mix back into solution, and the gas bubbles can pass through the flowmeter 24, altering the readings.

**[0020]** One solution to cavitation and gas breakout problems has been to add a valve or orifice downstream of the Coriolis flowmeter 24. In this position, the valve or orifice can reduce the effects of cavitation by adding backpressure within the pipe that extends from the chokes 22 to the flowmeter 24. However, the control valve that has been used is typically controlled manually and is unable to be reliably reset during operations as flow conditions change.

**[0021]** The subject matter of the present disclosure is directed to overcoming, or at least reducing the effects of, one or more of the problems set forth above.

## SUMMARY OF THE DISCLOSURE

**[0021A]** According to a first aspect of the invention, there is provided a method of drilling a wellbore with a drilling system, the method comprising: obtaining a measurement of drilling fluid flow from the wellbore through one or more of a plurality of flowmeters of the drilling system disposed in parallel communication; controlling, with one or more valves of the drilling system, upstream surface backpressure of the drilling fluid flow in the wellbore based at least in part on feedback of the obtained measurement to control the drilling of the wellbore by operating at least one first adjustable choke of the one or more valves, disposed in fluid communication upstream of a plurality of flowmeters, to adjust the upstream surface backpressure; and selectively distributing, with the one or more valves, the drilling fluid flow from the wellbore through the one or more of the plurality of flowmeters of the drilling system based at least in part on feedback of the obtained measurement.

**[0021B]** According to a second aspect of the invention, there is provided an apparatus for controlled pressure drilling of a wellbore, the apparatus comprising: a plurality of flowmeters in parallel fluid communication; a distributor in fluid communication between the wellbore and the plurality of flowmeters and having a plurality of valves, at least one of the valves being a first adjustable choke disposed in fluid communication upstream of the flowmeters; and a control in operable communication with the flowmeters and the valves, the control operating one or more of the valves to selectively direct the drilling fluid flow from the wellbore to one or more of the plurality of flowmeters based at least in part on

feedback of the obtained reading, the control obtaining a reading from one or more selected ones of flowmeters and adjusting, with the at least one first adjustable choke, an upstream surface backpressure to control the drilling of the wellbore based at least in part on feedback of the obtained reading.

**[0022]** According to the present disclosure, a drilling system drills a wellbore using one or more valves or chokes to control pressure in drilling fluid flow in a control pressure drilling operation. A measurement of drilling fluid flow from the wellbore is obtained. Based at least in part on the obtained measurement, upstream pressure of the drilling fluid flow in the wellbore is controlled with one or more valves of the drilling system. Based at least in part on the obtained measurement, the drilling fluid flow from the wellbore is selectively distributed through one or more of a plurality of flowmeters of the drilling system. The one or more selected flowmeters can at least periodically obtain the measurement of the drilling fluid flow. For example, the one or more selected flowmeters can obtain a mass flow rate of the drilling fluid flow.

**[0023]** To selectively distribute the drilling fluid flow through the one or more flowmeters, a determination can be made of which of the one or more flowmeters to select for distribution by comparing a measured flow rate, a measured pressure, and the like to a capacity for each of the flowmeters. Additionally, the selective distribution of the drilling fluid flow can seek to minimize an overall measurement error in the measurement obtained using the one or more flowmeters by determining which of the one or more flowmeters to select for distribution based on a comparison of a measurement error for each of the flowmeters.

**[0024]** Controlling the upstream pressure of the drilling fluid flow in the wellbore can occur concurrently with or separately from the selective distribution of the drilling fluid

**CLAIMS**

1. A method of drilling a wellbore with a drilling system, the method comprising:

obtaining a measurement of drilling fluid flow from the wellbore through one or more of a plurality of flowmeters of the drilling system disposed in parallel communication;

controlling, with one or more valves of the drilling system, upstream surface backpressure of the drilling fluid flow in the wellbore based at least in part on feedback of the obtained measurement to control the drilling of the wellbore by operating at least one first adjustable choke of the one or more valves, disposed in fluid communication upstream of a plurality of flowmeters, to adjust the upstream surface backpressure; and

selectively distributing, with the one or more valves, the drilling fluid flow from the wellbore through the one or more of the plurality of flowmeters of the drilling system based at least in part on feedback of the obtained measurement.

2. The method of claim 1, wherein obtaining the measurement of the drilling fluid flow from the wellbore comprises obtaining, at least periodically, the measurement from the one or more selected flowmeters.

3. The method of claim 1, wherein selectively distributing the drilling fluid flow from the wellbore through the one or more of the plurality of flowmeters based at least in part on the feedback of the obtained measurement comprises at least one of:

determining which of the one or more of the plurality of flowmeters to select for distribution by comparing a flow rate of the obtained measurement to a flow capacity of each of the flowmeters; and

determining which of the one or more of the plurality of flowmeters to select for distribution by comparing a pressure of the obtained measurement to a pressure capacity of each of the flowmeters.

4. The method of claim 1, wherein selectively distributing the drilling fluid flow from the wellbore through the one or more of the plurality of flowmeters based at least in part

on the feedback of the obtained measurement comprises minimizing a measurement error of the measurement obtained with the one or more of the plurality of flowmeters.

5. The method of claim 4, wherein minimizing the measurement error comprises determining which of the one or more of the plurality of flowmeters to select for distribution by comparing the obtained measurement to the measurement error of each of the flowmeters.

6. The method of claim 1, wherein controlling the upstream surface backpressure and selectively distributing the drilling fluid flow comprises:

controlling the upstream surface backpressure of the drilling fluid flow in the wellbore concurrently with the selective distribution of the drilling fluid flow through the one or more of the plurality of flowmeters; or

controlling the upstream surface backpressure of the drilling fluid flow in the wellbore separately from the selective distribution through the one or more of the plurality of flowmeters.

7. The method of claim 1, further comprising adjusting an internal pressure at least inside at least one of the one or more selected flowmeters using at least one second adjustable choke of the valves, disposed in fluid communication downstream of the at least one selected flowmeter, in response to the adjustment of the at least one first adjustable choke.

8. The method of claim 7, further comprising readjusting the at least one first adjustable choke in response to the adjustment of the at least one second adjustable choke.

9. The method of claim 7, wherein adjusting the internal pressure at least inside the at least one selected flowmeter using the at least one second adjustable choke comprises determining a portion of gas breakout in the at least one selected flowmeter caused by the at least one first adjustable choke and adjusting the at least one second adjustable choke based on the determination.

10. The method of claim 9, wherein determining the portion of the gas breakout in the at least one selected flowmeter caused by the at least one first adjustable choke comprises

comparing one or more operational parameters of the at least one selected flowmeter to empirical information associated with the at least one selected flowmeter.

11. The method of claim 7, wherein adjusting the internal pressure at least inside the at least one selected flowmeter using the at least one second adjustable choke comprises calculating a cavitation index based on pressure measured relative to the at least one selected flowmeter and determining that the cavitation index differs from an expected value for the cavitation index for a current position of the at least one first adjustable choke.

12. The method of claim 7, wherein adjusting the internal pressure at least inside the at least one selected flowmeter using the at least one second adjustable choke comprises:

estimating cavitation in the drilling fluid flow through the at least one selected flowmeter caused by the at least one first adjustable choke; and

adjusting, based on the estimated cavitation, the internal pressure of the drilling fluid flow within the at least one selected flowmeter with the at least one second adjustable choke of the drilling system disposed in fluid communication downstream communication with the at least one selected flowmeter.

13. The method of claim 1, wherein selectively distributing the drilling fluid flow through the one or more of the plurality of flowmeters of the drilling system based at least in part on the feedback of the obtained measurement comprises:

distributing the drilling fluid flow through a first of the one or more selected flowmeters based on a first level of the obtained measurement and distributing the drilling fluid flow through a second of the one or more selected flowmeters and not the first flowmeter based on a second level of the obtained measurement, the first flowmeter having a first flow capacity, the second flowmeter having a second flow capacity different from the first flow capacity; or

distributing the drilling fluid flow through a first of the one or more selected flowmeters based on a first level of the obtained measurement and distributing the drilling fluid flow through the first flowmeter and a second of the one or more selected flowmeters based on a second level of the obtained

measurements, the first flowmeter having a first flow capacity, the second flowmeter having a second flow capacity the same as or different from the first flow capacity.

14. The method of claim 1, wherein obtaining the measurement of the drilling fluid flow from the wellbore:

obtaining, at least periodically, a first reading of the drilling fluid flow from the wellbore with a first of the flowmeters of the drilling system;

obtaining, at least periodically, at least one second reading of the drilling fluid flow from the wellbore with at least one second of the flowmeters of the drilling system disposed in series communication with the first flowmeter; and

comparing the first and at least one second readings with one another; and

wherein controlling the surface backpressure comprises controlling, with the at least one first adjustable choke of the drilling system, the upstream surface backpressure based at least in part on the comparison.

15. An apparatus for controlled pressure drilling of a wellbore, the apparatus comprising:

a plurality of flowmeters in parallel fluid communication;

a distributor in fluid communication between the wellbore and the plurality of flowmeters and having a plurality of valves, at least one of the valves being a first adjustable choke disposed in fluid communication upstream of the flowmeters; and

a control in operable communication with the flowmeters and the valves, the control operating one or more of the valves to selectively direct the drilling fluid flow from the wellbore to one or more of the plurality of flowmeters based at least in part on feedback of the obtained reading, the control obtaining a reading from one or more selected ones of flowmeters and adjusting, with the at least one first adjustable choke, an upstream surface backpressure to control the drilling of the wellbore based at least in part on feedback of the obtained reading.

16. The apparatus of claim 15, wherein the flowmeters comprise at least one of: a same flow capacity as one another; at least two different flow capacities from one another; a same type of flowmeter device; and at least two different types of flowmeter device.

17. The apparatus of claim 15, further comprising at least one second adjustable choke disposed in fluid communication downstream of the distributor, the at least one second adjustable choke being operable to control an internal pressure within the one or more selected flowmeters.

18. The apparatus of claim 15, wherein the distributor comprises a plurality of the at least one first adjustable chokes each disposed in fluid communication upstream of a respective one of the flowmeters.

19. The apparatus of claim 18, wherein each of the first adjustable chokes is operable to control upstream pressure in the drilling fluid flow for controlling the upstream surface backpressure, and wherein each of the first adjustable chokes is operable to permit and deny the selective direction of the drilling fluid flow through the respective one of the flowmeters.

20. The apparatus of claim 18, further comprising a plurality of second adjustable chokes each disposed in fluid communication downstream of a respective one of the flowmeters, each of the second adjustable chokes being operable to control an internal pressure in the respective one of the flowmeters.

21. The apparatus of claim 15, wherein the apparatus comprises at least one second adjustable choke disposed in fluid communication downstream of one or more of the flowmeters, the at least one second adjustable choke being operable to control an internal pressure in the respective one or more of the flowmeters.

22. The apparatus of claim 21,

wherein the at least one first adjustable choke in fluid communication with the drilling fluid flow of the wellbore is operable with first states to control the upstream surface backpressure of the drilling fluid flow;

wherein at least one of the one or more selected flowmeters in fluid communication downstream of the at least one first valve is operable to measure the drilling fluid flow past the at least one selected flowmeter;

wherein the at least one second adjustable choke in fluid communication downstream of the at least one selected flowmeter is operable with second states to control the internal pressure of the drilling fluid flow at least in the at least one selected flowmeter; and

wherein the control in operable communication with the at least one second adjustable choke automatically adjusts the second state of the at least one second adjustable choke based on a cavitation value associated with the first state of the at least one first adjustable choke.

23. The apparatus of claim 15,

wherein the at least one first adjustable choke in fluid communication with drilling fluid flow from the wellbore is operable with first states to control the upstream surface backpressure of the drilling fluid flow;

wherein a first of the one or more selected flowmeters in fluid communication downstream of the at least one first valve is operable to measure a first of the reading of the drilling fluid flow past the first flowmeter;

wherein at least one second of the one or more flowmeters in series communication downstream of the first flowmeter is operable to measure at least one second of the reading of the drilling fluid flow past the at least one second flowmeter; and

wherein the control in operable communication with the first and the at least one second flowmeters compares the first and the at least one second readings, the control controlling the first state of the at least one first adjustable choke based at least in part on the comparison.