Claims

1. A selective catalytic reduction system (2) applying diesel oil (40,40') as reductant for converting nitrogen oxides (NOx) through a NO reduction process by means of a catalyst into diatomic nitrogen (N_2) and water (H_2O) in a diesel engine (4), wherein the selective catalytic reduction system (2) is configured to be installed and used in a two-stroke or a four-stroke diesel engine for marine purposes, wherein the selective catalytic reduction system (2) comprises:
- an oil injection system (6), a reactor (10) and
- a number of selective catalytic reduction catalysts (109, 109') provided in at least a first section (14) comprising a plurality of separated layers (S_1, S_2, S_3, S_4, S_5, E_1, E_2) and in a second section (16) arranged downstream of said first section, comprising a plurality of separated layers (S_1', S_2', S_3', S_4', S_5', E_1, E_2), wherein the reactor (10) is configured to house the sections (14, 16) in order to facilitate the NO oxidation process, **characterised in** that the distance (D_1, D_2, D_3, D_4) between the sections (14, 16, 16', 16'', 16''') is larger than the thickness of the layers (S_1, S_2, S_3, S_4, S_5, S_1', S_2', S_3', S_4', S_5', E_1, E_2), wherein the layers each having a thickness within the range 5-200 mm.

2. A selective catalytic reduction system (2) according to claim 1, **characterised in** that the selective catalytic reduction system (2) comprises a first section (14) comprising two or more layers (S_1, S_2, S_3 S_4, S_5) provided in a non-zero distance from each other.

3. A selective catalytic reduction system (2) according to claim 1 or 2, **characterised in** that the selective catalytic reduction system (2) comprises one or more additional sections (16', 16'', 16''') each comprising two or more layers (S_1', S_2', S_3', S_4', S_5', S_1'', S_2'', S_3'' S_4'', S_5'') provided in a non-zero distance from each other, wherein the reactor (10) is configured to house the one or more additional sections (16', 16'', 16''') in order to facilitate the NO oxidation process.

4. A selective catalytic reduction system (2) according to one of the

preceding claims 2-3, **characterised in** that a plate member (84, 84') is provided between at least some of the adjacent sections (14, 16, 16', 16'', 16''').

5. A selective catalytic reduction system (2) according to one of the preceding claims, **characterised in** that the selective catalytic reduction catalysts (109, 109') are arranged in layers (S_1, S_2, S_3, S_4, S_5, S_1', S_2', S_3', S_4', S_5', S_1'', S_2'', S_3'', S_4'', S_5'', E_1, E_2) each having a thickness within the range 5-1000 mm, preferably in the range 50-500 mm, such as 100-400 mm.

6. A selective catalytic reduction system (2) according to one of the preceding claims, **characterised in** that the selective catalytic reduction catalysts (109, 109) are selected among the following: Ce/Cu-ZSM-5, Ce-Zr/Cu-ZSM-5, Ce/Fe-ZSM-5 or Ce-Zr/Fe-ZSM-5, Ce/Mg-ZSM-5 or Ce-Zr/Mg-ZSM-5, wherein the selective catalytic reduction catalysts (109, 109') are calcinated respectively after Cu, Fe or Mg adding and after Ce and Zr adding.

7. A selective catalytic reduction system (2) according to one of the preceding claims 1-4, **characterised in** that the selective catalytic reduction catalysts (S_1, S_2, S_3, S_4, S_5, S_1', S_2', S_3', S_4', S_5', S_1'', S_2'', S_3'', S_4'', S_5'', E_1, E_2) are selected among the following: Ce/Cu-ZSM-5, Ce-Zr/Cu-ZSM-5, Ce/Fe-ZSM-5 or Ce-Zr/Fe-ZSM-5, Ce/Mg-ZSM-5 or Ce-Zr/Mg-ZSM-5, wherein Cu, Fe or Mg and Ce and Zr is added at same time and the powder is calcined after the adding of Cu, Fe or Mg and Ce and Zr.

8. A selective catalytic reduction system (2) according to one of the preceding claims, **characterised in** that the selective catalytic reduction system (2) comprises a tubular structure (86) extending centrally along the longitudinal axis of the reactor (10), wherein the tubular structure (86) extends through the first section (14) and protrudes therefrom.

9. A selective catalytic reduction system (2) according to one of the preceding claims, **characterised in** that the selective catalytic reduction system (2) comprises a diffuser (88).

10. A selective catalytic reduction system (2) according to one of the preceding claims, **characterised in** that the selective catalytic reduction system (2) comprises a heat recovering unit.

11. A method for nitrogen oxides (NOx) reduction, said method comprising the step of using a selective catalytic reduction system (2) configured to be installed and used in a two-stroke or a four-stroke diesel engine for marine purposes and applying diesel oil (40, 40') as reductant for converting nitrogen oxides (NOx) by means of a catalyst into diatomic nitrogen (N_2) and water (H_2O) in a diesel engine (4), **wherein** the method comprises the step of injecting evaporated diesel oil (40, 40') into the exhaust gas entering a reactor (10), the method comprises the step of carrying out a NOx conversion including a NO oxidation followed by a heterogeneous catalyzing process followed by a homogeneous catalyzing process by applying a number of selective catalytic reduction catalysts (109, 109') provided in a first section (14) having a plurality of separated ayers (S_1, S_2, S_3, S_4, S_5), and in a second section arranged downstream from said first section, said second section comprising a plurality of separated layers (S_1', S'_2, S_3', S_4', S_5'), wherein the distance (D_1, D_2, D_3, D_4) between the sections (14, 16, 16', 16'') is larger than the thickness of the layers (S_1, S_2, S_3, S_4, S_5, S_1', S_2' S_3', S_4', S_5', S_1'', S_2'', S_3'', S_4'', S_5'', E_1, E_2) wherein the layers each having a thickness within the range 5-200 mm, wherein a non-zero distance between the layers (S_1, S_2, S_3, S_4, S_5, S_1', S_2', S_3', S_4', S_5', E_1, E_2) is within range, in which the residence time for moving a gas molecule from one layer (S_1) to the next layer (S_2) is between 0.01 seconds to 10.0 seconds.

12. A method according to claim 11, **characterised in** that the resi-

dence time is between 0.1 – 5.0 seconds.

13. A method according to claim 11, **characterised in** that the residence time is 0.2 – 2.5 seconds.

14. A method according to one of the claims 11-13, **characterised in** that the method comprises the step of cracking at least a portion of the evaporated diesel oil, carrying out a heterogeneous NOx conversion that causes formation of the radical NH_4^+, wherein the radical NH_4^+ is used for carrying out homogeneous NO_x conversion.

15. A method according to one of the claims 11-14, **characterised in** that the method comprises the step of providing the at least one additional section (16, 16', 16'', 16''') in a non-zero distance (D_1, D_2, D_3, D_4) from the first section (14).

16. A method according to one of the preceding claims 11-15, **characterised in** that the method is applied for selective catalytic reduction of NOx in an exhaust stream either after a four-stroke diesel engine (4) or between the exhaust receiver (78) and the exhaust turbine(s) (82) on a two-stroke diesel engine (4).