INTERNATIONAL MARITIME ORGANIZATION

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SUB-COMMITTEE ON POLLUTION PREVENTION AND RESPONSE
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Agenda item 7

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REVIEW OF THE 2011 GUIDELINES FOR THE CONTROL AND MANAGEMENT OF SHIPS' BIOFOULING TO MINIMIZE THE TRANSFER OF INVASIVE AQUATIC SPECIES (RESOLUTION MEPC.207(62))

Full report of biofouling survey 2021

Submitted by ICS, BIMCO and INTERTANKO

SUMMARY

Executive summary:	The document reports on the results of a survey asking shipowners and other stakeholders about their biofouling management
Strategic direction, if applicable:	1
Output:	1.19
Action to be taken:	Paragraph 14
Related documents:	PPR 9/7/3; PPR 7/7/1; MEPC 76/13/2 and resolution MEPC.207(62)

Introduction

1 MEPC 73 decided on the new output titled "Review of the 2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (resolution MEPC.207(62)".

2 Biofouling management is an important issue for shipowners because biofouling has the potential to transfer invasive aquatic species (IAS) and to increase the ship's drag in the water. An increased drag significantly reduces the hydrodynamic performance and increases fuel consumption, thereby impacting the ship's greenhouse gas (GHG) emissions.

3 In September 2021, BIMCO launched a biofouling survey to gain insights into how shipowners are managing biofouling, in-water cleaning and specially to learn about their experiences on the anti-fouling systems in use.

4 This information document presents the results of the survey together with possible explanations related to the work of the Sub-Committee. The full report is annexed to this document (annex 1).

Survey participants

5 The survey was conducted over a four-week period starting in September 2021. The survey aimed to collect information on biofouling management directly from entities that had a direct link to ships and anti-fouling systems (AFS).

6 Responses from 53 companies representing 5,668 ships were analysed. This sample size represents companies operating approximately 8% of the world merchant fleet*. Of the 53 companies, 43 identified themselves as being a shipowner or operator, nine as a ship manager, and one as a trading company.

7 The following insights were gained from the survey:

.1 of the 53 companies, 42 companies implement biofouling management on their ships;

.2 the survey gathered information about 88 AFS, which are not grouped into any brands or types but are all considered as separate and distinct entities as they are used on different ships operating with different profiles;

.3 67 of the 88 submitted AFS claimed a lifetime of 5 years, seven responses claimed 2.5 and 3 years each because their dry-dock cycle was 2.5 years rather than the popular 5-yearly dry-dock cycle;

.4 average claimed lifetime of all submitted AFS was 4.92 years; and

.5 the survey asked the participants' experience on the performance of the AFS against the claimed lifetime to determine effectiveness of AFS. Effectiveness is described as the ability of the AFS to prevent or control the attachment of unwanted organisms in ships' submerged surfaces, including the hull and niche areas.

How effective were the AFS?	**Number of AFS**
100% of claimed lifetime	18
80% of claimed lifetime	40
60% of claimed lifetime	21
40% of claimed lifetime	6
less than 40% of the claimed lifetime	3

8 In 90% of the responses the AFS lasted more than 60% of their lifetime. Three AFS lasted less than 40% of their effective lifetime. These seem to be cases of AFS failures where the reason for failure is not linked directly to the AFS themselves.

9 The respondents who indicated they undertook biofouling management (42) provided information about the methods used to assess the biofouling. The question only gave a choice of methods to choose and did not ask further details about them. The participants were allowed to choose more than one method.

* BIMCO ICS Seafarer Workforce Report 2021 calculated the world merchant fleet at 74,505 ships in international trade. The number does not include ships operating on domestic voyages and tugs less than 300 GT.

10 Several respondents used a combination of methods to assess the growth of biofouling. Physical inspection of the hull and niche areas to assess the biofouling was the most popular way to assess the biofouling growth.

11 Regular in-water inspection is a reliable method to assess biofouling growth and has the advantage that the condition of the AFS can also be observed. Ships are also inspected in connection with other activities. It is, for example, convenient to have divers inspect the hull in connection with a propeller polishing. Other reasons for inspections include to undertake an assessment of the propulsion power and fuel consumption over a specified period, related to the availability of services provided by divers, during idle periods or specified lay ups, as requested by the AFS manufacturer, where it is mandatory according to regulatory regimes, to arrive at a port or waters of a particular coastal State, for performance monitoring, for repair, for statutory/class, or to more broadly assess biofouling risk.

12 The next three popular methods of assessment are semi-automatic or manual calculations using data collected from ship's staff (e.g. noon reports), online hull performance monitoring systems, and conducting speed trials and comparing the performance, which represent methods that measure the energy consumption of the ship. These methods mainly calculate the fuel consumption and compare it with the speed of the ship under given conditions, including cargo quantity, trim, etc., and then make allowances for the prevailing weather and sea conditions including ocean currents.

13 The survey asked the participants about the first time they needed to clean their hull after application of AFS and number of cleanings in a given 5-year period. 22 (26%) of these AFS did not need any cleaning until their next dry-dock. Only seven AFS, representing 8% of the sample, needed to be cleaned within the first year. These included those AFS that failed and hard coatings (non-toxic) that are designed to be cleaned to be effective. The remaining AFS were cleaned between the first and the fourth year of service. On average, the AFS needed to be cleaned less than twice (1.84 times) every five years.

Action requested of the Sub-Committee

14 The Sub-Committee is requested to note the information provided in this document.

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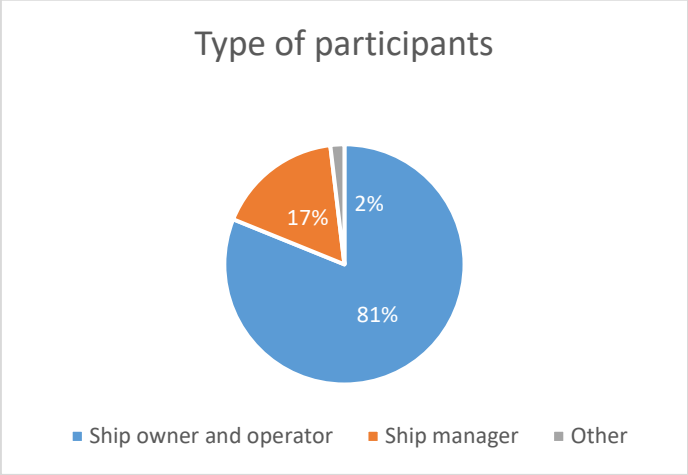
ANNEX 1

SURVEY REPORT

BIMCO conducted a biofouling survey among shipping companies (both members and non-members) over a four-week period starting in September 2021. The survey aimed to collect information on biofouling management directly from entities that had a direct link to ships and anti-fouling systems (AFS). The following are the results obtained from the survey.

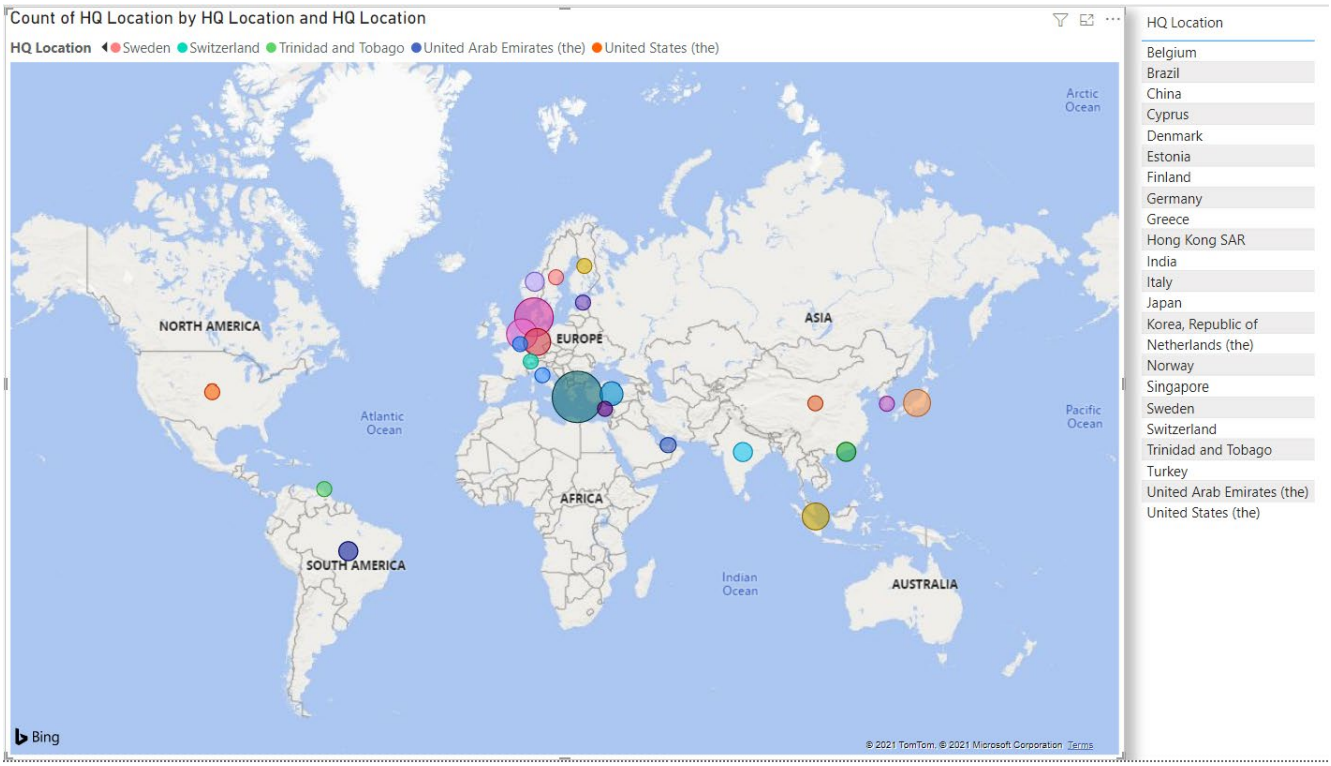
Fifty-seven companies participated in the survey. These included entries from shipowners, ship operators, trading companies, and related companies such as AFS manufacturers, cleaning equipment manufacturers, cleaning service providers, etc. Responses from 53 companies that have a direct link with ships and anti-fouling systems (AFS) were analysed further. These 53 companies represented 5,668 ships, which represents 8% of the world merchant fleet[1]

Of the 53 companies, 43 identified themselves as being a shipowner or operator, nine as a ship manager, and one as a trading company.



[1] BIMCO ICS Seafarer Workforce Report 2021, calculated the world merchant fleet at 74505 ships in international trade. The number does not include ships operating on domestic voyages and tugs less than 300 GT.

Following figure shows the geographical spread of the respondents



42 of the 53 companies (79%) reported that they implemented biofouling management on board their ships.

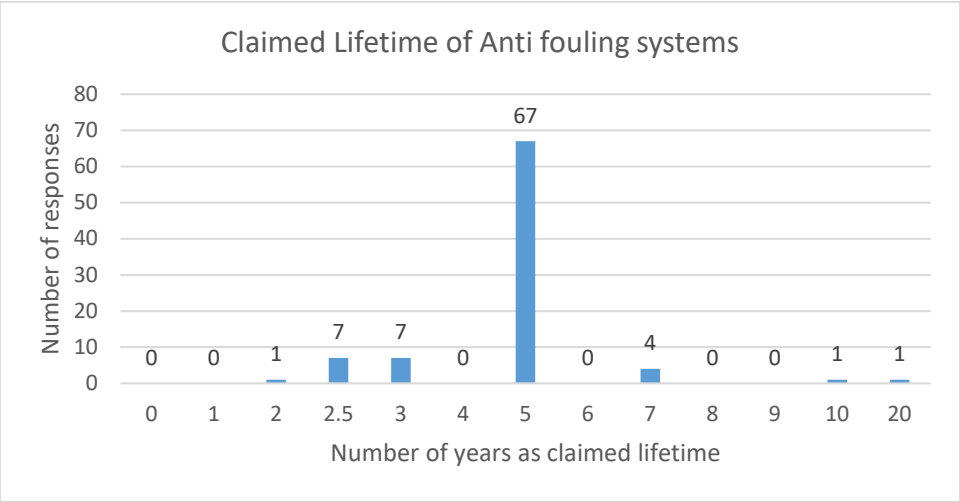
11 companies reported that they did not implement biofouling management. This can be attributed to the fact that the Guidelines are voluntary in nature, and it is not easy to follow and implement the Guidelines in their existing form, and lack of infrastructure such as availability of good quality in-water inspection and cleaning services in wide-ranging ports.

However, 10 of these companies asked to see the results of this survey, which indicates they may nevertheless have an interest in biofouling management.

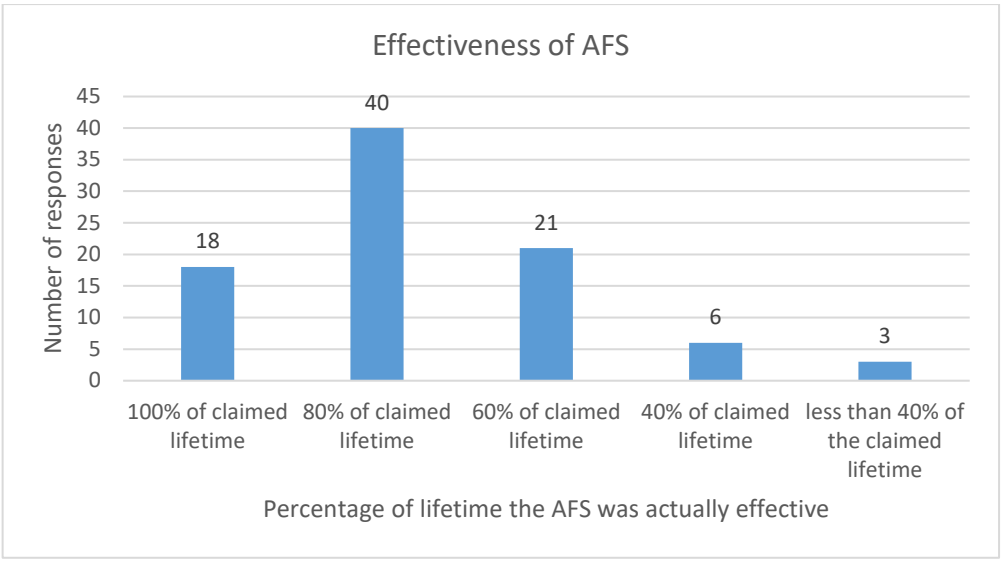
Participants were asked about their experience with biofouling management, especially with the anti-fouling system (AFS) used on board their ships. Each of them was asked to give details of up to three AFS on board their ships. The survey received information of 88 AFS. While some of these AFS were repeated, for this purpose they are not grouped into specific brands and/or types but each are considered as separate and distinct systems because they were applied on different ships, which operate in different conditions.

The average lifetime of the anti-fouling systems was found to be 4.92 years.

67 of the 88 submissions claimed a lifetime of 5 years, while the rest claimed a lifetime of either 2, 2.5, 3, 7, 10 or 20 years. The AFS that claimed 2.5- and 3-year lifetime were used on ships which follow the 2.5 yearly dry-dock cycle.



The survey also queried the participants on the effectiveness of AFS. Here, the effectiveness of AFS is described as its ability to prevent or control the attachment of unwanted organisms on ships' submerged surfaces, including the hull and niche areas. The question focussed to see if the AFS lasted their claimed lifetime and the deviation from them as noted by the users of the AFS. The table and graph below provide details on these.



As can be seen from the graph above, 90% of the AFS surveyed lasted 60% or more of their claimed lifetime and 66% of the responses stated that the AFS lasted more than the 80% of the claimed lifetime.

From the survey results, it seems that three AFS may have failed for unknown reasons as they only were effective less than 40% of the claimed lifetime. The reason for the failure of an AFS can be anything from low quality of the product itself or bad application in a shipyard to the ship having prolonged idle periods or damage happening to the surface during cleaning or cleaning at too frequent intervals. Here, it is believed, that the AFS may have failed due to other reasons than just a bad quality product. This hypothesis is built on the fact that other respondents reported that the AFS in question were performing much better.

For an AFS to last long, several factors must be in place:

a) The AFS manufacturer's required conditions of application of the AFS in the shipyard including the temperature, humidity, weather conditions, and workmanship of the people who apply it, should be optimal.

b) The ship should be operating continuously and in its planned profile, which includes the geographical area, the water salinity, speed and idle period amongst others.

c) The AFS should not be physically damaged by tugs, fenders during port stay, etc.

d) Cleaning should be carried out with care and only if needed. Cleaning will have an impact on the surface of the AFS and will remove or roughen its top layer. The frequency of cleaning and the quality of cleaning therefore plays an important role in maintaining the effectiveness of the AFS. Too frequent cleaning or an inappropriate method of cleaning may lead to the impairment of the AFS, leading to the loss of its effectiveness and thereby not lasting as predicted by the paint manufacturer.[2]

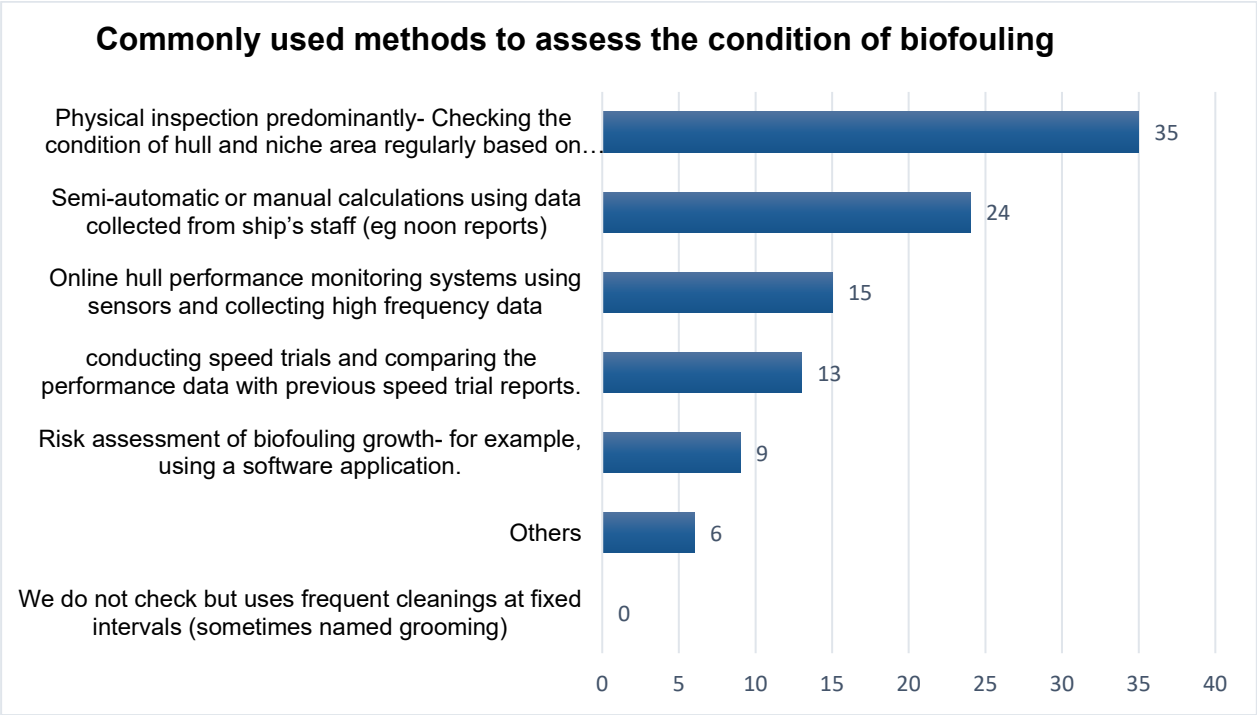
Therefore, when an AFS fails, apart from the product itself being poor, there could be a one or more of these factors that lead to the failure which needs to be carefully assessed and corrected to avoid future failures.

Methods used to assess biofouling growth

The survey queried on methods that were used to decide whether an inspection and/or cleaning was needed to be carried out. The table below shows the answers.

42 respondents replied to this question. If a respondent said "No" to using biofouling management, this part of the questionnaire would not be visible to him/her. The replies give a good picture of how biofouling growth is monitored.

[2] Hard coatings are excluded in our discussion, as hard coatings are not meant to be anti-fouling coatings and do not actively avoid the attachment of biofouling on them.



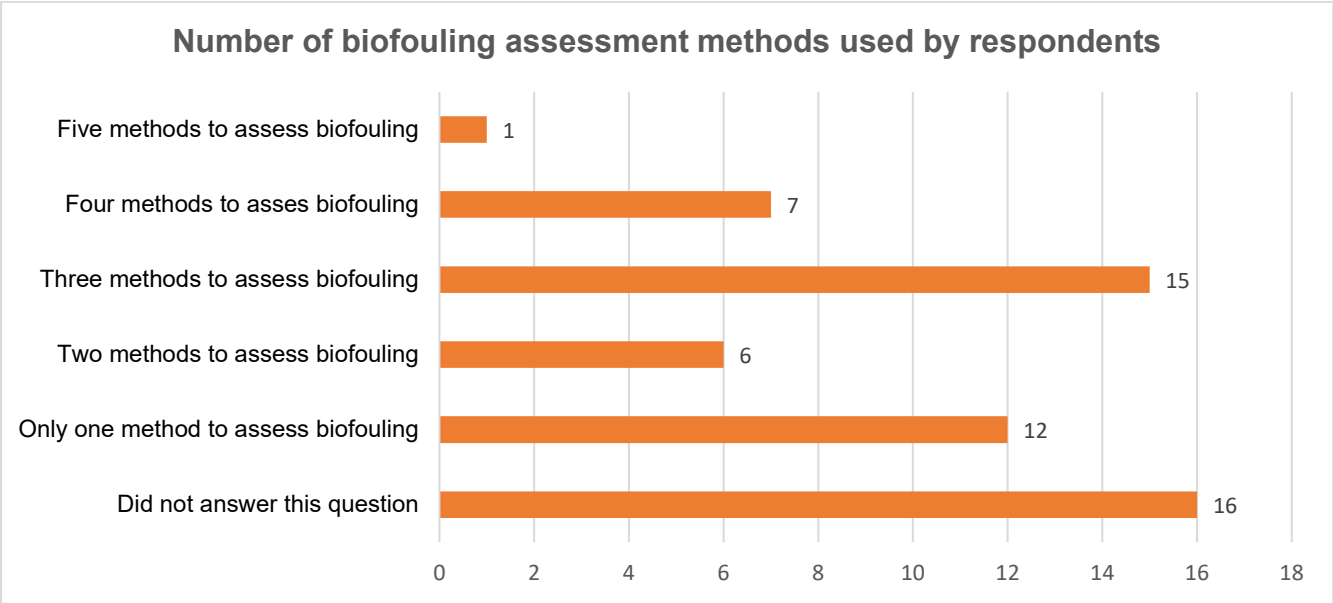
The most popular method was using physical inspection. The questionnaire did not ask for details about the inspections.

The next three popular methods are semi-automatic or manual calculations using data collected from ship's staff (e.g. noon reports), online hull performance monitoring systems, and conducting speed trials and comparing the performance; these represent methods that measure the energy consumption of the ship. These methods mainly calculate the fuel consumption and compare it with the speed of the ship under given condition, including cargo quantity, trim, etc., and then make allowances for the prevailing weather and sea conditions including water current. The result will indicate an estimated amount of biofouling growth on the ship's hull.

Some of the answers in the "others" category were

- "Some ships have been at anchorage for long time, waiting to load or discharge cargo (>30 days) that's why it has been necessary to carry out under water cleaning and propeller polishing"
- "Port requirements"
- "Depends on idle days, and trading patterns internationally"
- "Under water inspection based on earliest indication of rising fuel oil consumption in main engine"

Several respondents use more than just one method to assess the growth of biofouling. The following graph illustrates this



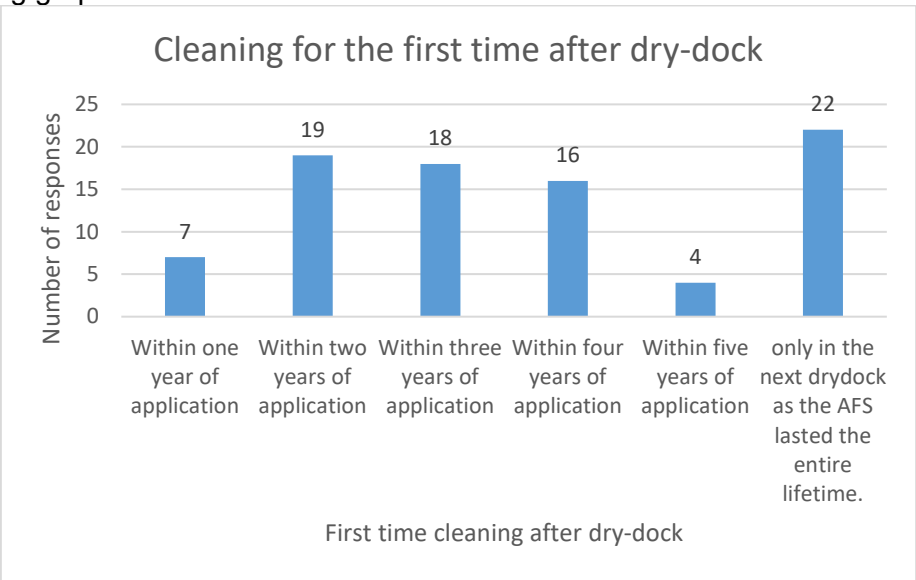
Cleaning of ship's hull

The survey gathered information on the frequency of cleaning (either in-water or out of water cleaning).

When there is biofouling build up on a ship's hull, it results in hull drag, which has a direct and negative impact on the performance of the ship in terms of loss of speed. To compensate for this loss of speed, the ship has to increase its power and therefore fuel consumption, which in turn results in higher fuel bills for either the charterer or the shipowner. The only way to reduce this financial impact is to remove the biofouling by cleaning the ship's hull.

Growth of biofouling directly affects these stakeholders in terms of financial loss. Therefore, these stakeholders have a direct financial incentive to ensure that the ship's hull is smooth, consequently they ensure that biofouling is removed well before the growth becomes significant.

The following graph shows this data.

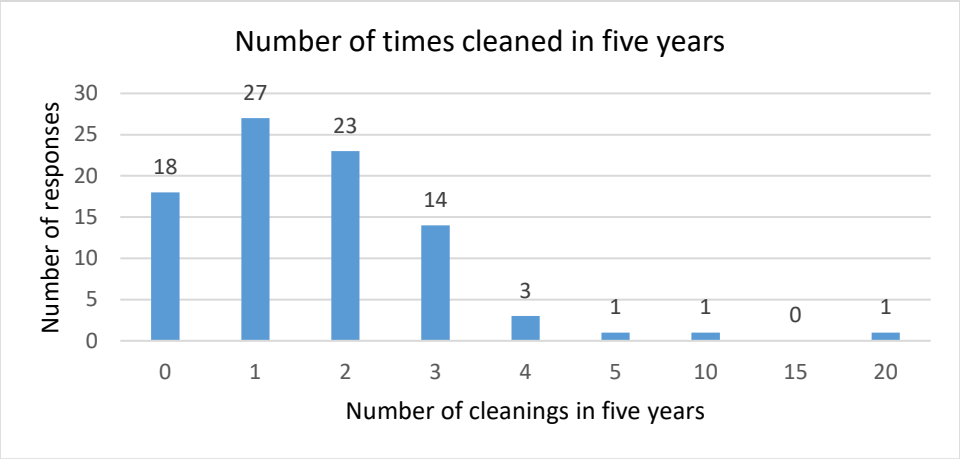


In cases where ships have been operated for many years, the hull drag has been monitored continually. The majority of 22 (26%) AFS were effective to the extent where the biofouling growth was not found before the ships entered the drydock after completing their dry-dock cycle.

Following this, majority of cleaning is conducted between first and fourth years of ship in service.

Only seven (8%) of 86 responses claimed that the AFS needed a cleaning within the first year of application. This includes non-toxic paints that, by design, need to be cleaned frequently during their lifetime.

On average the AFS needed to be **cleaned less than twice (1.84 times),** over a period of five years.



As can be seen, most of the AFS needed either no cleaning or one or two or three cleanings in 5 years. One AFS needed to be cleaned 5 times in 5 years, while one more AFS needed to be cleaned 10 times. These seem to be caused by an AFS failure. One AFS which was cleaned 20 times in 5 years involves hard coating without toxic properties. These hard coatings are meant to be cleaned frequently to remove the biofouling growth and to maintain a smooth hull.

Furthermore, in most trades involving time charter, ships are cleaned when the handover of the ship takes place between the charterer and the owner. This is also the case in offshore trade. A peculiarity of offshore trade is that ships (offshore boats) work in the same area and involve in long idle periods, which leads to the growth of biofouling. In most cases, these ships are cleaned every time there is a change of charterer, even if the charter party has lasted only a few months.

Challenges in the survey

While the survey managed to gather some good insights into the practice of shipowners and operators about biofouling management, there were some challenges in answering the questionnaire. It is not easy to generalise answers for a large fleet of ships, especially when the ships work in different profiles. For example, it is not easy to accurately estimate the effective lifetime of a particular AFS as they may be used on different ships operating in different conditions and therefore being affected by different trading and geographical conditions.

Furthermore, not every company follows the popular 5-yearly dry-dock cycles. There are companies that dock their ships every 2.5 years. This adds another level of complexity when estimating the average lifetime or effective lifetime of AFS. Despite the challenges in gathering and analysing the data, the survey provides some interesting insights into the practices followed.

Conclusion

From the survey above, it can be concluded that the commercial entities such as shipowners, operators and managers involved with a ship have a keen interest to keep ships free of biofouling. Biofouling management entails choosing the most appropriate AFS, continuously assessing the growth of biofouling by various and sometime combined methods, and cleaning the ships as soon as the need arises and at times before the need arises.

Furthermore, AFS manufacturers are continuously improving their range of products to cater for the demand and to get ahead of the competition. As a result, there are improved products on the market that last their lifetime and work effectively throughout this period.

It is interesting to note that shipowners and ship operators, who are users of the AFS, report that the quality and effectiveness of AFS have improved over the years resulting in lesser cleaning requirements.

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ANNEX 2

SURVEY QUESTIONNAIRE

The full survey questionnaire can be found here - https://form.jotform.com/211951779813970

It is also reproduced below.

BIMCO Biofouling survey

August / September 2021

Name of your Company *

BI

Location of Headquarters (select country) *

Denmark

Q1. How would you describe your Company's main activity?

- (●) Ship owner and operator
- ( ) Ship manager
- ( ) Other

Q2. How many ships does your company own/manage/operate ? *

200

Number of ships

Q3. On what type of charterparties (and how many) does your company operate? *

Type of charterparty *	Number of ships *	
Voyage charter (Spot market)	150	×
Time charter	150	×
Under own management	153	×
Other	150	×

+

Q4. Do you use bio-fouling management on your ships? *

Yes

Q5. Do you have regular contact with the Anti-Fouling System (AFS) manufacturers in between dry-dockings? (●) Yes ( ) No

Q6. Please name the three most used AFS products within your company. Please note that this information will not be shared outside BIMCO. Further, it will not be included in the final report.

AFS 1

Best AFS

AFS 2

2nd best AFS

AFS 3

3rd best AFS

For each of the mentioned AFS above, would you please give us some additional information

Q 6.1 The following questions relate to Best AFS (AFS 1) that you have chosen.

Q 6.1.1 - What is the average life-time claimed by your Anti-fouling system manufacturer?

Number years.

Q 6.1.2 - In your opinion, how long does the AFS actually remain effective ?

Q 6.1.3 - The first time the ship's hull needed to be cleaned after application of AFS coating was Please Select

Q 6.1.4 - How many times have you performed cleaning within a 5 year dry-dock cycle?

Number times.

Please Select

Q 6.2 The following questions relate to 2nd best AFS (AFS 2) that you have chosen.

Q 6.2.1 - What is the average life-time claimed by your Anti-fouling system manufacturer?

Number years.

Q 6.2.2 - In your opinion, how long does the AFS actually remain effective ?

Q 6.2.3 - The first time the ship's hull needed to be cleaned after application of AFS coating was Please Select

Q 6.2.4 - How many times have you performed cleaning within a 5-year dry-dock cycle?

Number times.

Q 6.3 The following questions relate to 3rd best AFS (AFS 3) what you have chosen.

Q 6.3.1 - What is the average lifetime claimed by your Anti-fouling system manufacturer?

Number years.

Q 6.3.2 - In your opinion, how long does the AFS actually remain effective?

Q 6.3.3 - The first time the ship's hull needed to be cleaned after application of AFS coating was Please Select

Q 6.3.4 - How many times have you performed cleaning within a 5-year dry-dock cycle?

Number times.

Q 7. To check the condition of AFS and accumulation of biofouling, what method do you use? Please choose all the options that apply to you.

- [ ] Physical inspection predominantly- Checking the condition of hull and niche area regularly based on calendar days and/or months.
- [ ] Risk assessment of biofouling growth- for example, using a software application.
- [ ] Online hull performance monitoring systems using sensors and collecting high frequency data
- [ ] Semi-automatic or manual calculations using data collected from ship's staff (eg noon reports)
- [ ] conducting speed trials and comparing the performance data with previous speed trial reports.
- [ ] We do not check but uses frequent cleanings at fixed intervals (sometimes named grooming)
- [ ] Others - please specify

Should you wish to receive a copy of the statistical analysis of the survey, please provide a valid email address below

example@example.com

Are you willing to be contacted if BIMCO have further questions for your company ?

Yes No

Name

First Name Last Name

Please state your position?

Please state your contact address

example@example.com

Phone Number

(000) 000-0000

Do you have other comments you want to share?

Feel free to add general question to the entire questionnaire

Save and Continue later Submit