CLAIMS

I claim:

1. Apparatus for compressing a multiphase fluid comprising:

a first conduit for conveying the multiphase fluid;

a slug suppressor connected to the first conduit;

a centrifugal compressor connected to an output of the slug suppressor; and

a distribution conduit connected to the compressor for conveying the compressed multiphase fluid to a desired location.

2. The apparatus of claim 1 further comprising an atomizing device positioned in the first conduit.

3. The apparatus of claim 2 wherein the atomizing device is a flow mixer that includes at least two counter swirling vanes or counter rotating vortices.

4. The apparatus of claim 1 further comprising a variable speed drive connected to a power input shaft of the compressor.

5. The apparatus of claim 2 wherein the slug suppressor and atomizing device are combined in a housing having an inlet and outlet, wherein the housing comprises

a first chamber for accumulating liquid;

a second chamber for accumulating gas;

a plurality of baffles between the first and second chambers for allowing accumulated liquid in the first chamber to spill over into the second chamber; and

a plurality of atomizing nozzles located at the end portion of the first chamber.

6. Apparatus according to claim 5 wherein the housing tapers from the inlet to the outlet.

7. Apparatus according to claim 1 further comprising a recycle conduit connected at one end to the output of the compressor and at its other end to the first conduit.

8. Apparatus according to claim 7 further comprising a recycle valve in the recycle conduit.

9. Apparatus for expanding a multiphase fluid comprising:

a first conduit for conveying the multiphase fluid;

a slug suppressor connected to the first conduit;

an expander connected to an outlet of the slug suppressor; and

a conduit connected to the expander for conveying the multiphase fluid to a desired location.

10. The apparatus of claim 9 further comprising an atomizing device connected to the first conduit.

11. The apparatus of claim 10 wherein the atomizing device is a flow mixer that includes at least two counter swirling vanes or counter rotating vortices.

12. The apparatus of claim 9 further comprising a generator or compressor connected to a power output shaft of the expander.

13. The apparatus of claim 10 wherein the slug suppressor and atomizing device are combined in a housing having an inlet and outlet, and the housing comprises

a first chamber for liquid;

a second chamber for accumulating gas;

a plurality of baffles between the first and second chamber for allowing accumulated liquid in the first chamber to spill over into the second chamber; and

a plurality of atomizing nozzles located at the end portion of the first chamber.

14. Apparatus according to claim 13 wherein the housing tapers from the inlet to the outlet.

15. Apparatus according to claim 9 further comprising a bypass conduit connected at one end to the output of the expander and at its other end to the first conduit.

16. Apparatus according to claim 15 further comprising a bypass valve in the bypass conduit.

17. Apparatus according to claim 9 further comprising means for controlling the expander or the driven equipment speed based on produced torque, load, fluid density, multiphase flow measurement or output power.

18. A method of compressing a multiphase fluid comprising:

providing a slug suppressor or an atomizing device;

directing a flow of multiphase fluid into the slug suppressor or atomizing device;

directing the output flow from the slug suppressor or atomizing device into an intake portion of a centrifugal compressor; and

compressing the multiphase fluid.

19. A method of compressing a multiphase fluid including liquid and gas components comprising:

separating the liquid from the gas within a housing;

atomizing the liquid;

redirecting the atomized liquid back into the gas flow; and

compressing the resulting mixture of atomized liquid and gas.

20. A method of expanding a pressurized multiphase fluid comprising:

providing a slug suppressor or atomizing device;

directing a flow of multiphase fluid into the slug suppressor or atomizing device;

directing the output flow from the slug suppressor or atomizing device into an intake portion of an expander; and

expanding the multiphase fluid.

21. A method of expanding a pressurized multiphase fluid including liquid and gas components comprising:

separating the liquid from the gas within a chamber;

atomizing the liquid;

redirecting the atomized liquid back into the gas flow; and

expanding the resulting mixture of atomized liquid and gas.

22. The method of claim 18 further comprising:

directing the multiphase fluid through a flow mixer prior to its being compressed.

23. The method of claim 18 further comprising:

using an electric or gas motor, gas or steam turbine, expander, hydraulic turbine or other driving device to provide power to the compressor.

24. The apparatus of claim 20 further comprising a means for controlling the compressor speed based on produced torque, load, fluid density, multiphase flow measurement or output power.

25. Apparatus for compressing a multiphase fluid comprising:

a first conduit for conveying the multiphase fluid;

an atomizing device connected to the first conduit;

a compressor connected to an output of the atomizing device; and

a distribution conduit connected to the compressor for conveying the compressed multiphase fluid to a desire location.

26. The apparatus of claim 25 wherein the atomizing device comprises one or more atomizing nozzles or a flow mixer connected to the first conduit.

27. The apparatus of claim 25, further comprising a variable speed drive connected to a power input shaft of the compressor.

28. The apparatus of claim 26 further comprising means for controlling the speed of the compressor based on torque, load, fluid density, GVF or input power.

29. Apparatus for expanding a multiphase fluid comprising:

a first conduit for conveying the multiphase fluid;

an atomizing device connected to the first conduit;

an expander connected to an output of the atomizing device; and

a distribution conduit connected to the expander for conveying the expanded multiphase fluid to a desired location.

30. The apparatus of claim 29, further comprising a slug suppressor connected to the first conduit.

31. The apparatus of claim 29, further comprising means for controlling the speed of the expander or the driven equipment based on torque produced, load, fluid density, multiphase flow measurement, GVF, or output power.

32. The apparatus of claim 29, further comprising a generator or compressor connected to a power output shaft of the expander.

33. Apparatus according to claim 29, further comprising a bypass conduit connected at one end to the output of the expander and at its other end to the first conduit.

34. The apparatus of claim 29, wherein the atomizing device is a flow mixer or one or more atomizing nozzles.

CLAIMS

1. Apparatus for compressing a multiphase fluid comprising:

a first conduit for conveying the multiphase fluid;

a slug suppressor connected to the first conduit;

a centrifugal compressor connected to an output of the slug suppressor; and

a distribution conduit connected to the compressor for conveying the compressed multiphase fluid to a desired location;

wherein the slug suppressor is provided in a housing having an inlet and an outlet, wherein the housing comprises

a first chamber for accumulating liquid;

a second chamber for accumulating gas, the second chamber surrounding the first chamber;

a plurality of baffles between the first and second chambers for allowing accumulated liquid in the first chamber to spill over into the second chamber; and

a plurality of atomizing nozzles located at a lower end of the first chamber and oriented to spray liquid from the first chamber into gas that has exited the second chamber.

2. The apparatus of claim 1 wherein the atomizing device is a flow mixer that includes at least two counter swirling vanes or counter rotating vortices.

3. The apparatus of claim 1 or 2 further comprising a variable speed drive connected to a power input shaft of the compressor.

4. Apparatus according to any one of claims 1 to 3 wherein the housing tapers from the inlet to the outlet.

5. Apparatus according to any one of claims 1 to 4 further comprising a recycle conduit connected at one end to the output of the compressor and at its other end to the first conduit.

6. Apparatus according to claim 5 further comprising a recycle valve in the recycle conduit.

7. A method of compressing a multiphase fluid comprising:

providing, in a housing, a slug suppressor and an atomizing device;

directing a flow of multiphase fluid into the slug suppressor and atomizing device;

accumulating liquid in a first chamber of the housing;

accumulating gas in a second chamber of the housing, the second chamber surrounding the first chamber;

spraying liquid from the first chamber into gas that has exited the second chamber;

directing the output flow from the slug suppressor and atomizing device into an intake portion of a centrifugal compressor; and

compressing the multiphase fluid.

8. A method of compressing a multiphase fluid including liquid and gas components comprising:

separating the liquid component from the gas component within a housing having a first chamber for accumulating the liquid component and a second chamber, surrounding the first chamber, for accumulating the gas component;

atomizing the liquid component;

redirecting the atomized liquid component back into the gas component; and centrifugally compressing the resulting mixture of the atomized liquid component and the gas component.

9. The method of claim 7 or 8 further comprising:

directing the multiphase fluid through a flow mixer prior to its being compressed.

10. The method of any one of claims 7 to 9 further comprising:

using an electric or gas motor, gas or steam turbine, expander, hydraulic turbine or other driving device to provide power to the compressor.