CLAIMS

What is claimed is:

1. A nozzle system for fluid deployment for treating a biological fluid within a bioreactor, comprising:

a bioreactor having an internal volume; and

an adjustable nozzle deployed within the internal volume;

a reservoir capable of containing an agent, a diluted agent or media; and

a tubing connecting the reservoir and the adjustable nozzle, wherein the adjustable nozzle is capable of being adjusted to distribute a processing agent in a plurality of distribution streams.

2. The nozzle system of claim 1, wherein the adjustable nozzle is capable of distribution streams that provide a focused stream, a median stream, and a diffuse stream in a linear or conical angle from 0 to 180 degrees.

3. The nozzle system of claim 1, wherein the adjustable nozzle is automatically adjusted or manually adjusted.

4. The nozzle system of claim 1, further comprising a sparger, an impeller, and a baffle.

5. The nozzle system of claim 1, wherein the processing agent is a defoaming agent.

6. The nozzle system of any of claims 1-5, further comprising a monitoring and regulation system for the bioreactor, the monitoring and regulation system comprising:

a light source capable of emitting laser light through the bioreactor;

a beamsplitter capable of splitting the laser light into more than one beam, wherein each of the more than one beam is at a different height of the bioreactor; and

a plurality of photosensors capable of measuring the light intensity of each beam, wherein each more than one photosensor corresponds to one laser beam to form an optical channel or a camera capable of capturing live imaging and sensing fluids in the bioreactor.

7. The nozzle system of claim 6, wherein the system is capable of measuring the level of contents within the vessel, and further comprises an alarm capable of being activated by the contents within the inner volume reaching a critical level within the bioreactor.

8. The nozzle system of claim 7, wherein the contents comprise a solution, a biological fluid, and/or foam on a liquid surface.

9. The nozzle system of any one of claims 6-8, wherein each of the plurality of photosensors is capable of differentiating the light intensity detected after passing through each of air, foam, and liquid in the vessel.

10. A method for treating a biological fluid, comprising:

providing the nozzle system of claim 1 for fluid deployment for treating a biological fluid within a bioreactor.

11. The method of claim 10, wherein a defoaming agent is added to the contents of the bioreactor focused to only an area covered by a foam.

12. The method of claim 10, wherein the nozzle system further comprises the monitoring and regulation system of claim 6 that is configured to detect a location of a foam on a surface of the biological fluid contained within the internal volume.

13. The method of claim 12, wherein a microprocessor sends a signal to the adjustable nozzle to spray a stream of defoaming agent on the foam.

14. A monitoring and regulation system for a bioreactor, the system comprising:

a light source capable of emitting laser light through the bioreactor;

a beamsplitter capable of splitting the laser light into more than one beam, wherein each of the more than one beam is at a different height of the bioreactor; and

a plurality of photosensors capable of measuring the light intensity of each beam, wherein each more than one photosensor corresponds to one laser beam to form an optical channel.

15. The monitoring and regulation system of claim 14, wherein the system is capable of measuring a liquid level or a foam level within the bioreactor, and further comprises an alarm capable of being activated by the liquid level or foam level reaching a critical level within the bioreactor within the inner volume of the bioreactor.

16. The monitoring and regulation system of any one of claims 14-15, wherein a foam is disposed on a liquid surface.

17. The monitoring and regulation system of any of claims 14-15, further comprising a FLIR camera.

18 The monitoring and regulation system of any one of claims 14-15, wherein each of the plurality of photosensors is capable of differentiating the light intensity detected after passing through each of air, foam, and liquid in the bioreactor.

19. A monitoring and regulation camera system for a bioreactor, the system comprising:

a thermographic camera; and

a transparent bioreactor or a bioreactor having a transparent window.

20. The monitoring and regulation system of claim 19, wherein the thermographic camera is an FLIR or a handheld FLIR, and is capable of sending a signal to a microprocessor that is capable of sending an operation signal to a device in communication with the bioreactor.

21. The monitoring and regulation system of any of claims 19-20, wherein the system is capable of measuring a temperature of a liquid level or a foam level within the bioreactor, and further comprises an alarm capable of being activated by the liquid level or foam level reaching a critical level within the inner volume of the bioreactor.

22. The monitoring and regulation system of claim 20, wherein the device is a nozzle.

23. A method for detecting a temperature of a fluid, a foam, or a gas using the monitoring and regulation system of claim 19, generating a signal, transmitting the signal to a microprocessor, and sending a signal for a device in communication with the bioreactor.