SPLIETHOFF
GROUP

Sustainability Report

EDITION 2 - APRIL 2022

Index

01 Introduction

Dear Reader,

Welcome to our second Sustainability Report.

We are happy to inform you further about our endeavours into greener shipping, which has become more and more an important part of our daily business.

Over the last months, we have set up our new Sustainability Agenda, which holds our guidelines and plans towards 70% reduction of carbon emissions in 2050.

You will find a short insight in how hull cleaning helps to reduce fuel consumption and our proud introduction of the latest LNG-powered newbuildings. Furthermore, you can read the intermittent report on the biofuel trials we have been conducting with two of our vessels and the results of the retrofit exercise for the P-type vessels.

Alongside all this, we will introduce the so-called TOP-portal to you.

We wish you a good read.

Towards a greener world,
Executive Board Spliethoff Group

02 Sustainability agenda

Ambition

Spliethoff Group is committed to contributing to a more sustainable shipping environment and bases its agenda, and especially the reductions, on the directions set by the various regulations/initiatives as IMO, EU and Poseidon. The reduction goals set by these organizations present a realistic and achievable goal.

In its GHG strategy, IMO envisages to reduce the carbon intensity of shipping and pursue 70% reduction by 2050 (compared to 2008). The 2008 reference is challenging, as reliable measurements of the emission data in this period are not available. When we compare the average EEXI values of the 2008 vessels in operation with the 2021 vessels, we see that, through fleet renewal, this value was lowered by 8%.

Over the last 5 years, operational measures were also introduced to sail the vessels more efficiently by optimum trim, digital twin and energy management plans, which also led to savings of around 3% on the fleet average.

Accounting for these achieved reductions, from 2021 onwards, the carbon intensity still has to be reduced by 60% to reach the 2050 target. This means around 2% per year.

The Poseidon Principles are also based on an average saving of 2% per year but the EUfuel directive is different. It is based more on the expected developments and application of alternative and sustainable fuels. This directive increases its reduction in emissions upto 1.4% per year until 2035, but accelerates thereafter to 2.6% and even to 6.6% after 2040. After 2045 it slows down again to 3.2% savings per year.

Spliethoff Group's ambition is to reduce the average emissions of its fleet with an average of 2% per year (% reduction of mt CO_2 / (dwt*distance sailed)) to reach 70% reduction of carbon emissions in 2050.

Emission reduction agenda

The availability of lower carbon emission energy carriers or fuels will have a significant influence on the ability to achieve the goals. The volumes, prices and worldwide availability of these types of fuels are uncertain, making it difficult to determine a route at this moment in time.

From research, publications and suppliers information, it is expected that bio or synthetic fuels will be available on a larger scale only from 2030 onwards.

The Spliethoff sustainability agenda is divided in three phases. The first phase covers the improvements of the existing fleet and the current replacement programme on order. In the second phase, from 2025 to 2035, the main improvements will be made by replacing existing series by more efficient vessels running on or prepared for alternative fuel types. From 2035 onwards, the third phase, synthetic and/or biofuel alternatives are to be used to achieve the ambition.

Phase 1 - Existing fleet and newbuild programme

The emission reduction for the existing fleet will be limited to system upgrades, operational measures and the use of bio and/or e-fuels. Due to technical challenges, retrofitting to a new fuel does not offer a solution. The designs of the existing fleet are optimized for flexibility, deadweight, deck space and m^3 intake. This resulted in designs where no space is left for new, larger systems and the redesign might impact the setup of main systems as for example hatch cover layout. The engine types installed on the existing fleet cannot be retrofitted and will require a replacement of the engines.

For the existing fleet, the emission reduction will be achieved by increasing efficiency of the vessel systems, optimizing the operational performance and using bio or synthetic fuel.

As a large amount of energy savings in the onboard systems have already been implemented, the maximum saving which can be achieved on the existing fleet is abt. 4.5%. The areas of improvement identified are operational optimization, shore power, pitch-RPM optimization, sailing on combinator mode and the installation of frequency drives on main consumers. This 4.5% can be achieved in 2024, the overall CO_2 emission would be reduced by 49,000 mt per year.

Slow steaming is an effective measure to reduce emissions, but it will also reduce the ton-mile number, as less miles are being made. However, slow steaming is not accounted for in the sustainability agenda and can be used when lagging on the 2% reduction target.

Currently, 4 series of vessels are on order. Although all these vessels still operate on fossil fuel only, their design has been optimized in hull form, operating speed and engine choice. Due to this replacement programme, the total CO_2 emissions will increase by 36.500 mt/yr. This is explained by the fact that the fleet will increase. However, the average fleet emissions per ton-mile will be reduced.

The emission reduction in phase 1 leads to an average fleet emission reduction to 82.5% compared to 2021. This is below our target and will require that this gap must be bridged by using biofuels, stepwise increasing from 0.5% of the bunkers in 2022 to 2.5% in 2025, which, based on the successful trials on our Flevogracht with 100% bio fuel, we feel confident to do.

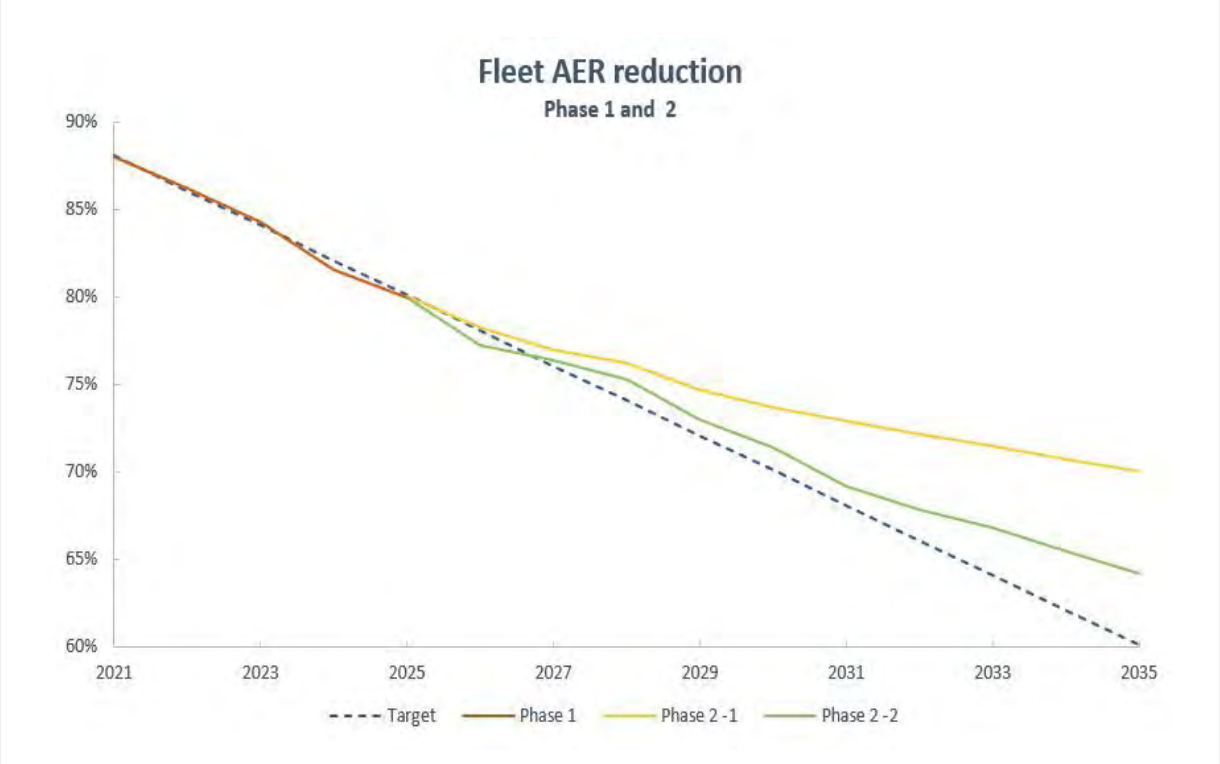
Phase 2 - Future fleet replacement

The newbuild programme between 2025 and 2035 should accommodate a large share of the emission reductions. This will partly be achieved by a more efficient design, but the main choice will be the fuel base. Two pathways are considered, either a heavy fuel oil-based design, ready for a retrofit to a synthetic fuel, or an LNG based design, which can switch to synthetic or bio-LNG in the future. The various choices for synthetic future fuels are discussed under Phase 3.

With a fleet renewal programme of three or four vessel series over the period 2026-2035 with heavy fuel oil, retrofit ready vessels would bring a saving of 11.5% in fleet emissions and a saving of CO_2 emissions of 184,500 mt/year.

The same replacement programme, but with LNG installed on these series would lead to an additional 6.5% reduction in the fleet AER and emissions which equals to 95,000 mt CO_2/year.

Below graph depicts the phase 1 and phase 2 emission savings. Although there are still choices to be made in the replacement programme, it is clear that each replacement of a smaller series will only have a limited impact on fleet AER savings.



Phase 3 - Future fuels

As indicated in the previous paragraphs, the future fuel choices will depend on the availability and price levels of the synthetic and bio-fuels. Currently there is a lot of uncertainty regarding the availability, the safety and prices of the future fuels. This means that at this moment in time there is no clear path forward and flexibility will be required in new designs.

For the fleet of MPPs, HLVs and RoRos, the following observations can be made on the carrier of the future.

The difference of grey/blue/green/bio-origin of a fuel will not influence the choice of the carrier of the future fuel, as both bio, green and blue will lead to net carbon savings at about the same level. However, if there is good availability of the grey variety, it could help soften the transition to fully sustainable in periods where availability is still limited.

The choice of fuel 'carrier' will have a large impact as there is a large variety in storage, fuel system and engine system. From the analysis of the future fuels the following pathways seems most likely for new-build designs. The first pathway is to build LNG – ammonia ready, and be able to switch to bio/E-LNG later. The second route is to build HFO – methanol ready, being able to retrofit to methanol later. This option limits the building costs and operational costs now and until the future of fuels becomes clearer.

Conclusions

The ambition of 2% emission reduction on average per year is in line with the IMO and EU regulations and ambitions, and this target seems achievable. However, to meet the target in 2035, a significant amount of E-fuel or biofuel must be blended in.

The three-phase approach is a good approach with a focus on optimizing the existing fleet and the existing newbuild programme up to 2025 first, focus on the future newbuild for the period 2025-2035 and keep the options after 2035 open, as this is fully dependent on the availability of the fuels of the future.

TRIALS USING BIOFUEL

03 Trials using biofuel on Spliethoff Group vessels

Spliethoff Group's constant striving to reduce its CO_2 emissions has led to two trials using biofuel on its vessels.

The first trial took place between June and November last year, on BigLift Shipping's HTV BigLift Baffin. The vessel was supplied with a blend of 50% FAME based biofuel – a second generation biofuel, made from waste streams – and 50% conventional HFO. This is a 'drop-in' biofuel, which means that it does not need any retrofit to the ship's engine.

The objective of this trial was to test if biofuel is suitable for use, as yet in combination with HFO, and to determine whether the biofuel can be stored in a bunker tank for a longer period of time before being used. Risks of using biofuels are, among others, microbial growth in fuel tanks and negative impact on seals, which can cause leakage.

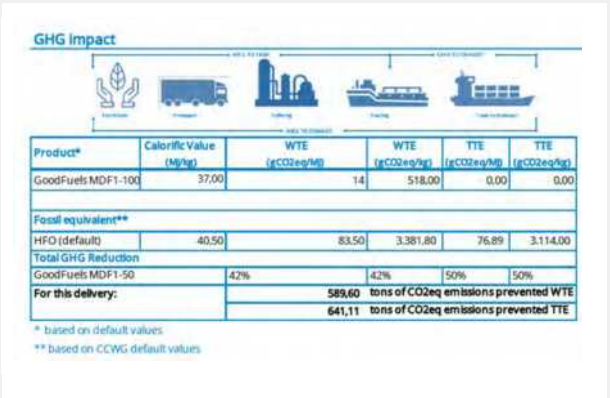
Since the results of this trial were positive on all points, the next step was to test the use of 100% biofuel. This step started in Amsterdam on December 13, when Spliethoff's MPP vessel Flevogracht bunkered 100% FAME based biofuel.

Both tests have resulted in a Tank to Exhaust (TTE) CO_2 equivalent emissions reduction of 1673 metric tons. For further reduction details please see the tables below.

Both tests have now been completed successfully which means that the Spliethoff Group is able to offer clients the option to use biofuels for certain trades and projects, which inherently gives the possibility of emission reduction in logistics. We look forward to sailing onwards on the road to sustainability in the years to come.

Both trials were executed in good cooperation with GoodFuels – a Netherlands-based global pioneer in sustainable marine fuels.

Fossil fuel quantity: 205,879 metrictons
Fossil component: HFO


GHG Impact

Product*	Calorific Value (MJ/kg)	WTE (gCO2eq/MJ)	WTE (gCO2eq/kg)	TTE (gCO2eq/MJ)	TTE (gCO2eq/kg)
GoodFuels MDF1-100	37,00	14	518,00	0,00	0,00
Fossil equivalent**					
HFO (default)	40,50	83,50	3.381,80	76,89	3.114,00
Total GHG Reduction					
GoodFuels MDF1-50		42%	42%	50%	50%
For this delivery:		589,60	tons of CO2eq emissions prevented WTE		
		641,11	tons of CO2eq emissions prevented TTE		

* based on default values
** based on CCWG default values


GHG impact

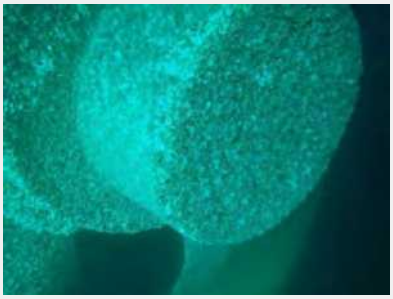
Product*	Calorific Value (MJ/kg)	WTE (gCO2eq/MJ)	WTE (gCO2eq/kg)	TTE (gCO2eq/MJ)	TTE (gCO2eq/kg)
GoodFuels MDF1-100	37.00	14	518.00	0.00	0.00
Fossil equivalent**					
HFO (default)	40.50	83.50	3,381.80	76.89	3,114.00
Total GHG Reduction					
GoodFuels MDF1-100		83%	85%	100%	100%
For this delivery:		349.71	tons of CO2eq emissions prevented WTE		
		1,032.68	tons of CO2eq emissions prevented TTE		

* based on default values
** based on CCWG default values

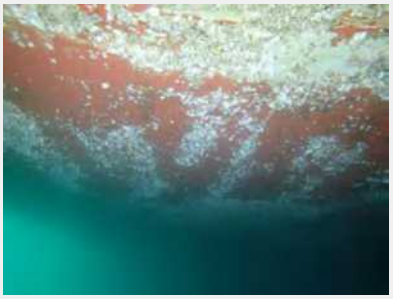
04 Hull cleaning pays off

Performance monitoring system phase II

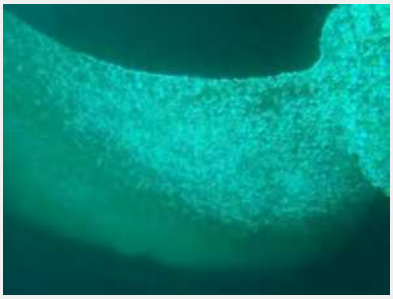
BEFORE POLISHING



BEFORE CLEANING



BEFORE POLISHING



AFTER POLISHING

AFTER CLEANING

AFTER POLISHING

Spliethoff group is putting in a lot of effort to make sure that its fleet is operated in the most efficient way. In the first edition of the sustainability report, we talked about the in-house developed performance monitoring system and the vessels' digital twins. In this edition, we present a practical example of how the data collected from our performance monitoring system are transformed into actionable information.

A common performance killer is hull and propeller fouling. A recently published study by IMO [1] indicates that biofouling can increase the Greenhouse Gas Emissions by around 10% in case of light slime, and by up to 40-50% in case of heavy fouling. The increase in GHG emissions is an outcome of the vessel's increased fuel consumption. A common approach, followed by many shipping companies, is to clean the vessels' hull and propeller on a regular basis, without having any information regarding the actual condition of the hull. That is a first step forward, but it is definitely not the ideal solution, since cleaning the hull when it is not needed only has a negative effect, as fouling protection will deteriorate faster.

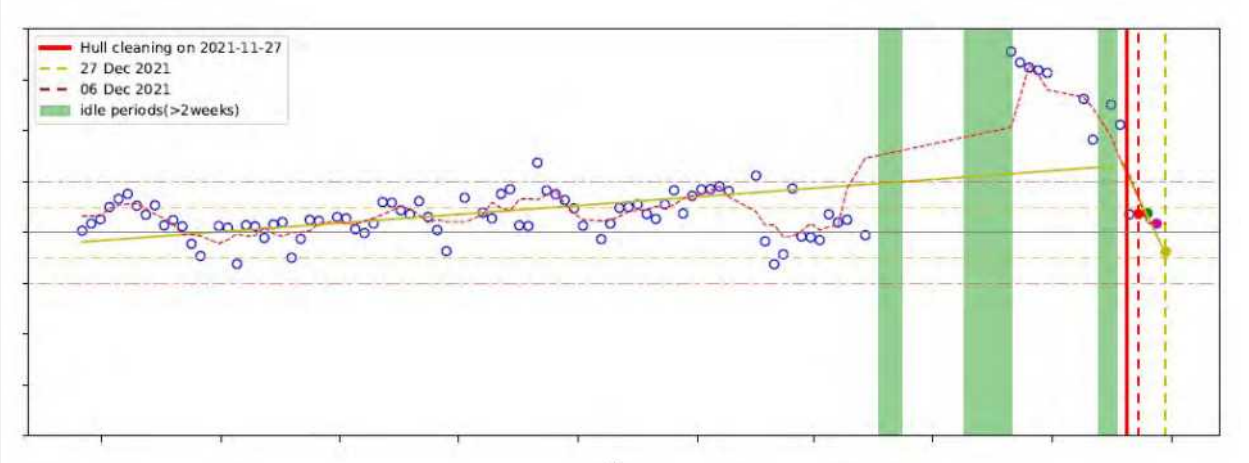
Spliethoff is going a step further and implements a condition-based approach by monitoring the actual

[1] Preliminary results Impact of Ships' Biofouling on Greenhouse Gas Emissions. IMO. 2021

condition of the hull. Hull condition monitoring is a complex task, due to the dynamic environment in which the vessel operates. The vessel's fuel consumption is affected by many parameters – speed, draft, trim, weather, etc – and that adds complexity when we come to the point where a decision has to be made. This is where the vessel's digital twin comes into play.

By making use of the digital twins, the data collected from the in-house developed monitoring tool are analysed and provide us with actionable information. This way a decision can be made based on the actual condition of the hull, and thus make sure that a hull cleaning will be arranged only when it is really needed.

Hull Propeller and Engine Performance KPI [%]



One of the cases we dealt with recently, is used here as an example. Due to congestion in Chinese ports, the vessel was at anchorage for about a month waiting to discharge. When the vessel started sailing again, the information presented in the dashboard summarizing the results from the digital twin analysis, showed that the vessel was overconsuming - on average consumption was up 20% - due to fouling. Hull cleaning and propeller polishing were arranged immediately, and after that, the performance returned to nominal levels.

The above screenshot is from the "Performance Dashboard" for the case discussed in the previous paragraph. Furthermore, some photos are shown from the condition of the hull and the propeller before and after cleaning.

Spliethoff group will continue to invest in technology, and work in close cooperation with academic institutions, targeting development and implementation of innovative solutions, to make sure its fleet is operated in the most efficient way.

05 LNG-powered newbuildings

As announced in the previous Sustainability Report, the first of seven LNG-powered vessels are being delivered presently. Both Bore and W&B have taken up their first newbuild vessels with their new propulsion systems.

Three 7,000 mt ro/lo vessels are being built for Bore Ltd, while Wijnne Barends will add four 5,800 dwt lo/lo coaster vessels to its fleet. The vessels are specially built to transport paper and forestry products for our longstanding client UPM.

Bore - Full ahead, meeting sustainability requirements for the future

Bore's three newbuildings, scheduled for delivery first half 2022, are prepared for the future with flexibility and optimized ship performance. The vessels will use LNG as primary fuel from the start. The hole propulsion train is optimized for efficient utilization of engine power in all operating conditions.

The present day change in technology gives the opportunity to utilize highly developed CFD calculations in areas such as underwater hull lines, propellers and rudder areas etc. The optimized CPP propeller control takes today's performance control of the vessel to a new dimension; it takes in all influences which have an impact on fuel consumption, such as weather, wind, waves, current and time table etc. All is controlled by a Voyage optimization program which gives a tool for maximum optimization of today and uses historical values for analyses to give input for further improvement of newbuildings and existing ships.

Today's digital platform and ship to shore communication gives an overview that every gram of fuel is utilized to its maximum potential through digital twins, analyses and follow up not only for the ship itself but also for the customer. Due to cargo room environmental supervision and control we can grant sensitive cargo to be transported in the best possible way.

The dual fuel engine gives flexibility to utilize future different low emission fuels with minimum changes required onboard. But already today the IMO EEDI requirements for newbuilding during phase 2 (2020-2024) are fulfilled with a big margin; abt 60% better than the required level is a good starting point. That gives confidence for the years to come. Even now, we could start to use a mix of BioLNG, 10%, 20% or even 100% without having to change the installation onboard. This means we will be able to sign up for the best category in sustainable performance with yearly improvements for many years to come.

Considering the high cost demanded for producing e-fuel for the future, where the Well-to-Wake energy consumption more than doubles, we take global responsibility for balancing the sustainable transition without compromising emission cutting. Taking GWP to be 100, the total Well to Wake GHG emissions reduction benefits are between 5% -10% for our LNG 4-stroke medium-speed engines on GAS operation compared to ordinary fuel. We fulfil the NOX Tier III level and the methane slip of our engines is down to 3.5 – 4 g/kWh (gives < 1%) at optimal load, were we strive to be at all times.

It is our goal to find ways to establish sustainable shipping with minimal impact on our environment.

Bore

Full ahead, meeting sustainability requirements for the future

Wijnne Barends' four newbuilding Lady M vessels

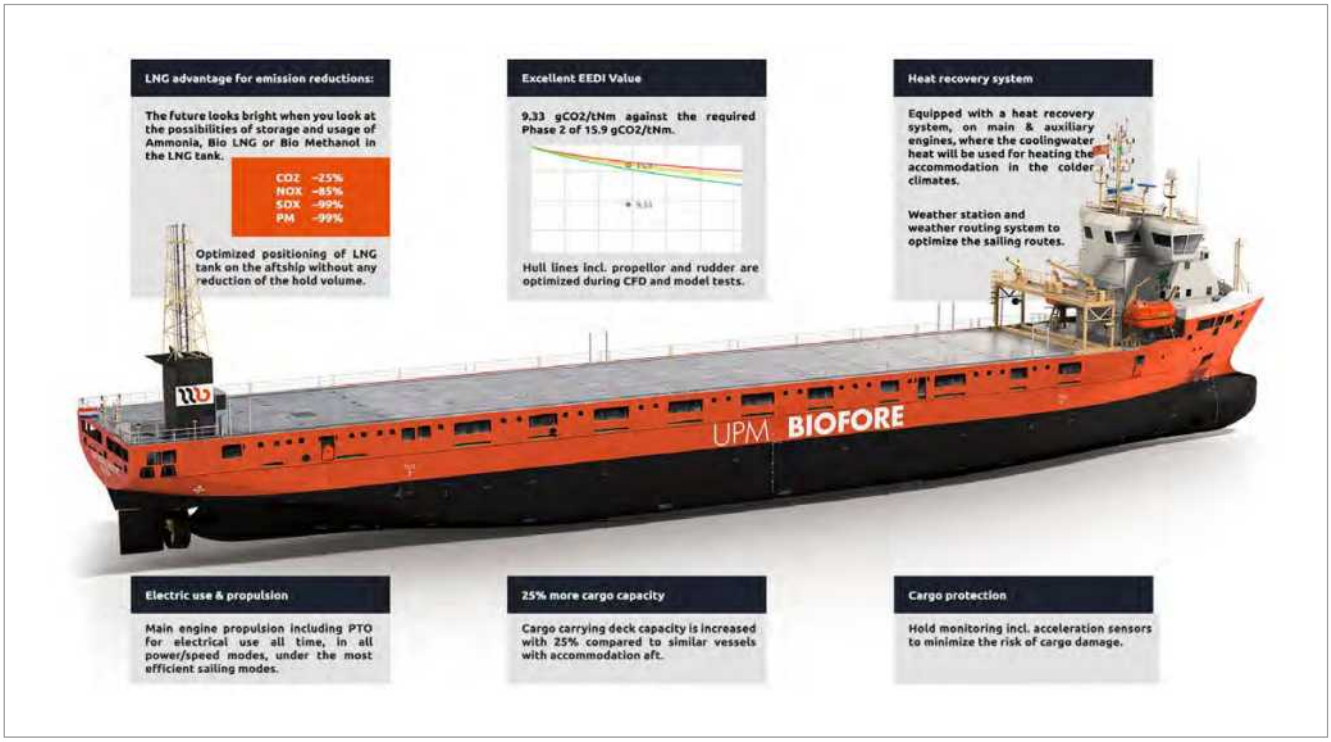
For Wijnne Barends, their four new Lady M 5,900 dwt dual fuel vessels, built at Wuhu Shipyard China are being delivered throughout 2022.

These four vessels have been designed to meet future environmental legislations, for which various features have been implemented. By optimizing their hull lines in relation to propeller/nozzle, resistance reduction has been achieved, whereas Dual Fuel (DF) main engines have been used to optimize the use of Bio LNG, Bio Gasoil or even Ammonia and Methanol for future zero emission performance. The vessels' 200 m^3 LNG storage tank is situated below the main deck, which reduces resistance and increases their cargo carrying deck capacity with 25% compared to similar vessels, further enabling the carriage of large project cargoes such as windmill blades with lengths over 80 mtr. Additionally, they have been designed for open top sailing at a draft of 5.5 mtr and provide excellent overview without any obstructions owing to the forward position of the bridge.

These vessels' design has been developed for excellent EEDI values of -56.7% below the required EEDI of 15.87 compared to 6.87 g CO_2/t nm for this kind of vessels. Their reduced use of auxillary energy is achieved by installation of a heat recovery system from main and auxiliary engines where the heat will be used for hot water systems and heating of the complete accommodation areas incl. the bridge. Besides, they avail over an optimized propulsion train in combination with vessels' electric load demands under all circumstances and speed, through the use of frequency controlled shaft generators in relation with CPP pitch/revolution optimization.

Furthermore, safe and efficient sailing is enhanced with the optimized route prediction systems installed with weather station, SPOS and acceleration/movement sensors.

Thus, the new Lady M vessels have been built to the maximum possible standards of today.



Wijnne Barends'

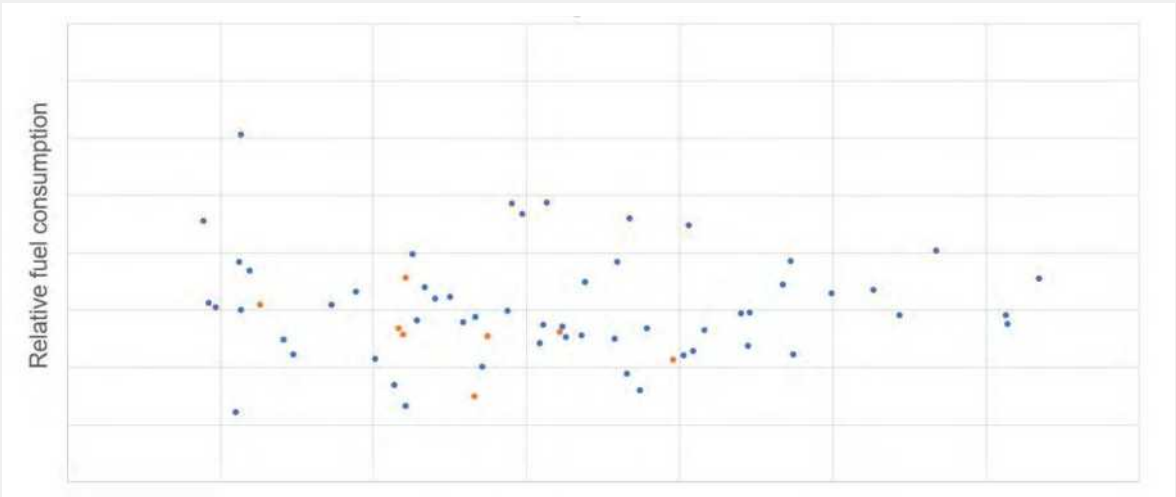
Four newbuilding Lady M vessels

06 Results P-type bulbous bow optimization

Spliethoff owns ten multipurpose, heavy lift Spliethoff P-type vessels. With our operational profile differing significantly from the one used for the original design, a study of the large bulbous bow was undertaken to improve the operational performance and environmental impact.

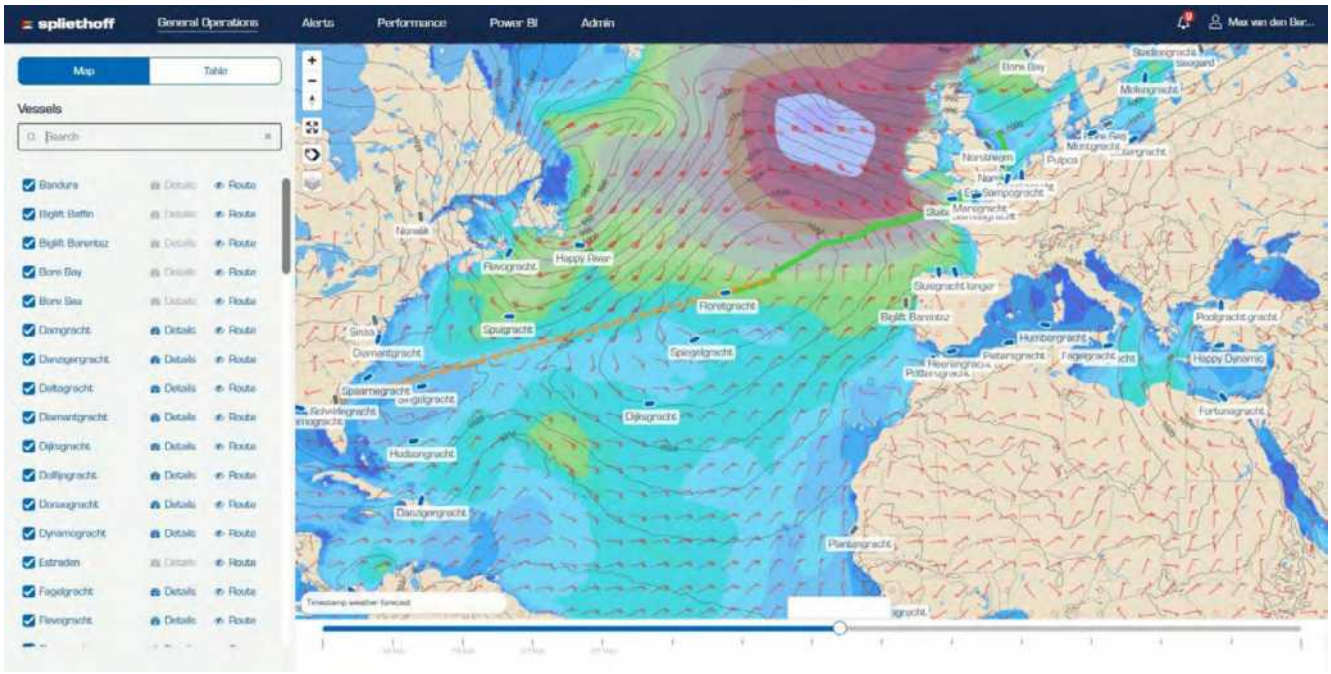
As presented in the previous sustainability report, the bulbous bow of our P8 and P14-type vessels was redesigned to meet the lower draft and speed profile the vessels are operated on. The smaller and flatter bulb was designed to reduce the calm water resistance at lower speeds and to reduce the added resistance due to waves.

As we have been sailing the Pauwgracht with this modified bow for over a year and a half now, all the while gathering data from the performance monitoring system installed on all P8 and P14 vessels, we have been able to study the in-service performance of the modified bow in more detail.
Although the monitoring time seems long, the very diversified use of the vessels still makes comparison difficult. A voyage via the Northern Sea Route is very different from a voyage in the Mediterranean which again differs from a westerly Cape Horn voyage.
The general conclusion is that the modification performs as expected. In calm waters at lower speeds the modified bulb performs better. In less moderate weather, for example during an ocean crossing, the modified bulb shows a saving in required power. In this graph the relative fuel consumption on longer voyages is presented as a function of the speed.



Looking at the total fuel consumption over one year, the numbers of the Pauwgracht also look favorable. However, the wide variation in sailing routes and in different seasons has a large influence on this comparison. More data needs to be measured and analyzed to come to a final judgement on the overall performance improvement.

07 Fleet performance 2.0



As mentioned in our previous sustainability report, we are focusing heavily on data collection systems and providing tools to support our operations and crews in order to optimize the operation of our fleet.

This year we have jumped up to another level, by developing a new portal to support our business in order to ensure efficient voyages. We have named this portal TOP (Tactical Operations Platform).

This new portal integrates data and information from several platforms into one. The portal gives us real time insight in the vessel's location, operational status and the weather she is currently sailing in. It even allows to have a look backwards and forwards in time, which helps to learn from our experiences and to improve our planning as well.

The portal also tracks the performance of the vessels, using digital twins, which enables us to assess performance loss at an early stage, due to for instance fouling, upon which information we can decide to clean the vessel to bring down increased fuel consumption. The planned route of the vessel is also synced to shore, which enables greater insights in the vessel's schedule and allows us to optimize the operations. It also creates better understanding for the routing decisions being made.

Lastly, an alerting system is implemented so that an operator is notified whenever an exceptional situation occurs.

The TOP portal has fortified our basis for optimisation of the operation of our fleet; reducing fuel consumptions and increasing operational efficiency. The portal will be further developed over the years, to offer ever greater insights.

Spliethoff Group

committed to contributing to a more sustainable shipping environment

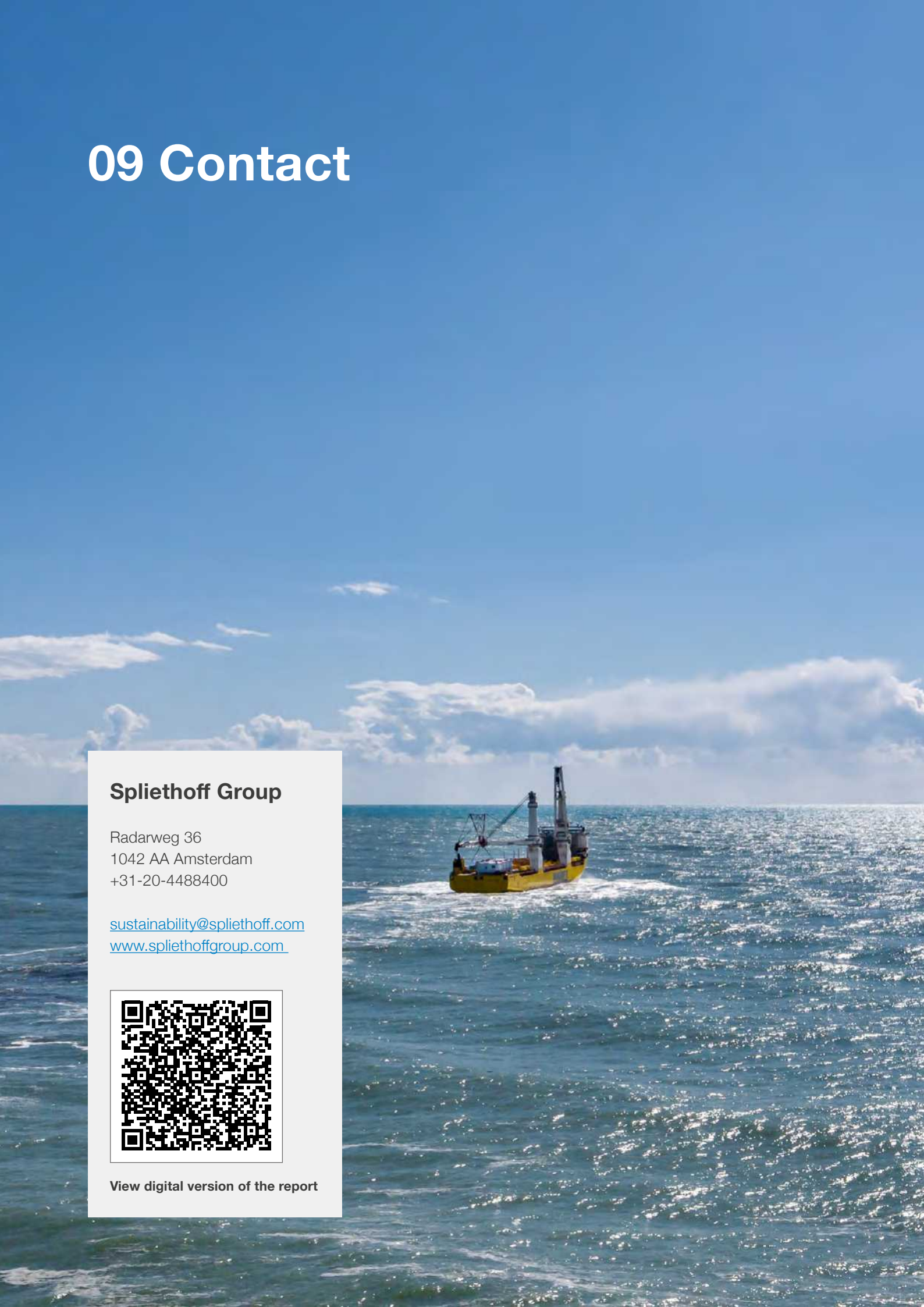
08 Spliethoff Group

The Spliethoff Group is one of the largest shipping companies in the Netherlands. With over a century of maritime expertise behind it, the Amsterdam-headquartered Group has a broad portfolio of specialised services in sectors including dry cargo, breakbulk & project cargo (Spliethoff) project & heavy lifts (BigLift Shipping), container & Ro-Ro cargo and door-to-door services (Transfennica & Transfennica Logistics), shortsea (Wijnne Barends), yacht transport (Sevenstar Yacht Transport and DYT Yacht Transport) and tonnage provider (Bore).

With a rich maritime heritage, Spliethoff Group provides quality services of the highest industry standards. A dedicated team of professionals is committed to making sure all cargoes are handled safely and efficiently. Drawing on Spliethoff's in-house engineering and logistic capacities, the companies within the Group work closely together to arrive at integrated and cost-effective solutions for clients.

The Spliethoff Group operates a large and modern fleet of more than 100 vessels ranging in size from 2,100 to 23,000 tonnes. Versatility and flexibility are at the heart of the Group's customer service and this is reflected in the fleet, which includes multipurpose, geared tween deckers, heavy lift vessels, shortsea vessels, Ro-Ro vessels and semi-submersible vessels. The company is used to operate in challenging areas, almost all the vessels have Swedish/Finnish Ice Class 1A and some even 1A Super.

09 Contact



Spliethoff Group

Radarweg 36
1042 AA Amsterdam
+31-20-4488400

sustainability@spliethoff.com
www.spliethoffgroup.com

View digital version of the report