

Floating type LNG regasification unit

BACKGROUND OF THE INVENTION

Field of the Invention

[01] The present invention relates to a floating type LNG regasification unit, and more particularly, to a floating type LNG regasification unit, which can simultaneously provide gas and electricity as including an LNG regasificator for regasifying LNG and a gas turbine generator of an electricity generation unit installed on the LNG regasificator for generating electricity, which can reduce installation costs of the gas turbine generator because it can operate the gas turbine generator using gas generated in the LNG regasificator and does not need any compressor for compressing gas of the gas turbine generator, and which can reduce expenses by minimizing the amount of energies required for all units due to waste heat recovery and prevent sea pollution by using waste heat because it produces steam using exhaust gas generated in the gas turbine generator and uses the steam as a driving power of the LNG regasificator and a steam turbine generator added for production of electricity.

Background Art

[02] In general, an LNG floater (LNG floating storage and production facility) is a marine facility equipped with a unit to

produce LNG (Liquefied Natural Gas) or natural gas on a barge-type float.

[03] Such an LNG floater has different configurations of upper units or components according to types of cargo tanks for storing LNG. For instance, in case of a cargo tank of a MOSS type, it is recognized that the MOSS-type cargo tank is safe because it does not cause sloshing of LNG. However, the LNG floater having the MOSS-type cargo tank has a problem in that it requires an excessive area because there are spatial constraints in manufacturing an FPSO (Floating Production, Storage and Offloading) unit for producing LNG or renovating the existing LNG ship into an LNG FPSO ship.

[04] Moreover, in case of a cargo tank of a membrane type, because the membrane-type cargo tank causes sloshing, there are many limitations on that the membrane-type cargo tank is used as a cargo tank for the LNG floater. Furthermore, in order to use the membrane-type cargo tank in the LNG floater, strength of insulation parts must be largely increased, and in case where the LNG ship is renovated into an LNG FPSO ship, materials of a part of the cargo tank must be substituted with a reinforced insulation material.

[05] Additionally, in case of an SPB (Self Supporting Prismatic Type-B) cargo tank, because it is expected that it does not cause sloshing, the SPB cargo tank has been used as a cargo

tank for the LNG floater, but it is more expensive in manufacturing costs than the membrane-type cargo tank.

[06] As described above, various types of LNG regasification units are used according to the types of cargo tanks to produce gas in a state where it floats on the surface of sea.

[07] As an example, a floating type LNG regasification unit according to a prior art is described in brief as follows.

[08] As shown in FIG. 1, the floating type LNG regasification unit according to the prior art floats on the surface of sea, and includes: an LNG tank 10 filled with LNG; a low-pressure pump 81 for discharging LNG of the LNG tank 10 to the outside; a buffer tank 82 mounted outside for first buffering the LNG discharged from the LNG tank 10; a high-pressure pump 83 for discharging the LNG of the buffer tank 82 to the outside; a flow control valve 84 for controlling a flow supply of LNG; and an LNG regasificator 20 for regasifying the LNG.

[09] Such a floating type LNG regasification unit receives LNG from the LNG tank 10, regasifies the LNG in the LNG regasificator 20, and then, produces gas.

[10] However, such a floating type LNG regasification unit has several problems in that it is designed to produce only gas, in that it has a bad effect on the marine environment because it uses seawater for regasification, in that it causes a waste of

energy because it forcibly burns gas, which is generated by heat transfer over time due to a long-term storage period, or releases the generated gas into the atmosphere in the summer that a gas consumption decreases, and in that generators used for supporting a plant construction on the coast cause sea pollution due to the existing fuel.

SUMMARY OF THE INVENTION

[11] Accordingly, the present invention has been made to solve the above-mentioned problems occurring in the prior arts, and it is an object of the present invention to provide a floating type LNG regasification unit, which can simultaneously provide gas and electricity as including an LNG regasificator for regasifying LNG and a gas turbine generator of an electricity generation unit installed on the LNG regasificator for generating electricity

[12] It is another object of the present invention to provide a floating type LNG regasification unit, which can reduce installation costs of the gas turbine generator because it can operate the gas turbine generator using gas generated in the LNG regasificator and does not need any compressor for compressing gas of the gas turbine generator.

[13] It is a further object of the present invention to provide a floating type LNG regasification unit, which can reduce

expenses by minimizing the amount of energies required for all units due to waste heat recovery and prevent sea pollution by using waste heat because it produces steam using exhaust gas generated in the gas turbine generator and uses the steam as a driving power of the LNG regasificator and a steam turbine generator added for production of electricity.

[14] To accomplish the above object, according to the present invention, there is provided a floating type LNG regasification unit including an LNG storage tank, an LNG regasificator, and an electricity generation unit for producing gas and electricity through the LNG regasificator.

[15] It is preferable that the electricity generation unit generates electricity through a gas turbine generator, which is operated by regasified gas produced in the LNG regasificator.

[16] Moreover, it is preferable that the floating type LNG regasification unit further includes an exhaust gas heat exchanger for generating high-temperature steam using exhaust gas generated in the gas turbine generator.

[17] Furthermore, it is preferable that the LNG regasificator uses steam generated in the exhaust gas heat exchanger as an energy source for regasification of LNG.

[18] Additionally, it is preferable that the steam passing through the LNG regasificator is converted into water and reused

as condensate for generating steam in the exhaust gas heat exchanger.

[19] In addition, it is preferable that the floating type LNG regasification unit further includes a heat exchanger for heating water discharged from the LNG regasificator to convert into a high-temperature condensate.

[20] Moreover, it is preferable that the heat exchanger cools high-temperature cooling water, which is discharged from the gas turbine generator or an air-conditioning system installed on the regasification unit, using cooled water discharged from the LNG regasificator.

[21] Furthermore, it is preferable that the floating type LNG regasification unit further includes a steam turbine generator for generating electricity using steam generated in the exhaust gas heat exchanger.

[22] Additionally, it is preferable that water discharged from the steam turbine generator is mixed with water, which is discharged from the LNG regasificator, and supplied to the heat exchanger.

[23] In addition, it is preferable that the floating type LNG regasification unit further includes a feed channel for feeding exhaust gas generated from the exhaust gas heat exchanger into the LNG regasificator.

[24] As described above, the floating type LNG regasification unit according to the present invention can simultaneously provide gas and electricity as including an LNG regasificator for regasifying LNG and a gas turbine generator of an electricity generation unit installed on the LNG regasificator for generating electricity.

[25] The floating type LNG regasification unit can reduce installation costs of the gas turbine generator because it can operate the gas turbine generator using gas generated in the LNG regasificator and does not need any compressor for compressing gas of the gas turbine generator.

[26] The floating type LNG regasification unit can reduce expenses by minimizing the amount of energies required for all units due to waste heat recovery and prevent sea pollution by using waste heat because it produces steam using exhaust gas generated in the gas turbine generator and uses the steam as a driving power of the LNG regasificator and the steam turbine generator added for production of electricity.

BRIEF DESCRIPTION OF THE DRAWINGS

[27] The above and other objects, features and advantages of the present invention will be apparent from the following detailed description of the preferred embodiments of the

invention in conjunction with the accompanying drawings, in which:

[28] FIG. 1 is a schematic diagram of a floating type LNG regasification unit according to a prior art; and

[29] FIG. 2 is a schematic diagram of a floating type LNG regasification unit according to a preferred embodiment of the present invention, which is equipped with an electricity generation unit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[30] Reference will be now made in detail to the preferred embodiment of the present invention with reference to the attached drawings.

[31] As shown in FIG. 2, a floating type LNG regasification unit according to a preferred embodiment of the present invention includes an LNG storage tank 10, an LNG regasificator 20, and an electricity generation unit for generating electricity.

[32] Here, the electricity generation unit generates electricity through a gas turbine generator 30, which is operated by regasified gas produced in the LNG regasificator 20.

[33] Moreover, the floating type LNG regasification unit further includes an exhaust gas heat exchanger 40 for generating high-temperature steam using exhaust gas generated in the gas turbine generator 30.

[34] Here, the LNG regasificator 20 uses steam generated in the exhaust gas heat exchanger 40 as an energy source for regasification of LNG.

[35] Furthermore, the steam passing through the LNG regasificator 20 is converted into water, and then, reused as condensate for generating steam in the exhaust gas heat exchanger 40.

[36] Additionally, the floating type LNG regasification unit further includes a heat exchanger 50 for cooling high-temperature cooling water, which is discharged from the gas turbine generator 30, an air-conditioning system installed on the regasification unit, or the like, using water discharged from the LNG regasificator 20.

[37] Here, heat obtained through heat-exchange in the heat exchanger 50 serves to heat water discharged from the LNG regasificator 20.

[38] In addition, the floating type LNG regasification unit further includes a steam turbine generator 60 for generating electricity using steam generated in the exhaust gas heat exchanger 40.

[39] Moreover, water discharged from the steam turbine generator 60 is mixed with water discharged from the LNG regasificator 20, and then, supplied to the heat exchanger 50.

[40] In the meantime, the floating type LNG regasification unit further includes a feed channel 70 for feeding exhaust gas generated from the exhaust gas heat exchanger into the LNG regasificator.

[41] In the drawing, the unexplained reference numeral 81 designates a low-pressure pump mounted in an LNG tank 10, 82 designates a buffer tank, 83 designates a high-pressure pump, and 84 designates a flow control valve.

[42] Furthermore, the unexplained reference numeral 85 designates a gas flow meter, 86 designates a divider, 87 designates a transformer, and 88 designates a circulating pump.

[43] The floating type LNG regasification unit having the above configuration is basically made to produce gas in the LNG regasificator 20 by receiving LNG from the LNG storage tank 10 through the low-pressure pump 81, the buffer tank 82, and the high-pressure pump 83 in order, and can generate electricity if the electricity generation unit is additionally installed on the floating type LNG regasification unit.

[44] Hereinafter, an electricity generation process through the electricity generation unit will be described. First, for the electricity generation unit, the gas turbine generator 30 is mounted and operated by regasified gas produced in the LNG regasificator 20 to thereby generate electricity.

[45] Here, exhaust gas generated in the gas turbine generator 30 produces steam through heat-exchange with condensate in the exhaust gas heat exchanger 40, and then, emitted into the atmosphere.

[46] Additionally, high-temperature steam obtained through the heat exchange is used as an energy source for LNG regasification of the LNG regasificator 20.

[47] That is, this is when the LNG regasificator 20 can be operated not using diesel, which is a start fuel, but using steam generated in the exhaust gas heat exchanger 40.

[48] Moreover, the steam passing through the LNG regasificator 20 is converted into water, and then, reused as condensate for generating steam in the exhaust gas heat exchanger 40.

[49] In this instance, the steam passing through the LNG regasificator 20 is converted into water (of about 20°C), and the, transferred into the heat exchanger 50. After that, the water is heat-exchanged with high-temperature cooling water (of about 60°C), which is discharged from the gas turbine generator 30, the air-conditioning system installed on the regasification unit, or the like, in the heat exchanger 50 to thereby convert the high-temperature cooling water into low-temperature cooling water (of about 30°C), and then, the low-temperature cooling water is reused as cooling water for the gas turbine generator 30 or the

air-conditioning system installed on the regasification unit, or the like.

[50] In the meantime, some of the steam generated in the exhaust gas heat exchanger 40 is transferred into the steam turbine generator 60 to generate electricity.

[51] Furthermore, water discharged from the steam turbine generator 60 (of about 40°C) is mixed with water discharged from the LNG regasificator 20, and then, supplied into the heat exchanger 50.

[52] In this instance, water heat-exchanged in the heat exchanger 50 is in a range of 45°C to 50°C, and transferred into the exhaust gas heat exchanger 40 through the circulating pump 88 as condensate.

[53] In the meantime, exhaust gas discharged from the exhaust gas heat exchanger 40 may be re-supplied into the LNG regasificator 20 through the feed channel 70.

[54] As described above, the floating type LNG regasification unit according to the present invention can produce gas through the LNG regasificator 20 and generate electricity by operating the gas turbine generator 30 using regasified gas. In addition, the floating type LNG regasification unit can make steam using exhaust gas of the gas turbine generator 30 to use it as a power source for the steam turbine generator 60, whereby the floating type LNG

regasification unit can provide various useful effects, for instance, effective utilization of energies, prevention of sea pollution, and so on.

[55] While the present invention has been described with reference to the particular illustrative embodiment, it is not to be restricted by the embodiment but only by the appended claims. It is to be appreciated that those skilled in the art can change or modify the embodiment without departing from the scope and spirit of the present invention.

What is claimed is:

1. A floating type LNG regasification unit, which includes
an LNG storage tank (10) and an LNG regasificator (20),
5 comprising:

an electricity generation unit for producing gas and
electricity through the LNG regasificator (20).

2. The floating type LNG regasification unit according to
10 claim 1, wherein the electricity generation unit generates
electricity through a gas turbine generator (30), which is
operated by regasified gas produced in the LNG regasificator (20).

3. The floating type LNG regasification unit according to
15 claim 2, further comprising an exhaust gas heat exchanger (40)
for generating high-temperature steam using exhaust gas generated
in the gas turbine generator (30).

4. The floating type LNG regasification unit according to
20 claim 3, wherein the LNG regasificator (20) uses steam generated
in the exhaust gas heat exchanger (40) as an energy source for
regasification of LNG.

5. The floating type LNG regasification unit according to claim 4, wherein the steam passing through the LNG regasificator (20) is converted into water and reused as condensate for generating steam in the exhaust gas heat exchanger (40).

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6. The floating type LNG regasification unit according to claim 5, further comprising a heat exchanger (50) for heating water discharged from the LNG regasificator (20) to convert into a high-temperature condensate.

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7. The floating type LNG regasification unit according to claim 6, wherein the heat exchanger (50) cools high-temperature cooling water, which is discharged from the gas turbine generator (30) or an air-conditioning system installed on the regasification unit, using cooled water discharged from the LNG regasificator (20).

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8. The floating type LNG regasification unit according to claim 3, further comprising a steam turbine generator (60) for generating electricity using steam generated in the exhaust gas heat exchanger (40).

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9. The floating type LNG regasification unit according to claim 8, wherein water discharged from the steam turbine

generator (60) is mixed with water, which is discharged from the LNG regasificator (20), and supplied to the heat exchanger (50).

10. The floating type LNG regasification unit according to
5 claim 3, further comprising a feed channel (70) for feeding exhaust gas generated from the exhaust gas heat exchanger (40) into the LNG regasificator (20).