Claims

1. Use of fiber-coated material on the underwater surface of structures for reducing residual drag, wherein said material comprises or consists of fibers having an average fiber length between 0.3 and 4 mm and an average fiber thickness between 5 and 80 µm.

2. Use according to claim 1, wherein said underwater surface of structures is the hull of a (self-)movable or moving vessel, or the underwater part of static structures such as offshore wind monopiles and off-shore rigs.

3. Use according to claim 1 or 2, for reduction of fuel consumption of a nautical vessel passing through water.

4. Use according to any one of the preceding claims, wherein the average fiber length is in the range of 0.5 and 3.5 mm, preferably between 0.5 and 3 mm, more preferably less than 2.5 mm, even more preferably less than 2 mm, most preferably less than 1 mm, most preferably in the range of 0.5 and 1 mm.

5. Use according to any one of the preceding claims, wherein the average fiber thickness is between 5 and 75 µm, preferably between 5 and 70µm, more preferably between 5 and 50µm, most preferably between 5 and 30µm.

6. Use according to any one of the preceding claims, wherein the fibers have a thickness-to-length ratio (based on average fiber length and average fiber thickness) at or below 0.05, preferably below 0.04, more preferably below 0.03, and preferably at least 0.005, more preferably at least 0.009, most preferably at least 0.01.

7. Use according to any one of the preceding claims, wherein the fiber flock density is between 3 and 25%.

8. Use according to any one of the preceding claims, wherein at least 5% of the submerged surface of the vessel is covered by said fiber-coated material.

9. Use according to any one of the preceding claims, wherein the fibers are synthetic fiber material and are selected from polyester, polyamide, polyethylene, polypropylene, polyacrylate, polysiloxane, fluoropolymer and combinations thereof.

10. Use according to any one of the preceding claims, wherein the fibers provide ease of cleaning of deposits.

11. Use according to claim 10, wherein the fibers have an average fiber length of at least 1 mm, more preferably at least 2 mm, more preferably at least 2.5 mm, most preferably at least 3 mm.

12. Use according to any one of the preceding claims, for reducing overall drag of a nautical vessel passing through water.

13. A method for reducing residual drag of a structure immersed in water, wherein at least part of the underwater surface of a structures is provided with a soft fiber-coated material, wherein said material comprises or consists of fibers having an average fiber length between 0.3 and 4 mm and an average fiber thickness between 5 and 80 µm.

14. A fiber-coated material on the underwater surface of a movable or moving nautical structure for reducing residual drag, wherein said material comprises or consists of fibers having an average fiber length between 0.3 and 4 mm and an average fiber thickness between 5 and 80 µm.

15. The fiber-coated material according to claim 14, wherein the average fiber length is in the range of 0.5 and 3 mm, more preferably less than 2.5 mm, even more preferably less than 2 mm, most preferably less than 1 mm, most preferably in the range of 0.5 and 1 mm.

16. The fiber-coated material according to any one of claims 14 or 15, wherein the fibers have a thickness-to-length ratio (based on average fiber length and average fiber thickness) at or below 0.05, preferably below 0.04, more preferably below 0.03, and preferably at least 0.005, more preferably at least 0.009, most preferably at least 0.01.

Claims

1. A method for reducing residual drag of a structure immersed in water, wherein at least part of the underwater surface of said structure is provided with a soft fiber-coated material, wherein said material comprises or consists of fibers having an average fiber length between 0.5 and 2.5 mm and an average fiber thickness between 5 and less than 50 µm, and wherein said fibers are attached perpendicularly to the underwater surface of the structure and configured to remain substantially perpendicular when there is relative motion between the water and the underwater surface of the structure, and wherein the angle of attack of water flow is 0 degrees and wherein water moves around said structure, wherein said fibers reduce the residual drag of the structure.

2. The method according to claim 1, wherein said underwater surface of structures is the hull of a movable or self-movable or moving vessel, or the underwater part of static structures.

3. The method according to any one of claims 1 to 2, for reduction of fuel consumption of a nautical vessel passing through water.

4. The method according to any one of claims 1 to 3, wherein the average fiber length is less than 2 mm.

5. The method according to any one of claims 1 to 4, wherein the average fiber thickness is between 10 and 30 µm.

6. The method according to any one of claims 1 to 5, wherein the fibers have a thickness-to-length ratio based on average fiber length and average fiber thickness at or below 0.05.

7. The method according to any one of claims 1 to 6, wherein the fibers have a thickness-to-length ratio of at least 0.005.

8. The method according to any one of claims 1 to 7, wherein the fiber flock density is between 3 and 25% coverage.

9. The method according to any one of claims 1 to 8, wherein at least 5% of the submerged surface of the vessel is covered by said fiber-coated material.

10. The method according to any one of claims 1 to 9, wherein the fibers are synthetic fiber material and are selected from polyester, polyamide, polyethylene, polypropylene, polyacrylate, polysiloxane, fluoropolymer and combinations thereof.

11. The method according to any one of claims 1 to 10, wherein the fibers provide ease of cleaning of deposits.

12. The method according to any one of claims 1 to 11, wherein the fibers have an average fiber length of at least 1 mm.

13. The method according to any one of claims 1 to 12, for reducing overall drag of a nautical vessel passing through water.

14. A fiber-coated material on the underwater surface of a movable or moving nautical structure, wherein said material comprises or consists of fibers having an average fiber length between 0.5 and 2.5 mm and an average fiber thickness between 5 and less than 50 µm, and wherein said fibers are attached perpendicularly to the underwater surface of the structure and configured to remain substantially perpendicular when there is relative motion between the water and the underwater surface of the structure, and wherein the angle of attack of the water flow is 0 degrees, and wherein the fibers reduce residual drag on the nautical structure when the structure is moving.

15. The material according to claim 14, wherein the average fiber length is in the range of less than 2 mm.

16. The fiber-coated material according to claim 14 or 15, wherein the fibers have a thickness-to-length ratio (based on average fiber length and average fiber thickness) at or below 0.05.

17. The material according to any one of claims 14 to 16, wherein the fibers have a thickness-to-length ratio of at least 0.005.

18. The method according to claim 2 wherein said static structure are offshore wind monopiles and off-shore rigs.

19. The material according to any one of claims 14 to 17, wherein the average fiber thickness is between 10 and 30 µm.