

## CLAIMS

What is claimed is:

1. A boil-off gas (BOG) reliquefaction system comprising:

an in-tank fuel pump **1**;

an LNG storage tank **2**;

a heat exchanger **3**;

a multistage compressor **4**;

a compressor after cooler **5**;

an expansion valve **6**; and

an LNG flash drum **7**;

wherein the in-tank fuel pump **1** is disposed inside the LNG storage tank **2** for drawing LNG from the LNG storage tank **2**;

wherein the heat exchanger **3** is fluidly coupled with the in-tank fuel pump **1** for receiving the LNG from the in-tank pump **1** and coupled with the storage tank **2** to receive BOG from the storage tank **2**; wherein the LNG is vaporized, and the vaporized LNG and the BOG provide cold sources, resulting in cold energy recovered BOG; wherein the vaporized LNG is used as fuel gas;

wherein the inlet of the multistage compressor **4** is coupled to the heat exchanger **3** to receive the cold energy recovered BOG, and the outlet of the multistage compressor **4** to the inlet of the compressor after cooler **5**; wherein the cold energy recovered BOG is compressed; and wherein the compressor after cooler **5** removes heat from the compressed BOG;

wherein the outlet of the compressor after cooler **5** is coupled with the heat exchanger **3**; and wherein the compressor after cooler **5** discharges the compressed and after cooled BOG to the heat exchanger **3** at a temperature ranging from 20°C to 45°C;

wherein inside the heat exchanger, the compressed and after cooled BOG is cooled down further by the cold sources from the vaporized LNG and BOG;

wherein the inlet of the expansion valve **6** is coupled with the heat exchanger **3** to receive the cryogenically cooled compressed BOG;

wherein the outlet of the expansion valve **6** is coupled with the flash drum **7**; wherein the cold compressed BOG is expanded via the expansion valve **6**, resulting in the expanded BOG that is close to atmospheric pressure; and

wherein the flash drum **7** receives the expanded BOG, and returns flash gas and LNG recovered to the LNG storage tank **2**.

2. The BOG reliquefaction system of claim 1, wherein the BOG is compressed in the multistage compressor **4** to a pressure range from 30 to 300barg.

3. The BOG reliquefaction system of claim 1, wherein the resultant cold compressed BOG leaves the heat exchanger at a temperature range from -130°C to -155°C, preferably around -150°C.

4. The BOG reliquefaction system of claim 1, further comprising an LNG booster pump **18**, wherein the LNG booster pump **18** is disposed between the LNG storage tank **2** and the heat exchanger **3**, and increases the pressure of the LNG so as to supply the fuel gas with increased pressure.

5. The BOG reliquefaction system of claim 1, further comprising an additional vaporizer **20**, wherein the vaporizer **20** is disposed downstream of the heat exchanger **3**.

6. The BOG reliquefaction system of claim 5, wherein the discharge cooling medium from the compressor after cooler **5** is used to heat the vaporizer **20**.

7. The BOG reliquefaction system of claim 1, wherein the expansion valve **6** is a Joule Thomson (JT) valve.

8. A process of reliquefaction of LNG boil-off gas (BOG) **500** comprises:

providing **510** cold BOG from an LNG storage tank, wherein the cold BOG is at close to atmospheric pressure and -160°C;

supplying **520** cold sources by passing cold LNG and the cold BOG through a heat exchanger, wherein the cold LNG is at close to atmospheric pressure and -160°C and from the LNG storage tank; wherein the cold BOG is heated in the heat exchanger to room temperature, and the LNG is vaporized in the process; wherein the vaporized LNG is used as fuel gas;

compressing **530** the heated BOG from the heat exchanger to a pressure ranges from 30 to 300barg, wherein the compressed BOG is discharged with temperature ranging from 100 to 150°C;

cooling **540** the compressed BOG to remove heat from the compressed BOG, resulting in a cooled compressed BOG at a temperature ranging from 20°C to 45°C;

further cooling **550** the cooled compressed BOG to a temperature ranging from -130°C to -155°C, preferably around -150°C;

expanding **560** the further cooled compressed BOG into flash gas and LNG close to atmospheric pressure and -160°C; and

returning **570** the flash gas and LNG to the storage tank.