

operators must predetermine how the inflow control devices 70 are to be preconfigured and deployed downhole before setting up the components for the rig.

[0009] When the joints 50 are used in a horizontal or deviated borehole of a well as shown in Figure 1, the inflow control devices 70 are configured to produce particular pressure drops to help evenly distribute the flow along the completion string 14 and prevent coning of water in the heel section. Overall, the devices 70 choke production to create an even-flowing pressure-drop profile along the length of the horizontal or deviated section of the borehole 12.

[0010] Although the inflow control device 70 of the prior art is effective, it is desirable to be able to configure the pressure drop for a borehole accurately to meet the needs of a given installation and to be able to easily configure the pressure drop as needed. Moreover, flow passing through an inflow control device can reach high velocities as the flow exits internal ports. The high velocity flow may tend to damage components. For example, the high velocity flow can stress the surface of the basepipe in the inflow control device and can encourage corrosion.

[0011] The subject matter of the present disclosure is, therefore, directed to overcoming, or at least reducing the effects of, one or more of the problems set forth above.

SUMMARY OF THE DISCLOSURE

[0012] According to the present disclosure, a flow control apparatus for a borehole comprises a basepipe, a screen, a sleeve, and at least one baffle. The basepipe has a bore for conveying fluid and defines at least one opening for communicating fluid into the bore. The screen is disposed on the basepipe and screens fluid from outside the basepipe for eventual passage into the bore of the basepipe via the at least one opening. The sleeve is disposed on the basepipe adjacent the screen and enclosing at least one inner chamber in communication with the at least one opening in the basepipe. The sleeve has at least one flow passage for communicating the fluid in a longitudinal direction from the screen toward the at least one inner chamber in fluid communication with the at least one opening in the basepipe. A shelf of the sleeve extends in the longitudinal direction downstream from the at least one flow passage and covers at least a portion of the basepipe upstream from the at least one opening. A plurality of baffles is disposed on the shelf of the sleeve downstream from the at least one flow passage and upstream from the at least one opening. The baffles changes the flow exiting from the at least one flow passage from the longitudinal direction to a lateral direction before allowing the flow to enter the at least one inner chamber in fluid communication with the at least one opening.

second sleeve. The second end-ring is affixed to the basepipe adjacent the at least one opening, and the second sleeve forms the second chamber. The second sleeve has a first end affixed to the second end ring and has a second end affixed to the body. The second end ring and the second sleeve at the first end can be integral with one another.

[0027] The at least one baffle can comprise one or more walls disposed partially about a circumference of the body. The one or more walls can be a set of the one or more walls separated along a length of the body, and a portion of the second housing portion can enclose the one or more walls. A shield can be affixed to a portion of at least one baffle and can be composed of a material different than the at least one baffle.

[0028] According to the present disclosure, a flow control method for a borehole comprises: selectively configuring one or more flow devices disposed in one or more flow passages of a sleeve on a basepipe; deploying the basepipe in the borehole; receiving fluid in the sleeve from outside the basepipe; controlling flow of the received fluid through the one or more flow passages to one or more inner chambers enclosed in communication with one or more internal openings in the basepipe using the one or more flow devices; and changing the flow exiting in a longitudinal direction from the one or more flow passages to a lateral direction before allowing the flow to enter the one or more inner chambers in fluid communication with the one or more internal openings of the basepipe by using a plurality of baffles disposed on a shelf of the sleeve extending downstream from the one or more flow passages and covering portion of the basepipe upstream of the one or more internal openings.

[0029] Selectively configuring the one or more flow devices can comprise selectively permitting or preventing fluid communication to the one or more internal openings through the one or more flow devices; selectively opening or closing fluid communication through the one or more flow devices by externally opening or closing an internal valve of the one or more flow devices; or selectively opening or closing fluid communication through the one or more flow devices by selectively inserting one of a set of inserts in an external opening of the housing on the basepipe.

[0030] The foregoing summary is not intended to summarize each potential embodiment or every aspect of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] Fig. 1 illustrates a completion system having completion screen joints deployed in a borehole.

[0032] Fig. 2A illustrates a completion screen joint according to the prior art.

[0033] Fig. 2B illustrates the prior art completion screen joint in partial cross-section.

WHAT IS CLAIMED IS:

1. A flow control apparatus for a borehole, the apparatus comprising:
a basepipe having a bore for conveying fluid and defining at least one opening for communicating fluid into the bore;
a screen disposed on the basepipe and screening fluid from outside the basepipe;
a sleeve disposed on the basepipe adjacent the screen and enclosing at least one inner chamber in communication with the at least one opening in the basepipe, the sleeve having at least one flow passage for communicating the fluid in a longitudinal direction from the screen toward the at least one inner chamber in fluid communication with the at least one opening in the basepipe, a shelf of the sleeve extending in the longitudinal direction downstream from the at least one flow passage and covering at least a portion of the basepipe upstream from the at least one opening; and
a plurality of baffles disposed on the shelf of the sleeve downstream from the at least one flow passage and upstream from the at least one opening, the baffles changing the flow exiting from the at least one flow passage from the longitudinal direction to a lateral direction before allowing the flow to enter the at least one inner chamber in fluid communication with the at least one opening.
2. The apparatus of claim 1, wherein one or more of the baffles is at least partially composed of an erosion-resistant material.
3. The apparatus of claim 2, wherein one or more of the baffles comprises a shield affixed thereto, the shield being composed of the erosion-resistant material.
4. The apparatus of claim 1, 2 or 3, wherein the baffles comprise a plurality of rib segments disposed on the shelf of the sleeve in an alternating pattern relative to one another and the at least one flow passage.
5. The apparatus of any one of claims 1 to 4, wherein the sleeve defines at least one external opening communicating with the at least one flow passage; and wherein the apparatus further comprises:
at least one valve disposed in the at least one external opening in the sleeve, the at least one valve interposed in the at least one flow passage of the sleeve and being externally configurable to selectively control flow of the fluid from the screen through the at least one flow passage to the at least one opening defined in the basepipe.
6. The apparatus of claim 5, wherein the at least one valve is externally configurable between first and second states, the at least one valve in the first state

permitting fluid communication to the at least one opening, the at least one valve in the second state preventing fluid communication to the at least one opening.

7. The apparatus of claim 6, wherein the at least one valve comprises a nozzle orifice restricting the flow of the fluid in the first state of the at least one valve through the at least one flow passage.

8. The apparatus of claim 5 or 6, wherein the at least one valve comprises a ball valve having an orifice defined therein and being rotatable relative to the at least one flow passage, the rotation of the ball valve being externally accessible on the exterior of the sleeve and changing fluid communication through the at least one flow passage.

9. The apparatus of any one of claims 1 to 4, wherein the at least one flow passage comprises a nozzle disposed therein and being selectively configurable from an open state without a pin disposed in the nozzle and a closed state with the pin disposed in the nozzle.

10. The apparatus of any one of claims 1 to 4, wherein the sleeve defines at least one external opening communicating with the at least one flow passage; and wherein the apparatus further comprises:
at least one set of first and second inserts selectively insertable in the at least one external opening in the sleeve relative to the at least one flow passage, the first insert selectively permitting the flow of the fluid from the screen through the at least one flow passage to the at least one opening defined in the basepipe, the second insert selectively preventing the flow of the fluid from the screen through the at least one flow passage to the at least one opening defined in the basepipe.

11. The apparatus of claim 10, wherein the at least one set of the first and second inserts are each selectively affixable in the at least one external opening.

12. The apparatus of any one of claims 1 to 11, wherein the sleeve comprises:
an intermediate body having the at least one flow passage and the shelf of the sleeve;
a first housing portion disposed about the basepipe between an end-ring of the screen and the intermediate body, the first housing portion enclosing a first chamber for passage of the fluid to the at least one flow passage; and
a second housing portion disposed about the basepipe from the intermediate body and enclosing the at least one inner chamber for passage of the fluid from the at least one flow passage to the at least one opening in the basepipe.

13. The apparatus of claim 12, wherein the second housing encloses the baffles disposed on the shelf of the sleeve.
14. The apparatus of any one of claims 1 to 11, wherein the sleeve comprises:
 - a body having the at least one flow passage and the shelf of the sleeve, the body having a first end disposed against an end-ring of the screen; and
 - a housing portion disposed about the basepipe from a second end of the body and enclosing the at least one inner chamber for passage of the fluid from the at least one flow passage to the at least one opening in the basepipe.
15. The apparatus of any one of claims 1 to 11, wherein the sleeve comprises:
 - a body having the at least one flow passage and having the shelf;
 - a first housing portion disposed about the basepipe between an end-ring of the screen to an intermediate portion of the body, the first housing enclosing communication of the fluid from the at least one screen; and
 - a second housing portion disposed about the basepipe from the intermediate portion of the body and enclosing the at least one inner chamber in communication with the at least one opening in the basepipe.
16. A flow control method for a borehole comprises:
 - selectively configuring one or more flow devices disposed in one or more flow passages of a sleeve on a basepipe;
 - deploying the basepipe in the borehole;
 - receiving fluid in the sleeve from outside the basepipe;
 - controlling flow of the received fluid through the one or more flow passages to one or more inner chambers enclosed in communication with one or more internal openings in the basepipe using the one or more flow devices; and
 - changing the flow exiting in a longitudinal direction from the one or more flow passages to a lateral direction before allowing the flow to enter the one or more inner chambers in fluid communication with the one or more internal openings of the basepipe by using a plurality of baffles disposed on a shelf of the sleeve extending downstream from the one or more flow passages and covering a portion of the basepipe upstream of the one or more internal openings.
17. The method of claim 16, wherein one or more of the baffles is at least partially composed of an erosion-resistant material.
18. The method of claim 16 or 17, wherein selectively configuring the one or more flow devices disposed in the sleeve on the basepipe comprises selectively permitting or

preventing fluid communication to the one or more internal openings through the one or more flow devices.

19. The method of claim 16 or 17, wherein selectively configuring the one or more flow devices disposed in the sleeve on the basepipe comprises selectively opening or closing fluid communication through the one or more flow devices by externally opening or closing an internal valve of the one or more flow devices.

20. The method of claim 16 or 17, wherein selectively configuring the one or more flow devices disposed in the sleeve on the basepipe comprises selectively opening or closing fluid communication through the one or more flow devices by selectively inserting one of a set of inserts in an external opening of the sleeve on the basepipe.