



The Fleet Manager's  
*easy guide to*  
**BIOFOULING  
MANAGEMENT**



# Biofouling management made easier

Thank you very much for your interest in this guide to Biofouling Management. Global megatrends are most likely to impact your fleet maintenance strategy.

One megatrend is the growing number of guidelines, rules and regulations that are applied by industrial and governmental authorities to prevent the threat of biological pollution (biofouling) of our globally shared waters.

Biofouling Management has become a strategic theme of growing concern in order to comply with governmental rules and regulations.

The rules and regulations require that you can document that the underwater hull and niche areas are clean when your vessels arrive in a growing number of ports and territorial waters.



In addition, it is widely known that a clean hull improves vessel performance and lowers fuel costs. This reduces carbon emissions as a result.

With this perspective, Biofouling Management has become a more important and complex task for fleet management teams in the maritime industry.

We have therefore created this guide to provide you with an easy-to-consume introduction to Biofouling Management and managerial situations in which you should pay extra attention to the task.

We sincerely hope that this guide will be enriching to you.

C-Leanship A/S



# What is Biofouling Management?

Biofouling Management is a task to minimize biofouling on a vessel's hull.

It is a managerial maintenance task in collaboration with external service providers, the captain, and colleagues from HQSE.

The importance of the task has its origins in IMO's guidelines and specific legislation for entry into a growing number of ports and territorial waters.

Both guidance and legislation aim to protect the global port and marine environments against biological pollution and the spread of unwanted invasive aquatic species.

However, it is important to add that Biofouling Management is also about keeping the vessel's hull as clean and friction-free as possible. It helps improve the vessel's performance with reduced fuel costs and reduced CO2 emissions as a result.

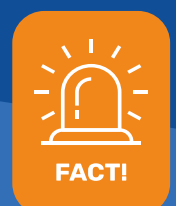
A Biofouling Management Plan for each individual vessel is one of the most important tools. It enables you to plan and keep track of your activities to protect and clean the underwater hull and niche-areas from unwanted biofouling.

The Biofouling Management Plan is closely associated with the Biofouling Management Record Book for ongoing journaling of inspection data and cleaning activities.

Combining the Plan and Record Book typically forms the framework for audits and compliance with the authorities' mandatory documentation requirements.

## Biofouling:

*"The accumulation of marine animals, plants and algae on the surface of ships and other marine structures."*



FACT!



# Biofouling management Plan:



- Vessel data
- Anti-fouling system
- Anti-fouling certificates
- Vessel operating profile
- Area description
- Anti-fouling operations & maintenance
- In-water cleaning & maintenance
- Safety
- Disposal of biological waste
- Recording requirements
- Training





# Why should Fleet Managers be interested in Biofouling Management?



## Stricter regulations and requirements for protection against biological pollution

Public authorities are introducing stricter regulations and requirements for protection against biological pollution and the spread of invasive aquatic species in global port and marine environments.

In this context, it is typically expected that you have an overview and insight into the vessel's documentation for compliance with environmental requirements and regulations from the relevant authorities (embodied in the vessel's Biofouling Management Plan).



## Reduction in fuel costs

Biofouling Management has always been important in terms of vessel performance and fuel economy. Several studies indicate that even early growth of slime and algae can have considerable impact on the fuel consumption of a vessel.

For this economic reason alone, it is important that Fleet Management teams take an interest in Biofouling Management.

UP TO  
**22%**  
Savings in fuel consumption<sup>1</sup>



## Green transition and reduction of CO2 emissions

The maritime industry is busy with the green transition in order to live up to the market's expectations for achieving the industry's target for reducing CO2 emissions to achieve a competitive advantage with good CII ratings and EEXI certifications. Both new industrial performance indicators will take effect as of January 2023.

UP TO  
**25%**  
Increase in GHG emissions<sup>1</sup>

<sup>1</sup>) *Analysing the Impact of Marine Biofouling on the Energy Efficiency of Ships and the GHG Abatement Potential of Biofouling Management Measures, IMO, 2022*

SITUATIONS WHERE

# Biofouling Management should get your attention

As part of the Fleet Management team in the maritime industry, you are naturally busy with tasks other than Biofouling Management.

However, there are typical situations in which Biofouling Management should, rightfully, be given more attention than otherwise. This should happen:



- SITUATION 01** When introducing and preparing a Biofouling Management Plan for a vessel(s) in the organization.
- SITUATION 02** When an anti-fouling solution must be selected and purchased for a vessel(s) in the organization.
- SITUATION 03** When the vessel's operational profile changes
- SITUATION 04** When the vessel has been idling.
- SITUATION 05** In cases of the inclusion of specially regulated waters or ports on sailing and freight routes.
- SITUATION 06** In connection with underwater inspection of the vessel's hull and niche areas.
- SITUATION 07** When underwater cleaning of the vessel's hull must be selected and purchased.
- SITUATION 08** When the vessel is dry-docked for inspection, repair, and maintenance



When introducing and preparing a Biofouling Management Plan for vessels in your organization

# Getting started with Biofouling Management

More and more Fleet Management teams are tasked with introducing plans for anti-fouling systems, and for maintenance and cleaning of the vessel's hull and niche areas.

As mentioned in the introduction to Biofouling Management, the Biofouling Management Plan is a central tool to plan and keep track of your activities to protect and clean the underwater hull and niche areas from unwanted biofouling.

A plan should be drawn up for each vessel you are responsible for.

## Preparing a Biofouling Management Plan

**Initially, the plan must describe the following:**

- ✓ Master data and operating profile for the vessel
- ✓ Information on applied anti-fouling system and certificates
- ✓ Information about the systems, hull and niche areas exposed to biofouling risk
  - + External hull surfaces
  - + Hull appendages and fittings
    - Steering and propulsion
  - + Seawater intakes and internal seawater cooling systems
- ✓ Plan and management actions for anti-fouling operations and maintenance

**In addition, organizational procedures and employee training must be described and incorporated in relation to:**

- ✓ In-water inspection, cleaning and maintenance between dry-docks
- ✓ Safety policies according to recommendations provided by your anti-fouling supplier
- ✓ Sustainable disposal of biological waste



# Continuously updating the Biofouling Management Record Book

Finally, you will have to prepare a system for the activity journal (Record Book) in relation to ongoing detailed recording of:

- ✓ Data and reports from in-water inspections and cleaning of systems, hull and niche areas
- ✓ Completed maintenance and cleaning actions on systems, hull, and niche areas

The vessel's activity log must also be prepared for continuous updates on:

- ✓ Periods of time when the vessel was laid up/ inactive for an extended period of time
- ✓ Periods of time when the vessel was operating outside its normal operating profile

With these you are well on your way to professional Biofouling Management.



## Free expert advice on biofouling management

Feel free to contact us for free advice and inspiration for the Biofouling Management Plan and how C-Leanship provides visual inspection data and reliable cleaning reports for easy journaling in the Biofouling Management Plan's Record Book.

[CONTACT US HERE >>](#)





When an anti-fouling solution must be selected and purchased for a vessel(s) in the organization.

# Which Biofouling Management strategy to pick?

You should be concerned with Biofouling Management when your company has to choose and purchase the right anti-fouling solution for the long-term reduction of biofouling on the hull of your vessels in the fleet.

**First of all, the choice of strategy should interest you in relation to:**

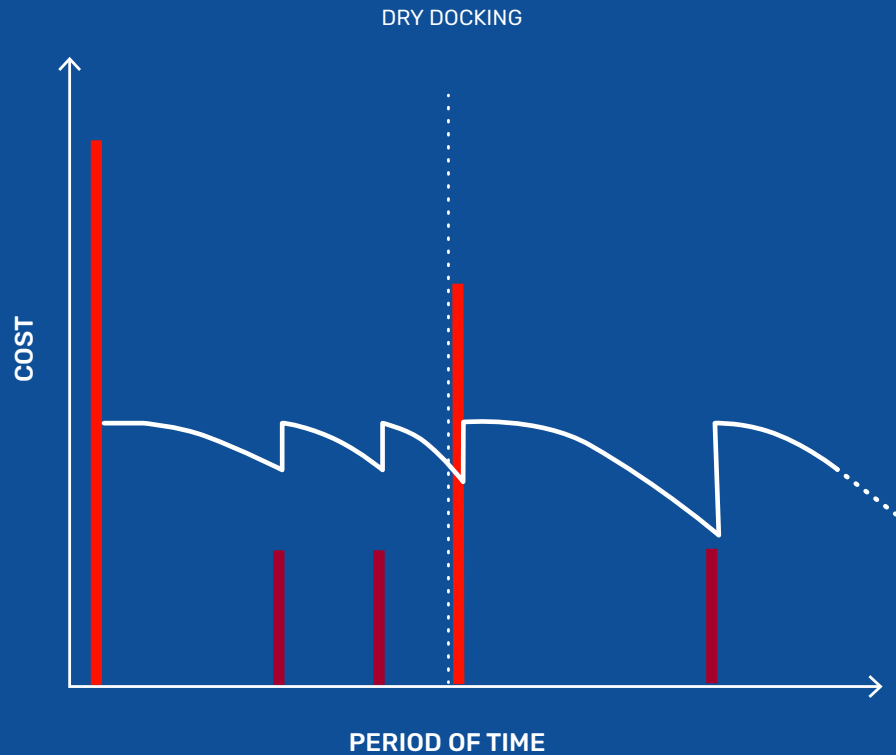
- Cost
- Lifetime effectiveness of the anti-fouling system
- Flexibility in the vessel's operational profile

**The choice of strategy can be narrowed down to 3 options:**



# Preventive Strategy

- ANTI-FOULING SYSTEM COSTS
- HULL CLEANING COSTS
- ANTI-FOULING EFFECTIVENESS



*This graphic is for illustrative purpose only*

**A preventive strategy requires that heavy investment is made in the acquisition of advanced anti-fouling systems (paint, coating, surface treatment, and devices) with guaranteed anti-fouling certificates.**

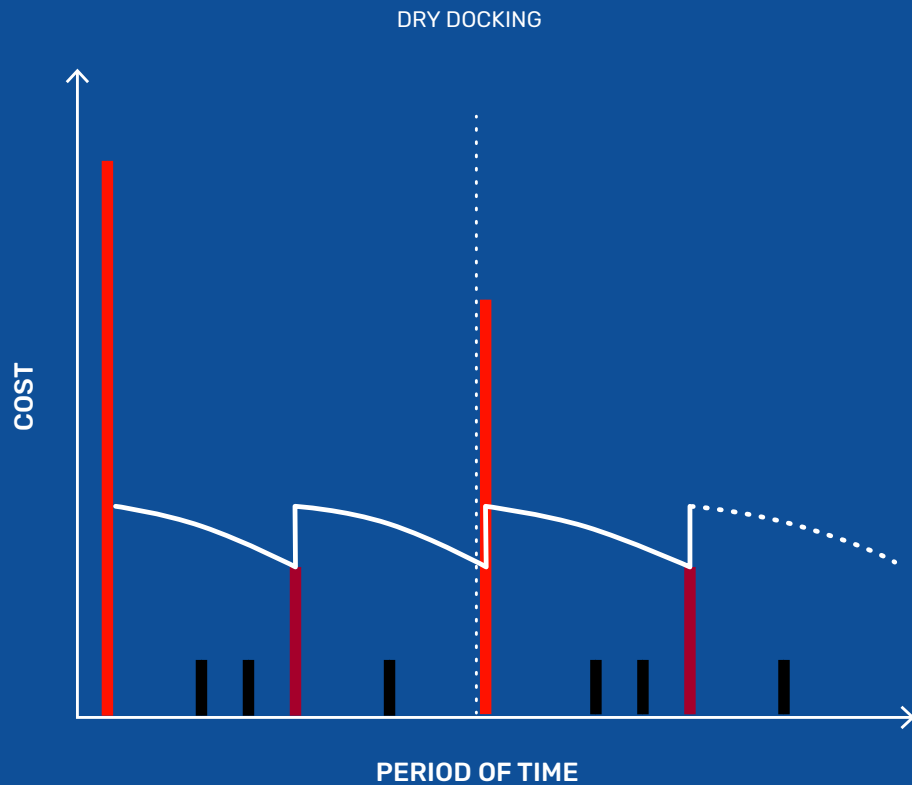
It is still expected that there will be a need for hull cleaning, but there is a high trust in the preventive systems and hull cleaning and/or inspection is kept to a minimum. It is believed that the anti-fouling system, and guarantees, prevent bio fouling.

**The advantages** can be less administration of the Biofouling Management Plan and lower maintenance costs for cleaning the hull in the periods between planned dry docking.

**The disadvantages** can be high acquisition costs and less flexibility in relation to changes to the vessel's operational profile (if the lifetime of the anti-fouling solution and the warranty certificate are to be maintained).

# Responsive Strategy

- ANTI-FOULING SYSTEM COSTS
- HULL CLEANING COSTS
- HULL INSPECTION COSTS
- ANTI-FOULING EFFECTIVENESS



*This graphic is for illustrative purpose only*

**A responsive strategy requires the least possible investment is made in a preventive anti-fouling system (paint and coating) and more is invested in planned underwater services for the vessel’s hull and niche areas.**

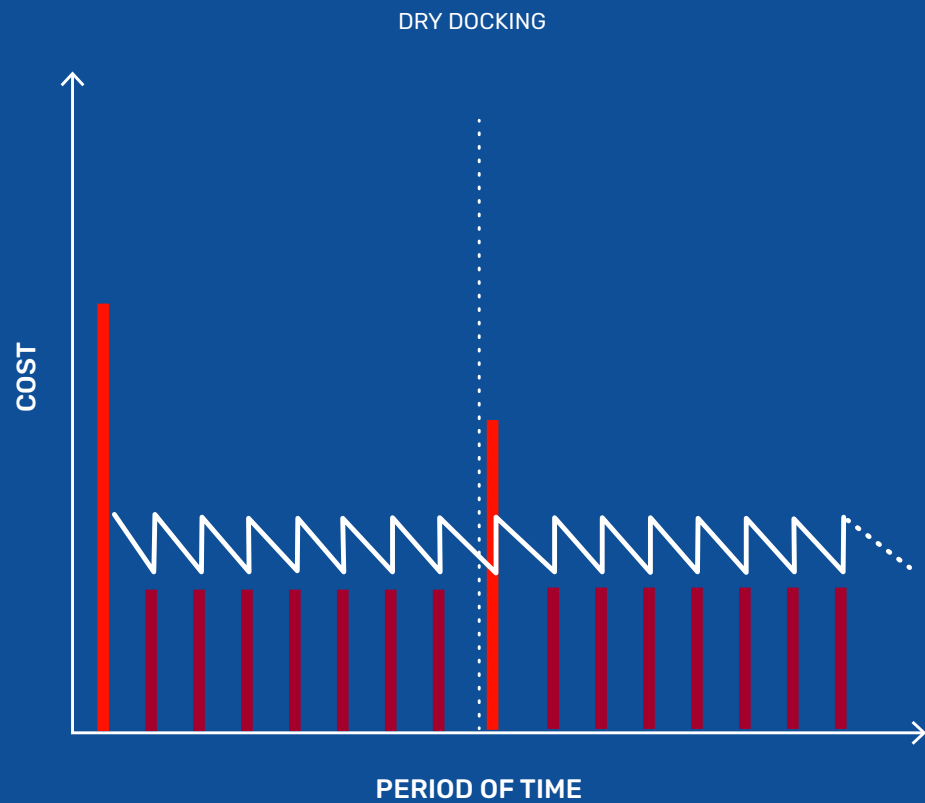
**The advantages** are lower acquisition costs for the anti-fouling system and more flexibility in relation to changes to the vessel’s operating profile.

**The disadvantages** are higher ongoing costs for cleaning the vessel’s hull, as well as more administration of the Record Book.

**For the record**, it should be noted that regular cleaning of the vessel’s hull does not necessarily add additional downtime to the vessel’s operation. Our ROV technology makes it possible to clean the vessel’s bunkering, in the port terminal and at anchorage.

# Proactive Strategy

- ANTI-FOULING SYSTEM COSTS
- HULL CLEANING COSTS
- ANTI-FOULING EFFECTIVENESS



*This graphic is for illustrative purpose only*

**A Proactive Strategy is to choose a Biofouling Management strategy that prevents biofouling with the combination of a solid anti-fouling system (paint, coating, surface treatment and devices) and regular hull cleaning.**

It is a strategic choice with approximately equal distribution of costs for prevention and control in order to avoid bio fouling growth.

With the choice, you and your colleagues acknowledge the risk of biofouling on the vessel's hull despite preventive measures and therefore perform hull cleaning on a planned schedule no matter the condition or performance data.

**The advantage** of this choice is flexibility in relation to changes to the vessel's operational profile, as well as ongoing documentation of the hull's condition in relation to the life of the anti-fouling solution and the need for cleaning.

**The disadvantages** may be more administration and updating of the Record Book.



When the vessel's operational profile changes.

# Underwater inspection and updating the Biofouling Management Plan

The operating profile of your vessel(s) may change in relation to fleet capacity and market conditions.

The changes in the operational profile can also influence the risk profile for biofouling.

For example, the changes may result in the vessel having to operate in new, warmer waters with a lower sailing speed.

These changes can expose the vessel to more biological growth than the vessel's preventive anti-fouling system is designed for.

**In connection with changes to the vessel's operating profile, many peers choose to conduct an underwater inspection of the vessel's hull and niche areas.**

In this way, you gain insight into the hull's current condition and can plan maintenance activities in relation to:

- Extending the life of the anti-fouling system compared to planned dry-docking
- Optimizing the vessel's performance with the new operating profile
- Reduction of carbon emissions with better CII ratings and EEXI certification

As part of the fleet management team, you should revisit the Biofouling Management Plan and update the vessel's operating profile, if the vessel is about to change long-term speed or sailing and freight routes.

When you update the vessel's operating profile for short-term changes in the vessel's operation, be aware that you should also specify and describe the relationship between the vessel in motion and periods when the vessel is stationary (at anchorage or in the port terminal) in the plan's Record Book.

At the same time, you should update information on the planned duration between dry-docking periods.





When the vessel has been idling

# Fleet Management teams should pay extra attention to Biofouling Management when a vessel has been idling.

This is especially true if the vessel has been idling for a longer period of time in warm waters – in the so-called Biofouling “hotspots” with water temperatures above 25°C.

Periods of idling impose a greater risk of growing underwater Biofouling and, not least, a risk of more rapid growth of Hard Biofouling (barnacles etc.).

If your vessels have been idling for some time, it is highly recommended that you get the underwater hull inspected to:

- Make sure your Biofouling Management Plan and Record Book is fully updated
- Use the information to plan for the next in-water hull cleaning if Biofouling is detected
- Safeguard the anti-fouling coating/paint by preventing excessive growth of Hard fouling (that is harder and potentially damaging to clean)



In cases of the inclusion of specially regulated waters or ports on sailing and freight routes.

# Inspect or clean the hull if in doubt about regulatory compliance

**Some countries and states have already introduced legislative rules and regulations to protect the marine environments from invasive aquatic species.**

This is why Fleet Management teams should pay extra attention to Biofouling Management when vessels operate on a sailing route that includes specially regulated territorial waters and ports.

It generally applies that the following requirements must be complied with before entering regulated waters and ports:

1. Anti-fouling declarations and certificates must be valid
2. Biofouling Management Plan is up to date
3. Biofouling Management Record Book contains detailed inspection data
4. Cleaning of hull and niche areas is performed prior to arrival

Be aware that regulatory 'clean hull' compliance is expected to be applied in a growing number of countries and states.

## Regulatory overview & insights

Visit our updated list of countries in which special regulatory compliance is applied to learn about the specific requirements.

[VISIT OUR LIST >>](#)



# In doubt? Get the hull inspected!

If your vessel's sailing route is expected to include authority-regulated waters and ports and you are not sure whether your vessel complies with the authorities' requirements, the simplest advice is to have the vessel's underwater hull and niche areas inspected.

An in-water inspection gives you quick visual documentation of the condition of the hull in relation to the overall coverage and precise locations of biofouling. The inspection report is easily added to the Biofouling Management Record Book as documentation.

This inspection report with visual data enables you to decide what maintenance and cleaning activities must be done before taking the risk of arriving in regulated territorial waters and ports.

## Cleaning according to regulations

Visit our website to learn more about our regulatory compliant hull cleaning services

[VISIT SERVICE PAGE >>](#)





*In connection with underwater inspection of the vessel's hull and niche areas*

# A visual shortcut to informed maintenance decisions

Underwater hull inspection is a powerful element in any Biofouling Management strategy.

Fleet Management teams should pay attention to Biofouling Management in a situation where they have planned for an underwater hull inspection to understand the current condition of the vessel's hull.

Also, situations where there is concern about the condition of the hull may arise. This may happen due to poor vessel performance data or an unexpected short-term port of call into territorial waters and ports with a high degree of biofouling regulations with which to comply.

In that respect, errors with the vessel's mechanics and software systems play a big role in bad vessel performance. But it's evident that underwater hull biofouling impacts vessel performance as well.

The impact of Biofouling on vessel performance can be difficult to monitor and measure with regard to the hull and propeller before it's too late.

This is why an unplanned decision to perform an underwater hull inspection is a good idea to prevent operational losses in both the short- and the long-term.

In both situations, it is time to revisit your Biofouling Management Plan (the Record Book in particular).





# Informed decisions with visual biofouling data

Planned and unplanned underwater hull inspections are most likely the most efficient method to provide trustworthy visual data about Biofouling and the condition of the hull – both in relation to vessel performance and compliance with biofouling measures.

The visual data are delivered as subsea images or videos of the hull. The data, generally, show the *extent and types of Biofouling throughout the hull*.

Such underwater hull inspection data allow Fleet Management teams to make informed decisions about the need for hull cleaning to ensure a better and environmentally more sustainable vessel performance.

The visual data from the underwater hull inspection provide easy-to-record-data for the Record Book in your Biofouling Management Plan.

## Hull inspections during simops in port terminal

You might wonder how a decision to perform an underwater hull inspection impacts the core operations of your vessel.

The inspection is usually conducted by divers when the vessel is at anchorage.

Nowadays, you can inspect the underwater hull using safe and more regulatory reporting-compliant ROV technology during simultaneous operations while the vessel is in port terminal.

This is why core operations typically aren't impacted in terms of delays or unexpected deviations from the vessel's operating profile.



## Reliable ROV hull inspection

Visit our website and learn about our reliable hull inspection 24/7 services using safe and efficient ROV technology.

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# When to inspect the hull of a vessel?

Unless your vessel is equipped with a hull monitoring system, there are no exact measures to help Fleet Management teams decide when to perform a hull inspection to safeguard great vessel performance.

It all depends on a combination of parameters:



01

Type and condition of the anti-fouling system (such as the antifouling coating)

02

The age and type of the vessel

03

Previous travelling routes of the vessel

Though, a proactive rule of thumb is to inspect the hull of the vessel every 6 months. This is especially true if the vessel has travelled in warm waters or has been idling quite a bit.

In general, it's also important to inspect the vessel's hull if you suspect any biofouling growth.

# What is learned from a hull inspection?

The visual biofouling data from the hull inspection reveals information about the exact coverage throughout the hull.

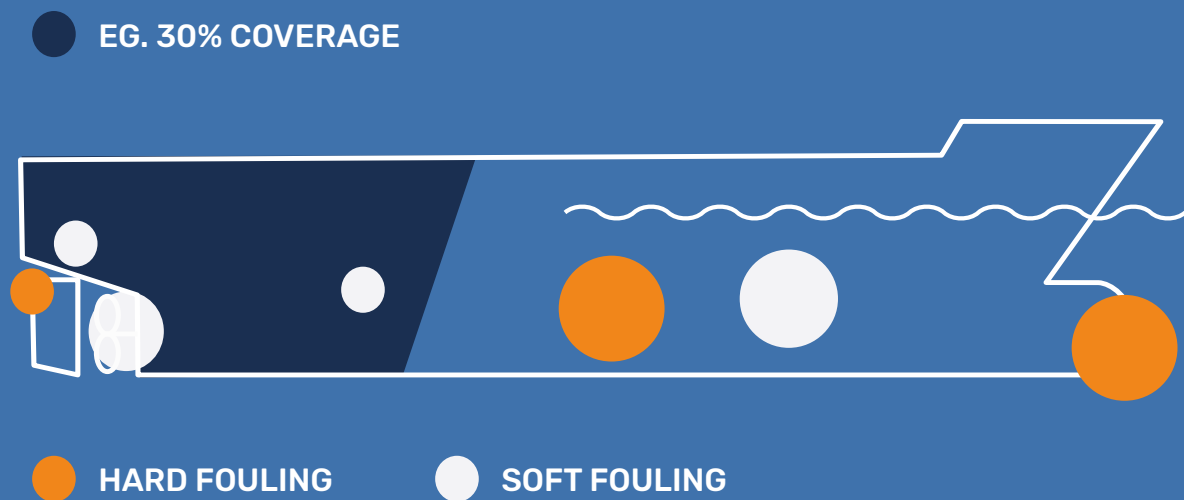
**But it also reveals important planning information about the biofouling on the hull - especially in terms of:**

- Overall coverage
- Precise locations
- Condition of niche areas
- Types of Biofouling

Indeed, this information is important for the prioritization and enablement of the right service and maintenance operations.

The visual inspection report from your service supplier must be added (as documentation) to your Record Book in the Biofouling Management Plan of the vessel.

In addition, the inspection data enables you to visually document the underwater condition of the paint/coating system.



*This graphic is for illustrative purpose only*



When selecting and purchasing an underwater hull cleaning solution

# Pick the right hull cleaning solution to comply and compete

Cleaning of biofouling on the vessel's hull and niche areas is an important task within Biofouling Management and technical maintenance.

The task has historically been most important when trying to optimize the vessel's performance in relation to expected punctuality and fuel costs on the sailing and freight routes.

In addition, the importance of the task has grown in relation to the competitiveness of the shipping industry within sustainable operations with less CO2 emissions and environmental compliance.

Therefore, you should also consider which type of hull cleaning solution you choose to purchase.





# Do you have a maintenance plan for proactive hull cleaning? Or do you prefer responsive cleaning?

First, let us look at the difference between proactive and responsive cleaning of the vessel's hull and niche areas.

## Proactive hull cleaning:

- Most relevant when the Biofouling Management strategy is based on the proactive strategy.
- Less relevant in prevention strategy
- Performed regularly and removes soft biofouling (slime, light algae)
- Is gentle to the hull's anti-fouling paint
- Reduces the risk of growth to medium and hard biofouling (hard fouling)

*worth noting that most system that are specifically build for this strategy do not have collection & filtration. this means that in some areas they will not be allowed to clean as there are requirements for collection & filtration*

## Responsive hull cleaning:

- Most relevant in prevention & responsive strategy
- Only performed upon specific observation of biofouling or in under-performing/poor vessel data for performance and fuel consumption
- Can remove most types of bio fouling
- Cleaning systems used for this strategy should have collection & filtration to protect the local environment.





# Planned maintenance or unplanned maintenance?

## Hull cleaning can be carried out as a **planned maintenance task** in connection with:

- The vessel's planned repair and maintenance during dry docking
- Regular proactive underwater cleaning while the vessel is in the port terminal or at anchor in the periods between planned dry docking

## In addition, hull cleaning can be carried out as an **unplanned maintenance task** in situations such as:

- After an underwater inspection that documents surprising biofouling on the vessel's hull.
- In case of justified suspicion of biofouling in relation to the vessel's poorer performance than otherwise.
- The vessel's operating profile changes and includes calls to waters and ports regulated by public authorities.
- If the lifetime of the anti-fouling system needs to be extended temporarily before the next dry docking.

Regardless of whether the hull cleaning is planned or unplanned, the activity should be described in the Biofouling Management Plan and documented in the associated Record Book.

## Reliable ROV hull cleaning

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# Choose the right cleaning method and solution

There are different ways to solve the cleaning task.

- Can be performed by divers or with a pilot-controlled ROV (Remotely Operated Vehicle) underwater.
- In some cases, the combination of divers and ROV may be the best solution.
- Complete cleaning with simultaneous repair and maintenance of the anti-fouling system during dr docking.



## Advantages and disadvantages

Divers typically use brushes for cleaning. The method is effective against all types and degrees of biofouling. But the method carries the risk of damaging the anti-fouling coating. Some ROV technologies also use brushes with the same risk.

Use of cleaning with water jetting is most prevalent in ROV technologies. The method is gentle to the anti-fouling coating and effective against most types of biofouling. Some divers also use high pressure cleaning.

For Fleet Management teams, however, it is also relevant to evaluate the solution in relation to where, when and how the hull cleaning should take place.

The vast majority of vessel owners and operators prefer to be able to have the cleaning task carried out 24/7 in port terminals or at anchorage along the vessel's planned sailing and freight route – and preferably while waiting or carrying out simultaneous tasks such as bunkering and unloading/loading activities.





# Sustainability and data compliance

In relation to the solution of the task, you should investigate what is happening with regard to the sustainable collection and disposal of the residual biological waste from the vessel's hull.

Your hull cleaning provider should make sure that the biological waste is collected, filtered, and transported to the water's surface without releasing any debris into the water. At the same time, you should make sure that further disposal is conducted by environmental certified companies.



You should, of course, also investigate whether you get the necessary data for documented updating of the Biofouling Management Plan.

A growing number of authorities require a detailed cleaning report with “before and after” images including trustworthy documentation on where the images were taken of the hull and niche areas.



When the vessel is dry-docked for inspection, repair and maintenance



# Time to record and revise

When your vessel is dry-docked, you should update the Biofouling Management plan's Record Book.

A few simple facts about the actual dry-docking process must be recorded:

- Where, when and for how long?
- Information about the cleaning
- Information on updated anti-fouling system

The planned dry-docking should also give rise to a thorough evaluation of whether the existing Biofouling Management strategy should be revised in relation to new market conditions and the concrete experiences with the anti-fouling system, as well as the overall maintenance performed since the last dry-docking.

# About us

**We are an underwater service provider using field-proven ROV (Remotely Operated Vehicles) systems to deliver safe, reliable and sustainable underwater services.**



## **Inspection Service**

We provide safe and fast inspection of your hull and niche areas with our inspection ROV.

## **Hull Cleaning**

Hull cleaning with our Shipshiner ROV system, which is gentle on your anti-fouling coating. We cover vertical sides, flat of bottom as well as bulbous bow.

## **Cleaning according to regulations**

Some regulation requires additional inspections, niche area cleanings and reporting. We've got you covered with this package.

## **Propeller Cleaning**

We provide safe propeller cleaning and inspection with our PropShiner ROV – both inside the terminal and at anchorage.

## **More information**

Visit our website to learn about tomorrow's hull cleaning today

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