23. The system of claim 14, wherein at least one of the plurality of valve wells is a dedicated holding volume valve well.

24. The system of claim 14, wherein the pumping cassette includes a pump chamber on the first side of the pumping cassette and the control surface includes a pump chamber control region which is in selective communication with the positive pressure and the negative pressure via pneumatic pump control valves, and wherein the controller is further configured to fill the pump chamber by applying the negative pressure to the flexible membrane adjacent to the pump chamber via actuation of one of the pneumatic pump control valves, the controller configured to monitor the volume of the pump chamber and close the one of the pneumatic pump control valves when the volume of the pump chamber is within a second range of the target volume.

25. The system of claim 14, wherein a difference between bounds of the second range is greater than a difference between bounds of the first range.

26. The system according to claim 14, wherein the positive pressure source and the negative pressure source are in fluid communication with the plurality of valve wells through a pneumatic valve network.

27. The system according to claim 14, wherein the pumping cassette only includes valved-pumping chambers between the source reservoir and the destination.

28. The system according to claim 14, wherein all of the valve wells include volcano valves.

29. The system according to claim 14, wherein the valve wells include a first valve well, a second valve well, and a third valve well.

30. The system according to claim 29, wherein the control surface is configured to fluidly isolate the first valve well, the second valve well, and the third valve well from each other when the control surface is mated against the first flexible membrane.

o