treatment system for a vessel, which includes a cargo tank storing liquefied natural gas (LNG), and a main engine and a sub engine using the LNG stored in the cargo tank as fuel, the liquefied gas treatment system including: a main boil-off gas (BOG) supply line configured to compress the BOG generated in the cargo tank by a compressor and supply the compressed BOG to the main engine as fuel; a sub BOG supply line configured to compress BOG generated in the cargo tank by a compressor and supply the compressed BOG to the sub engine as fuel; a main LNG supply line configured to compress the LNG stored in the cargo tank by a pump and supply the compressed LNG to the main engine as fuel; and a sub LNG supply line configured to compress the LNG stored in the cargo tank by a pump and supply the compressed LNG to the sub engine as fuel, wherein the BOG generated in the cargo tank is compressed at 150 to 400 bara by the compressor in the main BOG supply line and the LNG stored in the cargo tank is compressed at 150 to 400 bara by the pump in the main LNG supply line, wherein the BOG which is not supplied to the main engine and the sub engine among the BOG compressed at 150 to 400 bara by the compressor, is cooled in a heat exchanger by exchanging heat with the BOG that is discharged from the cargo tank and then transferred to the compressor, and wherein the BOG cooled in the heat exchanger is decompressed by a decompressing means~~the fuel supplied to the main engine is compressed at a pressure of 150 to 400 bara~~.

The pump may include: a discharge pump installed within the storage tank to discharge the LNG to the outside of the cargo tank; and a high pressure pump configured to secondarily compress the LNG, which is primarily compressed in the discharge pump, to a pressure necessary for the main engine.

The sub LNG supply line may be branched from the main LNG supply line at an upstream side of the high pressure pump.

The sub LNG supply line may include a gas-liquid separator configured to separate a heavy hydrocarbon component from the LNG so as to adjust a methane number of the fuel to a value necessary for the sub engine.

The sub LNG supply line may further include a vaporizer configured to partially vaporize the LNG by applying heat to the LNG supplied to the gas-liquid separator.

The sub LNG supply line may further include a heater configured to adjust a temperature of the fuel, of which the methane number is adjusted by the gas-liquid separator, to a value necessary for the sub engine.

The compressor may include a plurality of compression cylinders.

The liquefied gas treatment system may further include BOG consuming means

configured to receive and uses BOG that is compressed while passing through a part of the plurality of compression cylinders included in the compressor.

The BOG supplied to the main engine may be BOG that is compressed while passing through all or part of the plurality of compression cylinders included in the compressor.

The liquefied gas treatment system may further include a forcible vaporizer configured to forcibly vaporize the LNG stored in the cargo tank and supply the forcibly vaporized LNG to the compressor.

The main engine may be an MEGI engine and the sub engine is a DF engine.

~~The main BOG supply line may include a heat exchanger configured to liquefy BOG, which is not supplied to the main engine and the sub engine among BOG compressed by the compressor, by exchanging heat with BOG that is discharged from the cargo tank and transferred to the compressor.~~

According to the disclosure, there is provided a liquefied gas treatment system for a vessel, which includes a cargo tank storing liquefied natural gas (LNG), and an engine using the LNG stored in the cargo tank as fuel, the liquefied gas treatment system including: a compressor line configured to compress BOG generated in the cargo tank by a compressor and supply the compressed BOG to the engine as fuel; a pump line configured to compress the LNG stored in the cargo tank by a pump and supply the compressed LNG to the engine as fuel; and a gas-liquid separator configured to separate a heavy hydrocarbon component from the LNG so as to adjust a methane number of the LNG to a value necessary for the engine.

According to another aspect of the present invention, there is provided a liquefied gas treatment method for a vessel, which is performed by a liquefied gas treatment system for the vessel including a cargo tank storing LNG, and an engine supplied with the LNG stored in the cargo tank and using the LNG as fuel, the liquefied gas treatment system including a compressor line configured to compress BOG generated in the cargo tank by a compressor and supply the compressed BOG to the engine as fuel, and a pump

line configured to compress the LNG stored in the cargo tank by a pump and supply the compressed LNG to the engine as fuel, the liquefied gas treatment method including adjusting a methane number of the LNG to a value necessary for the engine by separating a heavy hydrocarbon component from the LNG when the LNG is supplied to the engine through the pump line, wherein the BOG generated in the cargo tank is compressed at 150 to 400 bara by the compressor and the LNG stored in the cargo tank is compressed at 150 to 400 bara by the pump, wherein the BOG which is not supplied to the engine among the BOG compressed at 150 to 400 bara by the compressor, is cooled in a heat exchanger by exchanging heat with the BOG that is discharged from the cargo tank and then transferred to the compressor, and wherein the BOG cooled in the heat exchanger is decompressed by a decompressing means .

ADVANTAGEOUS EFFECTS

According to embodiments of the present invention, all BOG generated during the transportation of cargo (that is, LNG) in the LNG carrier can be used as the fuel of the engine, or may be reliquefied, be returned to the cargo tank and be stored therein. Therefore, an amount of BOG consumed in the GCU or the like can be reduced or removed. Furthermore, BOG can be treated by reliquefaction, without using separate refrigerants such as nitrogen.

Therefore, according to the liquefied gas treatment system in embodiments of the present invention, BOG generated from the cargo tank can be reliquefied without installing a reliquefaction apparatus consuming a large amount of energy and requiring excessive initial installation cost, which may save energy consumed in the reliquefaction apparatus.

In addition, according to the liquefied gas treatment system in embodiments of the present invention, a part of compressed BOG after pressurizing BOG discharged from a cargo tank can be supplied to a high pressure gas injection engine (that is, a propulsion system) as fuel. The remaining compressed BOG can be cooled with cold energy of BOG after discharge from the cargo and before compression, and returned to the cargo

tank.

In addition, in the liquefied gas treatment system according to embodiments of the present invention, since it is unnecessary to install the reliquefaction apparatuses using separate refrigerants (that is, nitrogen-refrigerant refrigeration cycle, mixed-refrigerant refrigeration cycle, or the like), facilities for supplying and storing the refrigerants need not be separately installed. Consequently, it is possible to save initial installation cost and operation cost for configuring the entire system.

WHAT IS CLAIMED IS:

1. A liquefied gas treatment system for a vessel, which includes a cargo tank storing liquefied natural gas (LNG), and a main engine and a sub engine using the LNG stored in the cargo tank as fuel, the liquefied gas treatment system comprising:

a main boil-off gas (BOG) supply line configured to compress the BOG generated in the cargo tank by a compressor and supply the compressed BOG to the main engine as fuel;

a sub BOG supply line configured to compress BOG generated in the cargo tank by a compressor and supply the compressed BOG to the sub engine as fuel;

a main LNG supply line configured to compress the LNG stored in the cargo tank by a pump and supply the compressed LNG to the main engine as fuel; and

a sub LNG supply line configured to compress the LNG stored in the cargo tank by a pump and supply the compressed LNG to the sub engine as fuel,

wherein the BOG generated in the cargo tank is compressed at 150 to 400 bara by the compressor in the main BOG supply line and the LNG stored in the cargo tank is compressed at 150 to 400 bara by the pump in the main LNG supply line,

wherein the BOG which is not supplied to the main engine and the sub engine among the BOG compressed at 150 to 400 bara by the compressor, is cooled in a heat exchanger by exchanging heat with the BOG that is discharged from the cargo tank and then transferred to the compressor, and

wherein the BOG cooled in the heat exchanger is decompressed by a decompressing means~~the fuel supplied to the main engine is compressed at a pressure of 150 to 400 bara~~.

2. The liquefied gas treatment system according to claim 1, wherein the pump includes:

a discharge pump installed within the storage tank to discharge the LNG to the outside of the cargo tank; and

a high pressure pump configured to secondarily compress the LNG, which is primarily compressed in the discharge pump, to a pressure necessary for the main engine.

3. The liquefied gas treatment system according to claim 2, wherein the sub LNG supply line is branched from the main LNG supply line at an upstream side of the high pressure pump.

supply the forcibly vaporized LNG to the compressor.

11. The liquefied gas treatment system according to claim 1, wherein the main engine is an MEGI engine and the sub engine is a DF engine.

~~12. The liquefied gas treatment system according to claim 1, wherein the main BOG supply line includes a heat exchanger configured to liquefy BOG, which is not supplied to the main engine and the sub engine among BOG compressed by the compressor, by exchanging heat with BOG that is discharged from the cargo tank and transferred to the compressor.~~

~~13~~12. A liquefied gas treatment method for a vessel, which is performed by a liquefied gas treatment system for the vessel including a cargo tank storing LNG, and an engine supplied with the LNG stored in the cargo tank and using the LNG as fuel, the liquefied gas treatment system including a compressor line configured to compress BOG generated in the cargo tank by a compressor and supply the compressed BOG to the engine as fuel, and a pump line configured to compress the LNG stored in the cargo tank by a pump and supply the compressed LNG to the engine as fuel, the liquefied gas treatment method comprising:

adjusting a methane number of the LNG to a value necessary for the engine by separating a heavy hydrocarbon component from the LNG when the LNG is supplied to the engine through the pump line,

wherein the BOG generated in the cargo tank is compressed at 150 to 400 bara by the compressor and the LNG stored in the cargo tank is compressed at 150 to 400 bara by the pump,

wherein the BOG which is not supplied to the engine among the BOG compressed at 150 to 400 bara by the compressor, is cooled in a heat exchanger by exchanging heat with the BOG that is discharged from the cargo tank and then transferred to the compressor, and

wherein the BOG cooled in the heat exchanger is decompressed by a decompressing means.