Claims:

1. An apparatus for reducing greenhouse gas emission in a vessel cooperated with EGR and iCER, the apparatus comprising:

an exhaust gas receiver that temporarily stores exhaust gas exhausted from each cylinder of a vessel engine and removes pulsation;

a turbo charger that compresses and supplies scavenge air by the exhaust gas supplied from the exhaust gas receiver;

a cleaning unit that removes and cleans SO_X and soot by spraying cleaning water to the exhaust gas supplied through the turbo charger and cools the exhaust gas by circulating cooling water;

a CO_2 absorbing unit that absorbs and removes CO_2 by spraying an absorbent liquid to the exhaust gas having passed through the cleaning unit;

a scavenge air receiver that temporarily stores the scavenge air compressed by the turbo charger, removes pulsation, and supplies air to each cylinder of the vessel engine; and

an exhaust gas circulating unit that supplies the turbo charger with the exhaust gas having passed through the CO_2 absorbing unit so as to be mixed with outside air,

wherein the CO_2 absorbing unit comprises:

an absorbent liquid storage tank that stores the absorbent liquid;

one or more spray nozzles that spray the absorbent liquid, wherein the one or more spray nozzles comprise an upper spray nozzle and a lower spray nozzle that spray the absorbent liquid downward,

one or more passages that comprise an upper passage and a lower passage that convert CO_2 into the certain material through a chemical reaction by contacting CO_2 with the absorbent liquid,

an absorbent liquid spray pump that pumps the absorbent liquid to the upper spray nozzle and the lower spray nozzle,

a cooling module that circulates the cooling water to the one or more passages and cools heat generated by the CO_2 absorption reaction by circulating cooling water to the upper passage and the lower passage,

a mist catcher that is formed at an end of the passage in a curved multiplate shape and removes moisture from the exhaust gas having passed through the passage; and

an absorbent liquid tank that separates and stores the absorbent liquid having passed through the passage,

wherein the absorbent liquid storage tank stores

a) $NH_4OH(aq)$ as the absorbent liquid,

CO_2 is absorbed and converted into $NH_4HCO_3(aq)$ by $NH_4OH(aq)$ passing through the upper passage and the lower passage, and

the cooling module is disposed in the form of a cooling jacket or a cooling coil in the upper passage and the lower passage and cools heat generated by the CO_2 absorption reaction to 20°C to 50°C; or

b) NaOH(aq) as the absorbent liquid,

CO_2 is absorbed and converted into $NaHCO_3$ or Na_2CO_3 by NaOH(aq) passing through the upper passage and the lower passage, and

the cooling module cools heat generated by the CO_2 absorption reaction to 80°C to 100°C.

2. The apparatus according to claim 1, wherein the vessel engine is a low pressure two-stroke dual fuel engine or a four-stroke dual fuel engine.

3. The apparatus according to claim 1, wherein the turbo charger comprises:

a turbine that is rotated by high-temperature and high-pressure exhaust gas supplied from the exhaust gas receiver;

a compressor that is coupled to a rotation shaft of the turbine and rotated to compress scavenge air and supply the compressed scavenge air to the scavenge air receiver;

an air suction filter that is formed on a suction port side of the compressor to filter foreign matter from the outside air and the exhaust gas from which CO_2 has been removed by passing through the CO_2 absorbing unit, and mix the outside air with the exhaust gas;

a scavenge air cooling module that cools the scavenge air supplied from the compressor to the scavenge air receiver;

a first control valve that controls a flow rate of exhaust gas from the turbine to the cleaning unit; and

a second control valve that controls a flow rate of exhaust gas supplied from the turbine to an exhaust gas use-related device.

4. The apparatus according to claim 3, wherein, when damage to the exhaust gas use-related device connected to an exhaust gas pipe of the turbine is expected due to a high load or high-temperature exhaust gas, opening or closing of the second control valve is controlled

so that the flow rate of the exhaust gas to the cleaning unit is increased to decrease the temperature of the exhaust gas.

5. The apparatus according to claim 3, wherein the scavenge air cooling module comprises:

a cooling jacket of one or more stages that cools the scavenge air by circulating cooling water; and

a mist catcher that is formed in a curved multi-plate shape and removes moisture from the scavenge air having passed through the cooling jacket.

6. The apparatus according to claim 1, wherein the cleaning unit comprises:

a cleaning water supply module that receives fresh water, neutralizes and supplies the circulating cleaning water;

a cleaning module that cools and cleans the exhaust gas from the turbo charger by spraying the cleaning water supplied from the cleaning water supply module to the exhaust gas supplied from the turbo charger;

a cooling module that cools the exhaust gas by circulating the cooling water;

a cleaning water circulation module that circulates the cleaning water through the cleaning module; and

a water treatment module that performs water treatment on the cleaning water.

7. The apparatus according to claim 6, wherein the cleaning water supply module comprises:

a cleaning water replenishing pump that receives fresh water, replenishes cleaning water, and supplies the cleaning water to the cleaning module; and

a neutralizing agent supply valve that supplies a neutralizing agent for controlling pH to the circulating cleaning water supplied from the cleaning water replenishing pump to the cleaning module, the cleaning module comprises one or more cleaning units that remove and clean SO_X and soot by spraying the cleaning water,

the cooling module comprises one or more cooling units formed below the one or more cleaning units to cool the exhaust gas to a certain temperature according to a type of the absorbent liquid by the circulating cooling water,

the cleaning water circulation module comprises: a cleaning water circulation tank that collects the cleaning water having passed through the cleaning module;

a pH meter that measures pH of the cleaning water from the cleaning water circulation tank, controls the neutralizing agent supply valve to set an input amount of the neutralizing agent;

a buffer tank that storing an initial amount of cleaning water and replenishes the cleaning water;

a cleaning water circulation pump and a cleaning water control valve that supply some of the cleaning water having passed through the cleaning module to the buffer tank and circulate a remaining cleaning water to the cleaning module; and

a cleaning water cooling unit that is installed behind the cleaning water circulation pump and cools the circulating cleaning water, and the water treatment module comprises:

a water treatment unit that performs water treatment on the cleaning water drained from the buffer tank and returns the treated cleaning water to the buffer tank;

a sludge tank that stores sludge by the water treatment unit;

an outboard discharge valve that discharges the cleaning water satisfying a certain discharge condition by the water treatment unit to the outside of the vessel; and

a cleaning water drain tank that temporarily stores the cleaning water from the buffer tank.

8. The apparatus according to claim 1, wherein the upper passage or the lower passage is provided with a plurality of stages and partition walls to form a long passage so as to increase a contact time between the absorbent liquid and the exhaust gas.

9. The apparatus according to claim 1, wherein packing materials, in which distilling column packings designed to have a large contact area per unit volume so as to increase a contact time between the absorbent liquid and the exhaust gas are provided in multi-stages, and a solution redistributor, which is formed between the distilling column packings provided in multi-stages, are formed in the upper passage or the lower passage.

10. The apparatus according to claim 1, wherein the certain material discharged through the passage is stored in a sludge tank or discharged to the outside of the vessel.

11. The apparatus according to claim 4, wherein the exhaust gas circulating unit comprises:

a first valve that controls a flow rate of exhaust gas supplied to the air suction filter; and

a second value that controls a flow rate of exhaust gas supplied to the exhaust gas use-related device through the exhaust gas pipe.

12. The apparatus according to claim 4, wherein a flow rate of the exhaust gas supplied to the turbo charger and mixed with the outside air and a flow rate of the exhaust gas supplied to the exhaust gas pipe are individually controlled.

13. The apparatus according to claim 1, wherein the cleaning unit, the CO_2 absorbing unit, and the exhaust gas circulating unit are mounted inside the vessel engine.

14. A vessel comprising the apparatus according to any one of claims 1 to 13.