Claims

1. A liquid process assembly, the assembly including a length of pipework, and a reversible pump for selectively reciprocally moving liquid through the pipework; wherein the reversible pump is a positive displacement replacement rotary pump; wherein the pump has a magnetic drive located on the exterior of the pump; and wherein the pump is controlled by a servo motor.

2. The assembly of Claim 1, wherein the assembly includes a vessel for liquid connected to the pipework.

3. The assembly of Claim 2, wherein the vessel is located on an opposite side of the pump to at least the majority of the pipework.

4. The assembly of Claim 2 or Claim 3, wherein the vessel is a feed vessel.

5. The assembly of any preceding claim, wherein the assembly includes a plurality of vessels, each vessel being configured to operate with a positive displacement pump

6. The assembly of Claim 5, wherein each pump includes a controller, the controller being operable to reciprocate flow through the pump.

7. The assembly of Claim 6, wherein the controller is configured to generate a greater flow away from the vessels such that liquid passes through the assembly and out of the far end of the pipework.

8 The assembly of any of Claims 5 to 7, wherein each pump is operable at a different pumping volume.

9. The assembly of any of Claims 5 to 8, wherein at least one pump oscillates/reciprocates its flow and at least one other pump does not oscillate/reciprocate its flow.

10. The assembly of any of Claims 5 to 9, wherein one or more liquid level sensors are provided in the assembly, and the liquid level sensor or sensors are connected to the controller such that the reciprocal movement of the pump can be varied in response to the detected liquid levels.

11. The assembly of any of Claims 5 to 10, wherein one or more pressure sensors are provided in the assembly, and the pressure sensor or sensors are connected to the controller such that the reciprocal movement of the pump can be varied in response to the detected pressure levels.

12. The assembly of any preceding claim, wherein the assembly is arranged such that it can be selectively pressurised.

13. The assembly of any preceding claim, wherein one or more level devices are provided in the assembly, the one or more level devices being configured to detect changes in the liquid level.

14. The assembly of any of Claims 2 to 13, wherein the vessel includes an impellor to substantially prevent crystallisation or settling out within the vessel.

15. The assembly of any of Claims 2 to 14, wherein the vessel is a feed vessel, and includes an inlet for process liquid.

16. The assembly of any of Claims 2 to 15, wherein an inlet is provided downstream of the vessel, the inlet being connected to a feed pump, the feed pump being connected to a feed supply of material.

17. The assembly of Claim 16, wherein the vessel includes a vent, the vent being located on an opposite side to the inlet.

18. The assembly of any of Claims 2 to 15, wherein an inlet is provided upstream of the vessel, the inlet being connected to a feed pump, the feed pump being connected to a feed supply of material.

19. The assembly of any preceding claim, wherein the pipework and vessel are configured such that a substantially equal upper liquid level is provided in each.

20. The assembly of any preceding claim, wherein the end of the pipework is closed, and a pressure relief valve is provided on the end of the pipework.

21. The assembly of any preceding claim, wherein the pipework is in the form of a closed circular loop.

22. The assembly of any of Claims 1 to 21, wherein the pipework includes two or more circular loops, the two or more circular loops being joined, such that liquid may flow therethrough.

23. The assembly of Claim 1, Claim 12, Claim 13 and Claim 20 to 22, wherein the assembly includes a pressure absorption arrangement.

24. The assembly of Claim 23, wherein the pressure absorption arrangement includes a closed container with gas trapped therein; a diaphragm; or a gas filled resilient member.

25. The assembly of Claim 23 or Claim 24, wherein the pipework and an accumulator vessel are vertically configured at least generally adjacent each other.

26. The assembly of any of Claims 10 to 22, wherein the liquid level sensors are provided on the vessel.

27. The assembly of any of Claims 11 to 22, wherein the pressure sensor or sensors are provided on the vessel.

28. A method of carrying out a liquid process, the method including using an assembly according to any of Claims 1 to 27, and reciprocally moving the liquid in the pipework.

29. The method of Claim 25, wherein the reciprocal pumping of the liquid is selectively biased to be greater in a direction away from an inlet, such that a continuous process is carried out, with additional liquid being supplied into the accumulator vessel.

30. The method of Claim 28 or Claim 29, wherein the assembly is configured such that in response to signals from the one or more liquid level sensors, the pumping is biased in either direction so as to provide a required liquid level in the assembly either side of the pump.

31. The method of any of Claims 28 to 30, wherein the process is carried out at an elevated pressure.

32. The method of any of Claims 28 to 31, wherein the liquid process is a continuous reaction.

33. The method of any of Claims 28 to 32, wherein the liquid process is a crystallisation.

34. A method of cleaning a liquid process assembly according to any of Claims 1 to 27, the method comprising reciprocally moving cleaning liquid through the pipework by reciprocal pumping thereof.

35. An apparatus for cleaning a liquid process assembly, the apparatus including a pump for selectively reciprocally moving cleaning liquid through pipework wherein the reversible pump is a positive displacement replacement rotary pump; wherein the pump has a magnetic drive located on the exterior of the pump; and wherein the pump is controlled by a servo motor.

36. The apparatus of Claim 35, wherein the apparatus is selectively connectable to a liquid process assembly when cleaning is required.

37. The apparatus of Claim 35 or Claim 36, wherein the apparatus includes a length of pipework selectively connectable across a part of the liquid process assembly, with the pump part way along the length of pipework.

38. The apparatus of Claim 37, wherein a reservoir is provided part way along the length of pipework.