to 100 bara.

[26] A fluid may be discharged from the receiver and divided into a third flow and a fourth flow, the divided third flow may be expanded to cool the fourth flow, and the cooled fourth flow may be supplied to the storage tank.

[27] The cooled fourth flow may be expanded and supplied to the storage tank and a level of the receiver may be measured to regulate a degree of expansion of the cooled fourth flow.

[28] The first flow may be expanded to a pressure of 4 to 15 bara, the third flow may be expanded to a pressure of 2 to 5 bara, and the expanded first flow and the expanded third flow may be supplied to the compressor after cooling the second flow and the fourth flow, and the third flow is supplied farther downstream of the compressor than the first flow.

[29] The BOG compressed by the compressor may be cooled to 12°C to 45°C before heat exchange with the BOG generated from the liquefied gas.

[30] In accordance with a further aspect of the present invention, a method for reliquefying boil-off gas generated from a liquefied gas comprising at least one selected from the group consisting of ethane, propane, and butane through natural vaporization, wherein the total amount of the BOG is reliquefied by compressing the BOG, performing heat exchange between the compressed BOG and non-compressed BOG, and expanding at least some of the compressed BOG to perform heat exchange between the expanded BOG and non-expanded BOG at least once, and wherein the reliquefied BOG is stored in a pressure container to control an inner pressure of the pressure container such that the compressed BOG is maintained at a preset pressure until the compressed BOG is reliquefied and stored in the pressure container.

[31] The reliquefied BOG may be stored in a pressure container to control an inner pressure of the pressure container such that the compressed BOG is maintained at a preset pressure until the compressed BOG is reliquefied and stored in the pressure container.

【Advantageous Effects】

[32] The BOG reliquefaction apparatus and method according to the present invention can reduce installation costs by omitting a separate independent cold heat supply cycle and is adapted to reliquefy BOG through self-heat exchange of BOG, such as ethane and the like, thereby providing the same level of reliquefaction

【CLAIMS】

【Claim 1】

An apparatus for reliquefaction of boil-off gas (BOG) generated in a liquefied gas storage tank provided to a vessel, comprising:

a compressor compressing BOG discharged from the storage tank;

a heat exchanger performing heat exchange of the BOG compressed by the compressor with the BOG discharged from the storage tank, the BOG having passed through the heat exchanger being divided into at least two flows comprising a first flow and a second flow;

a first expansion unit expanding the first flow;

a first intermediate cooler cooling the second flow remaining after division into the at least two flows using the first flow expanded by the first expansion unit as a refrigerant; and

a receiver receiving the second flow having passed through the first intermediate cooler,

wherein pressure downstream of the compressor is controlled by the receiver.

【Claim 2】

The apparatus according to claim 1, further comprising:

a pressure control line regulating a pressure of the receiver by discharging a fluid from the receiver,

wherein the fluid discharged through the pressure control line is returned to the liquefied gas storage tank or is discharged therefrom.

【Claim 3】

The apparatus according to claim 1 or 2, further comprising:

a level control line regulating a level of the receiver by discharging a fluid from the receiver,

wherein at least some of the fluid discharged through the level control line is returned to the liquefied gas storage tank.

【Claim 4】

The apparatus according to claim 3, further comprising:

a third expansion unit disposed on the level control line and expanding the fluid returned to the liquefied gas storage tank along the level control line.

【Claim 5】

The apparatus according to claim 4, wherein the pressure downstream of the compressor is in the range of 40 to 100 bara.

【Claim 6】

The apparatus according to claim 4, wherein the BOG compressed by the compressor has a temperature of 80°C to 130°C.

【Claim 7】

The apparatus according to claim 4, further comprising:

an after-cooler disposed downstream of the compressor and cooling the BOG compressed by the compressor,

wherein the BOG cooled by the after-cooler has a temperature of 12°C to 45°C.

【Claim 8】

The apparatus according to claim 4, wherein the BOG expanded by the first expansion unit has a pressure of 4 to 15 bara.

【Claim 9】

The apparatus according to claim 4, further comprising:

a second expansion unit disposed on the level control line, the second expansion unit dividing the fluid discharged from the receiver into at least two flows comprising a third flow and a fourth flow and expanding the third flow; and

a second intermediate cooler cooling the fourth flow remaining after division into the at least two flows using the third flow expanded by the second expansion unit as a refrigerant,

wherein the fourth flow having passed through the second intermediate cooler is returned to the liquefied gas storage tank and the third flow having passed through the second intermediate cooler is supplied to the compressor.

【Claim 10】

The apparatus according to claim 9, wherein the BOG expanded by the second expansion unit has a pressure of 2 to 5 bara.

【Claim 11】

The apparatus according to claim 9, wherein the compressor is a multistage compressor comprising multiple compressors, and each of the first flow having passed through the first intermediate cooler and the third flow having passed through the second intermediate cooler is supplied downstream of any one of the multiple compressors.

【Claim 12】

A method for reliquefying boil-off gas (BOG) generated in a liquefied gas storage tank provided to a vessel, comprising:

compressing, by a compressor, BOG generated from the liquefied gas;

cooling the compressed BOG using the BOG generated from the liquefied gas;

dividing the cooled BOG into a first flow and a second flow, followed by expanding the first flow;

cooling the second flow using the expanded BOG;

supplying the cooled second flow to a receiver; and

controlling a pressure downstream of the compressor by controlling a pressure of the receiver.

【Claim 13】

The method according to claim 12, wherein a fluid is discharged from the receiver to be supplied to the storage tank and a fluid discharged from the receiver is controlled to maintain an inner pressure of the receiver or the pressure downstream of the compressor at a preset pressure.

【Claim 14】

The method according to claim 13, wherein the pressure downstream of the compressor is set in the range of 40 to 100 bara.

【Claim 15】

The method according to claim 13, wherein a fluid is discharged from the receiver and divided into a third flow and a fourth flow, the divided third flow is expanded to cool the fourth flow, and the cooled fourth flow is supplied to the storage tank.

【Claim 16】

The method according to claim 15, wherein the cooled fourth flow is expanded and supplied to the storage tank and a level of the receiver is measured to regulate a degree of expansion of the cooled fourth flow.

【Claim 17】

The method according to claim 15, wherein the first flow is expanded to a pressure of 4 to 15 bara,

the third flow is expanded to a pressure of 2 to 5 bara, and

the expanded first flow and the expanded third flow are supplied to the compressor after cooling the second flow and the fourth flow,

the third flow being supplied farther downstream of the compressor than the first flow.

【Claim 18】

The method according to claim 13, wherein the BOG compressed by the compressor is cooled to 12°C to 45°C before heat exchange with the BOG generated from the liquefied gas.

【Claim 19】

A method for reliquefying boil-off gas (BOG) generated from a liquefied gas comprising at least one selected from the group consisting of ethane, propane, and butane through natural vaporization,

wherein a total amount of the BOG is reliquefied by compressing the BOG, performing heat exchange between the compressed BOG and non-compressed BOG, and expanding at least some of the compressed BOG to perform heat exchange between the expanded BOG and non-expanded BOG at least once, and

wherein the reliquefied BOG is stored in a pressure container to control an inner pressure of the pressure container such that the compressed BOG is maintained at a preset

pressure until the compressed BOG is reliquefied and stored in the pressure container.