CLAIMS

1. An exhaust gas cleaning equipment for a diesel engine, comprising a gas scrubber (1) for cleaning exhaust gas whereby the gas scrubber produces polluted scrubber fluid comprising pollutant particles, a scrubber fluid cleaning equipment connected to the gas scrubber for cleaning said polluted scrubber fluid, said scrubber fluid cleaning equipment comprising a centrifugal separator (9) for separating at least a pollutant phase comprising pollutant particles and a cleaned scrubber fluid from said polluted scrubber fluid, which centrifugal separator comprises a rotor (11) enclosing a separation space (12) with a stack of separating discs (13), a separator inlet (8) for polluted scrubber fluid extending into said separation space, a first separator outlet (14) for cleaned scrubber fluid extending from said separation space, and a second separator outlet (15) for the pollutant phase extending from said separation space, which scrubber fluid cleaning equipment further comprises means for conducting polluted scrubber fluid from the exhaust gas scrubber to the separator inlet, and means for conducting cleaned scrubber fluid from the first separator outlet to the exhaust gas scrubber.

2. An exhaust gas cleaning equipment according to claim 1, further comprising a buffer tank (6), wherein the means for conducting cleaned scrubber fluid from the first separator outlet to the exhaust gas scrubber are arranged for conducting cleaned scrubber fluid from the first separator outlet (14) to the exhaust gas scrubber (1) via the buffer tank.

3. An exhaust gas cleaning equipment according to claim 2 wherein the means for conducting polluted scrubber fluid from an exhaust gas scrubber to the separator inlet are arranged for conducting polluted scrubber fluid from the exhaust gas scrubber (1) to the separator inlet (8)

via the buffer tank (6).

4. An exhaust gas cleaning equipment according to claim 2, wherein the means for conducting polluted scrubber fluid from an exhaust gas scrubber to the separator inlet are arranged for conducting polluted scrubber fluid directly from the exhaust gas scrubber (1) to the separator inlet (8).

5. An exhaust gas cleaning equipment according to claim 1, wherein the means for conducting cleaned scrubber fluid from the first separator outlet to the exhaust gas scrubber are arranged for conducting cleaned scrubber fluid directly from the first separator outlet (14) to the exhaust gas scrubber (1).

6. An exhaust gas cleaning equipment according to claim 5, further comprising a buffer tank (6), wherein the means for conducting polluted scrubber fluid from an exhaust gas scrubber to the separator inlet are arranged for conducting polluted scrubber fluid from the exhaust gas scrubber (1) to the separator inlet (8) via the buffer tank (6).

7. An exhaust gas cleaning equipment according to any one of the preceding claims wherein the second separator outlet (15) comprises discharge ports for intermittent discharge of the pollutant phase.

8. An exhaust gas cleaning equipment according to claim 7 wherein the scrubber fluid cleaning equipment further comprises means for determining a process parameter of the centrifugal separator related to

the amount of pollutant phase in the radially outer parts of the separation space (12) and means arranged to open the discharge ports of the second separator outlet (15) under a predetermined condition on said process parameter indicating that the amount of pollutant phase in the radially outer parts of the separation space exceeds a predetermined level.

9. An exhaust gas cleaning equipment according to claim 8 wherein the operational parameter is the turbidity of cleaned scrubber fluid in the first separator outlet (14) and the predetermined condition of said operational parameter is that the turbidity exceeds a predetermined level.

10. An exhaust gas cleaning equipment according to claim 8 wherein the centrifugal separator further comprises a third separator outlet, said third separator outlet extending from a radially outer part of the separation space (12), and wherein the operational parameter is the pressure at the third separator outlet and the predetermined condition is that the pressure is below a predetermined level.

11. An exhaust gas cleaning equipment according to any one of the preceding claims, wherein the separator inlet (8) is of a hermetic type.

12. An exhaust gas cleaning equipment according to any one of the preceding claims wherein the scrubber fluid cleaning equipment further comprises a bypass (19) communicating with the separator inlet (8) and the first separator outlet (14).

13. An exhaust gas cleaning equipment according to any one of the preceding claims, wherein the scrubber fluid is water, such as tap water, desalinated water, fresh water, etc.

14. An exhaust gas cleaning equipment according to any one of the preceding claims further comprising means for bleeding off part of the polluted scrubber fluid to a bleed-off disc stack centrifugal separator (20, 20'), which is arranged for separating at least a pollutant phase comprising pollutant particles and a cleaned scrubber fluid from said polluted scrubber fluid.

15. An exhaust gas cleaning equipment according to claim 14 wherein said bleed-off disc stack centrifugal separator (20, 20') further is arranged to receive pollutant phase from said second separator outlet (15).

16. A method for cleaning polluted scrubber fluid, comprising the steps of;
- providing polluted scrubber fluid from an exhaust gas scrubber (1), said polluted scrubber fluid comprising pollutant particles,
- separating, in a disc stack centrifugal separator (9), a pollutant phase comprising pollutant particles from the polluted scrubber fluid, thereby providing a cleaned scrubber fluid, and
- providing cleaned scrubber fluid to the exhaust gas scrubber.

17. A method according to claim 16, further comprising the step of;
- providing cleaned scrubber fluid from the centrifugal separator to a buffer tank (6), and
- providing cleaned scrubber fluid from the buffer tank (6) to the exhaust gas scrubber (1).

18. A method according to claim 16, wherein cleaned scrubber fluid is provided directly from the centrifugal separator to the exhaust gas scrubber.

19. A method according to any one of the claims 16-18, further comprising the step of;

- discharging the separated pollutant phase comprising pollutant particles from the centrifugal separator (9).

CLAIMS

1. An exhaust gas cleaning equipment for a diesel engine, comprising a gas scrubber (1) for cleaning exhaust gas whereby the gas scrubber produces polluted scrubber fluid comprising pollutant particles,
a scrubber fluid cleaning equipment connected to the gas scrubber for cleaning said polluted scrubber fluid, said scrubber fluid cleaning equipment comprising a separator (9) for separating at least a pollutant phase and a cleaned scrubber fluid from said polluted scrubber fluid, which separator comprises a separator inlet (8) for polluted scrubber fluid which scrubber fluid cleaning equipment further comprises means for conducting polluted scrubber fluid from the gas scrubber to the separator inlet, and means for conducting cleaned scrubber fluid from a separator outlet to the gas scrubber,
characterized in that the separator is a centrifugal separator for separating oil and particles as the pollutant phase from said polluted scrubber fluid, which centrifugal separator comprises a rotor (11) enclosing a separation space (12) with a stack of separating discs (13), a first separator outlet (14) for cleaned scrubber fluid extending from said separation space, and a second separator outlet (15) for the pollutant phase extending from said separation space, wherein the separator inlet (8) extends into said separation space and is of a hermetic type, and wherein the means for conducting cleaned scrubber fluid is arranged from the first separator outlet to the gas scrubber.

2. An exhaust gas cleaning equipment according to claim 1, further comprising a buffer tank (6), wherein the means for conducting cleaned scrubber fluid from the first separator outlet to the gas scrubber are arranged for conducting cleaned scrubber fluid from the first separator outlet (14) to the gas scrubber (1) via the buffer tank.

3. An exhaust gas cleaning equipment according to claim 2, wherein the means for conducting polluted scrubber fluid from the gas scrubber to the separator inlet are arranged for conducting polluted scrubber fluid from the gas scrubber (1) to the separator inlet (8) via the buffer tank (6).

4. An exhaust gas cleaning equipment according to claim 2, wherein the means for conducting polluted scrubber fluid from the gas scrubber to the separator inlet are arranged for conducting polluted scrubber fluid directly from the gas scrubber (1) to the separator inlet (8).

5. An exhaust gas cleaning equipment according to claim 1, wherein the means for conducting cleaned scrubber fluid from the first separator outlet to the gas scrubber are arranged for conducting cleaned scrubber fluid directly from the first separator outlet (14) to the gas scrubber (1) without further treatment equipment between the centrifugal separator and the gas scrubber.

6. An exhaust gas cleaning equipment according to claim 5, further comprising a buffer tank (6), wherein the means for conducting polluted scrubber fluid from the gas scrubber to the separator inlet are arranged for conducting polluted scrubber fluid from the gas scrubber (1) to the separator inlet (8) via the buffer tank (6).

7. An exhaust gas cleaning equipment according to any one of the preceding claims, wherein the second separator outlet (15) comprises discharge ports for intermittent discharge of the pollutant phase.

8. An exhaust gas cleaning equipment according to claim 7, wherein the scrubber fluid cleaning equipment further comprises means for determining a process parameter of the centrifugal separator related to the amount of pollutant phase in the radially outer parts of the separation space (12) and means arranged to open the discharge ports of the second separator outlet

(15) under a predetermined condition on said process parameter indicating that the amount of pollutant phase in the radially outer parts of the separation space exceeds a predetermined level.

9. An exhaust gas cleaning equipment according to claim 8, wherein the process parameter is the turbidity of cleaned scrubber fluid in the first separator outlet (14) and the predetermined condition of said process parameter is that the turbidity exceeds a predetermined level.

10. An exhaust gas cleaning equipment according to claim 8, wherein the centrifugal separator further comprises a third separator outlet, said third separator outlet extending from a radially outer part of the separation space (12), and wherein the operational parameter is the pressure at the third separator outlet and the predetermined condition is that the pressure is below a predetermined level.

11. An exhaust gas cleaning equipment according to any one of the preceding claims, wherein the scrubber fluid cleaning equipment further comprises a bypass (19) communicating with the separator inlet (8) and the first separator outlet (14).

12. An exhaust gas cleaning equipment according to any one of the preceding claims, wherein the scrubber fluid is water, such as tap water, desalinated water, fresh water, etc.

13. An exhaust gas cleaning equipment according to any one of the preceding claims further comprising means for bleeding off part of the polluted scrubber fluid to a bleed-off disc stack centrifugal separator (20, 20'), which is arranged for separating at least a pollutant phase comprising pollutant particles and a cleaned scrubber fluid from said polluted scrubber fluid.

14. An exhaust gas cleaning equipment according to claim 13, wherein said bleed-off disc stack centrifugal separator (20, 20') further is arranged to receive pollutant phase from said second separator outlet (15).

15. A method for cleaning polluted scrubber fluid in an exhaust gas cleaning equipment for a diesel engine, comprising the steps of;
- providing polluted scrubber fluid from an exhaust gas scrubber (1), said polluted scrubber fluid comprising pollutant particles,
- separating, in a disc stack centrifugal separator (9) comprising a separator inlet (8) of a hermetic type, a pollutant phase comprising oil and the pollutant particles from the polluted scrubber fluid, thereby providing a cleaned scrubber fluid, and
- providing the cleaned scrubber fluid to the exhaust gas scrubber.

16. A method according to claim 15, further comprising the step of;
- providing the cleaned scrubber fluid from the centrifugal separator to a buffer tank (6), and
- providing the cleaned scrubber fluid from the buffer tank (6) to the exhaust gas scrubber (1).

17. A method according to claim 15, wherein the cleaned scrubber fluid is provided directly from the centrifugal separator to the exhaust gas scrubber, without further treatment equipment between the centrifugal separator and the gas scrubber.

18. A method according to any one of the claims 15-17, further comprising the step of;
- discharging the separated pollutant phase comprising pollutant particles from the centrifugal separator (9).