WHAT IS CLAIMED IS:

1. A system for fluid sterilization, comprising:

an inlet for operative connection to a fluid source to provide fluid along a flow path for sterilization by the system;

a heating section in fluid communication with the inlet along the flow path, the heating section heats pressurized fluid therein above prescribed thresholds for temperature, pressure, and dwell time to achieve a desired level of sterilization;

a heat exchanger having a first path disposed in fluid communication between the inlet and the heating section along the flow path to preheat fluid prior to entering the heating section and having a second path positioned between the heating section and a system outlet along the flow path to cool outflow of the heating section prior to exiting the outlet, wherein the first path and the second path of the heat exchanger are configured to pass heat energy therebetween; and

a plurality of valves disposed along the flow path, including a first valve positioned downstream of the inlet and upstream of the first path of the heat exchanger, a second valve positioned downstream of the first path of the heat exchanger and upstream of the heating section, and a third valve disposed along the flow path configured for proportional control of fluid flow therethrough;

a plurality of sensors disposed along the flow path, including (a) a temperature sensor positioned on the flow path downstream of the heating section and upstream of the second path of the heat exchanger, and (b) a pressure sensor; and

a digital controller in operative communication with the plurality of sensors to receive measurements therefrom and in operative control of at least the third valve to control flow through the system to ensure prescribed pressure and temperature profiles across prescribed ranges for pressure and temperature to achieve the desired level of sterilization without need of maintaining a fixed temperature or a fixed pressure within any portion of the system, including the heating section.

2. The system for fluid sterilization as defined in claim 1, wherein the first valve is a check valve configured for unidirectional flow.

3. The system for fluid sterilization as defined in claim 1, wherein the second valve is a check valve configured for unidirectional flow.

4. The system for fluid sterilization as defined in claim 1, wherein the third valve is a proportional control valve.

5. The system for fluid sterilization as defined in claim 1, wherein the pressure sensor is disposed upstream of the heating section.

6. The system for fluid sterilization as defined in claim 1, wherein the pressure sensor is positioned downstream of the heating section.

7. The system for fluid sterilization as defined in claim 1, further comprising a flow meter disposed on the flow path upstream of the third valve.

8. The system for fluid sterilization as defined in claim 1, wherein in the third valve is positioned downstream of the second path of the heat exchanger.

9. A system for fluid sterilization, comprising:

an inlet for operative connection to a fluid source to provide fluid along a flow path for sterilization by the system;

a heating section in fluid communication with the inlet along the flow path, the heating section heats pressurized fluid therein above prescribed thresholds for temperature, pressure, and dwell time to achieve a desired level of sterilization;

a heat exchanger having a first path disposed in fluid communication between the inlet and the heating section along the flow path to preheat fluid prior to entering the heating section and having a second path positioned between the heating section and a system outlet along the flow path to cool outflow of the heating section prior to exiting the outlet, wherein the first path and the second path of the heat exchanger are configured to pass heat energy therebetween; and

a plurality of valves disposed along the flow path, including a first unidirectional valve positioned downstream of the inlet and upstream of the first path of the heat exchanger, a second unidirectional valve positioned downstream of the first path of the heat exchanger and upstream of the heating section, and a third valve along the flow path configured for proportional control of fluid flow therethrough;

a plurality of sensors disposed along the flow path, including (a) a temperature sensor positioned downstream of the second valve and upstream of the second path of the heat exchanger, and (b) a pressure sensor along the flow path disposed upstream of the heating section; and

a digital controller in operative communication with the plurality of sensors to receive measurements therefrom and in operative control of at least the third valve to control flow through the system to ensure prescribed pressure and temperature profiles across prescribed ranges for pressure and temperature to achieve the desired level of sterilization without need of maintaining a fixed temperature or a fixed pressure within any portion of the system, including the heating section.

10. The system for fluid sterilization as defined in claim 9, further comprising a second pressure sensor positioned downstream of the heating section.

11. The system for fluid sterilization as defined in claim 9, wherein the temperature sensor is positioned downstream of the heating section and upstream of the second path of the heat exchanger.

12. The system for fluid sterilization as defined in claim 9, further comprising a flow meter disposed on the flow path upstream of the third valve.

13. The system for fluid sterilization as defined in claim 9, wherein in the third valve is positioned downstream of the second path of the heat exchanger.

14. The system for fluid sterilization as defined in claim 9, wherein the pressure sensor is downstream of the first valve and upstream of the first path of the heat exchanger.

15. The system for fluid sterilization as defined in claim 9, further comprising a flow meter disposed on the flow path upstream of the third valve.

16. A system for fluid sterilization, comprising:

an inlet for operative connection to a fluid source to provide fluid along a flow path for sterilization by the system;

a heating section in fluid communication with the inlet along the flow path, the heating section heats pressurized fluid therein above prescribed thresholds for temperature, pressure, and dwell time to achieve a desired level of sterilization;

a heat exchanger having a first path disposed in fluid communication between the inlet and the heating section along the flow path to preheat fluid prior to entering the heating section and having a second path positioned between the heating section and a system outlet along the flow path to cool outflow of the heating section prior to exiting the outlet, wherein the first path and the second path of the heat exchanger are configured to pass heat energy therebetween; and

a plurality of valves disposed along the flow path, including a first unidirectional valve positioned downstream of the inlet and upstream of the first path of the heat exchanger, a second unidirectional valve positioned downstream of the first path of the heat exchanger and upstream of the heating section, and a third valve along the flow path configured for proportional control of fluid flow therethrough;

a plurality of sensors disposed along the flow path, including (a) a temperature sensor positioned downstream of the second valve and upstream of the second path of the heat exchanger, and (b) a pressure sensor along the flow path disposed downstream of the heating section; and

a digital controller in operative communication with the plurality of sensors to receive measurements therefrom and in operative control of at least the third valve to control flow through the system to ensure prescribed pressure and temperature profiles across prescribed ranges for pressure and temperature to achieve the desired level of sterilization without need of maintaining a fixed temperature or a fixed pressure within any portion of the system, including the heating section.

17. The system for fluid sterilization as defined in claim 16, further comprising a second pressure sensor positioned upstream of the heating section and downstream of the first valve.

18. The system for fluid sterilization as defined in claim 16, wherein the temperature sensor is positioned downstream of the heating section and upstream of the second path of the heat exchanger.

19. The system for fluid sterilization as defined in claim 16, further comprising a flow meter disposed on the flow path upstream of the third valve.

20. The system for fluid sterilization as defined in claim 16, wherein in the third valve is positioned downstream of the second path of the heat exchanger.