WHAT IS CLAIMED IS:

1. A variable flow resistance system for use with a subterranean well, the system comprising:

a flow chamber through which a fluid composition flows, the chamber having multiple inlet flow paths, and a flow resistance which varies depending on proportions of the fluid composition which flow into the chamber via the respective inlet flow paths; and

an actuator which varies the proportions of the fluid composition which flow into the chamber via the respective inlet flow paths.

2. The system of claim 1, wherein the actuator displaces a deflector relative to a passage through which the fluid composition flows.

3. The system of claim 1, wherein the actuator comprises a swellable material.

4. The system of claim 1, wherein the actuator comprises a material which changes shape in response to contact with a selected fluid type.

5. The system of claim 1, wherein the actuator comprises a material which changes shape in response to a temperature change.

6. The system of claim 1, wherein the actuator comprises a piezoceramic material.

7. The system of claim 1, wherein the actuator comprises a material selected from the following group: piezoelectric, pyroelectric, electrostrictor, magnetostrictor, magnetic shape memory, permanent magnet, ferromagnetic, swellable, polymer hydrogel, and thermal shape memory.

8. The system of claim 1, wherein the actuator comprises an electromagnetic actuator.

9. The system of claim 1, further comprising a controller which controls operation of the actuator, and wherein the controller responds to a signal transmitted from a remote location.

10. The system of claim 9, wherein the signal comprises an electrical signal.

11. The system of claim 9, wherein the signal comprises a magnetic signal.

12. The system of claim 9, wherein the signal comprises a type selected from the following group: thermal, ion concentration, and fluid type.

13. The system of claim 1, wherein the fluid composition flows through the flow chamber in the well.

14. The system of claim 1, further comprising a fluid switch which, in response to a change in a property of the fluid composition, varies the proportions of the fluid composition which flow into the chamber via the respective inlet flow paths.

15. The system of claim 14, wherein the property comprises at least one of the following group: velocity, viscosity, density, and ratio of desired fluid to undesired fluid.

16. The system of claim 1, wherein deflection of the fluid composition by the actuator transmits a signal to a remote location.

17. The system of claim 16, wherein the signal comprises pressure variations.

18. The system of claim 16, wherein the signal comprises flow rate variations.

19. A method of variably controlling flow resistance in a well, the method comprising:

changing an orientation of a deflector relative to a passage through which a fluid composition flows, thereby influencing the fluid composition to flow toward one of multiple inlet flow paths of a flow chamber, the chamber having a flow resistance which varies depending on proportions of the fluid composition which flow into the chamber via the respective inlet flow paths.

20. The method of claim 19, wherein changing the orientation of the deflector further comprises transmitting a signal to a remote location.

21. The method of claim 20, wherein transmitting the signal further comprises a controller selectively operating an actuator which displaces the deflector relative to the passage.

22. The method of claim 20, wherein the signal comprises pressure variations.

23. The method of claim 20, wherein the signal comprises flow rate variations.

24. The method of claim 19, wherein changing the orientation of the deflector further comprises operating an actuator which comprises a swellable material.

25. The method of claim 19, wherein changing the orientation of the deflector further comprises operating an actuator which comprises a material which changes shape in response to contact with a selected fluid type.

26. The method of claim 19, wherein changing the orientation of the deflector further comprises operating an actuator which comprises a material which changes shape in response to a temperature change.

27. The method of claim 19, wherein changing the orientation of the deflector further comprises operating an actuator which comprises a piezoceramic material.

28. The method of claim 19, wherein changing the orientation of the deflector further comprises operating an actuator which comprises a material selected from the following group: piezoelectric, pyroelectric, electrostrictor, magnetostrictor, magnetic shape memory, permanent magnet, ferromagnetic, swellable, polymer hydrogel, and thermal shape memory.

29. The method of claim 19, wherein changing the orientation of the deflector further comprises operating an electromagnetic actuator.

30. The method of claim 19, wherein changing the orientation of the deflector further comprises operating an actuator in response to a signal transmitted from a remote location.

31. The method of claim 30, wherein the signal comprises an electrical signal.

32. The method of claim 30, wherein the signal comprises a magnetic signal.

33. The method of claim 30, wherein the signal comprises a type selected from the following group: thermal, ion concentration, and fluid type.

34. The method of claim 19, wherein the fluid composition flows through the flow chamber in the well.

35. The method of claim 19, wherein a fluid switch, in response to a change in a property of the fluid composition, varies the proportions of the fluid composition which flow into the chamber via the respective inlet flow paths.

36. The method of claim 35, wherein the property comprises at least one of the following group: velocity, viscosity, density, and ratio of desired fluid to undesired fluid.

37. A variable flow resistance system for use with a subterranean well, the system comprising:

a flow chamber through which a fluid composition flows, the chamber having at least first and second inlet flow paths, and a flow resistance which varies depending on proportions of the fluid composition which flow into the chamber via the respective first and second inlet flow paths; and

an actuator which deflects the fluid composition toward the first inlet flow path.

38. The system of claim 37, wherein the actuator displaces a deflector relative to a passage through which the fluid composition flows.

39. The system of claim 37, wherein the actuator comprises a piezoceramic material.

40. The system of claim 37, wherein the actuator comprises a material selected from the following group: piezoelectric, pyroelectric, electrostrictor, magnetostrictor, magnetic shape memory, permanent magnet, ferromagnetic, swellable, polymer hydrogel, and thermal shape memory.

41. The system of claim 37, wherein the actuator comprises an electromagnetic actuator.

42. The system of claim 37, further comprising a controller which controls operation of the actuator, and

wherein the controller responds to a signal transmitted from a remote location.

43. The system of claim 42, wherein the signal comprises an electrical signal.

44. The system of claim 42, wherein the signal comprises a magnetic signal.

45. The system of claim 42, wherein the signal comprises a type selected from the following group: thermal, ion concentration, and fluid type.

46. The system of claim 37, wherein the fluid composition flows through the flow chamber in the well.

47. The system of claim 37, further comprising a fluid switch which, in response to a change in a property of the fluid composition, varies the proportions of the fluid composition which flow into the chamber via the respective first and second inlet flow paths.

48. The system of claim 47, wherein the property comprises at least one of the following group: velocity, viscosity, density, and ratio of desired fluid to undesired fluid.

49. The system of claim 37, wherein deflection of the fluid composition by the actuator transmits a signal to a remote location.

50. The system of claim 49, wherein the signal comprises pressure variations.

51. The system of claim 49, wherein the signal comprises flow rate variations.

What is claimed is:

1. A variable flow resistance system for use with a subterranean well, the system comprising:

a flow chamber through which a fluid composition flows, the chamber having multiple inlet flow paths, and a flow resistance which varies depending on proportions of the fluid composition which flow into the chamber via the respective inlet flow paths, wherein at least a majority of the fluid composition flows through an inlet flow passage;

an actuator which displaces a deflector in the inlet flow passage, whereby the proportions of the fluid composition which flow into the chamber via the respective inlet flow paths are varied in response to the displacement of the deflector; and

a fluid switch which, in response to a change in a property of the fluid composition, varies the proportions of the fluid composition which flow into the chamber via the respective inlet flow paths.

2. The system of claim 1, wherein the actuator comprises a swellable material.

3. The system of claim 1, wherein the actuator comprises a material which changes shape in response to contact with a selected fluid type.

4. The system of claim 1, wherein the actuator comprises a material which changes shape in response to a temperature change.

5. The system of claim 1, wherein the actuator comprises a piezoceramic material.

6. The system of claim 1, wherein the actuator comprises a material selected from the following group: piezoelectric, pyroelectric, electrostrictor, magnetostrictor, magnetic shape memory,

permanent magnet, ferromagnetic, polymer hydrogel, and thermal shape memory.

7. The system of claim 1, wherein the actuator comprises an electromagnetic actuator.

8. The system of claim 1, further comprising a controller which controls operation of the actuator, and wherein the controller responds to a signal transmitted from a remote location.

9. The system of claim 8, wherein the signal comprises an electrical signal.

10. The system of claim 8, wherein the signal comprises a magnetic signal.

11. The system of claim 8, wherein the signal comprises a type selected from the following group: thermal, ion concentration, and fluid type.

12. The system of claim 1, wherein the fluid composition flows through the flow chamber in the well.

13. The system of claim 1, wherein the property comprises at least one of the following group: velocity, viscosity, density, and ratio of desired fluid to undesired fluid.

14. The system of claim 1, wherein deflection of the fluid composition by the actuator transmits a signal to a remote location.

15. The system of claim 14, wherein the signal comprises pressure variations.

16. The system of claim 14, wherein the signal comprises flow rate variations.

17. A method of variably controlling flow resistance in a well, the method comprising:

changing an orientation of a deflector in an inlet flow passage through which at least a majority of a fluid composition flows, thereby influencing the fluid composition to flow toward one of multiple inlet flow paths of a flow chamber, the chamber having a flow resistance which varies depending on proportions of the fluid composition which flow into the chamber via the respective inlet flow paths, wherein the fluid composition flows through the flow chamber in the well.

18. The method of claim 17, wherein changing the orientation of the deflector further comprises transmitting a signal to a remote location.

19. The method of claim 18, wherein transmitting the signal further comprises a controller selectively operating an actuator which displaces the deflector in the inlet flow passage.

20. The method of claim 18, wherein the signal comprises pressure variations.

21. The method of claim 18, wherein the signal comprises flow rate variations.

22. The method of claim 17, wherein changing the orientation of the deflector further comprises operating an actuator which comprises a swellable material.

23. The method of claim 17, wherein changing the orientation of the deflector further comprises operating an actuator which comprises a material which changes shape in response to contact with a selected fluid type.

24. The method of claim 17, wherein changing the orientation of the deflector further comprises operating an actuator which comprises a material which changes shape in response to a temperature change.

25. The method of claim 17, wherein changing the orientation of the deflector further comprises operating an actuator which comprises a piezoceramic material.

26. The method of claim 17, wherein changing the orientation of the deflector further comprises operating an actuator which comprises a material selected from the following group: piezoelectric, pyroelectric, electrostrictor, magnetostrictor, magnetic shape memory, permanent magnet, ferromagnetic, polymer hydrogel, and thermal shape memory.

27. The method of claim 17, wherein changing the orientation of the deflector further comprises operating an electromagnetic actuator.

28. The method of claim 17, wherein changing the orientation of the deflector further comprises operating an actuator in response to a signal transmitted from a remote location.

29. The method of claim 28, wherein the signal comprises an electrical signal.

30. The method of claim 28, wherein the signal comprises a magnetic signal.

31. The method of claim 28, wherein the signal comprises a type selected from the following group: thermal, ion concentration, and fluid type.

32. The method of claim 17, wherein a fluid switch, in response to a change in a property of the fluid composition, varies the proportions of the fluid composition which flow into the chamber via the respective inlet flow paths.

33. The method of claim 32, wherein the property comprises at least one of the following group: velocity, viscosity, density, and ratio of desired fluid to undesired fluid.

34. A variable flow resistance system for use with a subterranean well, the system comprising:

a flow chamber through which a fluid composition flows, the chamber having at least first and second inlet flow paths, and a flow resistance which varies depending on proportions of the fluid composition which flow into the chamber via the respective first and second inlet flow paths;

an actuator which deflects the fluid composition toward the first inlet flow path, wherein the actuator displaces a deflector in an inlet flow passage through which at least a majority of the fluid composition flows; and

a controller which controls operation of the actuator, wherein the controller responds to a signal transmitted from a remote location.

35. The system of claim 34, wherein the actuator comprises a piezoceramic material.

36. The system of claim 34, wherein the actuator comprises a material selected from the following group: piezoelectric, pyroelectric, electrostrictor, magnetostrictor, magnetic shape memory, permanent magnet, ferromagnetic, polymer hydrogel, and thermal shape memory.

37. The system of claim 34, wherein the actuator comprises an electromagnetic actuator.

38. The system of claim 34, wherein the signal comprises an electrical signal.

39. The system of claim 34, wherein the signal comprises a magnetic signal.

40. The system of claim 34, wherein the signal comprises a type selected from the following group: thermal, ion concentration, and fluid type.

41. The system of claim 34, wherein the fluid composition flows through the flow chamber in the well.

42. The system of claim 34, further comprising a fluid switch which, in response to a change in a property of the fluid composition, varies the proportions of the fluid composition which flow into the chamber via the respective first and second inlet flow paths.

43. The system of claim 42, wherein the property comprises at least one of the following group: velocity, viscosity, density, and ratio of desired fluid to undesired fluid.