CLAIMS

1. An electrochlorination process, comprising:

treating water from a source of water in a water conditioning system that removes at least a portion of anions and cations from the water to produce demineralized water;

blending the demineralized water with sodium chloride to form a brine solution;

forming a disinfection solution including sodium hypochlorite having a chlorate concentration of less than 0.25 mg/L by introducing the brine solution into an electrolyzer; and

controlling a shut off valve disposed downstream of the electrolyzer responsive to the chlorate concentration in the disinfection solution.

2. The method of claim 1, wherein treating the water in the water conditioning system includes treating the water in a pressure driven separation apparatus.

3. The method of claim 1, wherein treating the water in the water conditioning system includes treating the water in an electrically driven separation apparatus.

4. The method of claim 1, wherein treating the water in the water conditioning system includes treating the water in a distillation unit.

5. The method of claim 1, further comprising blending the demineralized water with the brine solution.

6. The method of claim 1, further comprising adjusting a pH of the water from the source of water to a pH in a range of between 6 and 10.

7. The method of claim 1, wherein forming the disinfection solution includes operating the electrolyzer to produce the disinfection solution having a concentration in a range of between 0.5 wt% and 1.0 wt % sodium hypochlorite.

8. The method of claim 1, further comprising monitoring and controlling at least one of sodium chloride concentration of the brine solution introduced into the electrolyzer and a flow rate of the brine solution introduced into the electrolyzer.

9. The method of claim 1, wherein monitoring and controlling the sodium chloride concentration of the brine solution introduced into the electrolyzer comprises forming a brine solution with a sodium chloride concentration of between 22 g/L and 30 g/L.

10. The method of claim 5, wherein blending demineralized water with the brine solution comprises mixing the demineralized water with the brine solution at a flow rate ratio of demineralized water to brine solution in a range of from 8:1 to 13:1.

11. The method of claim 1, further comprising monitoring and controlling at least one of temperature of the brine solution introduced into the electrolyzer, temperature of the disinfection solution, or power supplied to the electrolyzer.

12. The method of claim 1, further comprising introducing the brine solution into the electrolyzer at a temperature of between 10 degrees Celsius and 30 degrees Celsius.

13. The method of claim 1, further comprising operating the electrolyzer with a current density of between 1.06 amp/$in^2$ and 1.17 amp/$in^2$ of electrode area.

14. The method of claim 1, wherein treating the water from the source of water comprises treating potable water from a potable water source.

15. An electrochlorination system comprising:

a water conditioning system fluidly connectable to a source of water, the water conditioning system configured to remove at least a portion of anions and cations from the water to produce demineralized water;

a blending vessel fluidly connectable downstream from an outlet of the water conditioning system, the blending vessel including an inlet fluidly connectable to a source of sodium chloride and a brine solution outlet, the blending vessel configured to mix sodium chloride from the source of sodium chloride and the demineralized water to produce brine solution;

an electrolyzer having an inlet fluidly connectable with the brine solution outlet and configured to receive the brine solution;

a controller configured to regulate power from a power source delivered power to the electrolyzer at a current sufficient to generate a sodium hypochlorite solution having a chlorate concentration of less than 0.25 mg/L; and

a shut off downstream of the electrolyzer, the controller further configured to close the shut off valve responsive to a level of chlorate in the sodium hypochlorite solution being above the specified limit.

16. The system of claim 15, further comprising a source of potable water in fluid communication with the blending vessel.

17. The system of claim 15, wherein the water conditioning system comprises a pressure driven separation system.

18. The system of claim 15, wherein the water conditioning system comprises an electrically driven separation apparatus.

19. The system of claim 15, wherein the water conditioning system comprises a distillation unit.

20. The system of claim 15, wherein the controller is further configured to monitor and control at least one of sodium chloride concentration of the brine solution, flow rate of the brine solution to be received by the electrolyzer, and temperature of the brine solution to be received by the electrolyzer.

21. The system of claim 20, wherein the controller is further configured to control introduction of the sodium chloride and water into the blending vessel to form the brine solution with a sodium chloride concentration of between 22 g/L and 30 g/L.

22. The system of claim 20, further comprising a heat exchanger fluidly connectable between the brine solution outlet and the inlet of the electrolyzer, the heat exchanger connectable to the controller, the controller being further configured to allow adjustment of a temperature of the brine solution to a temperature in a range of from 10 degrees Celsius to 30 degrees Celsius.

23. The system of claim 20, further comprising a source of demineralized dilution water fluidly connectable to the brine solution from the blending vessel, wherein the controller is further configured to cause the dilution water and the brine solution into the electrolyzer at a ratio of flow rates of 8:1 to 13:1 dilution water to brine solution.

24. The system of claim 15, wherein the controller is further configured to monitor and control at least one of temperature of the sodium hypochlorite solution, or power supplied to the electrolyzer.

25. The system of claim 24, wherein the controller is further configured to operate the electrolyzer with a current density of between 1.06 amp/$in^2$ of electrode area and 1.17 amp/$in^2$ of electrode area.

26. The system of claim 15, further comprising a source of pH adjustment solution fluidly connectable to the source of water and configured to maintain a pH of water from the source of water between 6 and 10.

27. A method of modifying an electrochlorination system having an electrolyzer fluidly connected to a source of brine solution, the method comprising:

providing a water conditioning system configured to remove a portion of anions and cations from water from a source of water and produce demineralized water;

providing a controller configured to communicate with the electrochlorination system and configured to cause the electrochlorination system to mix the demineralized water with the brine solution, and to operate the electrolyzer under conditions sufficient to generate a sodium hypochlorite solution having a concentration of chlorate of less than 0.25 mg/L;

providing a shut off valve to be installed downstream of the electrolyzer; and

programming the controller to control the shut off valve responsive to a level of chlorate in the sodium hypochlorite solution.

28. The method of claim 27, further comprising a providing and installing a pH adjustment sub-system including a pH adjustment solution metering valve or pump configured to dose the water from the source of water with the pH adjustment solution in an amount sufficient to maintain a pH of the water from the source of water at between 6 and 10.