges.

COMPLETION DEADLINE : 31-12-2024

ACTION DESCRIPTION

Discharge of sewage and grey water in shallow or confined waters may have the following environmental impacts: Sewage contains large concentrations of nitrogen which is a source of food for algae. Excess algal growth can starve an aquatic ecosystem of oxygen thereby stressing fish, and in extreme cases causing fish kills. Excess algal growth can also smother and kill coral reefs and lead to a loss of biodiversity. Sewage can contain high concentrations of pathogens, such as viruses, bacteria, and protozoa which could lead to sea water contamination which could increase the likelihood of contracting diseases (i.e. when swimming) and can also contaminate shellfish beds. Grey water can also contain bacteria, pathogens, oil and grease, detergent/soap residues, nutrients and as such their discharge in near-shore marine environments could cause negative environmental impacts.

PHASE II – MID TERM ACTIONS (DUE DATE: 31-12-2021)

1	<p>Consider use of environmentally friendly vacuum toilet cleaners with the aim of enhancing the efficacy of the sewage treatment systems.</p> <p>Responsible Person: Operations Manager / DPA Assisted by / In cooperation with: Masters</p> <p>Comments: With the aim of enhancing the overall efficacy of the onboard sewage treatment systems, the Company considers to supply the fleet vessels with vacuum toilet systems with an environmentally friendly vacuum toilet cleaners (such as the ENVIROCARE® VTC 3000) which is a blend of surfactants and specially selected bacteria designed to clean the toilet bowl and help prevent the formation of pipe blockages in waste systems, and to degrade biological waste that enter such systems. The frequent use of such products delays, prevents or dissolves the typical biological build-up in sewage systems, thereby increasing the overall efficacy of such systems.</p> <p>Masters will be instructed to:</p> <p>(a) Ensure that only these cleaners are used for the toilet cleaning.</p> <p>(b) Avoid the use of harsh chemicals such as acids, caustics and bleaches, while using environmentally friendly cleaners, since these chemicals will temporarily deactivate or kill the bacteria, thereby, reducing or eliminating the cleaner functionality.</p> <p>I Post the following notice at each vacuum toilet: USE ONLY ENVIRONMENTALLY FRIENDLY CLEANERS – AVOID USING HARSH CHEMICALS SUCH AS ACIDS, CAUSTICS & BLEACHES.</p>
2	<p>Consider the installation of a piping connection for temporarily storing the grey water.</p> <p>Responsible Person: Operations Manager / DPA Assisted by / In cooperation with: Masters</p> <p>Comments: A piping connection (via a flexible hose) for temporarily storing the grey water to the After-Peak tank will be installed.</p>
3	<p>Consider installation of a grease trap to the galley grey water discharge piping to new buildings.</p> <div style="text-align: center;">  </div> <p style="text-align: center;">Photo: Grease trap</p> <p>Responsible Person: Operations Manager / DPA Assisted by / In cooperation with: Masters</p>

PHASE III – LONG TERM ACTIONS (DUE DATE: 31-12-2024)	
1	<p>Consider the installation of sewage treatment plants equipped with means to treat grey water in addition to sewage for new buildings.</p> <p>Responsible Person: Operations Manager / DPA Assisted by / In cooperation with: Technical Assistant/ Masters Comments: Sewage treatment systems of adequate capacity and type to treat both black and grey waters are to be installed. Operation shall be made in conjunction of the arrangements as listed below when practically possible.</p>
2	<p>Consider the installation of a sewage / grey water holding tank with sufficient capacity for the storage of both sewage and grey water for new buildings.</p> <p>Responsible Person: Technical Department Assisted by / In cooperation with: SQHE Department Comments: The capacity of the dual-purpose holding tank shall be such as to allow the operation of the vessel within a considerable time period without the use of sewage treatment plant for minimizing overboard discharges of treated water and subsequent bilges and sludges as resulted in from the use of such machinery equipment.</p>
3	<p>Consider the installation of a piping connection for permanently storing the grey water to a dedicated grey water tank for new buildings.</p> <p>Responsible Person: Operations Manager / DPA Assisted by / In cooperation with: Technical Assistant/ Masters Comments: Piping sub-branches from the accommodation areas will be connected to a main line which will be subsequently led into a dedicated grey water holding tank of adequate capacity. This tank will be connected with an overboard discharge pipe (the use of which is to be recorded) and with the suction branch of the sewage treatment pump for the use of sewage treatment plant, provided that the particular equipment will be sufficient for such a treatment.</p>
4	<p>Shore-utilized practices such as filtration and purification of grey water for becoming reusable shall be considered for the new buildings.</p> <p>Responsible Person: Operations Manager / DPA Assisted by / In cooperation with: Technical Assistant/ Masters Comments: Grey water to be recycled by means of filtration and purification arrangements. The treated water can be reused for washing (deck & cargo areas), cooling, drenching and even for hygiene purposes. This will minimize the impact to the surrounding environment and lead to fully integrated eco procedures.</p>

ENVIRONMENTAL PROGRAM 5 (EP-5)
MINIMISATION OF THE USE OF ANTIFOULING PAINTS CONTAINING BIOCIDES
Objective: Minimize the use of antifouling paints containing biocides
COMPLETION DEADLINE : 31-12-2024
ACTION DESCRIPTION

The introduction of invasive aquatic species (IAS) as a result from international shipping has been identified as a significant threat to the world’s oceans and coastal ecosystems and research suggests that 70-80% of IAS introductions occur through biofouling. Biofouling is defined as undesirable accumulation of various aquatic organisms (microorganisms, plants, algae and animals) on submerged structures like ships’ hulls, which can lead to the introduction of invasive aquatic species into new environments.

There is also an increased focus on hull performance for improved energy efficiency; furthermore, the need to minimise the transfer of invasive species on ships’ hulls has seen the importance of antifouling coating selection elevated in shipping companies. Since the entry into force of the IMO’s Antifouling Convention (AFS) in September 2008 and the banning of organotin based antifouling systems, such as those containing tributyl-tin (TBT), there exists a large diversity and effectiveness of antifouling products. This has become increasingly relevant in recent years due to changes in the market, with vessels speed now much lower, and an introduction of regional biofouling legislation. Both factors have also led, to a certain degree, to an increase in underwater hull cleaning.

Anti-fouling coatings are used to improve the speed and energy efficiency of ships by preventing organisms, such as barnacles and weed building up on the underwater hull, restricting the ships speed through the water. They may contain biocides or be biocides-free. Biocidal antifouling depend for their effectiveness on both the biocide itself and the technology used to control the biocide release, or leaching rate.

AFS Convention: The International Convention on the Control of Harmful Anti-Fouling Systems on Ships (AFS convention) prohibits/restricts the use of organotin biocides in anti-fouling paints used on ships. As a consequence, ships had to either replace or overcoat their existing organotin-based anti-fouling systems. All vessels must comply with the AFS Convention requirements, as follows:

- vessels painted with antifouling paints after 1/1/2003 must apply a TBT-free paint; while
- in all other vessels, any underlying AFS non-compliant paint must be sealed with a TBT-free paint, in full compliance with the AFS Convention.

Environmental aspect: Leaching of biocides in the marine environment.

Environmental impact: The most common anti-fouling biocides are organotin (tributyltin-TBT) and copper. However, it has been recognized that TBT is harmful to the marine environment since it can cause reproductive anomalies and population effects in certain marine species (at concentrations even in the parts-per-trillion range) and it has been implicated in endocrine effects on other organisms. Oysters exposed to low levels of TBT can develop shell deformities that reduce their value as seafood. TBT is also associated with immune suppression and other adverse effects in other marine species, is slow to degrade, and is very persistent in sediments, where many affected species live and feed.

None of the current antifouling systems can match the effectiveness of the best TBT-based systems and it is accepted that some of the TBT free systems are better than other in specific operative conditions. It can be therefore suggested that an optimisation of the antifouling selection based on the ship’s operational profile can improve the overall performance. The optimisation should also assist in reducing cleaning operation frequency and harshness.

PHASE II – MID / LONG TERM ACTIONS (DUE DATE: 31-12-2024)
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1	<p>Evaluate the effectiveness of the biocides-free antifouling paints.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Superintendent Comments: Paint manufacturers claim that advanced technology of the silicon-based systems provides a high-performance solution to fouling control in comparison to traditional (contact leaching) and polishing antifouling technologies. Benefits include:</p> <ul style="list-style-type: none"> • Control of fuel efficiency and speed; • Control of maintenance and repair costs; • Environmental compliance with current industry regulations and freedom from current and future biocide restrictions; • Control of treatment and disposal costs for wash water/ blasting abrasive at subsequent dry-dockings; • Silicon based coating acts also as a sealer coat for the existing (biocide containing) SPC antifouling; and • Surface remains smooth-if not subjected to abrasion or mechanical damage. <p>In order to evaluate benefits of the foul release AF implementation project, advanced computerized data logging system will be considered for installation on two (2) vessels dry docked during the same period, where the first painted with a tin-free self-polishing system while the second with a silicon based foul release system. It is expected that the advanced process of the measurements logged in subject system will evaluate and provide comparative and measurable figures of the fuel efficiency and speed gain between the two vessels.</p>
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2	<p>Biofouling resistant materials should be used for piping and other unpainted components.</p> <p>Responsible Person: Technical Department Assisted by / In cooperation with: - Comments: -</p>
3	<p>A ship specific Biofouling record book to be implemented, recording details of all inspections and biofouling management measures undertaken on the ship.</p> <p>Responsible Person: Technical Department Assisted by / In cooperation with: DPA Comments: Biofouling management measures should be undertaken specific to each ship and be included in the ship's operational documentation.</p>
4	<p>An anti-fouling system should be used along with other innovative measures.</p> <p>Responsible Person: Technical Department Assisted by / In cooperation with: - Comments: -</p>
5	<p>Marine growth prevention systems (MGPSs) to be utilised for sea chests and internal seawater cooling systems.</p> <p>Responsible Person: Technical Department Assisted by / In cooperation with: - Comments:-</p>

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ENVIRONMENTAL PROGRAM 6 (EP-6)
MINIMISATION OF THE USE OF REFRIGERANT GASES (CFCs, HCFCs, HFCs) ONBOARD
Objective: Minimizing refrigerant gas emissions
COMPLETION DEADLINE : 31-12-2024
ACTION DESCRIPTION

Operation of onboard refrigeration and air-conditioning systems: Refrigerant gases and coolants onboard vessels are used for multiple purposes, i.e. for cooling/freezing purposes such as provisions care and internal climate control.

Environmental impact: The leakage of refrigerant gases and coolants has harmful effects on the climate:

.1 some synthetic coolants and refrigerants (CFCs, HCFCs) damage the ozone layer; furthermore, continued emissions of ozone-depleting substances (ODS) cause significant damage to ozone layer. There is evidence of a decrease in the atmospheric burden of ODS and some early signs of stratospheric ozone recovery have been observed. However, the recovery of ozone layer to concentrations level existing before 1980 is not projected to take place before the middle of the 21st century. Increased UV-B radiation resulting from ozone depletion therefore persists as a significant threat to health and environment;

.2 most refrigerants intensify the Greenhouse effect (CFCs, HCFCs & HFCs) since they have a high global warming potential and are contributory factors towards increasing the temperature of the planet.

New installations which contain ODS shall be prohibited on all ships, except new installations containing hydrochlorofluorocarbons (HCFCs) which are permitted until 1/1/2020.

01/01/2020 No production or imports of HCFC-22 and HCFC-14b, achieving 99,5% of reduction goal.
01/01/2030 BAN ON REMAINING PRODUCTION AND IMPORT OF HCFCs, RESULTING IN COMPLETE HCFC PHASE OUT.

HCFCs are used in a wide variety of applications. The most widely used include HCFC-22, HCFC-141b and HCFC-142b. To be noted that HCFC-22, HCFC-141b and HCFC-142b have the highest ozone depletion potentials of all HCFCs. Reg. 12 of MARPOL Annex VI requires to prohibit virgin HCFCs (including R22) from 1/1/2020. The European Parliament through Reg. EC.1005/2009 banned the use of HCFCs from use in new refrigeration and air-conditioning installations effective from 1/1/2001.

It is therefore considered that a refrigerant leak monitoring system is required if an ozone depleting substance is being used, and the Flag Administration of the ship requires compliance with other Statutory Instruments or legislation such as Reg. (EC) No. 842/2006 or Reg. (EC) 1005/2009 for EC countries.

Although the Company has switched to refrigerants with zero ozone depletion potential to vessels built after 2001, taking into account the high/modest global warming potential of these refrigerants, this Program aims to closely monitor their consumption and minimize their release to atmosphere.

PHASE II – MID TERM ACTIONS (DUE DATE: 31.12.2021)	
	<p>All vessels are equipped with a portable refrigerant's gas leak detector and refrigerant recovery units.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant</p>
	<p>Market research for environmentally friendly refrigerant substitutes for existing systems onboard vessels— consider progressive replacement of refrigerant gas R-22 by a refrigerant gas having zero ozone depletion potential. The main options are to use one of 3 categories of HFC refrigerant:</p> <ul style="list-style-type: none"> • A pure HFC fluid such as R134a. • An HFC blend that is often used in new systems, such as R407C or R404A. • An HFC "Service blend" specifically designed to be retro filled into an existing R22 plant. <p>Responsible Person: Technical Department Assisted by / In cooperation with: - Comments: -</p>
PHASE III – LONG TERM ACTIONS (DUE DATE: 31-12-2024)	
	<p>Consider installation of a fixed refrigerant leak detection system in new buildings.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant Comments: Improvement of PMS of related machinery taking into account the history of the defects occurred. Improve the quality control of spare parts supplied for the subject units (refrigeration and air condition plants).</p>

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ENVIRONMENTAL PROGRAM 7 (EP-7)
PROMOTION OF ENVIRONMENTALLY FRIENDLY SHIP RECYCLING PRACTICES
Objective: Promote environmentally friendly ship recycling practices
COMPLETION DEADLINE : 31-12-2020 – COMPLETED
ACTION DESCRIPTION

Activity: Ship Recycling

Environmental aspect: Uncontrolled discharge of pollutants ashore and into the sea, air emissions during ship recycling.

Environmental impact: In the process of recycling ships, virtually nothing goes to waste. The materials and equipment are almost entirely reused. Steel is reprocessed to become, for instance, reinforcing rods for use in the construction industry or as corner castings and hinges for containers. Ships' generators are reused ashore. Batteries find their way into the local economy. Hydrocarbons become reclaimed oil products and used as fuel in rolling mills or brick kilns. Light fittings find further use on land. Furthermore, new steel production from recycled steel requires only one third of the energy used for steel production from raw materials. Recycling thus makes a positive contribution to the global conservation of energy and resources and, in the process, employs a large, if predominantly unskilled, workforce. Properly handled, ship recycling is, without question, a "green" industry. However, although the principle of ship recycling may be sound, the working practices and environmental standards in the yards often leave much to be desired. Environmental, health and safety problems relating to the practice of ship recycling in many of the leading recycling facilities around the world has led to a global effort to find solutions to these problems.

Legal developments: On 15/5/2009, a Diplomatic Conference adopted the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (SR Convention). The IMO Convention will impose new requirements on ships from 'cradle to grave', i.e. from the time of a ship's construction to its final demolition. The Convention also creates a new obligation for shipowners to sell their redundant ships only to recycling facilities that meet IMO standards and which have been approved by the Flag State and by the authorities in the Ship Recycling State. Ships will be required to have an initial survey to verify the inventory of hazardous materials, renewal surveys which shall not exceed 5 years, additional surveys during the life of the ship, and a final survey prior to recycling. Recycling yards will be required to provide a "Ship Recycling Plan", to specify the manner in which each ship will be recycled, depending on its particulars and its inventory. Parties will be required to take effective measures to ensure that ship recycling facilities under their jurisdiction comply with the Convention. The Convention enters into force 24 months after the date on which 15 States, representing 40 % of world merchant shipping by gross tonnage, have either signed it without reservation as to ratification, acceptance or approval or have deposited instruments of ratification, acceptance, approval or accession with the Secretary General. EU Regulation on ship recycling (EU SRR). The Reg. (EU) No 1257/2013 on ship recycling entered into force on 30/12/2013 and is mostly aligned with IMO Hong Kong Convention on Ship Recycling. However, the regulation sets some additional requirements, including the addition of 2 hazardous substances to be listed in the inventory of hazardous materials (IHM).

EU SRR requirements for ships > 500 GT

- By the date of general application (31/12/2018):
 - new EU-flagged ships contracted from this date need an IHM that complies with EU requirements;
 - existing EU-flagged ships going for recycling need an IHM that complies as far as practicable with EU IHM requirements, and are to be recycled at facilities included in the EU list.
- By 31 December 2020:
 - existing EU-flagged ships will need an IHM that complies as far as practicable with the EU requirements;
 - non-EU-flagged ships calling at an EU port or anchorage will need an IHM that complies as far as practicable with the EU requirements.
- *EU SRR defines 'new ships' as ships for which either
 - the building contract is placed on or after 31 December 2018;
 - in the absence of a building contract, the keel is laid or the ship is at a similar stage of construction on or after 30 June 2019; or
 - the delivery takes place on or after 30 June 2021.

Adherence to these Transitional Measures will increasingly be required by Flag States and authorities in recycling States. In view of this, shipowners should apply these Measures as soon as possible.

- Section 1 of these Guidelines focuses on the preparation and maintenance of IHM, as required by the IMO Convention and the EU Regulation (EU SRR).
- Section 2 focuses on the measures that Shipping Companies are recommended to take when selling ships during the transitional period before the IMO Convention comes into force.
- Annexes A and B list materials to be included in the IHM as required by the IMO Convention and the EU Regulation.
- Annex C explains the compliance dates for the EU.
- Annex D contains a feedback form for shipowners to provide comments on their experiences in attempting to implement these Transitional Measures.

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ENVIRONMENTAL PROGRAM 8 (EP-8)

INCREASE OF ENVIRONMENTAL AWARENESS OF OFFICE/SHIPBOARD PERSONNEL

Objective: Increasing of environmental awareness of office / shipboard personnel on minimizing the impacts of their activities.

COMPLETION DEADLINE : 31-12-2024

ACTION DESCRIPTION

The control of office and ships activities with an impact to the environment requires efforts from all employees, including changes in everyday living and working habits. This Program aims to minimize the impact to the environment related to our activities and to promote environmental best practices.

Office activities are divided in 2 main categories i.e. resources consumption (including energy) and garbage management. The target is to make the most efficient use of resources, material, electricity, heat and water, as well as to reduce the quantity of garbage and minimize the impact from contamination.

Resource Management Methodology

The key words for efficient use of resources are: Reduce, Re-use, Recycle and Recover (4R).

Reduce: Wherever possible, it would be best to reduce material, energy and water consumption, so as to produce as little waste as possible.

Re-use: Once a product or material, solid, liquid, energy, etc. has been used, every effort should be made to re-use it, if feasible.

Recycle: Recycling should be considered only for materials and products that cannot be re-used. Although, recycling does help to conserve resources and reduce waste, there are economic and environmental costs associated with waste collection and recycling process. Company's involvement is restricted to the collection and forwarding of material for recycling.

Recover: It may be possible to recover materials or energy from solid waste that cannot be reduced, re-used or recycled at source. This is a specialized activity, not within Company's capabilities.

Contamination/Pollution Control

Minimizing chemical contamination or pollution of the environment is an important objective. Many of the products used for office activities contain ingredients that are harmful to the environment, therefore, every possible effort should be made to retain these substances out of the air, water and waste stream.

In principle, a resources management methodology is applicable. The best way to minimize pollution from environmentally harmful materials is to reduce the use of products containing such materials to a minimum, by changing processes or by substituting them with more environmentally friendly products.

Many products and wastes contain toxic chemicals in insufficient quantities or concentration to be considered as hazardous, but should still be used and disposed of with care. Products such as correction fluid, markers, dry cell batteries, photocopy toner and cleaning products contain small quantities of harmful substances, and wastes from their use (e.g. spent containers, soiled rags) can be considered as "environmentally harmful". Although the quantity of harmful material in any individual product or waste container may be small, the cumulative effect to the environment of a large number of these wastes is significant.

Where reduction is not possible, chemicals shall be re-used (as long as permitted under applicable regulations). Chemicals that cannot be reduced or re-used should be recycled wherever possible.

Initial Data Collection

Through implementing the waste management procedures, the current practices shall be examined and changes shall be considered. Opportunities to Reduce, Re-use and Recycle, to save energy and to improve the management of chemicals shall be investigated as well.

A lot of initiatives can be taken by changing our attitudes and habits. Some cases will require substantive involvement from Managers, employees and 3rd parties. Some will be simple, with low or no-cost; others will require the development of the existing infrastructure or supply of new equipment. To address all of the above cases the following 2-fold approach has been selected:

- Cases that data is not available or cannot be measured or determined. Mostly, they are simple cases of no or low-cost implementation that mainly require changes in habits.

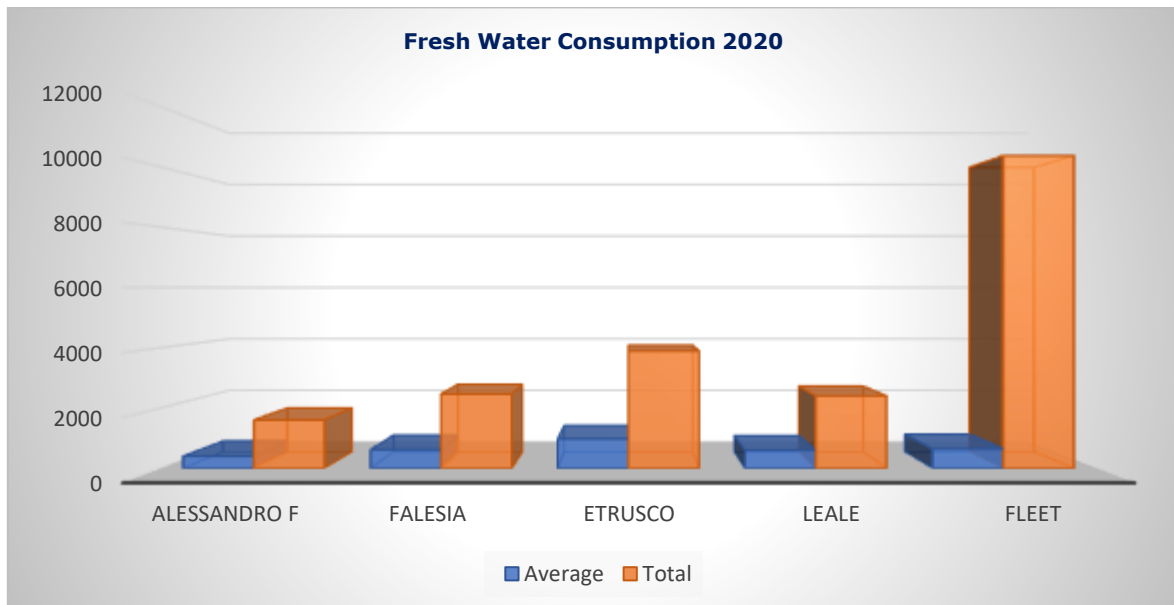
Cases that data should be collected and measured prior to define targets.

PHASE II- MID TERM ACTIONS (DUE DATE: 31-12-2021)	
1	<p>An Environmental notice board (Green Board) to be established ashore and onboard to communicate new "green" ideas, post environmental information, announcements, posters, results of implemented programs, promote relevant ideas and best practices etc.</p> <p>Responsible Person: DPA Assisted by / In cooperation with: Crew Manager Comments: A relevant notice board has been established and was enthusiastically welcomed by all Office employees. It is considered to make one staff member in the office responsible for turning off all shared equipment at the end of each day, which can be proved very useful.</p>
2	<p>Introduce the initiative of a "green team" or "green staff member" and assign green responsibilities on a quarterly rotating basis. Those persons will be responsible for the environmental management of the office.</p> <p>Responsible Person: DPA / Marine Superintendent Assisted by / In cooperation with: Crew Manager Comments: Responsibilities are assigned in groups of different persons every quarter. Those persons are responsible for turning off all shared equipment at the end of each day which is proved very useful. Another initiative is to propose new energy efficient practices.</p>
PHASE III – LONG TERM ACTIONS (DUE DATE: 31-12-2024)	
	<p>Organise an 'Environmental idea' annual award among employees. Create an energy efficient work culture in the office. Saving energy will require the employees to take on some of the responsibility, so make sure to consult them before changing your practises, and ensure everyone is on board in the effort to reduce power usage.</p> <p>Responsible Person: DPA Assisted by / In cooperation with: Crew Manager Comments: Establishment of environmental awareness Campaigns on board all managed vessels and in office, in order to ensure that employees receive updated information on environmental management.</p>

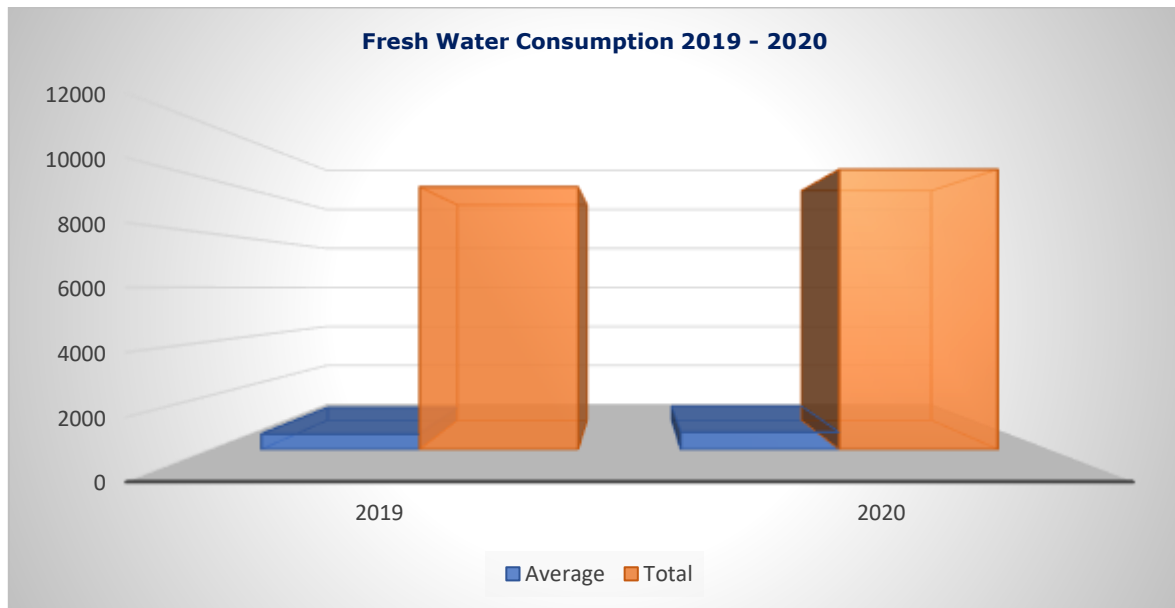
8.1.FW Management (m³)

- Fresh Water Consumption

The fresh water consumed during the year was totally 10370 m³, with an average consumption per vessel of 648 m³



It should be noted that the water purchased is used mainly for the tank washing of the cargo tanks. Being it difficult to be calculated the use for tank washing and the quantity for human use the amount is commingled in only one value. Due to this it cannot be estimated the best and the worst performing vessel.



Variations 2019 - 2020: + 6,6%

ENVIRONMENTAL PROGRAM 9 (EP-9)
REDUCTION OF PAPER AND BATTERIES CONSUMPTION IN OFFICE

Objective: Implementing environmental practices on handling paper consumption and disposal of batteries.

COMPLETION DEADLINE : 31-12-2024

ACTION DESCRIPTION

This Program aims to eliminate depletion of resources related to our activities and to promote environmental best practices.

The average employee generates approximately 1 kilogram of paper and paperboard products every day. From mistakes printed, bad photocopies and reports 90 % of all office waste is paper. With so much paper discarded on a consistent basis, offices are ideal for recycling programs because large quantities of paper can be gathered efficiently.



As far as batteries consumption, not all spent batteries are considered hazardous waste and some types can be managed as non-regulated wastes, e.g., individual alkaline battery cells and individual rechargeable battery cells. Some are non-toxic (such as alkaline or lithium types), while others are quite dangerous (lead-acid, nickel-cadmium, etc.). Incompatible batteries should not be mixed and used batteries should be safe for disposal, e.g., not leaking, not wet. Batteries contain heavy metals such as mercury, lead, cadmium, and nickel, which can contaminate the environment when batteries are improperly disposed of.

PHASE I – CONTINUOUS

- | | |
|---|--|
| 1 | <p>Initiate batteries recycling. Assign a qualified subcontractor to collect and recycle waste batteries. All office staff are encouraged to bring their used batteries from home and utilize the collection bins in the office.</p> <p>Be aware of the following guidelines in order to reduce the risk of fire and to safeguard the safety of the user and the environment:</p> <ol style="list-style-type: none"> i. Install and use batteries properly; ii. Keep batteries dry and away from any heat sources (including direct sunlight); iii. Remove batteries from equipment when not in use; iv. Install batteries in well ventilated areas to prevent the build-up of explosive gases; v. Remove depleted or weak batteries from device; vi. Enforce No Smoking policies in the battery storage/charging area; vii. Wash area of skin with soap and water if exposed to battery electrolyte. If acid enters the eyes, rinse them thoroughly with cold running water and consult a doctor; viii. Avoid mixing batteries of different chemistries, ages or brands and avoid using damaged batteries; ix. Do not attempt to charge non-rechargeable batteries; x. Do not charge batteries in temperatures higher than 40oC; xi. Do not connect batteries in parallel; xii. Lithium batteries should be placed one by one in a plastic bag to reduce fire hazard. All other types (chemistries) must be stored by placing tape over the electrodes (poles). xiii. Collect batteries in the designated collection points ashore and onboard. <p>Responsible Person:DPA
 Assisted by / In cooperation with: Technical Department
 Comments: Recycling for batteries disposal has been initiated. Relevant responsibilities are assigned to office personnel.
 Statistics of batteries collected are disseminated to all personnel through the Management reviews.</p> |
|---|--|

Most of the waste production from office activities is paper, e.g. printer and photocopy paper, stationary, packaging material etc. The main effort should be directed to "Reduce" by changing habits and implementing specific measures.



Photocopy

- i. Make only the number of copies needed. Think before you print.
- ii. Copy documents double-sided when possible.
- iii. Be familiar on how to use the copier.
- iv. Keep the copier in top running order, properly maintained and timely changing toner.
- v. Before printing, see if reducing margins will fit more on fewer pages.

Filing, Circulation and Communication

- i. Edit on computer screen to avoid printing multiple drafts.
- ii. Use electronic files to the maximum extent.
- iii. Head of Departments to define required hard-copies and electronic files within their department.
- iv. Develop a "pending" browse (file) in your computer to file temporarily messages requiring action soon, rather than printing out them and lost in desk papers.
- v. Wherever possible, modify the format of standard documents to use less paper e.g. margin width, space between paragraphs/ lines, etc.
- vi. Post documents of general information or distribute them electronically, rather than in hard copies. File them in a central electronic folder for future reference.
- vii. Regularly review and update distribution lists on a "need to know" basis.
- viii. Send internal memos electronically rather than written memos or messages copied.
- ix. Collect scrap paper - use the clean side for notes, informal messages, drafts, etc.

2

Recovered paper and paperboard needs to be clean, dry and free of contaminants in order for industry to use it as a raw material for making new paper products. Although small amounts of contaminants may be acceptable in certain paper products, steps should be taken to limit contaminants as much as possible. Contaminants include, though are not limited to, Plastic (e.g., report covers, spiral bindings), glass, metal, most tapes, glues, and some adhesives (e.g., sticky notes, self-stick labels, book binding), food wastes, some coatings, etc.

Other Initiatives:

- i. Share newspapers, magazines and books with colleagues.
- ii. Establish a common circulation systematic approach for newspapers & magazines.
- iii. Digital subscriptions shall be encouraged.
- iv. Re-use file folders, dividers and cardboard boxes.
- v. Check commonly ordered supplies. Packaging paper may be reduced by ordering in bulk.
- vi. Null, invalid and useless paper documents to be separated from domestic garbage and disposed according to municipality's garbage disposal programs.
- vii. Loose leaves of A4 paper to be placed in bins free from any metal staples or clips.
- viii. At the end of daily work, cleaning staff should collect all waste paper from the bins and dispose it to applicable recycling bin.

Paper Recycling

Up to 50% of office waste is recyclable paper. By diverting usable paper from the waste stream, we help to reduce the volume disposed in garbage sites. Recycling paper also reduces the need for virgin wood pulp (1 ton of paper production requires 19 trees). Paper production from recycled paper requires less energy and creates less air and water pollution than using virgin pulp. It is also expected that any expenses or effort to separate paper from other waste, will be compensated by income from the sale or recycled paper.

The main effort of paper recycling activity is directed to "COPIERS" and "PRINTERS" A4 paper which presents a significant volume of waste.

Organise two different ways of paper disposal:

- i. Drop-off of smaller quantities to collection areas; and
- ii. Schedule pick up of large or heavier quantities that cannot be easily or safely moved.

Responsible Person: DPA

Assisted by / In cooperation with: Crew Manager

Comments: All personnel to be aware of the separation during the paper disposal.

Statistics of paper consumed are disseminated to all personnel through the Management reviews.

PHASE II – MID TERM ACTIONS (DUE DATE: 31-12-2021)

1	<p>Communicate to all employees the Company’s intention to “going paperless”. Equipment maintenance, ink, toner, paper, payroll, storage and security measures are reduced expenditures once the office environment turns to a paperless solution.</p> <p>Responsible Person: DPA Assisted by / In cooperation with: Technical Department</p> <p>Comments: Make sure that the entire Company is aware and educated on what “going paperless” really means. Begin to discourage photocopies, faxes, and printing. Reducing paper usage will simplify everyday tasks. Spread the word internally, and also to outside world – it’s a great publicity tactic. Creating an eco-friendly office environment will boost Company’s reputation.</p>
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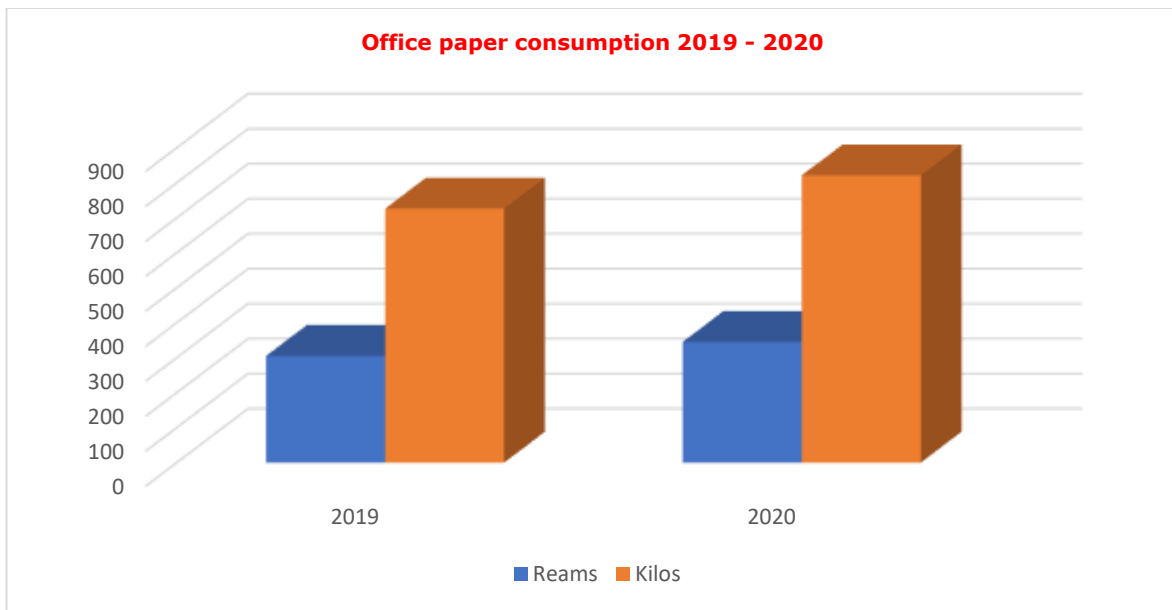
PHASE III – LONG TERM ACTIONS (DUE DATE: 31-12-2024)

1	<p>Follow contract with an approved Subcontractor for batteries recycling</p> <p>Responsible Person: HSSE Department Assisted by / In cooperation with: Technical Department</p> <p>Comments:</p>
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9.1. Office paper consumptions

- Office Paper Consumption (1 ream = 2,380 Kilos)

The office paper consumption over the year 2020 was of 345 reams for a total weight of 821,1 Kilos



Variations 2019 – 2020: +13,1%

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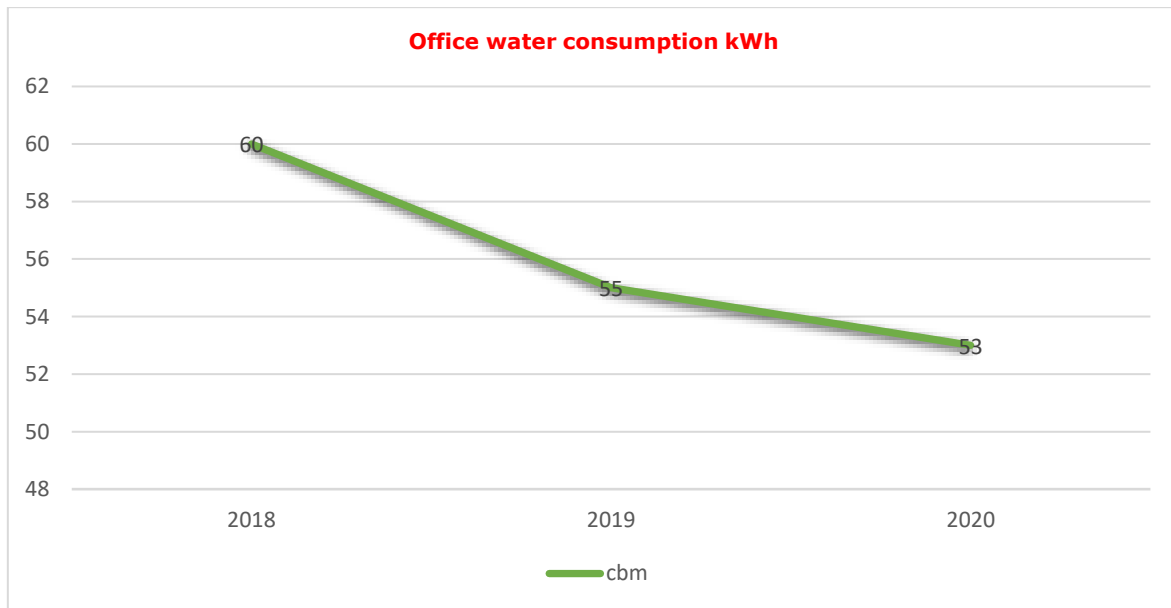
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ENVIRONMENTAL PROGRAM 10 REDUCTION OF FW AND ELECTRIC ENERGY CONSUMPTION IN OFFICE Objective: Orientation towards best practices on FW and Energy Consumption in office. COMPLETION DEADLINE : 31-12-2024 ACTION DESCRIPTION	
This Program aims to eliminate depletion of resources related to our activities and to promote environmental best practices.	
PHASE I – SHORT TERM ACTIONS (DUE DATE: 31-12-2020)	
1	<p>Following actions for reducing energy consumption to be promoted / implemented:</p> <ul style="list-style-type: none"> • Turn-off lights when you are the last to leave. • Turn-off equipment not needed for continuous use. • Shut-off domestic appliance when you do not need them. • Use stand-by or energy saving mode in electronic devices, if available. • Window blinds/shades should be closed in summer during daylight to prevent office overheating and in winter during dark to avoid heat losses. • Use steps rather than the elevator, in particular when going down. • Use warm rather than hot water. • Avoid frequent opening of doors or windows to minimize heating or cooling losses. • Follow Authorities and Public Power Corporation instructions through press, radio, TV channels, concerning reduction of energy consumption during peak hours. • Most electronic office equipment such as printers and photocopiers have energy saving capabilities. Employees to be instructed on how to use these features. <p>Responsible Person: DPA Assisted by / In cooperation with: Technical Department</p> <p>Comments: Records(receipts) from electricity consumption will be kept.</p>
2	<p>Following actions for reducing Fresh Water consumption to be promoted / implemented:</p> <ul style="list-style-type: none"> • Water taps should tightly close to avoid dripping. • Leaks in plumbing fixtures should be promptly reported to repair staff. • Amount and flow of water in WC should be adjusted as required. • Watering of grass around the building should be adjusted according to weather conditions. • Follow Authorities and Public Water Corporation instructions through press, radio, TV, etc. concerning reduction of water consumption during peak hours. <p>Responsible Person: DPA Assisted by / In cooperation with: Technical Department</p> <p>Comments: Records(receipts) from FW consumption will be kept.</p>
3	<p>Adjust PC monitors to shut down if they are not used for more than 10 minutes. Issue an Environmental Circular encouraging employees to shut off the PC monitors and the printers when they leave the office.</p> <p>Responsible Person: DPA Assisted by / In cooperation with: Marine Superintendent</p> <p>Comments: Employees have been instructed accordingly. Setting PCs to go into sleep mode when not in use can save up to 70% of the energy they consume when in full power mode. The PC monitors have been adjusted to shut down if they are not used for more than 10 minutes. Notices to be posted on desk PCs to switch off after use. Employees shut off the monitors and the printers when they leave the office. Even when turned off electronic and IT equipment often use a small amount of electricity when plugged in. Use a power strip as a central "turn off" point when you are done using office equipment to completely disconnect the power supply.</p>
4	<p>Air conditioning system use to be adjusted in accordance with external environmental conditions. Efficient use of air conditioning central or local units includes the following basic steps:</p> <ul style="list-style-type: none"> • Winter temperature setting between 20-21 °C. • Summer temperature setting between 24-25°C. • Local units and fan coils must be shut down when no personnel are present in the office. • Central unit temperature settings must be lowered 3-4°C during after office hours (conservation mode). • Clean or replace air filters. Energy is lost when air conditioners and hot-air furnaces have to work harder to draw air through dirty filters. Cleaning a dirty air conditioner filter can save 5% of the energy used. <p>Responsible Person: DPA Assisted by / In cooperation with: Technical Department</p> <p>Comments: In warmer months, setting air conditioner's temperature just 1 degree higher than usual can reduce the power it uses by up to 10%. Positioning thermostats away from draughts and direct sunlight ensures they are accurate. Make sure window vents are clear of papers /other items so the air can circulate freely.</p>

PHASE II – MID/LONG TERM ACTIONS (DUE DATE : 31-12-2024)	
1	<p>Minimize unnecessary use of lights, by using natural light to illuminate the office environment a significant amount of energy and associated greenhouse gas emissions can be saved.</p> <ul style="list-style-type: none"> Clean dirty lamps and fittings on a regular basis. This will enable you to maximise your lighting efficiency by up to 30 per cent. Clean globes and fittings cast more light than dirty ones, enabling you to get the same amount of light from fewer lamps. Use of eco-friendly, energy saving, fluorescent lights. <p>Responsible Person: DPA Assisted by / In cooperation with: Technical Department Comments: Energy-efficient compact fluorescent bulbs will be used for the most-used lights. Although they cost more initially, they save money in the long run by using only 1/4 the energy of an ordinary incandescent bulb and lasting 8-12 times longer and reduce running costs by up to 70 per cent.</p>
2	<p>Switch computer screens to LCD since they consume less electricity than conventional monitors. Replace the existing ones and ensure that they are recycled.</p> <p>Responsible Person: DPA Assisted by / In cooperation with: Technical Department Comments: LCD monitors use on average 50 to 70% less energy in on-mode than conventional CRT (Cathode Ray Tube) monitors. All in all, at 8 working hours a day, the energy saving of choosing an LCD over an equal size CRT could typically be well over 100 kWh/year.</p>

10.1. Office Fresh Water Consumption (m³)

The office fresh water consumptions for the year 2020 was 53 m³

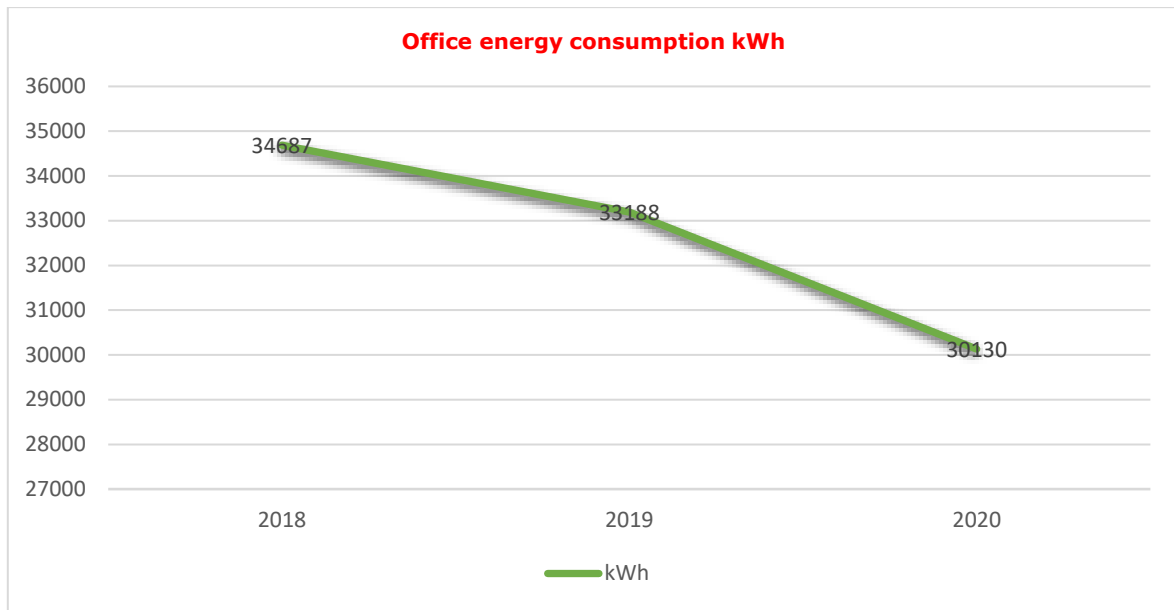


10.2. Office Electrical Energy Consumption (kWh)

The office electrical energy consumption for the year 2018 was 34687 kWh

The office electrical energy consumption for the year 2019 was 33188 kWh.

The office electrical energy consumption for the year 2020 was 30130 kWh



The diminution energy consumption could be attributable to a mild winter season of 2020 and the efficiency of new windows and fixtures replaced during 2019 on the north side of the building.

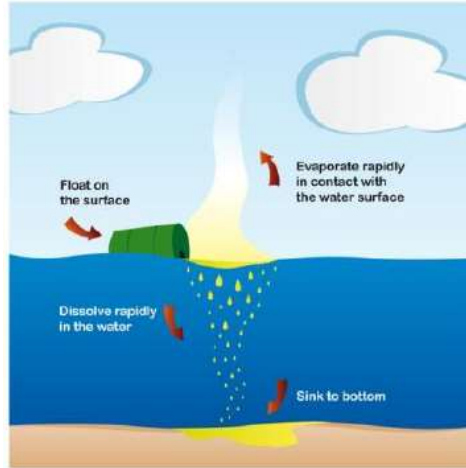
2018 – 2019 -4,3%

2019 – 2020 -9,2%

2018 – 2020 -13,1%

ENVIRONMENTAL PROGRAM 11
REDUCTION OF CHEMICAL CONSUMPTION
Objective: Monitoring consumption of chemicals on board vessels
COMPLETION DEADLINE : 31-12-2024
ACTION DESCRIPTION

Environmental aspect: Evaporation and discharge of chemicals used onboard for various reasons e.g. treatment of the Aux. Boilers water/cooling water system through the boiler blow down/bilge system at sea.



Processes that can act on a chemical spill (Source: ITOFP)

Environmental impact: Discharge of hazardous chemicals at sea (in particular in areas close to shore) could affect the quality of the sea water, pH etc.

Expired Engine Chemicals

- *The use of engine chemicals should be prioritized taking into consideration their expiration date. These chemicals should be stored in such a way to allow the use of those already onboard instead of those recently received.*
- *An inventory should be available indicating the type of chemicals (including maker/supplier), their quantity and their expiration date.*
- *Unused expired engine chemicals should be separated from other chemicals and stored in a separate place, without being opened.*
- *The C/E should inform the Company on the quantity, type and supplier/manufacturer of expired chemicals.*
- *The Company should contact the supplier's representative, taking in consideration his availability and vessel's trading patterns and arrange for the landing of expired chemicals.*

Used Engine Chemicals

Used engine chemical waste generated onboard during operation and maintenance procedures should not be treated as common waste. They should be stored in tightly closed containers, in a dry area away from directed sunlight and protected against excessive heat conditions.

PHASE I – SHORT TERM ACTIONS (DUE DATE: 31-12-2021)

1	<p>Monitor the chemicals consumption for Aux. Boilers feed water treatment</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant Comments: Cases of high consumption of the boiler water treatment chemical could be attributed to one or more of the following reasons:</p> <ul style="list-style-type: none"> • System losses from cargo oil pump turbine drains during start-up (so the more cargo operations the more the consumption is); • System leakages; • Frequent blow downs for reducing the chloride levels of the boiler water; • Excessive chemical dosage to the boiler water; • Inaccurate testing procedure; • Inaccurate recordkeeping of dosage rates. <p>On the other hand, cases of low consumption of the boiler water treatment chemical could be attributed to one or more of the following reasons:</p> <ul style="list-style-type: none"> • Less frequent cargo operations; • Inadequate blow-down procedure; • Inaccurate testing procedure; <p>Inaccurate recordkeeping of dosage rates.</p>
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2	<p>Monitor the chemicals consumption for Cooling Water treatment as per Maker's instructions (measured in liters per day).</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant</p> <p>Comments: Cases of high consumption of the cooling water treatment chemical could be attributed to one or more of the following reasons:</p> <ul style="list-style-type: none"> • Leakages from the cooling system (e.g. from broken gaskets); • Water losses during routine maintenance (e.g. M/E and D/G overhauling (exhaust valves, liners, cylinder covers), air coolers cleaning, LTFW coolers cleaning) <p>Water replacement in case of discoloration from piping rust.</p>
3	<p>Correct handling of chemicals is a priority. The following measures should be considered:</p> <ul style="list-style-type: none"> • Always read the safety data sheet and the text on the packaging carefully when you are about to use a product with which you are not completely familiar with the risks. Contact the Office if you are unsure about handling methods. • Use personal protection equipment (e.g. gloves, face mask) where necessary. • Surplus chemicals and hazardous waste must be dealt with in accordance with the information in the safety data sheet. • First Aid equipment must be available. • Workplaces must be cleaned regularly. There must not be chemical spills on the floor. <p>Responsible Person: HSSE Department Assisted by / In cooperation with: Technical Department Comments: -</p>
PHASE II – MID / LONG TERM ACTIONS (DUE DATE: 31-12-2024)	
1	<p>Ensure that an inspection by a representative of the chemicals supply company takes place onboard each vessel at least every 12 months, if feasible.</p> <p>Responsible Person: Technical Superintendent Assisted by / In cooperation with: Technical Assistant Comments: The purpose of the onboard inspection by a representative of the water treatment chemicals supplier is to verify the proper implementation of the recommended water treatment program. Following this inspection, a relevant report should be issued, containing results, comments and recommendations for follow up actions.</p>
2	<p>As a part of every vessel's routine, cleaning and the use of cleaning chemicals at sea is a task that is becoming highly regulated, with increasingly strict environmental protection requirements. From cargo hold cleaning to essential maintenance tasks in the engine room, or general cleaning of crew and galley areas, every cleaning task contributes directly the operating efficiency of the vessel. Cleaning products must be specially formulated and tested to meet current IMO/MARPOL standards to ensure compliance.</p> <p>Responsible Person: Technical Department Assisted by / In cooperation with: SQHE Department</p> <p>Comments: International environmental regulations set strict rules as to the oil content in effluent water from ships. The Company considers to proceed in a market research on biodegradable and safe to use products. The main applications are for cleaning and degreasing in the engine room and for deck for removal of grease, oil, sludge, polymer compounds, carbon deposits, dirt and grime.</p> <p>We focus on:</p> <ul style="list-style-type: none"> • the effectiveness of chemical products without compromising safety; • lowering the environmental impact of chemicals by minimising waste and hazardous substances; and minimising hazards while maximising efficiency.
3	<p>Investigation of products that gradually could replace traditional chemicals used onboard with ones that are biodegradable, non-accumulating and less toxic to both personnel and marine life.</p> <p>Responsible Person: Technical Department Assisted by / In cooperation with: - Comments: -</p>

Chemical detergent purchased during the year 2020

Alessandro F:	3700 Litres
Etrusco:	5000 Litres
Falesia:	3250 Litres
Leale:	2490 Litres

ENVIRONMENTAL PROGRAM 12
NOISE MANAGEMENT
Objective: Minimize Noise from the vessels' operations, including underwater disturbance
COMPLETION DEADLINE : 31-12-2024
ACTION DESCRIPTION

Legal Basis for Noise

- IMO Res. MSC.337(91): On 1/7/2014, SOLAS made the 'Code on Noise Levels Onboard Ships' (the Noise Code) mandatory for new vessels. The Code recommends measurement of noise levels in work, navigation, accommodation and service spaces under simulated port conditions and at normal service speed at no less than 80% of the maximum continuous rating (MCR). The Code is applicable to ships 1600 GT or more with:
 - Building contract on or after **1 July 2014**
 - Construction on or after **1 January 2015**
 - Delivery or after **1 July 2018**

Limits for noise levels (dB(A)) are specified for various spaces as follows:

Designation of rooms and spaces	Ship size	
	1,600 up to 10,000 GT	≥10,000 GT
4.2.1 Work spaces (see 5.1)		
Machinery spaces ⁵	110	110
Machinery control rooms	75	75
Workshops other than those forming part of machinery spaces	85	85
Non-specified work spaces ⁶ (other work areas)	85	85
4.2.2 Navigation spaces		
Navigating bridge and chartrooms	65	65
Look-out posts, incl. navigating bridge wings ⁷ and windows	70	70
Radio rooms (with radio equipment operating but not producing audio signals)	60	60
Radar rooms	65	65
4.2.3 Accommodation spaces		
Cabin and hospitals ⁸	60	55
Messrooms	65	60
Recreation rooms	65	60
Open recreation areas (external recreation areas)	75	75
Offices	65	60
Designation of rooms and spaces	Ship size	
	1,600 up to 10,000 GT	≥10,000 GT
4.2.4 Service spaces		
Galleys, without food processing equipment operating	75	75
Serveries and pantries	75	75
4.2.5 Normally unoccupied spaces		
Spaces referred to in section 3.14	90	90

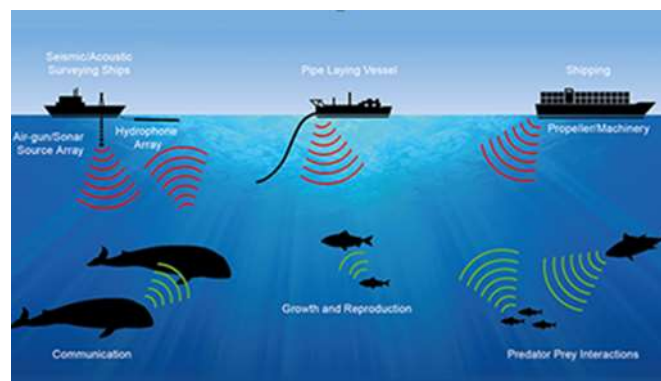
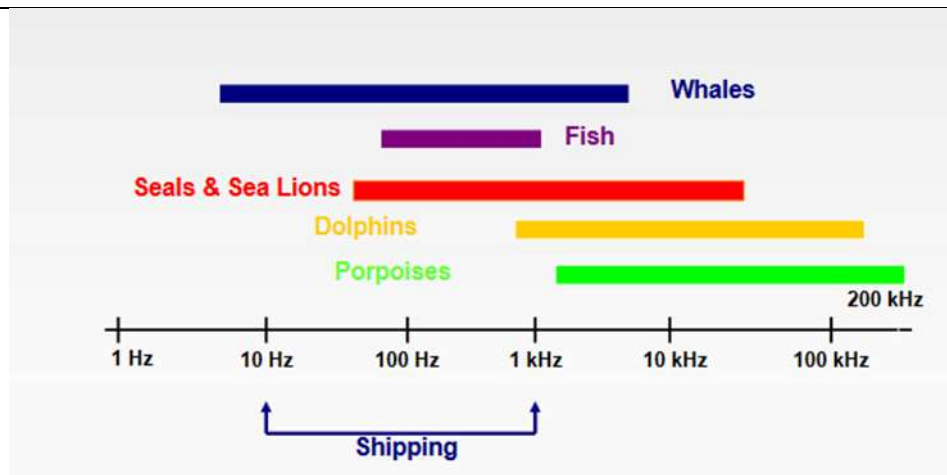
- EU Marine Strategy Framework Directive (2008/56/EC).
- IMO Res. MSC.338(91) – Amendments to SOLAS 1974 - Protection against noise.
- USA: The Marine Mammal Protection Act of 1972, as amended, establishes a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).

Underwater noise: MEPC.1/Circ.833 "Guidelines for the reduction of Underwater Noise from the commercial shipping to address adverse impacts on marine life"; this Circular gives advice on design and operational solutions that may be adopted to reduce underwater radiated noise.

The term "underwater noise" is used to refer to the noise introduced into the oceans by human activities. Shipping noise can have short term and long-term impacts on marine life and in marine mammals.

Standards and references: Underwater noise should be measured to an objective standard for any meaningful improvements:

- The ISO/PAS17208-1–Acoustics –Quantities and procedures for description and measurement of underwater sound from ships–Part1: General requirements for measurements in deep water: This measurement standard is for deep water which implies that the water depth should be larger than 150m or 1.5 times over all ship length (engineering method), whichever is greater. This standard is based on the American National Standard institute and Acoustic Society of America (ANSI/ASA)S12.64-2009 "Quantities and Procedures for Description and Measurement of Underwater Sound from Ships,Part1:General Requirements".
- ISO is also developing ISO/DIS 16554 – Ship and marine technology – Measurement and reporting of underwater sound radiated from merchant ships – deep-water measurement. The standard provides a well-established measurement method for underwater sound radiated from merchant ships for use at the final delivery stage of ships.



Actions to be taken: The Company recognises the need to comply with regulations (local or otherwise) governing underwater radiated noise levels. Vessels are monitored to ensure that the effects of underwater radiated noise from plant operations are minimised, coincident with safe vessel operations. However, whilst the compliance with the above aim is rather straightforward for the new vessels by controlling the propeller cavitation inception speed via the CFD investigation or the model test runs at the design stage, the task is more complicated and difficult for existing ships.

Focus shall be given on primary sources of underwater noise, associated with propellers, hull form, onboard machinery, and operational aspects. Underwater noise is mainly due to the following reasons:

- Propellers in cavitating and non-cavitating conditions
- Main and auxiliary engines
- Flow around the hull and in the propeller.

Both the technical and cost-effectiveness of measures considered, either individually or in combination, are dependent on the design, operational parameters, and mandatory requirements relevant for a particular ship. A successful strategy to reduce radiated noise should consider interactions and contributions from measures provided to achieve other objectives such as reduction of onboard noise and improvements in energy efficiency.

When efforts have been made to mitigate underwater noise, as far as reasonable and practical, evaluation should be undertaken to determine the success or otherwise of ship noise reduction efforts and to guide and enhance future activities at noise reduction. Such evaluation can include forms of radiated-noise measurements, simulations or other ways of data gathering.

Predicting underwater noise levels: Underwater noise computational models are useful in understanding what reductions might be achievable for certain changes in design or operational behaviour. Such models may be used to analyse the noise sources on the ship, the noise transmission paths through the ship and estimate the total predicted noise levels. This analysis aims to identify noise control measures that could be considered for the specific application, taking into account expected operational conditions. Measures may include amongst others vibration isolation mounts (i.e. resilient mounts) for machinery and other equipment, dynamic balancing, structural damping, acoustical absorption and insulation, hull appendages and propeller design for noise reduction. Types of computational models that may assist in reducing underwater noise include:

- Computational Fluid Dynamics (CFD) to predict and visualize flow characteristics around the hull and appendages, generating the wake field in which the propeller operates;
- Propeller analysis methods such as lifting surface methods or CFD for predicting cavitation;

- Statistical Energy Analysis (SEA) to estimate high-frequency transmitted noise and vibration levels from machinery; and
- Finite Element Analysis (FEA) and Boundary Element Method (BEM) to estimate low-frequency noise and vibration levels from the structure of the ship excited by the fluctuating pressure of propeller and machinery excitation.

The value of a modelling exercise is enhanced if its predictive capabilities are assessed in case studies under various operational conditions.

Design considerations - Hull design: The largest opportunities for reduction of underwater noise will be during the initial design of the ship. For existing ships, it is unlikely to be practical to meet the underwater noise performance achievable by new designs. The following design issues are therefore primarily intended for consideration for new ships. However, consideration can also be given to existing ships if reasonable and practicable.

While flow noise around the hull has a negligible influence on radiated noise, the hull form has influence on the inflow of water to the propeller. For effective reduction of underwater noise, hull and propeller design should be adapted to each other. These design issues should be considered holistically as part of the overall consideration of ship safety and energy efficiency.

Uneven or non-homogeneous wake fields are known to increase cavitation. Therefore, the ship hull form with its appendages should be designed such that the wake field is as homogeneous as possible. This will reduce cavitation as the propeller operates in the wake field generated by the ship hull. Consideration can be given to the investigation of structural optimization to reduce the excitation response and the transmission of structure-borne noise to the hull.

Underwater hull surface: Maintaining a smooth underwater hull surface and smooth paintwork may also improve a ship's energy efficiency by reducing the ship's resistance and propeller load. Hence, it will help to reduce underwater noise emanating from the ship. Effective hull coatings that reduce drag on the hull and turbulence can facilitate the reduction of underwater noise as well as improving fuel efficiency.

Propellers: Propellers should be designed and selected in order to reduce cavitation. Cavitation is the dominant radiated noise source and may increase underwater noise significantly. Cavitation can be reduced under normal operating conditions through good design, such as optimizing propeller load, ensuring as uniform water flow as possible into propellers (which can be influenced by hull design), and careful selection of the propeller characteristics such as diameter, blade number, pitch, skew and sections.

Propeller polishing done properly removes marine fouling and vastly reduces surface roughness, helping to reduce propeller cavitation.

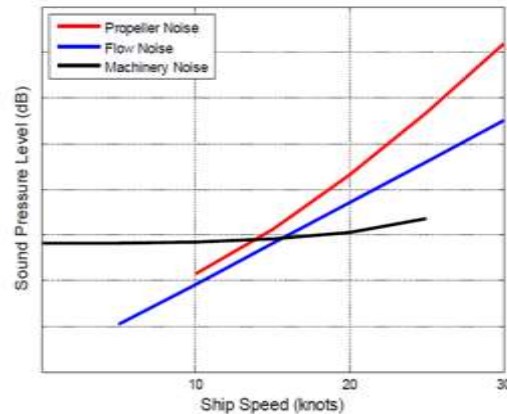
An important noise control approach is to operate a vessel below the propeller cavitation inception speed. A well-designed propeller can have a relatively high cavitation inception speed, which makes it less susceptible to cavitation. In order for a propeller to have a good acoustic performance, it is also important to have a sufficient clearance between the blade tips and the hull of the vessel, and have smooth inflows of water into the propeller. Maintenance of propeller is critical to underwater noise control. Propellers with dings, missing sections, barnacles, etc., can be significantly louder than a clean propeller in its original form. The following are some general design guidelines for quieter propellers:

- Increasing propeller diameter and reducing rotation rate can generally increase the cavitation inception speed.
- Increasing the number of blades can delay inception of tip vortex cavitation and thicker blade sections can be used to delay the inception of sheet cavitation.
- A well-designed skewed propeller shape can normally have a better acoustic performance
- Adjusting blade pitch distribution to unload tip can reduce cavitation.

Whilst the above should be taken into account at the design stage of a new ship, it is difficult to adopt retrofitting measures for existing ships in drydock, mainly because it is impossible to reliably quantify underwater noise levels by the vessel itself in various depths, let alone to identify the source of radiated noise i.e. whether hull/propeller or machinery created. Studies however have shown that adjusting shipping operations and maintenance hold potential to reduce underwater radiated noise by a modest 3 dB. In many ships, a 1 kt reduction in speed leads to a 1 dB reduction in broadband source level.

The illustration below indicates the ship noise source mechanisms grouped as being; (1) propeller noise, (2) flow noise, and (3) machinery noise. The relative level and possible character of each of these sources for a specific vessel depends on the type of ship, the type of propulsion system used, and the degree that noise quieting features are incorporated in the design. As illustrated, at low ship speed the dominant source is machinery noise which generally increases slowly in level with ship speed. At higher speeds underwater noise is dominated by propeller noise, particularly for speeds above cavitation onset. Flow noise, which is noise generated by flow over the ship hull and hull-mounted components, may be a contributor to underwater noise in the mid-speed range but is not a controlling source at any speed.

Notwithstanding any regional or port-state regulated speed restrictions the illustration below should be consulted whenever Company Operations and/or Charterers are issuing speed/power orders to vessel.



Ships with a controllable pitch propeller could have some variability on shaft speed to reduce operation at pitch settings too far away from the optimum design pitch which may lead to unfavourable cavitation behaviour (some designs may be able to operate down to a shaft speed of two thirds of full). For these ships there may be no reduction in noise with reduced speed. Therefore, consideration should be given to optimum combinations of shaft speed and propeller pitch.

The ship and its propeller could be model tested in a cavitation test facility such as a cavitation tunnel for optimizing the propeller design with respect to cavitation induced pressure pulses and radiated noise.

If predicted peak fluctuating pressure at the hull above the propeller in design draft is below 3 kPa (1st harmonic of blade rate) and 2 kPa (2nd harmonic) for ships with a block coefficient below 0.65 and 5 kPa (1st harmonic) and 3 kPa (2nd harmonic) for ships with a block coefficient above 0.65, this could indicate a potentially lower noise propeller. Comparable values are likely to be 1 kPa higher in ballast condition.

Noise-reducing propeller design options are available for many applications and should be considered. However, the optimal propeller with regard to underwater noise reduction cannot always be employed due to technical or geometrical constraints (e.g. ice-strengthening of propeller). However, design principles for cavitation reduction (i.e. reduce pitch at the blade tips) can cause decrease of efficiency.

Onboard machinery: Consideration should be given to selection of onboard machinery along with appropriate vibration control measures, proper location of equipment in the hull, and optimization of foundation structures that may contribute to reducing underwater radiated and onboard noise affecting passengers and crew.

Manufacturers should supply information on the airborne sound levels and vibration produced by their machinery to allow analysis and recommend methods of installation that may help reduce underwater noise.

Diesel-electric propulsion is an effective propulsion-train configuration option for reducing underwater noise. In some cases, the adoption of a diesel-electric system shall be considered as it may facilitate effective vibration isolation of the diesel generators which is not usually possible with large direct drive configurations. The use of high-quality electric motors may also help to reduce vibration being induced into the hull.

The most common means of propulsion is the diesel engine. The large 2-stroke engines used for most ships' main propulsion are not suitable for consideration of resilient mounting. However, for suitable 4-stroke engines, flexible couplings and resilient mountings should be considered, and where appropriate, may significantly reduce underwater noise levels. Four-stroke engines are often used in combination with a gear box and controllable pitch propeller. For effective noise reduction, consideration should be given to mounting engines on resilient mounts, possibly with some form of elastic coupling between the engine and the gear box. Vibration isolators are more readily used for mounting of diesel generators to foundations.

Consideration should be given for the appropriate use of vibration isolation mounts as well as improved dynamic balancing for reciprocating machinery such as refrigeration plants, air compressors and pumps. Vibration isolation of other items and equipment such as hydraulics, electrical pumps, piping, large fans, vent and AC ducting may be beneficial for some applications, particularly as a mitigating measure where more direct techniques are not appropriate for the specific application under consideration.

Selection of ship speed: A vessel's slowest operating speed is not necessarily its quietest, although in average, slower vessels do make less noise. The individual vessel's acoustic footprint can be best assessed during the design phase of new ships, but modifications to existing vessels can also help.

In general, for ships equipped with fixed pitch propellers, reducing ship speed can be an effective measure for reducing underwater noise, especially when it becomes lower than the cavitation inception speed. However, there may be other, overriding reasons for a particular speed to be maintained, such as safety, operation and energy efficiency. Consideration should be given in general to any critical speeds of an individual ship with respect to cavitation and resulting increases in radiated noise.

Operational and maintenance considerations: Although the main components of underwater noise are generated from the ship design (i.e. hull form, propeller, interaction of hull and propeller, and machinery configuration), operational modifications and maintenance measures should be considered as ways of reducing noise for both new and existing ships.

Rerouting and operational decisions to reduce adverse impacts on marine life: Routing decisions to avoid sensitive marine areas including well-known habitats or migratory pathways when in transit will help to reduce adverse impacts on marine life.

Technologies for existing ships: In addition to their use for new ships, the following technologies are known to contribute to noise reduction for existing ships:
 1 design and installation of new state-of-the-art propellers;
 2 installation of wake conditioning devices; and
 3 installation of air injection to propeller (e.g.in ballast condition).

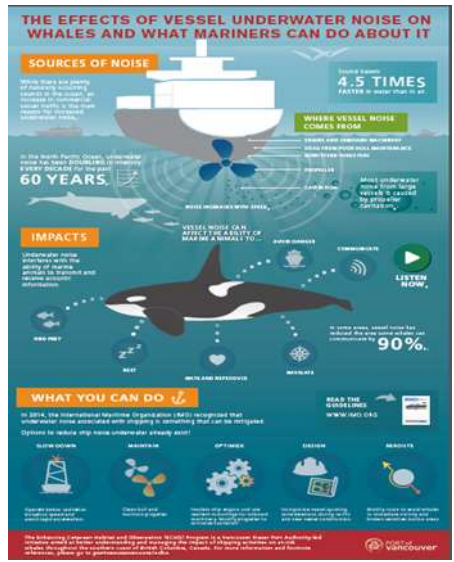
PHASE II – MID TERM ACTIONS (DUE DATE: 31-12-2021)

1	The Company to disseminate instructions to the whole fleet for avoiding sensitive marine areas and reduce speed when the vessels are nearby those areas. Responsible Person: HSSE Department Assisted by / In cooperation with: - Comments:
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2	Evaluate new actions and measures for reducing underwater noise pollution. Responsible Person: Crew Manager Assisted by / In cooperation with: DPA Comments: The Company will consider modifications to the existing ships’ propellers for reducing underwater noise and improve energy efficiency. Ducts may also be added to improve propeller wake flow.
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PHASE III - LONG TERM ACTIONS (DUE DATE: 31.12.2024)

1	The Company shall investigate all measures in order to reduce underwater noise during the specification review of all new buildings – effort to be given in order to upgrade vessel’s specifications as per latest industry best practices.
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Responsible Person: Crew Manager
Assisted by / In cooperation with: DPA

ENVIRONMENTAL PROGRAM 13
Ballast Water Management
Objective: Maintain a zero-ballast contamination incident record / Zero legislative violation
COMPLETION DEADLINE : DEPENDING ON VESSELS AS FOR III (BETWEEN 21/12/2020 AND 22/06/2022)
ACTION DESCRIPTION

Activity: Ballast Water Exchange - Ballast Water Treatment.

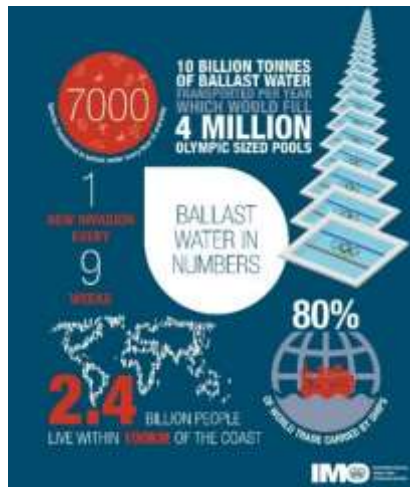
Environmental aspect: Water ballast may pose a serious ecological, economic and public health impact on the receiving environment due to the multitude of marine species carried in it.

Environmental impact: Ballast water contains a variety of organisms, such as marine and coastal plants and animals from different regions of the world. If taken up in one place and released in another, some organisms may survive and prosper in their new environment. These "non-native species" can have a serious ecological, economic and public health impact on the receiving environment. These species include bacteria, microbes, small invertebrates, eggs, cysts and larvae of various species. The transferred species may survive to establish a reproductive population in the host environment, becoming invasive, out-competing native species and multiplying into pest proportions.

Legal Basis: To cope with the problem of invasive species from ballast water, IMO has developed guidelines for the development and implementation of the ballast water management on board ships aiming in preventing, minimising and ultimately eliminating the risk of introducing harmful aquatic organisms and pathogens from ships' ballast water and associated sediments while protecting ships' safety. IMO also adopted the Int. Convention for the Control and Management of Ships' Ballast Water and Sediments entered into force on September 2017. The Convention applies to all ships registered in countries which are IMO member states and to foreign-flag ships when trading in waters coming under the jurisdiction of the countries that are party to the Convention. Implementation date varies depending on each vessel's keel-laying, IOPP and dry-dock schedules.

Ships must have an International BWM Certificate. To obtain the certificate, a vessel must have a BWM Plan addressing procedures for BW exchange, BW treatment or both. If a BWM System is installed, then approved technical documentation for the BW treatment system installation must be available on board. Lastly, a Ballast Water record book is required, and the vessel must employ the chosen ballast water management method.

The revised USCG regulations on ballast water management entered into force 21/06/2012. The regulations require compliance with the treatment standard at the first scheduled dry-docking after 1 January 2016 for sailing ships, and at delivery for newbuilding. Before any type approved systems were available, the USCG allowed shipowners to apply for an extension of their compliance date.



PHASE I – SHORT TERM ACTIONS (DUE DATE: 31-07-2020)	
1	Collecting relevant quotation by manufacturer in order to be in compliance with BWC for managed vessels. Responsible Person: Technical Manager Assisted by / In cooperation with: DPA Comments:
2	Analyse relevant quotation and select. Responsible Person: Managing Director Assisted by / In cooperation with: Technical Manager

3	<p>The following are being considered by the Company for the existing vessels:</p> <ul style="list-style-type: none"> • Comply with BWMP (IMO Ballast Convention D-1) • Determine the IMO Ballast Convention D-2 compliance date • Decide whether the vessel is fit to be equipped with a BWTS – a ship specific feasibility study to be conducted • 3D scanning to be conducted on all managed vessels • Market research in order to identify the most proper BWTS • Ships/Office to be furnished with latest international and local requirements <p>The following are being considered for all newbuilding:</p> <ul style="list-style-type: none"> • To be equipped with a BWTS • Crew to be well trained for the use of such systems • Ensure availability of required materials for the use of the systems <p>Responsible Person: Technical Department Assisted by / In cooperation with: HSSE Department Comments: -</p>
4	<p>Ballast operations should be monitored with respect to the following:</p> <ul style="list-style-type: none"> • Water Volume Ballasted at Cargo Discharging Ports • Ballast Water Volume Exchanged during Sea Passages • Water volume Discharged at loading Ports • Monitor the proper implementation of the BWMP <p>Responsible Person: HSSE Department Assisted by / In cooperation with: Technical Department Comments: -</p>
5	<p>The Company shall implement the following measures:</p> <ul style="list-style-type: none"> • Personnel familiarization with BWMP and local/international regulations • Crew to be well trained for the use of BWTS • Familiarization of Crew for record/sample keeping <p>Responsible Person: HSSE Department Assisted by / In cooperation with: Technical Department Comments: -</p>
PHASE II – MID TERM ACTIONS (DUE DATE: 30-09-2020)	
1	<p>Complete with on-board inspection technical and risk assessment</p> <p>Responsible Person: Technical Manager Assisted by / In cooperation with: DPA</p>
PHASE III – LONGTERM ACTIONS (DUE DATE: 22-06-2022)	
1	<p>Compliance with BW Convention D2:</p> <p>Falesia: 21 February 2021 Etrusco: 23 May 2021 Alessandro F: 06 October 2021 Leale: 22 June 2022</p>

	ELBANA DI NAVIGAZIONE S.P.A.	HSSE Department
		ENVIRONMENTAL MANAGEMENT MANUAL Environmental Management Review Report
<small>Document may not to be disclosed to any third party without the prior approval of the management.</small>		

B. OUTPUT

B.1. Conclusion on the continuing suitability, adequacy and effectiveness of the environmental management system

Based on the experience gained through the implemented period of IMS the overall impression throughout the Company is that the IMS serves as the solid basis upon which we can build upon and achieve concrete results. Our Company takes into account all remarks/observations/proposals related to the suitability and effectiveness of the IMS, reviews them regularly through relevant MRC meetings and incorporates them in the Company's processes and manuals as necessary.

B.2. Decision related to continual improvement opportunities

All Company's personnel are encouraged to provide ideas towards further improvement of Company's environmental performance.

B.3. Decision related to any need for changes to the environmental management system, including resources

No changes have been established during the management review

B.4. Actions when environmental objectives have not been achieved

Presently no actions required

B.5. Opportunities to improve integration of the environmental management system with other business process

Presently no opportunities have been identified, apart the fact that being the environmental management, part of the ISM and TMSA requirements all the systems are connected one to the other.

B.6. Implications for the strategic direction of the organization

No implications identified

Environmental Objective					
Main and Auxiliary Engine Operations – Boilers’ Operation – Aerial Emission					
KPI N.°	Title	2020 Result	KPI result	2021Goal	Long term Goal (2024)
EO -1	CO ₂ Carbon Dioxide (EEOI) gr CO ₂ /tonne-mile	Alessandro F 66,1 Falesia 99,2 Etrusco 62,2 Leale 65,6	Not achieved	0.1% annual reduction of CO ₂ emissions required for transportation of 1 tonne for 1 mile	0.1% annual reduction of CO ₂ emissions required for transportation of 1 tonne for 1 mile
EO-2	SO _x Sulphur Oxide gr SO _x /tonne-mile	Alessandro F 0,09 Falesia 0,13 Etrusco 0,09 Leale 0,09	----	0.1% annual reduction of SO _x emissions required for transportation of 1 tonne for 1 mile	0.1% annual reduction of SO _x emissions required for transportation of 1 tonne for 1 mile
EO-3	NO _x Nitrogen Oxide gr NO _x /tonne-mile	Alessandro F 0,83 Falesia 1,27 Etrusco 0,81 Leale 0,95	Not achieved	0.1% annual reduction of NO _x emissions required for transportation of 1 tonne for 1 mile	0.1% annual reduction of NO _x emissions required for transportation of 1 tonne for 1 mile
EO-4	Particulate Matter Emissions	Alessandro F 0,0265 Falesia 0,0404 Etrusco 0,0259 Leale 0,0275	----	0.1% annual reduction of PM emissions required for transportation of 1 tonne for 1 mile	0.1% annual reduction of PM emissions required for transportation of 1 tonne for 1 mile
Action 1	Monitoring of performances on a quarterly base				
Action 2	New EEXI parameters to be considered for the year 2023				
Responsible	DPA /HSE Manager				

Environmental Objective	Maintenance and operation				
KPI N.°	Title	2020 Result	KPI Result	2021Goal	Long term Goal (2024)
EO-5	Emission from use of the incinerators	No incinerations	No incinerations	Zero Non-Conformities	Zero Non-Conformities
EO-6	Use of spare part and consumables packed in environmental harmful packaging	No non-conformities	Achieved	Zero Non-Conformities	Zero Non-Conformities
EO-7	Ships recycling	No ships recycled	No ships recycled	Zero Non-Conformities	Zero Non-Conformities
EO-8	Discharge of sludges at sea	No discharge	Achieved	0.1% annual reduction for sludge production	0.1% annual reduction for sludge production
EO-9	Discharge of oily water bilges at sea	No discharge	Achieved	No discharge at sea	No discharge at sea
EO-10	Oil spill from Bunkering/Collision / Stern tube lube oil	No spills	Achieved	Zero Non-Conformities	Zero Non-Conformities
EO-11	Uncontrolled disposal of Solid Waste/Garbage at sea and on land/ Garbage production	No disposal	Achieved	0,1 % annual reduction for garbage production	0,1 % annual reduction for garbage production
EO-12	Noise (including underwater noise)	No non-conformities	Achieved	Zero Non-Conformities	Zero Non-Conformities
EO-13	Use of TBT or other tri-organotin antifouling	No non-conformities	Achieved	Zero Non-Conformities	Zero Non-Conformities
Action 1	Monitoring of performances on a quarterly base				
Action 2	Encourage Masters, officers and crew to report potential dangerous environmental situation				
Responsible	DPA /HSE Manager				

Environmental Objective	Crew Accommodation				
KPI N.°	Title	2020 Result	KPI result	2021 Goal	Long term Goal (2024)
EO-14	Uncontrolled discharge of untreated Sewage - Grey water	No discharge	Achieved	Zero Non-Conformities	Zero Non-Conformities
EO-15	Emissions of Chlorofluorocarbons CFCs & Ozone Depleting Substances	No emission	Achieved	Zero Non-Conformities	Zero Non-Conformities
Action 1	Supply of CFC free item				
Responsible	DPA /HSE Manager				

Environmental Objective		Office / Ship Operation			
KPI N.º	Title	2020 Result	KPI Result	2021Goal	Long term Goal (2024)
EO-16	Fuel consumption in ships	See EO-1	Not achieved	0.1% annual reduction of specific consumption of fuel 0.5% annual reduction of specific consumption onboard ships	0.1% annual reduction of specific consumption of fuel 0.5% annual reduction of specific consumption onboard ships
EO-17	Fresh water purchased in ships (m ₃)	10370	Not achieved		
EO-18	Electric energy consumption in offices	30130 kWh	Achieved	0.5% annual reduction of specific consumption of electric energy 0.5% annual reduction of specific consumption of fresh water in offices	0.5% annual reduction of specific consumption of electric energy 0.5% annual reduction of specific consumption of fresh water in offices
EO-19	Fresh water consumption in offices	53 m ³	Achieved		
EO-20	Operation of Heating, Ventilation and Air Conditioning (HVAC) System in offices	No non-conformities	Achieved	Zero Non-Conformities	Zero Non-Conformities
EO-21	Paper consumption in offices	345 reams	Not achieved	0.5% annual reduction of specific consumption of paper	0.5% annual reduction of specific consumption of paper
EO-22	Various hazardous waste (i.e. batteries, medical waste, fluorescent lamps, aerosol cans, chemical waste, pyrotechnics, detergents, plastic)	No non-conformities	Achieved		
Action 1	Continuous monitoring of fresh water purchased on board and in office				
Action 2	Quarterly monitoring of office energy consumption				
Responsible	DPA /HSE Manager				

Environmental Objective		Cargo Operations			
KPI N.°	Title	2020 Result	KPI Result	2021 Goal	Long term Goal (2024)
EO-23	Ballast Operations	No non-conformities	Achieved	Zero Non-Conformities	Zero Non-Conformities
EO-24	Accidental oil discharges (crude oil/chemical/ oil product cargoes)	No non-conformities	Achieved	Zero Non-Conformities	Zero Non-Conformities
EO-25	Accidental discharge of slops & cargo residues into the sea	No non-conformities	Achieved	Zero Non-Conformities	Zero Non-Conformities
EO-26	Emission of Volatile Organic Compounds (VOCs) (ONLY FOR CRUDE OIL TANKERS)	-	Achieved	-	-
Responsible	DPA / HSE Manager				