bus; a third DC/DC converter connected to the DC bus; a fourth DC/DC converter connected to the DC bus; a first power storage unit connected to the first DC/DC converter and storing electric power when a voltage of the DC bus is maintained at a first threshold value or higher for a first period of time; and a first resistor connected to the second DC/DC converter and consuming electric power when the voltage of the DC bus is maintained at the first threshold value or higher for a second period of time; a second power storage unit connected to the third DC/DC converter and storing electric power when the voltage of the DC bus is maintained at the first threshold value or higher for the first period of time; and a second resistor connected to the fourth DC/DC converter and consuming electric power when the voltage of the DC bus is maintained at the first threshold value or higher for the second period of time, wherein the second period of time is longer than the first period of time.

[24] The first DC/DC converter may measure the voltage of the DC bus, and may allow electric power to be supplied from the DC bus to the first power storage unit such that the first power storage unit stores electric power, when the voltage of the DC bus is maintained at the first threshold value or higher for the first period of time.

[25] The second DC/DC converter may allow electric power to be suppled from the DC bus to the first resistor such that the first resistor consumes electric power when the voltage of the DC bus is maintained at the first threshold value or higher for the second period of time.

[26] The hybrid power supply apparatus may further include: a third DC/DC converter connected to the DC bus; a fourth DC/DC converter connected to the DC bus; a second power storage unit connected to the third DC/DC converter and storing electric power when the voltage of the DC bus is maintained at the first threshold value or higher for the first period of time; and a second resistor connected to the fourth DC/DC converter and consuming electric power when the voltage of the DC bus is maintained at the first threshold value or higher for the second period of time.

[27] The first power storage unit may be an ultracapacitor.

[28] The electric power load may be a draw-works.

[29] The electric power load may be a top drive.

[30] In accordance with another aspect of the present invention, there is provided a hybrid power supply method for an offshore plant, including: measuring voltage of a DC bus; storing, by a plurality of power storage units, electric power when the measured voltage is maintained at a first threshold value or higher for a first period of time; and consuming, by a plurality of resistors, electric power when the measured voltage is

maintained at the first threshold value or higher for a second period of time, wherein a plurality of DC/DC converters connected to the DC bus, the plurality of power storage units and the plurality of resistors connected to the plurality of DC/DC converters respectively, the DC bus is connected to an electric power load generating regenerative power and the second period of time is longer than the first period of time.

[31] The DC bus may be connected to a first DC/DC converter and a second DC/DC converter, the power storage unit may be connected to the first DC/DC converter, and the resistor may be connected to the second DC/DC converter.

[32] The first DC/DC converter may measure the voltage of the DC bus, and may allow electric power to be supplied from the DC bus to the first power storage unit such that the first power storage unit stores electric power, when the voltage of the DC bus is maintained at the first threshold value or higher for the first period of time.

[33] The second DC/DC converter may allow electric power to be suppled from the DC bus to the first resistor such that the first resistor consumes electric power when the voltage of the DC bus is maintained at the first threshold value or higher for the second period of time.

[34] The power storage unit may be an ultracapacitor.

[35] The electric power load may be a draw-works.

[36] The electric power load may be a top drive.

【Advantageous Effects】

[37] According to embodiments of the present invention, it is possible to provide a hybrid power supply apparatus and method which allow regenerative power generated in a draw-works motor, a top drive motor, and a thruster motor to be stored in a power storage unit and supply electric power stored in the power storage unit upon abrupt increase in power consumption of the draw-works motor, the top drive motor, and the thruster motor to efficiently utilize regenerative power while maintaining power output of a power generator at a constant level to reduce exhaust gas.

[38] In addition, it is possible to provide a hybrid power supply apparatus and method which use an ultracapacitor having high responsiveness as a power storage unit, thereby supplying suitable electric power corresponding to abrupt change in

apparatus according to the embodiments of the invention will be described with reference to FIG. 9. FIG. 9 is a graph showing power consumption of each component of the power supply apparatus according to the embodiments of the invention.

[80] As shown in FIG. 9, it can be seen that, when regenerative power is generated in the electric power load, the power storage unit stores the generated regenerative power, and, when power consumption of the electric power load is suddenly increased, the power storage unit supplies electric power to the electric power load, thereby maintaining power output of the power generator at a constant level.

[81] Although some embodiments have been described herein, it should be understood by those skilled in the art that these embodiments are given by way of illustration only, and that various modifications, variations and alterations can be made without departing from the spirit and scope of the invention. Therefore, the embodiments disclosed herein should not be construed as limiting the technical scope of the present invention, but should be construed as illustrating the idea of the present invention. The scope of the present invention should be interpreted according to the appended claims as covering all modifications or variations derived from the appended claims and equivalents thereof.

【CLAIMS】

【Claim 1】

A hybrid power supply apparatus for an offshore plant, comprising:

a power generator;

an AC/DC converter converting alternating current produced by the power generator into direct current and supplying the direct current to a DC bus;

an electric power load connected to the DC bus and generating regenerative power;

a first DC/DC converter connected to the DC bus;

a second DC/DC converter connected to the DC bus;

a third DC/DC converter connected to the DC bus;

a fourth DC/DC converter connected to the DC bus;

a first power storage unit connected to the first DC/DC converter and storing electric power when a voltage of the DC bus is maintained at a first threshold value or higher for a first period of time; and

a first resistor connected to the second DC/DC converter and consuming electric power when the voltage of the DC bus is maintained at the first threshold value or higher for a second period of time;

a second power storage unit connected to the third DC/DC converter and storing electric power when the voltage of the DC bus is maintained at the first threshold value or higher for the first period of time; and

a second resistor connected to the fourth DC/DC converter and consuming electric power when the voltage of the DC bus is maintained at the first threshold value or higher for the second period of time,

wherein the second period of time is longer than the first period of time.

【Claim 2】

The hybrid power supply apparatus according to claim 1, wherein the first DC/DC converter measures the voltage of the DC bus, and allows electric power to be supplied from the DC bus to the first power storage unit such that the first power

storage unit stores electric power, when the voltage of the DC bus is maintained at the first threshold value or higher for the first period of time.

【Claim 3】

The hybrid power supply apparatus according to claim 1, wherein the second DC/DC converter allows electric power to be suppled from the DC bus to the first resistor such that the first resistor consumes electric power when the voltage of the DC bus is maintained at the first threshold value or higher for the second period

of time.

【Claim 4】

The hybrid power supply apparatus according to claim 1, wherein the first power storage unit is an ultracapacitor.

【Claim 5】

The hybrid power supply apparatus according to claim 1, wherein the electric power load is a draw-works.

【Claim 6】

The hybrid power supply apparatus according to claim 1, wherein the electric power load is a top drive.

【Claim 7】

A hybrid power supply method for an offshore plant, comprising:

measuring voltage of a DC bus;

storing, by a plurality of power storage units, electric power when the measured voltage is maintained at a first threshold value or higher for a first period of time; and

consuming, by a plurality of resistors, electric power when the measured voltage is

maintained at the first threshold value or higher for a second period of time,

wherein a plurality of DC/DC converters connected to the DC bus,

the plurality of power storage units and the plurality of resistors connected to the plurality of DC/DC converters respectively,

the DC bus is connected to an electric power load generating regenerative power and the second period of time is longer than the first period of time.

【Claim 8】

The hybrid power supply method according to claim 7, wherein the plurality of DC/DC converters connected to the plurality of power storage units measure the voltage of the DC bus, and allows electric power to be supplied from the DC bus to the plurality of power storage units such that the plurality of power storage units store electric power, when the voltage of the DC bus is maintained at the first threshold value or higher for the first period of time.

【Claim 9】

The hybrid power supply method according to claim 7, wherein the plurality of DC/DC converters connected to the plurality of resistors allow electric power to be supplied from the DC bus to the plurality of resistors such that the plurality of resistors consume electric power when the voltage of the DC bus is maintained at the first threshold value or higher for the second period of time.

【Claim 10】

The hybrid power supply method according to claim 7, wherein more than one of the plurality of power storage units are ultracapacitors.

【Claim 11】

The hybrid power supply method according to claim 7, wherein the electric

power load is a draw-works.

【Claim 12】

The hybrid power supply method according to claim 7, wherein the electric power load is a top drive.