Claims

1. A ballast water management (BWM) system configured to introduce ballast water into a ballast tank through a ballast water line and to discharge ballast water from the ballast tank after a retention time in the ballast tank, the system comprising:

a biocide source configured to introduce a biocide into the ballast water, the biocide source comprising a source of chloride-containing water fluidly connected to an electrolytic cell with at least one anode and at least one cathode, a power supply disposed to supply direct current through at least one anode and at least one cathode to generate the biocide, wherein an applied voltage of the supplied direct current is regulated to achieve a target amperage of the direct current, the biocide source configured to decrease a flow rate of the chloride-containing water introduced into the electrolytic cell if an amperage of the supplied direct current falls below the target amperage and the applied voltage is at a maximum value; and

a neutralization system configured to introduce a neutralizing agent selected to at least partially neutralize the biocidal activity of the biocide into the discharged ballast water.

2. The BWM system of claim 1, further comprising a filter fluidly connected to the ballast water line and disposed to remove at least a portion of solids from the ballast water to be introduced into the ballast tank.

3. The BWM system of claim 1, wherein the source of chloride-containing water is any of a ship cooling water system, a sea chest, and a chloride-containing water storage tank.

4. The BWM system of claim 1, wherein the biocide source comprises an inlet fluidly connected to a source of chloride-containing water that is fluidly isolated from the ballast water line.

5. The BWM system of claim 1, further comprising a first oxidation-reduction potential (ORP) sensor configured to measure an ORP value of the discharged ballast water.

6. The BWM system of claim 5, wherein the neutralization system is configured to discontinue introducing the neutralizing agent, in an OFF mode, if the measured ORP value from the first ORP sensor is less than a target ORP value.

7. The BWM system of claim 6, further comprising a second ORP sensor configured to measure a second ORP value of the discharged ballast water downstream from the neutralization agent introduction site.

8. A ballast water management (BWM) system fluidly connectable to a ballast tank of a ship, comprising:

a chlorination system comprising an electrolyzer configured to generate a chlorine-based biocide to be introduced into ballast water;

a first controller configured to regulate operation of the electrolyzer, the first controller programed to decrease a flow rate of water introduced into the electrolyzer if an amperage of a current applied in the electrolyzer falls below a target amperage value and a voltage applied in the electrolyzer is at a maximum value;

a dechlorination system fluidly connected downstream from the ballast tank, the dechlorination system comprising a source of neutralizing agent selected to reduce the chlorine-based biocide in ballast water to be discharged from the ship;

an oxidation-reduction potential (ORP) sensor configured to determine an ORP value of the ballast water to be discharged; and

a second controller configured to regulate addition of the neutralizing agent to the ballast water to be discharged in at least one of a first dechlorination mode and a second dechlorination mode,

wherein the second controller regulates addition of the neutralizing agent in the first dechlorination mode if the ORP value of the ballast water to be discharged is less than a target ORP value, and

wherein the second controller regulates addition of the neutralizing agent in the second dechlorination mode if the ORP value of the ballast water to be discharged is greater than or equal to the target ORP value.

9. The BWM system of claim 8, wherein the target ORP value is less than about 200 mV.

10. The BWM system of claim 9, wherein the dechlorination system further comprises a second ORP sensor configured to determine an ORP value of the ballast water downstream from a point of introduction of the neutralizing agent into the ballast water to be discharged and wherein the second controller is further configured to regulate addition of the neutralizing agent to a high target dechlorination concentration of neutralizing agent in the ballast water to be discharged if the downstream ORP value measured by the second ORP sensor is greater than the target ORP value.

11. The BWM system of claim 10, further comprising an integrated control system including the first controller and the second controller.

12. A method of managing ship ballast water, comprising:

drawing ballast water into a ballast tank of the ship;

introducing a chloride-containing water into an electrolytic cell at a flow rate;

applying a current through the electrolytic cell at a voltage to achieve an amperage sufficient to generate a chlorine-based biocide;

comparing the amperage to a target value;

adjusting the voltage to maintain the amperage at the target value;

decreasing the flow rate of the chloride-containing water introduced into the electrolytic cell if the amperage of the current applied to the electrolytic cell falls below

the target value and the voltage applied to the electrolytic cell is at a maximum value;

introducing the chlorine-based biocide into the ballast water;

discharging the ballast water from the ballast tank; and

dechlorinating the ballast water.

13. The method of claim 12, wherein dechlorinating the ballast water comprises adding a neutralizing agent to the ballast water during discharge thereof from the ballast tank in at least one of a low dechlorination mode and a high dechlorination mode, wherein dechlorination is performed in the low dechlorination mode if an ORP value of the ballast water to be discharged is less than a target ORP value, and wherein dechlorination is performed in the high dechlorination mode if the ORP value of ballast water to be discharged is at least the target ORP value.

14. The method of claim 12, wherein dechlorinating the ballast water comprises adding a neutralizing agent to the ballast water during discharge thereof from the ballast tank in at least one of a low dechlorination mode and a high dechlorination mode, wherein dechlorination is performed in the low dechlorination mode if an ORP value of the ballast water to be discharged is less than a target ORP value, and wherein dechlorination is performed in the high dechlorination mode if the ORP value of ballast water to be discharged is at least the target ORP value.

15. The BWM system of claim 1, further comprising a first oxidation-reduction potential (ORP) sensor configured to measure an ORP value of the discharged ballast water, and wherein the neutralization system is configured to discontinue introducing the neutralizing agent, in an OFF mode, if the measured ORP value from the first ORP sensor is less than a target ORP value.

16. The BWM system of claim 2, further comprising a first oxidation-reduction potential (ORP) sensor configured to measure an ORP value of the discharged ballast water, and wherein the neutralization system is configured to discontinue introducing the neutralizing agent, in an OFF mode, if the measured ORP value from the first ORP sensor is less than a target ORP value.

17. The BWM system of claim 3, further comprising a first oxidation-reduction potential (ORP) sensor configured to measure an ORP value of the discharged ballast water, and wherein the neutralization system is configured to discontinue introducing the neutralizing agent, in an OFF mode, if the measured ORP value from the first ORP sensor is less than a target ORP value.

18. The BWM system of claim 4, further comprising a first oxidation-reduction potential (ORP) sensor configured to measure an ORP value of the discharged ballast water, and wherein the neutralization system is configured to discontinue introducing the neutralizing agent, in an OFF

mode, if the measured ORP value from the first ORP sensor is less than a target ORP value.