【Technical Problem】

In use of LNG as fuel for ships, LNG in a cryogenic state must be increased in pressure and then gasified depending upon pressure and temperature conditions for an engine.

In a ship engine, for example, a propulsion engine, since load of the engine can vary depending upon a navigation speed of the ship, it is necessary for supply pressure of fuel to be varied depending upon the load of the engine.

To this end, a valve may be provided to a front end of the engine in a fuel supply line to change the degree of opening. However, when operation of the overall system depends on such a valve, there can be problems such as frequent repair and replacement of the valve due to damage to a sheet of the valve and reduction in lifespan of the valve.

Further, the valve can be rapidly closed in order to block fuel supply to the engine, thereby causing abrupt increase in pressure of the system.

Embodiments of the present invention seek to solve such problems and provide a fuel supply control system that can secure stable supply of fuel to an engine by allowing variable fuel supply depending upon variation of load of the engine.

【Technical Solution】

In accordance with one aspect of the present invention, a system for controlling fuel supply to an engine for ships includes: a system operating zone in which LNG is pumped by a pump and gasified; and a supply operating zone receiving the pumped and gasified LNG from the system operating zone and supplying the LNG to the engine, wherein a preset pressure of the system operating zone is set to be higher than that of the supply operating zone, and wherein the system operating zone comprises: a high pressure pump pumping LNG; a gasifier gasifying the LNG pumped by the high pressure pump; a recirculation valve configured to return at least part of the pumped LNG from the pump to an LNG tank; a gas pipeline connecting between the gasifier and a fuel supply line for the engine; a first pressure detection unit configured to detect a first pressure on the gas pipeline downstream the gasifier; and wherein the supplying operating zone comprises: a

shut-off valve installed on the gas pipeline downstream the gasifier; a main gas valve installed on the gas pipeline downstream the shut-off valve; a vent line branched off the gas pipeline between the shut-off valve and the main gas valve; a pressure regulation valve installed on the vent line; and a second pressure detection unit configured to detect a second pressure on the gas pipeline downstream the main gas valve; and wherein the system further comprises: at least one controller configured to control operation of the pump, the recirculation valve, the shut-off valve, the main gas valve and the pressure regulation valve based on a load of the engine, the first pressure detected by the first pressure detection unit, and the second pressure detected by the second pressure detection unit such that: rotational speed of the pump and a degree of opening of the recirculation valve are controlled to make the first pressure detected by the first pressure detection unit upstream the shut-off valve follow a first preset pressure as higher than the second preset pressure by a pressure difference that is maintained by the shut-off valve and the main gas valve, and opening and closing of at least one of the main gas valve and the pressure regulation valve are controlled to make the second pressure detected by the second pressure detection unit downstream the main gas valve follow a second preset pressure corresponding to a required supply pressure for the load of the engine.

The system operating zone may include: a high pressure pump pumping LNG; a gasifier gasifying the LNG pumped by the high pressure pump; and a return line through which the pumped LNG introduced into the gasifier is returned from downstream of the high pressure pump to upstream of the storage tank or the high pressure pump.

The system operating zone may include: a recirculation valve provided to

the return line; a first pressure detection unit detecting pressure of the system operating zone at downstream side of the gasifier; and a first controller receiving a pressure value detected by the first pressure detection unit and controlling a degree of opening of the recirculation valve and a speed of the high pressure pump depending upon the preset pressure of the system operating zone to control the pressure of the system operating zone.

The system may further include: a heat medium circulation line through which a heat medium for gasifying the LNG in the gasifier is circulated; a heat medium pump provided to the heat medium circulation line and pumping the heat medium to be introduced into the gasifier; and a heat medium heater heating the heat medium at a downstream side of the heat medium pump.

The supply operating zone may include: a supply line through which the LNG gasified by the gasifier is supplied to the engine; a main gas valve provided to the supply line; and a vent line branched from the supply line at an upstream side of the main gas valve, and when the pressure of the supply line increases above the preset pressure of the supply operating zone, the main gas valve is closed and the gasified LNG is discharged through the vent line.

The supply operating zone may include: a pressure regulation valve provided to the vent line; a second pressure detection unit detecting the pressure of the supply operating zone at a downstream side of the main gas valve; and a second controller receiving a pressure value detected by the second pressure detection unit and controlling opening or closing of the main gas valve and the pressure regulation valve depending upon the preset pressure of the supply operating zone to control the pressure of the supply operating zone.

The system may further include: a first shut-off valve disposed downstream of the gasifier and a second shut-off valve disposed upstream of a point where the vent line is branched from the supply line.

In accordance with embodiments of the present invention, a method of controlling fuel supply to an engine for ships includes: 1) pumping LNG using a pump, followed by gasifying the LNG; and 2) supplying the pumped and gasified LNG to the engine, wherein operation is carried out by setting a preset

pressure of a zone in which step 1 is performed to be higher than a preset pressure of a zone in which step 2) is performed.

The pressure of the zone in which step 1) is performed may be controlled by controlling a speed of the pump or by returning the pumped LNG to a storage tank or upstream side of the pump based on a detected pressure value of the pumped and gasified LNG.

The pressure of the zone in which step 2) is performed may be controlled by closing a valve to block supply of the pumped and gasified LNG into the engine while discharging the gasified LNG from the zone in which step 2) is performed, when pressure of the pumped and gasified LNG introduced into the engine for ships is higher than the preset pressure of the zone in which step 2) is performed, based on a detected pressure value of the pumped and gasified LNG introduced into the engine for ships.

In accordance with embodiments of the present invention, a system for controlling fuel supply to an engine for ships includes: a system operating zone in which LNG is pumped by a pump and gasified; and a supply operating zone receiving the pumped and gasified LNG from the system operating zone and supplying the pumped and gasified LNG to the engine, wherein pressure of the system operating zone is controlled independently of the pressure of the supply operating zone.

In accordance with embodiments of the present invention, a method of controlling fuel supply to an engine for ships includes: pumping LNG using a pump, followed by gasifying the LNG; and 2) supplying the pumped and gasified LNG to the engine, wherein pressure of a zone in which step 1) is performed is controlled independently of the pressure of a zone in which step 2) is performed.

【Advantageous Effects】

Embodiments of the preset invention provide a system for controlling fuel supply to an engine for ships that includes a system operating zone in which LNG is pumped by a pump and gasified, and a supply operating zone receiving the pumped and gasified LNG from the system operating zone and supplying the LNG to the engine, in which the system operating zone is set to have a higher preset pressure

【CLAIMS】

【Claim 1】

A system for controlling fuel supply to an engine for ships, comprising:

a system operating zone in which LNG is pumped by a pump and gasified; and

a supply operating zone receiving the pumped and gasified LNG from the system operating zone and supplying the LNG to the engine,

wherein a preset pressure of the system operating zone is set to be higher than that of the supply operating zone, and

wherein the system operating zone comprises:

a high pressure pump pumping LNG;

a gasifier gasifying the LNG pumped by the high pressure pump;

a recirculation valve configured to return at least part of the pumped LNG from the pump to an LNG tank;

a gas pipeline connecting between the gasifier and a fuel supply line for the engine;

a first pressure detection unit configured to detect a first pressure on the gas pipeline downstream the gasifier;

and wherein the supplying operating zone comprises:

a shut-off valve installed on the gas pipeline downstream the gasifier;

a main gas valve installed on the gas pipeline downstream the shut-off valve;

a vent line branched off the gas pipeline between the shut-off valve and the main gas valve;

a pressure regulation valve installed on the vent line; and

a second pressure detection unit configured to detect a second pressure on the gas pipeline downstream the main gas valve; and

wherein the system further comprises:

at least one controller configured to control operation of the pump, the recirculation valve, the shut-off valve, the main gas valve and the pressure

regulation valve based on a load of the engine, the first pressure detected by the first pressure detection unit, and the second pressure detected by the second pressure detection unit such that:

rotational speed of the pump and a degree of opening of the recirculation valve are controlled to make the first pressure detected by the first pressure detection unit upstream the shut-off valve follow a first preset pressure as higher than the second preset pressure by a pressure difference that is maintained by the shut-off valve and the main gas valve, and

opening and closing of at least one of the main gas valve and the pressure regulation valve are controlled to make the second pressure detected by the second pressure detection unit downstream the main gas valve follow a second preset pressure corresponding to a required supply pressure for the load of the engine.

【Claim 2】

The system for controlling fuel supply to an engine for ships according to claim 1, further comprising:

a heat medium circulation line through which a heat medium for gasifying the LNG in the gasifier is circulated;

a heat medium pump provided to the heat medium circulation line and pumping the heat medium to be introduced into the gasifier; and

a heat medium heater heating the heat medium at a downstream side of the heat medium pump.

【Claim 3】

A method of controlling fuel supply to an engine for ships, comprising:

providing the system of claim 1;

pumping LNG using the pump,

gasifying pumped LNG from the pump for generating gasified LNG using the gasifier;

supplying gasified LNG from the gasifier to the engine via the gas pipeline;

controlling opening and closing of the main gas valve and the pressure regulation valve to make the second pressure detected by the second pressure detection unit downstream the main gas valve follow the second preset pressure corresponding to the required supply pressure for the load of the engine; and

controlling rotational speed of the pump and a degree of opening of the recirculation valve to make the first pressure detected by the first pressure detection unit upstream the shutoff valve follow the first preset pressure higher than the second preset pressure by a pressure difference that is maintained by the shutoff valve and the main gas valve.