## CLAIMS

1. A multiphase separation system, including:

an inlet line configured to allow a multiphase fluid to flow into the multiphase separation system, the inlet line including a number of divisions configured to lower a velocity of the multiphase fluid and feed the multiphase fluid into a distribution header;

the distribution header configured to split the multiphase fluid among a number of lower pipes, wherein each of the number of lower pipes includes an expansion zone upstream of a corresponding downcomer, and wherein the expansion zone is configured to lower a pressure within the number of lower pipes to allow entrained liquids to drain from a number of upper pipes via the corresponding downcomer.

2. The multiphase separation system of claim 1, including a liquid header for collecting the liquids from the number of lower pipes and flowing the liquids out of the multiphase separation system via a liquid outlet line.

3. The multiphase separation system of any of claims 1 or 2, wherein each of the number of upper pipes feeds into a common gas header, and wherein the common gas header includes a gas outlet line for flowing the gases from the number of upper pipes out of the multiphase separation system.

4. The multiphase separation system of any of claims 1, 2, or 3, wherein entrained gases within any of the number of lower pipes rise to any of the number of upper pipes via the corresponding downcomer.

5. The multiphase separation system of any of claims 1-4, including a stratification section upstream of each expansion zone that is configured to separate gases from liquids within the multiphase fluid.

6. The multiphase separation system of any of claims 1-5, wherein the multiphase separation system is implemented within a subsea environment.

7. The multiphase separation system of any of claims 1-6, wherein the multiphase separation system includes a slug catcher.

8. The multiphase separation system of any of claims 1-7, wherein a desander is located upstream of the inlet line.

9. The multiphase separation system of any of claims 1-8, wherein a desander is located downstream of a liquid outlet line.

10. The multiphase separation system of any of claims 1-9, including;

an oil/water separation section that is coupled to each of a number of lower pipes and is configured to separate the liquids into oil and water;

an oil outlet line that is configured to flow the oil out of the multiphase separation system; and

a water outlet line that is configured to flow the water out of the multiphase separation system.

11. The multiphase separation system of claim 10, wherein the oil/water separation section is coupled to each of the number of lower pipes via a sealing downcomer.

12. The multiphase separation system of any of claim 1-10, wherein the distribution header is configured to split the multiphase fluid among a number of pipes in a same plane as the distribution header, and wherein:

each pipe includes an expansion zone upstream of an upper and a lower finger that is configured to lower a pressure of the multiphase fluid prior to separating the multiphase fluid among the upper finger and the lower finger;

each upper finger feeds into a corresponding upper pipe in a second plane disposed above a plane of the distribution header;

each lower finger feeds into a corresponding lower pipe in the plane of the distribution header;

each upper pipe is coupled to a corresponding lower pipe by a downcomer;

each lower pipe is configured to allow entrained gases to rise to the corresponding upper pipe via the downcomer; and

each upper pipe is configured to allow entrained liquids to drain to the corresponding lower pipe via the downcomer.

13. The multiphase separation system of claim 12, wherein each upper finger is raised at an acute angle relative to the distribution header, and wherein each lower finger is in the plane of the distribution header.

14. The multiphase separation system of any of claims 12 or 13, wherein each upper

finger includes a droplet separation section configured to remove the entrained liquids from gases.

15. The multiphase separation system of any of claims 12, 13, or 14, wherein each lower finger includes a liquid degassing section configured to remove entrained gases from the liquids.

16. The multiphase separation system of any of claims 1-10 or 12, wherein the distribution header is configured to split the multiphase fluid among a number of upper fingers and a number of lower fingers, and wherein:

each upper finger feeds into a corresponding upper pipe in a first plane disposed above the distribution header;

each lower finger feeds into a corresponding lower pipe in a second plane disposed below the distribution header;

each upper pipe is coupled to a corresponding lower pipe by a downcomer;

each lower pipe includes an expansion zone configured to lower a pressure within the number of lower pipes to allow entrained liquids to drain from the number of upper pipes via a corresponding downcomer.

17. The multiphase separation system of claim 16, wherein each upper finger is raised at an acute angle relative to the distribution header, and wherein each lower finger is lowered at an acute angle relative to the distribution header.

18. The multiphase separation system of any of claims 16 or 17, wherein each upper finger includes a droplet separation section configured to remove the entrained liquids from gases.

19. The multiphase separation system of any of claims 16, 17, or 18, wherein each lower finger includes a liquid degassing section configured to remove entrained gases from liquids.

20. The multiphase separation system of any of claims 1-10, 12, or 16, wherein the multiphase fluid includes slugs including liquids entrained within gases.

21. A method for separation of liquids and gases within a multiphase fluid, including:

flowing a multiphase fluid into a number of divisions within a multiphase separation system, wherein the number of divisions are configured to lower a velocity of the multiphase fluid; and

separating the multiphase fluid among a number of lower pipes and a number of upper pipes, wherein each of the number of lower pipes includes an expansion zone upstream of a downcomer that is configured to lower a pressure within the lower pipe to allow entrained liquids to drain from a corresponding upper pipe via the downcomer.

22. The method of claim 21, including:

flowing gases from the multiphase separation system to downstream gas processing equipment or a gas export line; and

flowing the liquids from the multiphase separation system to downstream liquid processing equipment or a liquid export line.

23. The method of any of claims 21 or 22, including:

separating the liquids into oil and water;

flowing the oil out of the multiphase separation system via an oil outlet line; and

flowing the water out of the multiphase separation system via a water outlet line.

24. The method of any of claims 21, 22, or 23, including:

collecting the liquids within a liquid header; and

flowing the liquids out of the multiphase separation system via a liquid outlet line.

25. The method of any of claims 21-24, including:

collecting the gases within a gas header; and

flowing the gases out of the multiphase separation system via a gas outlet line.

26. The method of any of claims 21-25, including:

flowing the multiphase fluid into a distribution header configured to split the multiphase fluid among a number of pipes in a same plane as the distribution header;

separating the multiphase fluid into gases and liquids within an expansion zone of each of the number of pipes;

flowing the gases within each of the number of pipes into a corresponding upper pipe in a second plane disposed above a plane of the distribution header; and

flowing the liquids within each of the number of pipes into a corresponding lower

pipe in the plane of the distribution header;

wherein entrained liquids within each upper pipe are drained to a corresponding lower pipe via a downcomer.

27. The method of claims 26, including flowing entrained gases within each lower pipe to a corresponding upper pipe via the downcomer.

28. The method of any of claims 26 or 27, including lowering a velocity and a pressure of the multiphase fluid by splitting the multiphase fluid among the number of pipes in the same plane as the distribution header.

29. The method of any of claims 21-26, including:

separating the multiphase fluid into gases and liquids within a distribution header;

flowing the gases into a number of upper pipes in a first plane disposed above the distribution header;

flowing the liquids into a number of lower pipes in a second plane disposed below the distribution header,

flowing the gases out of the multiphase separation system via a gas outlet line; and

flowing the liquids out of the multiphase separation system via a liquid outlet line;

wherein entrained liquids within any of the number of upper pipes are drained to a corresponding lower pipe via a downcomer.

30. The method of claim 29, including flowing the gases into the number of upper pipes via a number of upper fingers.

31. The method of any of claims 29 or 30, including lowering a velocity and a pressure of the gases within the distribution header.

32. The method of any of claims 29, 30, or 31, including flowing the liquids into the number of lower pipes via a number of lower fingers.

33. The method of claim 32, including separating entrained gases from the liquids within a liquid degassing section of each of the number of lower fingers.

34. The method of any of claim 29-32, including lowering a velocity and a pressure of the liquids within the distribution header.

**ARTICLE 34 AMENDMENTS (REPLACEMENT SHEETS)**
**2012EM303**

## CLAIMS

What is claimed is:

1. A multiphase separation system, comprising:

an inlet line configured to allow a multiphase fluid to flow into the multiphase separation system, the inlet line comprising a plurality of divisions configured to lower a velocity of the multiphase fluid and feed the multiphase fluid into a distribution header;

the distribution header configured to split the multiphase fluid among a plurality of lower pipes, wherein each of the plurality of lower pipes comprises an expansion zone upstream of a corresponding downcomer, wherein the plurality of lower pipes are in the same plane as the distribution header, and wherein the expansion zone is configured to lower a pressure within the plurality of lower pipes to allow entrained liquids to drain from a plurality of upper pipes via the corresponding downcomer.

2. The multiphase separation system of claim 1, comprising a liquid header for collecting the liquids from the plurality of lower pipes and flowing the liquids out of the multiphase separation system via a liquid outlet line.

3. The multiphase separation system of claim 1, wherein each of the plurality of upper pipes feeds into a common gas header, and wherein the common gas header comprises a gas outlet line for flowing the gases from the plurality of upper pipes out of the multiphase separation system.

4. The multiphase separation system of claim 1, wherein entrained gases within any of the plurality of lower pipes rise to any of the plurality of upper pipes via the corresponding downcomer.

5. The multiphase separation system of claim 1, comprising a stratification section upstream of each expansion zone that is configured to separate gases from liquids within the multiphase fluid.

6. The multiphase separation system of claim 1, wherein the multiphase separation system is implemented within a subsea environment.

7. The multiphase separation system of claim 1, wherein the multiphase separation system

comprises a slug catcher.

8. The multiphase separation system of claim 1, wherein a desander is located upstream of the inlet line.

9. The multiphase separation system of claim 1, wherein a desander is located downstream of a liquid outlet line.

10. The multiphase separation system of claim 1, comprising:

an oil/water separation section that is coupled to each of a plurality of lower pipes and is configured to separate the liquids into oil and water;

an oil outlet line that is configured to flow the oil out of the multiphase separation system; and

a water outlet line that is configured to flow the water out of the multiphase separation system.

11. The multiphase separation system of claim 10, wherein the oil/water separation section is coupled to each of the plurality of lower pipes via a sealing downcomer.

12. The multiphase separation system of claim 1, and wherein:

each pipe comprises an expansion zone upstream of an upper and a lower finger that is configured to lower a pressure of the multiphase fluid prior to separating the multiphase fluid among the upper finger and the lower finger;

each upper finger feeds into a corresponding upper pipe in a second plane disposed above a plane of the distribution header;

each lower finger feeds into a corresponding lower pipe;

each upper pipe is coupled to a corresponding lower pipe by a downcomer;

each lower pipe is configured to allow entrained gases to rise to the corresponding upper pipe via the downcomer; and

each upper pipe is configured to allow entrained liquids to drain to the corresponding lower pipe via the downcomer.

**ARTICLE 34 AMENDMENTS (REPLACEMENT SHEETS)**
**2012EM303**

13. The multiphase separation system of claim 12, wherein each upper finger is raised at an acute angle relative to the distribution header.

14. The multiphase separation system of claim 12, wherein each upper finger comprises a droplet separation section configured to remove the entrained liquids from gases.

15. The multiphase separation system of claim 12, wherein each lower finger comprises a liquid degassing section configured to remove entrained gases from the liquids.

16. The multiphase separation system of claim 1, wherein the distribution header is configured to split the multiphase fluid among a plurality of upper fingers and a plurality of lower fingers, and wherein:

each upper finger feeds into a corresponding upper pipe in a first plane disposed above the distribution header;

each lower finger feeds into a corresponding lower pipe;

each upper pipe is coupled to a corresponding lower pipe by a downcomer;

each lower pipe comprises an expansion zone configured to lower a pressure within the plurality of lower pipes to allow entrained liquids to drain from the plurality of upper pipes via a corresponding downcomer.

17. The multiphase separation system of claim 16, wherein each upper finger is raised at an acute angle relative to the distribution header.

18. The multiphase separation system of claim 16, wherein each upper finger comprises a droplet separation section configured to remove the entrained liquids from gases.

19. The multiphase separation system of claim 16, wherein each lower finger comprises a liquid degassing section configured to remove entrained gases from liquids.

20. The multiphase separation system of claim 1, wherein the multiphase fluid comprises slugs comprising liquids entrained within gases.

21. A method for separation of liquids and gases within a multiphase fluid, comprising:

flowing a multiphase fluid through a distribution header into a plurality of divisions

within a multiphase separation system, wherein the plurality of divisions are configured to lower a velocity of the multiphase fluid; and

separating the multiphase fluid among a plurality of lower pipes and a plurality of upper pipes, wherein the plurality of lower pipes are in the same plane as the distribution header, and wherein each of the plurality of lower pipes comprises an expansion zone upstream of a downcomer that is configured to lower a pressure within the lower pipe to allow entrained liquids to drain from a corresponding upper pipe via the downcomer.

22. The method of claim 21, comprising:

flowing gases from the multiphase separation system to downstream gas processing equipment or a gas export line; and

flowing the liquids from the multiphase separation system to downstream liquid processing equipment or a liquid export line.

23. The method of claim 21, comprising:

separating the liquids into oil and water;

flowing the oil out of the multiphase separation system via an oil outlet line; and

flowing the water out of the multiphase separation system via a water outlet line.

24. The method of claim 21, comprising:

collecting the liquids within a liquid header; and

flowing the liquids out of the multiphase separation system via a liquid outlet line.

25. The method of claim 21, comprising:

collecting the gases within a gas header; and

flowing the gases out of the multiphase separation system via a gas outlet line.

26. The method of claim 21, comprising:

flowing the multiphase fluid into a distribution header configured to split the multiphase fluid among a plurality of pipes in a same plane as the distribution header;

separating the multiphase fluid into gases and liquids within an expansion zone of each of the plurality of pipes;

flowing the gases within each of the plurality of pipes into a corresponding upper pipe in a second plane disposed above a plane of the distribution header; and

flowing the liquids within each of the plurality of pipes into a corresponding lower pipe;

wherein entrained liquids within each upper pipe are drained to a corresponding lower pipe via a downcomer.

27. The method of claim 26, comprising flowing entrained gases within each lower pipe to a corresponding upper pipe via the downcomer.

28. The method of claim 26, comprising lowering a velocity and a pressure of the multiphase fluid by splitting the multiphase fluid among the plurality of pipes in the same plane as the distribution header.

29. The method of claim 21, comprising:

separating the multiphase fluid into gases and liquids within a distribution header;

flowing the gases into a plurality of upper pipes in a first plane disposed above the distribution header;

flowing the liquids into a plurality of lower pipes;

flowing the gases out of the multiphase separation system via a gas outlet line; and

flowing the liquids out of the multiphase separation system via a liquid outlet line;

wherein entrained liquids within any of the plurality of upper pipes are drained to a corresponding lower pipe via a downcomer.

30. The method of claim 29, comprising flowing the gases into the plurality of upper pipes via a plurality of upper fingers.

31. The method of claim 29, comprising lowering a velocity and a pressure of the gases within the distribution header.

32. The method of claim 29, comprising flowing the liquids into the plurality of lower pipes

via a plurality of lower fingers.

33. The method of claim 32, comprising separating entrained gases from the liquids within a liquid degassing section of each of the plurality of lower fingers.

34. The method of claim 29, comprising lowering a velocity and a pressure of the liquids within the distribution header.