

A PROCESS OF SELECTING AND APPLYING A PROTECTIVE COATING

FIELD OF THE INVENTION

5 The present invention relates to a process of applying a protective coating to a vessel, wherein the protective coating is selected on the basis of a novel method which takes into account the risks associated with regions where the vessel is expected to travel. The present invention also relates to the manufacture and supply of the protective coating selected in accordance with the selection-method, and a computer system or computer
10 program product that is used for carrying out the selection-method (completely or in part).

BACKGROUND ART

Protective coatings for different vessels are posed with different challenges, depending not
15 just on the type of vessel but also the geographical location of that vessel. This is because different regions/locations will present different risks/challenges to the protective coatings on the vessel. Provided herein is a novel method for selecting the most suitable protective coating for a vessel, in particular a movable vessel. The selected protective coating is selected by taking into account the regions (locations) the vessel has been, or is expected
20 to be located in the future, and the risks and challenges the protective coating is expected to endure as a consequence of its location(s).

Known methods for selecting a protective coating often do not take into account the location(s) of that vessel over time. Sometimes the principle that "one size fits all" is
25 applied for selecting a protective coating for a vessel. Following this principle, the same type of coating or binder system is selected for the vessel irrespective of its location(s) and the consequential challenges that are posed to the integrity of the protective coating as a result of its location over time. Protective coatings for vessels are also sometimes selected on the basis of cost, or the type of vessel to be coated. Consequently, the
30 protective coating does not necessarily suit the risks and potential challenges that lay ahead. If the selected protective coating is not suitable, then the vessel will experience a greater risk of failure or damage compared to if a more suitable protective coating was selected.

It is known to use fouling-control coatings on marine vessels immersed in an aquatic environment, for instance as a top coat on underwater hulls to inhibit the settlement and growth of marine organisms such as barnacles and algae, generally by release of a biocide. Man-made structures such as boat hulls, buoys, drilling platforms, oil production rigs, and pipes which are immersed in water are prone to fouling by aquatic organisms such as green and brown algae, barnacles, mussels, and the like. This fouling is particularly a nuisance on marine vessel hulls because it increases frictional resistance during movement through the water, the consequence being reduced speeds and/or increased fuel costs. In addition, fouling makes it difficult to inspect the vessel structure for defects such as stress cracking and corrosion.

The term "fouling-control coatings" used in the present application is intended to cover, without limitation, all coatings used to inhibit the settlement and growth of marine/aquatic organisms, including for example, anti-fouling coatings and fouling-resistant/non-fouling coatings. Fouling control-coatings, include for example, vinyl resins, rosin-containing resins, rubber coatings such as those disclosed in GB 1,307,001 and US 3,702,778, fluorinated polymers such as those described in JP 04-045170, JP 61-043668 and JP 06-322294 and "self-polishing copolymer" (SPC) paints such as described in GB-A-1 457 590, EP779304, WO2005005516, WO200202698, WO2004018533 or WO201018144 and WO9937723, Silyl Acrylate systems such as described in WO 00/77102 A1, US 4,593,055, US 5,436,284, EP 0 802 243, EP 1 127 902, EP 1 127 925, EP 0 775 733, EP 1 310 530, EP 1 367 100, US 2006/0189708, and WO 2005/005516, and Copper Acrylate systems such as described in EP-A-204 456, EP-A-779 304, WO98/53015 and EP1167398.

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Fouling control coatings include, for example, all coatings disclosed in the following review articles: Alistair A. Finnie and David N. Williams, Chapter 13, "Paint and Coatings Technology for the Control of Marine Fouling", in Biofouling, (Eds Dürr S & Thomason JC), Wiley-Blackwell, Oxford, 2009; and/or Yebra, D.M., Kiil, S. & Dam-Johansen, K. (2004) Antifouling technology – past, present and future steps towards efficient and environmentally friendly antifouling coatings. Progress in Organic Coatings, 50, 75-104. Different marine vessels which are immersed in an aquatic environment experience vastly

different fouling challenges depending on many factors such as the routes the marine vessel takes, the speed of travel and the form of the hull (i.e. the shape and material of the hull). Currently, when a protective coating is selected, the selection process does not take into account factors that indicate different risks or challenges posed by the environment. If the protective coating to be selected is a fouling-control coating, and an unsuitable fouling-control coating is selected, then the marine vessel will experience a greater risk of fouling than if a more suitable fouling-control coating is selected, leading to excessive fouling, a reduction of the speed of the marine vessel, increase in fuel costs, increase in fuel emissions into the atmosphere, an increase in the risk of translocation of invasive species from one aquatic environment to another, and an increase in frequency carrying out maintenance and repair.

The inventors have identified a need for an improved and more accurate method for selecting a more appropriate protective coating for a vessel. Selecting, providing and applying a coating to the vessel in accordance with the method provided herein, will result in a coated substrate designed to cope with the challenges expected to be endured. As previously discussed, the same cannot be said for selecting, providing and applying coatings in accordance with current methodology. Using the most suitable coating has a number of technical advantages. For example, the use of a more suitable coating will result in less damage to the coated substrate, less maintenance and repair having to be carried out, and consequently less emission of VOCs into the environment. If the coating is a fouling-control coating, there should be less fouling and consequently less drag and associated fuel costs.

DESCRIPTION OF THE INVENTION

The present invention provides an improved (more accurate) process for selecting a protective coating for a vessel which is suitable for the predicted challenges expected to be endured.

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In particular, the present invention provides an improved (more accurate) process for selecting a protective coating for a vessel, wherein the protective coating is selected on

the basis of regions of the environment the vessel is expected to travel and the risks these regions of the environment pose to the deterioration of the protective effect of the protective coating.

- 5 The present invention also provides a process of applying a protective coating to a vessel comprises the following steps:
- (i) selecting a protective coating, wherein the selection is made on the basis of risks associated with regions where the vessel has travelled or is expected to travel;
 - 10 (ii) providing the protective coating selected in step (i); and then
 - (iii) applying the protective coating provided in step (ii) to the vessel.

Once the protective coating has been selected in accordance with the method described herein, this protective coating is *provided* and then *applied* to the vessel.

- 15 By *providing the protective coating*, we mean (i) the manufacture/preparation of the protective coating composition, and/or (ii) the sourcing/supplying of the protective coating composition, from one or more location(s) to the vessel, ready to be applied.

- 20 By *applying the protective coating* we mean: applying the protective coating composition on to the surface of the vessel thereby forming a curable and/or dryable coating film, and then allowing the curable and/or dryable coating film to cure and/or dry thereby forming a protective coating on the surface of the vessel. Application of the protective coating may be by any means, for example, by spray or by brush.

- 25 In more detail, the present invention provides a process of applying a protective coating to a vessel comprising the following steps:

- (i) selecting the protective coating, where in the method of selecting the protective coating comprises the steps:

- 5 (a) dissecting the environment into regions, and associating a risk rating with each region,
- (b) obtaining information about the route(s) the vessel has historically taken and/or will take in future through the environment, over a specified period of time,
- (c) determining which regions of the environment the vessel has travelled and/or will travel through over the specified period of time,
- 10 (d) combining the data from steps (a), (b) and (c) to calculate the average risk rating the vessel has experienced and/or will experience in the specified period of time, and
- (e) based on the average risk rating calculated in step (d), selecting a protective coating that has been associated with that average risk rating,
- (ii) providing the protective coating selected in step (i)(e), and then
- 15 (iii) applying the protective coating provided in step (ii) to the vessel.

Risk in the context of the present application should be understood as the likelihood that the activity the protective coating is protecting against will occur. For example, if the coating is a fouling-control coating, the risk relates to likelihood that fouling will occur; if the coating is an anti-corrosion coating, the risk relates to the likelihood that corrosion will occur; if the coating is a coating for protection against solid and liquid particle abrasion, the risk relates to the likelihood that abrasion from liquid particles (e.g. rain) or solid particles (e.g. dust or sand) will occur; if the coating is for protection against deterioration due to UV absorbance, the risk relates to the likelihood that deterioration due to UV absorbance will occur; if the coating is for protection against ice, the risk relates to the likelihood that ice build-up will occur.

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A vessel is a moveable object, capable of moving throughout the environment. For example, the vessel may be a marine vessel (a submarine, yacht, tanker ship, fishing boat,

ferry, or a fresh water vessel/boat such as a canal boat, and a motor boat), land vessel (an automotive vehicle, truck, lorry, bike) or an airborne vessel (an aircraft).

5 The environment is all locations that the vessel may travel, be located and be in contact with. By dissecting the environment into separate regions, we mean spatially distinguishing different regions of the environment from other regions. The dissection of the environment into different regions is based on the perceived risk posed to the protective coating in that region of the environment. If the protective coating is a fouling-control coating, then the risk is related to the amount/type of fouling that may occur in that region. If the protective
10 coating is an anticorrosive coating, then the risk is related to the amount of corrosion that may occur in that region. The spatial dissection of the environment may be in two-dimensions or in three-dimensions.

The method/process described herein could be used to select (provide and apply):

- 15 (a) a coating for protection against marine fouling, such as a marine fouling control coating, wherein the vessel is a marine vessel, and the challenge/risk faced by the coating is the risk of marine fouling,
- (b) a coating for protection against corrosion, such as an anti-corrosive coating, wherein the vessel is a marine, airborne or a land vessel, and the
20 challenge/risk faced by the coating is the risk of corrosion,
- (c) a coating for protection against solid and liquid particle abrasion, such as a (cosmetic) top-coat, wherein the vessel is a marine, airborne or land vessel, and the challenge/risk faced by the vessel is the risk of abrasion from liquid particles (e.g. rain) or solid particles (e.g. dust or sand),
- 25 (d) a coating for protection against deterioration due to UV absorbance, such as a (cosmetic) top-coat, wherein the vessel is a marine, airborne or land vessel, and the challenge/risk faced by the vessel is the risk of deterioration due to UV absorbance, or
- 30 (e) a coating for protection against ice, such as an anti-ice or ice release coating, wherein the vessel is a marine, airborne or a land vessel, and the challenge/risk faced by the coating is the risk of ice build-up.

A “specified period of time”, means any period of time between any two dates, whether past or future, for example, 3 months, 6 months, 1 year, 2 years, 3 years, 4 years, 5 years, 6 years, 7 years, 8 years, 9 years or 10 years or more.

- 5 One embodiment of the invention is a process of applying a fouling-control coating to a marine vessel, wherein the fouling-control coating is selected according to the method described herein. All or part of the method for selecting a fouling-control coating for a vessel may be implemented by a computer system or a computer. Another aspect of this invention is therefore a computer (system) or a computer program product for
10 implementing part or all of the method for selecting a fouling-control coating for a vessel as described herein.

- The method described herein may also be used to determine the optimum coating thickness for coating the vessel, and hence also the optimum volume of paint required for
15 coating the vessel. Ideally, the optimum thickness is just enough to provide effective protection, for example, against fouling. Application of more than the optimum thickness of paint would lead to more than necessary organic solvent being released into the atmosphere. Application of less than the optimum thickness of paint would result in not enough protection, leading more frequent maintenance/re-coating of the vessel. If the
20 vessel is a marine vessel and the protective coating is for protection against fouling, application of less than the optimum thickness of paint would result in greater drag when the marine vessel is in motion due to the presence of more fouling, and an associated increase fuel emissions into the atmosphere.

- 25 Another aspect of the present invention is therefore the selection, provision and application of a protective coating for a vessel, wherein the thickness (and therefore the corresponding volume) of the protective coating that is applied to the vessel is determined according to the method described herein.

- 30 The method for selecting a fouling control coating for a vessel comprises the method steps (a) to (e) described herein. In one embodiment, the vessel is a marine vessel, the environment is the Worldwide aquatic environment, the regions are fouling regions, the

risk rating is the fouling risk rating, and the average risk rating is the average fouling risk rating.

5 Fouling-control coatings are not only applied on outer surfaces of marine vessels which are in continual contact with the aquatic environment when immersed (such as the lower surface of a vessel hull), but can also be applied to surfaces above the water-line of the aquatic environment (e.g. the boottop region of the vessel hull). Further, fouling control coatings can also be applied onto surfaces of ballast tanks of marine vessels.

10 It has been found by the inventors that one of the most accurate ways to select an appropriate protective coating for a vessel is to consider previous travel routes and fouling challenges already experienced over the preceding years. In many cases, the travel routes undertaken do not vary substantially over time. One embodiment of the present invention therefore relates to a method of selecting (providing and applying) a protective coating for a vessel based on the route(s) the vessel has previously
15 travelled.

Sometimes however, there are plans for the vessel to travel alternative route(s) in the future. Should this be the case, the most accurate way to select a protective coating is not to consider past travel-routes, but to consider the planned travel route(s) of the future. Another embodiment of the present invention therefore relates to a method of
20 selecting a protective coating for a vessel based on the routes the vessel is predicted or planned to travel.

Step (a)

The risk posed by the environment can vary substantially depending on location. Step (a) of the present method is to dissect the environment into separate regions, and
25 associate a risk rating with each region.

The environment is all locations that the vessel may travel, be located and be in contact with.

There is no limit to the number, size or shape of the regions that may be defined. The spatial dissection of the environment into regions may be in two-dimensions or in three-

dimensions. The shape and size of all the regions does not need to be uniform. One theory is that, the greater the number of regions, the more accurate the determination of the average risk rating posed to the vessel and hence the more accurate the selection of protective coating. Practically however, it may be preferable to dissect the environment into between 50 and 100 regions for ease of data handling.

Over the course of time, the risk in a particular region may vary. To take into account the variation in risk/challenge in a particular region throughout the year, the environment may be dissected in to different regions at multiple times of the year. Alternatively, the same region may be associated with different risk rating at different times in the year. This means that a protective coating on a stationary vessel could be deemed to experience different levels of risk over the course of time.

In one embodiment, the vessel is a marine vessel, the environment is the Worldwide aquatic environment, the risk is the fouling risk, the regions are fouling regions and the risk rating is the fouling risk rating. The Worldwide aquatic environment is intended to encompass any aquatic region in the world in which the vessel hull can be (immersed) located, including fresh-water regions and salt-water regions.

There are numerous environmental factors that can be used to assess the fouling risk posed by an aquatic environment, including (but not exclusively), the amount of chlorophyll in the aquatic environment, the salinity of the aquatic environment, the temperature of the aquatic environment, the pH of the aquatic environment, the amount of carbon dioxide in the aquatic environment, speed and/or direction of the waves, and the nutrient levels in the aquatic environment. Other factors that affect the fouling risk of the aquatic environment include the presence of underwater currents, the latitude of the region and the depth of the aquatic marine environment. For example, for a shallow, tropical, coastal region, which has an abundance of nutrients and chlorophyll in the water, will have a greater likelihood of marine life and therefore the risk of fouling is greater than when compared to a colder deep sea area, which has little or no nutrients or chlorophyll present. One or more (preferably more) of these factors can be taken into account in order assess the fouling-risk of each fouling region.

Step (b)

The protective coating may be selected based on the route(s) a vessel has previously travelled over a specified period of time.

Information about the routes that the vessel has historically taken could be obtained from the vessel's own logs or from publically available GPS data (Global positioning
5 System) or AIS data (Automatic Identification System) or the like. Two suppliers of publically available GPS/AIS data are ORBCOMM and ExactEarth (www.ExactEarth.com or www.Orbcomm.com). Provided the vessel has a GPS or AIS transponder, GPS/AIS data on a vessel's past movements is publically available. It is preferable that information about the routes a vessel has historically taken is based on
10 GPS data or AIS data because journey and speed data according to the vessel's own logs may not to be as accurate as publically available GPS/AIS data. A protective coating which is selected based on flawed data, leads to an inappropriate protective coating being selected for use.

Alternatively, the protective coating may be selected based on the route(s) the vessel is
15 expected to travel over a specified period of time. This information could be obtained from the person who decides on future travel routes, for example, the vessel owner.

Step (a) and step (b) of the method of selection may be carried out in any order.

Step (c)

Once the environment has been dissected into separate regions and associated with a
20 rating (step (a)), and the information about the route(s) the vessel has historically taken over a specified period of time, or will take over a specified period of time, has been obtained (step (b)), then these two sets of information can be overlaid with one another to accurately determine (i.e. calculate) which regions the vessel has travelled through, or will travel through, over the specified period of time (step (c)).

Step (d)

Once the information in step (c) is calculated, it can then be used to calculate the average risk rating the vessel has experienced, or will experience, in the specified period of time (step (d)).

In one embodiment of the invention, the risk rating for a vessel in a region is a function of (i) the risk rating of said region and (ii) the time the vessel has spent or will spend in said region.

5 In an alternative embodiment of the invention, the risk rating for a vessel in a region is a function of (i) the risk rating of said region, (ii) the amount of time the vessel has spent in a said region, and also (iii) the average speed of the vessel in said region. The average speed of the vessel can be determined from the information gathered in step (b). This alternative embodiment may be preferred because it takes into account the speed of the moving vessel in each region.

10 For example, if the vessel is a marine vessel, the hull of a marine vessel having a high average speed would be expected to have a lower fouling risk in a fouling region than the same hull having a lower average speed or which is stationary for a greater proportion of time in that fouling region. The theory behind this is that the slower the marine vessel travels, the more easily marine life can adhere to the surfaces of the
15 marine vessel.

On the other hand, if the vessel is a land-travelling vehicle, the body of a land-travelling vehicle having a high average speed would be expected to have a higher risk with respect to abrasion from solid and liquid particles than the same land-vehicle having a lower average speed or which is stationary. The theory behind this is that the slower
20 the land-vehicle travels, the less of an impact on the protective coating experiences from liquid and solid particles, and the less potential for damage to the protective coating.

The skilled person will appreciate that there are a number of different ways an average can be calculated. The most commonly used average is the arithmetic mean. Other
25 averages include the geometric mean, the harmonic mean, the mode and median. Other less commonly used averages include the quadratic mean, generalized mean, weighted mean, truncated mean, interquartile mean, midrange and winsorized mean, trimean, trimedian, and normalized mean.

Step (e)

Step (e) of the method requires the average risk rating which is calculated in step (d) to be matched with the most suitable protective coating which has been pre-designated as being the most suitable protective coating for protection against that level of risk.

Therefore in order for step (e) of the present method to be carried out it is necessary to
5 pre-designate/associate for each average risk rating which may be calculated in step (d) with the most suitable protective coating for that vessel against that level of risk.

For example for a marine vessel which has an extremely high average fouling risk value, it would be necessary to select a very high performing fouling-control coating associated with that fouling risk value. For a marine vessel having an extremely low
10 average fouling risk value, it would be necessary to select lower performing fouling-control coating associated with that average risk value.

Other factors

Other factors which may also be taken into consideration when selecting the most suitable protective coating include, for example, vessel characteristics, such as shape
15 of the body of the vessel (i.e. shape of marine vessel hull), the amount and type of existing protective coatings already on the vessel, the structural material of the body of the vessel, regulatory constraints of using certain protective coatings, and potential lifetime and cost of the protective coating scheme.

The Use of Computer Systems and Programs

20 A vast quantity of information is obtained and required in steps (a) and (b) of the present invention. To facilitate the storage of the information from steps (a) and (b) and then the overlaying and computation of this information to determine which regions the vessel has travelled, or will travel, in a specified period of time (step c) and to calculate the average risk rating the vessel has experienced, or will experience, in the specified
25 period of time (step d), a computer or a computer program product may be used.

The final step of the method, step (e), is to select a protective coating that has been associated with the average risk rating determined in step (d). Although step (e) can be implemented by a computer or a computer program product, it may not be necessary.

The present invention therefore also provides:

- a computer, a computer program product or a computer system for completely or partially carrying out the method of selecting a protective coating described herein,
- 5 - a method of selecting a protective coating as described herein implemented in a computer system (or by a computer program product),
- a method of selecting a protective coating as described herein, wherein at least steps (c) and (d) are implemented in a computer system (or by a computer program product).

10 **Examples**

The invention will now be elucidated with reference to the following simple examples. These examples are intended to illustrate the invention but are not to be construed as limiting in any manner the scope thereof.

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Example 1

The Worldwide marine environment was dissected into 64 geographical regions. Each geographical region was associated with a fouling risk rating of 1 to 5 (1= Very low, 20 2=Low, 3=Medium, 4=High, 5=Very high) depending on (i) the amount of chlorophyll and nutrients in the water, and (ii) the time of year.

The fouling risk rating for each geographical region was determined on the basis of the amount of chlorophyll in that region. The higher the amount of chlorophyll in a region has been linked to the region having a greater amount of marine life, which is expected 25 to have a greater the risk of fouling.

'Vessel A' travelled from Northern England to Sweden, and Finland, then down to the north of Spain, over 3 months, between January and March 2010. The information on the exact route travelled by Vessel A was tracked using AIS.

It is planned that the Vessel A will continue to make the same journey repeatedly over 30 the coming years.

From the historical location data of Vessel A, the amount of time the Vessel spent in fouling regions designated with a Fouling Risk of 1, 2, 3, 4 or 5 was determined.

The results are tabulated in Table 1.

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<i>Fouling Risk</i>	<i>Fouling Risk Rating (x)</i>	<i>% of Time (y)</i>
Very low	1	0
Low	2	86
Medium	3	12
High	4	2
Very High	5	0

Table 1

The mean average fouling risk rating Vessel A experienced in the 3 month period of time was 1.3.

10 [calculation: $\sum xy / \sum y : (1 \times 0) + (2 \times 86) + (3 \times 12) + (4 \times 2) + (5 \times 0) / (0 + 86 + 12 + 2 + 0) = 1.3$]

The inventors selected a standard fouling control product, which was pre-associated with the average fouling risk rating of 1.3.

The inventors provided and applied the selected standard fouling control product to Vessel A.

15 Without carrying out this method, the inventors would have selected a premium fouling-control product instead, resulting in unnecessary expense for the boat owner and no associated benefit with respect to fouling protection.

Example 2

20 However if the same Vessel A was expected to change it's route and travel from the Gulf of Oman, to Japan, via Singapore, Hong Kong, South Korea, and the US (Seattle), in the same period, then the fouling-control coating selected for Vessel A according to the method described herein would be different.

Table 2 tabulates the amount of predicted time Vessel A, for this route, would be expected to spend in fouling regions designated with a Fouling Risk of 1, 2, 3, 4 or 5.

<i>Fouling Risk</i>	<i>Fouling Risk Rating (x)</i>	<i>% of Time (y)</i>
Very low	1	2
Low	2	9
Medium	3	22
High	4	53
Very High	5	14

Table 2

- 5 The mean average fouling risk rating Vessel A would be expected to experience in the 3 month period of time is 3.7.

calculation: $\sum xy / \sum y : (1 \times 2) + (2 \times 9) + (3 \times 22) + (4 \times 53) + (5 \times 14) / (2 + 9 + 22 + 53 + 14) = 3.7$

For this predicted travel route, the inventors would recommend, provide and apply to the vessel, a high specification self-polishing copolymer based coating system which

- 10 has been pre-associated with the average fouling risk rating of 3.7.

Claims

1. A process of applying a protective coating to a vessel comprising the following steps:
 - 5 (i) selecting a protective coating, wherein the selection is made on the basis of risks associated with regions where the vessel has travelled or is expected to travel;
 - (ii) providing the protective coating selected in step (i), and then
 - (iii) applying the protective coating provided in step (ii) to the vessel.
- 10 2. A process of applying a protective coating to a vessel as claimed in Claim 1, wherein step (i) comprises the following steps:
 - 15 (a) dissecting the environment into separate regions, and associating a risk rating with each region,
 - (b) obtaining information about the route(s) the vessel has historically taken and/or will take in future through the environment, over a specified period of time,
 - (c) determining which regions of the environment the vessel has
20 travelled and/or will travel through over the specified period of time,
 - (d) combining the data from steps (a), (b) and (c) to calculate the average risk rating the vessel has experienced and/or will experience in the specified period of time, and
 - 25 (e) based on the average risk rating calculated in step (d), selecting a protective coating that has been associated with that average risk rating.
3. The process of applying a protective coating to a vessel as claimed in Claim 2, wherein the protective coating is for one of the following:
 - protection against fouling, such as a fouling control-coating, and the vessel

is a marine vessel,

- protection against corrosion, such as an anti-corrosive coating, and the vessel is a marine, airborne or a land vessel,

5 - protection against solid and liquid particle abrasion, and the vessel is a marine, airborne or land vessel,

- protection against deterioration as a result of UV absorbance, and the vessel is a marine, airborne or land vessel, or

- protection against ice, such as an anti-ice or ice release coating, and the vessel is a marine, airborne or a land vessel.

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4. The process of applying a protective coating to a vessel as claimed in Claim 2 or Claim 3, wherein step (i)(c) also includes determining the amount of time the vessel has spent/will spend in each region in said specified period of time.

15 5. The process of applying a protective coating to a vessel as claimed in Claims 2 to 4, wherein the information obtained in step (i)(b) includes information about the speed of the vessel travelling in the environment.

20 6. The process of applying a protective coating to a vessel as claimed in Claims 2 to 5, wherein information obtained in step (i)(b) is GPS or AIS data.

25 7. The process of applying a protective coating to a vessel as claimed any of Claims 3(a), 4, 5 or 6, which is a process of applying a marine fouling control coating to a marine vessel, wherein the regions are a fouling regions, the risk rating is the fouling risk rating, the environment is the worldwide aquatic environment, and wherein the fouling risk rating of each fouling region of the worldwide aquatic environment in step (i)(a) is determined on the basis of at least one of the following:

30 (a) environmental data recorded in the fouling region, for example the amount of chlorophyll, the salinity, the temperature, the pH, the amount of CO₂,

speed and/or direction of the waves, and the nutrient levels, in the fouling region,

(b) the latitude of the fouling region,

5 (c) the distance of the fouling region from the coastline or from land,

(d) the depth of the aquatic environment of the fouling region.

10 8. The process of applying a protective coating to a vessel as claimed in of Claims 2-7 wherein the method in step (i) is used to calculate an optimum thickness of the coating required to coat the vessel.

15 9. The process of applying a protective coating to a vessel as claimed in Claim 8, wherein the protective coating is applied to the vessel at the calculated optimum thickness.

20 10. The process of applying a protective coating to a vessel as claimed in any preceding claim wherein step (ii) includes the manufacture of the protective coating selected in step (i).

11. Manufacture and/or supply of a protective coating selected in accordance with the process defined in step (i) of Claims 1 to 7.

25 12. Method of selecting a protective coating as defined in step (i) of Claim 2, wherein at least steps (c) and (d) are implemented in a computer system.

30 13. A computer system or a computer program product used to select a protective coating for a vessel, wherein the method of selecting the protective coating comprises the steps:

(a) dissecting a environment in which the vessel may travel into separate fouling regions, and associating a risk rating with each region,

- (b) obtaining information about the route(s) the vessel has historically taken and/or will take in future through the environment, over a specified period of time,
- 5 (c) determining which regions of the environment the vessel has travelled and/or will travel through over the specified period of time,
- (d) combining the data from steps (a), (b) and (c) to work out the average risk rating the vessel has experienced and/or will experience in the specified period of time, and
- 10 (e) based on the average risk rating calculated in step (d), selecting a protective coating that has been associated with that average fouling risk rating.