Apparatus for Treating a Wellbore Screen and Method

Field

The invention relates to an apparatus and methods for treating wellbore screens. In particular, the invention relates to an apparatus and methods for applying an internal coating to a wellbore screen.

Background

Various wellbore tubulars are known and serve various purposes. A wellbore screen is a tubular including a screen material forming or mounted in the tubular's wall. The wellbore screen can be used in wellbores such as those for water, steam injection and/or petroleum product production.

In one form, a wellbore screen is known that includes a wall of screen material held between end fittings. The wall includes screen material that may take various forms and is usually supported in some way, as by a perforated sleeve. These screens filter fluids passing through the screen material layer either into or out of the screen inner diameter.

In another form, a wellbore screen is an apparatus that can include a base pipe and a plurality of filter cartridges supported in the base pipe. The filter cartridges are mounted in openings through the base pipe wall. The filter cartridges screen fluids passing through the openings into the base pipe for pumping or flow up hole. Of course, the openings may be formed and/or employed to also permit flow of fluids outwardly therethrough from the inner diameter of the base pipe.

Summary

In accordance with one aspect of the present ~~D~~disclosure, there is provided an apparatus for treating a wellbore screen with a coating material, the apparatus comprising: a support for the wellbore screen, the support supporting an outer surface of the

wellbore screen and presenting the wellbore screen with open access to its inner bore, as defined by an inner tubular wall of the wellbore screen; an elongate injector for injecting coating material into the inner bore of the wellbore screen, the elongate injector including a supported end, a distal end, and a coating material delivery line extending through the elongate injector from a coating material supply to a port at the distal end; and a driver for positioning the elongate injector into the inner bore and moving the elongate injector through the inner bore to introduce coating material to the inner bore such that the coating material can be distributed on to the inner tubular wall of the wellbore screen.

In one aspect, there is provided an apparatus for treating a wellbore screen with a coating material, the apparatus comprising: a support for the wellbore screen, the support supporting an outer surface of the wellbore screen and presenting the wellbore screen with open access to its inner bore, as defined by an inner tubular wall of the wellbore screen; an elongate injector for injecting coating material into the inner bore of the wellbore screen, the elongate injector including a supported end, a distal end including an injector head having a port formed therein and a coating material delivery line extending through the elongate injector from a coating material supply to the port at the distal end; a spreader ring configured for urging against the inner tubular wall, for spreading the coating material introduced from the port onto the inner tubular wall and into a screening component of the wellbore screen; a heating element about the distal end of the elongate injector for heating the coating material passing through the coating material delivery line; and a driver for positioning the elongate injector into the inner bore and moving the elongate injector through the inner bore to introduce the coating material to the inner bore such that the coating material can be distributed on to the inner tubular wall of the wellbore screen.

In accordance with another aspect of the present ~~D~~disclosure, there is provided a method for treating a wellbore screen, the method comprising: providing a wellbore screen including a tubular wall with an inner tubular surface defining an inner bore, an outer tubular surface and a screening component installed to screen fluid passing through the tubular wall from the outer tubular surface to the inner bore; inserting an elongate injector into the inner bore; introducing a coating material in the form of a liquid via the elongate injector into the inner bore; distributing the coating material onto the inner tubular surface such that the coating material penetrates to some extent into the screening component from the inner tubular surface; and allowing the coating

material to set to form a removable seal across the screening component in the inner diameter.

In one aspect, there is provided a method for treating a wellbore screen, the method comprising: inserting an elongate injector into an inner bore of a wellbore screen including a tubular wall with an inner tubular surface defining the inner bore, an outer tubular surface and a screening component installed to screen fluid passing through the tubular wall from the outer tubular surface to the inner bore; heating a coating material to convert it from a solid to a liquid; introducing the coating material in the form of the liquid via the elongate injector into the inner bore; distributing the coating material onto the inner tubular surface by pushing a ring-shaped spreader head through the inner bore and against the inner tubular surface such that the coating material penetrates to some extent into the screening component from the inner tubular surface; and allowing the coating material to set to form a removable seal across the screening component in the inner diameter.

In another aspect, there is provided an apparatus for applying a coating material, the apparatus comprising: a support; an elongate injector for injecting the coating material, the elongate injector including a supported end, a distal end, and a coating material delivery line extending through the elongate injector from a coating material supply to an injector head at the distal end, the injector head including at least one port for emitting the coating material; and a drive mechanism, the drive mechanism and the injector head for distributing the coating material.

It is to be understood that other aspects of the present ~~D~~disclosure will become readily apparent to those skilled in the art from the following detailed description, wherein various embodiments of the ~~D~~disclosure are shown and described by way of illustration. As will be realized, the ~~D~~disclosure is capable for other and different embodiments and its several details are capable of modification in various other respects, all without departing from the spirit and scope of the present ~~D~~disclosure. Accordingly the drawings and detailed description are to be regarded as illustrative in nature and not as restrictive.

I claim:

1. An apparatus for treating a wellbore screen with a coating material, the apparatus comprising: a support for the wellbore screen, the support supporting an outer surface of the wellbore screen and presenting the wellbore screen with open access to its inner bore, as defined by an inner tubular wall of the wellbore screen; an elongate injector for injecting coating material into the inner bore of the wellbore screen, the elongate injector including a supported end, a distal end, and a coating material delivery line extending through the elongate injector from a coating material supply to a port at the distal end; and a driver for positioning the elongate injector into the inner bore and moving the elongate injector through the inner bore to introduce coating material to the inner bore such that the coating material can be distributed on to the inner tubular wall of the wellbore screen.

2. The apparatus of claim 1, wherein the driver comprises a drive mechanism comprising a fitting for engaging one end of the wellbore screen, and the inner bore is accessible by the elongate injector at at least the other end of the wellbore screen.

3. The apparatus of claim 2, wherein the drive mechanism further comprises a motor, a sprocket, and a chain or a belt, and the chain or belt is meshed with the sprocket, rotational movement of which is controlled by the motor.

4. The apparatus of claim 3, wherein the fitting is connected to the chain or belt such that the fitting is moved along a long axis of the support from the rotational movement of the sprocket.

5. The apparatus of claim 4, wherein the fitting comprises a rotator component for rotating the wellbore screen about its long axis.

6. The apparatus of claim 2, wherein the drive mechanism further comprises a plurality of rollers on which the wellbore screen is supported.

7. The apparatus of claim 1, wherein the delivery line comprises an inner tube and an outer tubing, an outer surface of the outer tubing having boom supports for supporting the elongate injector along its length.

8. The apparatus of claim 1, wherein the coating material supply comprises an extruder and an auger for delivering the coating material into the delivery line.

9. The apparatus of claim 1, wherein the elongate injector comprises an injector head having the port formed therein.

10. The apparatus of claim 9, wherein the injector head comprises a spreader head for distributing the coating material introduced from the port to the inner tubular wall of the wellbore screen.

11. The apparatus of claim 9, wherein the elongate injector further comprises a member for wiping off excess coating material and for driving the coating material into a screening component of the wellbore screen.

12. The apparatus of claim 9 wherein the injector head is selectively rotatable about a long axis of the elongate injector.

13. The apparatus of claim 7, wherein an annulus is formed between an outer surface of the inner tube and an inner surface of the outer tubing, and further comprising a heater is disposed in the annulus for heating the delivery line.

14. The apparatus of claim 1 further comprising a heating element about the distal end of the elongate injector.

15. The apparatus of claim 1, wherein the coating material is a polymer, a resin, a salt, a wax, or a combination thereof.

16. A method for treating a wellbore screen, the method comprising: inserting an elongate injector into an inner bore of a wellbore screen including a tubular wall with an inner tubular surface defining the inner bore, an outer tubular surface and a screening component installed to screen fluid passing through the tubular wall from the outer tubular surface to the inner bore; introducing a

coating material in the form of a liquid via the elongate injector into the inner bore; distributing the coating material onto the inner tubular surface such that the coating material penetrates to some extent into the screening component from the inner tubular surface; and allowing the coating material to set to form a removable seal across the screening component in the inner diameter.

17. The method of claim 16, wherein the elongate injector comprises a supported end, a distal end, and a coating material delivery line extending through the elongate injector from a coating material supply to a port at the distal end, and the coating material is distributed through the port on to the inner tubular surface.

18. The method of claim 16, wherein inserting of the elongate injector is performed by a drive mechanism.

19. The method of claim 18, wherein the drive mechanism engages an end of the wellbore screen and positions the inner bore of the wellbore screen about the elongate injector.

20. The method of claim 16 further comprising scraping excess coating material from a surface of the wellbore screen.

21. The method of claim 16 further comprising withdrawing the elongate injector from the wellbore screen.

22. The method of claim 16 further comprising rotating the wellbore screen during the introduction of the coating material.

23. The method of claim 17, wherein the port is formed in an injector head and the injector head is selectively rotatable about a long axis of the elongate injector.

24. The method of claim 23, further comprising rotating the injector head during the introduction of the coating material.

25. The method of claim 16, wherein distributing includes spreading the coating material using a spreader.

26. The method of claim 16, wherein distributing includes spraying the coating material.

27. The method of claim 16, wherein the coating material is introduced during the insertion of the elongate injector.

28. The method of claim 21, wherein the coating material is introduced during the withdrawal of the elongate injector.

29. The method of claim 17 further comprising heating a portion of the wellbore screen or a portion of the delivery line.

30. An apparatus for applying a coating material, the apparatus comprising: a support; an elongate injector for injecting the coating material, the elongate injector including a supported end, a distal end, and a coating material delivery line extending through the elongate injector from a coating material supply to an injector head at the distal end, the injector head including at least one port for emitting the coating material; and a drive mechanism, the drive mechanism and the injector head for distributing the coating material.

31. The apparatus of claim 30, wherein the driver comprises a drive mechanism having a motor, a sprocket, and a chain or a belt, and the chain or belt is meshed with the sprocket, rotational movement of which is controlled by the motor.

32. The apparatus of claim 30, wherein the injector head comprises a spreader head for spreading the coating material introduced from the at least one port.

33. The apparatus of claim 30 wherein the injector head is selectively rotatable about a long axis of the elongate injector.

34. The apparatus of claim 30, wherein the elongate injector further comprises a member for wiping off excess coating material.

35. The apparatus of claim 31, further comprising a fitting, the fitting being connected to the chain or belt, such that the fitting is moved along a long axis of the support from the rotational movement of the sprocket.

36. The apparatus of claim 35, wherein the fitting comprises a rotator component.

37. The apparatus of claim 30, wherein the coating material supply comprises an extruder and an auger for delivering the coating material into the delivery line.

38. The apparatus of claim 37, wherein the delivery line comprises an inner tube and an outer tubing, and an annulus formed therebetween, and the apparatus further comprising a heater disposed in the annulus for heating the delivery line.

39. The apparatus of claim 30 further comprising a heating element about the distal end of the elongate injector.

40. The apparatus of claim 30, wherein the coating material is a polymer, a resin, a salt, a wax, or a combination thereof.

41. The apparatus of claim 35, wherein the support is configured to support an outer surface of a wellbore screen and to present the wellbore screen with open access to its inner bore, as defined by an inner tubular wall of the wellbore screen.

42. The apparatus of claim 41, wherein the fitting engages one end of the wellbore screen, and the inner bore is accessible by the elongate injector at at least the other end of the wellbore screen.

43. The apparatus of claim 36, wherein the support is configured to support an outer surface of a wellbore screen, and the rotator component rotates the wellbore screen about its long axis.

44. The apparatus of claim 30, wherein an outer surface of the delivery line comprises boom supports for supporting the elongate injector along its length.

45. The apparatus of claim 41, wherein the drive mechanism further comprises a plurality of rollers on which the wellbore screen is supported.

CLAIMS

1. An apparatus for treating a wellbore screen with a coating material, the apparatus comprising: a support for the wellbore screen, the support supporting an outer surface of the wellbore screen and presenting the wellbore screen with open access to its inner bore, as defined by an inner tubular wall of the wellbore screen; an elongate injector for injecting coating material into the inner bore of the wellbore screen, the elongate injector including a supported end, a distal end including an injector head having a port formed therein and a coating material delivery line extending through the elongate injector from a coating material supply to the port at the distal end; a spreader ring configured for urging against the inner tubular wall, for spreading the coating material introduced from the port onto the inner tubular wall and into a screening component of the wellbore screen; a heating element about the distal end of the elongate injector for heating the coating material passing through the coating material delivery line; and a driver for positioning the elongate injector into the inner bore and moving the elongate injector through the inner bore to introduce the coating material to the inner bore such that the coating material can be distributed on to the inner tubular wall of the wellbore screen.

2. The apparatus of claim 1, wherein the driver comprises a drive mechanism comprising a fitting for engaging one end of the wellbore screen, and the inner bore is accessible by the elongate injector at at least the other end of the wellbore screen.

3. The apparatus of claim 2, wherein the drive mechanism further comprises a motor, a sprocket, and a chain or a belt, and the chain or belt is meshed with the sprocket, rotational movement of which is controlled by the motor.

4. The apparatus of claim 3, wherein the fitting is connected to the chain or belt such that the fitting is moved along a long axis of the support from the rotational movement of the sprocket.

5. The apparatus of claim 4, wherein the fitting comprises a rotator component for rotating the wellbore screen about its long axis.

6. The apparatus of claim 2, wherein the drive mechanism further comprises a plurality of rollers on which the wellbore screen is supported.

7. The apparatus of claim 1, wherein the delivery line comprises an inner tube and an outer tubing, an outer surface of the outer tubing having boom supports for supporting the elongate injector along its length.

8. The apparatus of claim 1, wherein the coating material supply comprises an extruder and an auger for delivering the coating material into the delivery line.

9. The apparatus of claim 1, wherein the elongate injector further comprises a member for wiping off excess coating material.

10. The apparatus of claim 1 wherein the injector head is selectively rotatable about a long axis of the elongate injector.

11. The apparatus of claim 7, wherein an annulus is formed between an outer surface of the inner tube and an inner surface of the outer tubing, and wherein the heating element is disposed in the annulus for heating the delivery line.

12. The apparatus of claim 1, further comprising an external heater positioned substantially concentrically about the distal end for heating the wellbore screen from the outer surface.

13. The apparatus of claim 1, further comprising a second spreader ring spaced from the spreader ring and the port opens on the injector head in a position between the spreader ring and the second spreader ring.

14. The apparatus of claim 1, wherein the port is one of a plurality of ports on the injector head spaced around a circumference of the injector head.

15. The apparatus of claim 14, further comprising an annulus within the injector head between the delivery line and the plurality of ports through which the coating material is distributed from the delivery line to the plurality of ports.

16. A method for treating a wellbore screen, the method comprising: inserting an elongate injector into an inner bore of a wellbore screen including a tubular wall with

an inner tubular surface defining the inner bore, an outer tubular surface and a screening component installed to screen fluid passing through the tubular wall from the outer tubular surface to the inner bore; heating a coating material to convert it from a solid to a liquid; introducing the coating material in the form of the liquid via the elongate injector into the inner bore; distributing the coating material onto the inner tubular surface by pushing a ring-shaped spreader head through the inner bore and against the inner tubular surface such that the coating material penetrates to some extent into the screening component from the inner tubular surface; and allowing the coating material to set to form a removable seal across the screening component in the inner diameter.

17. The method of claim 16, wherein the elongate injector comprises a supported end, a distal end, and a coating material delivery line extending through the elongate injector from a coating material supply to a port at the distal end, and the coating material is distributed through the port on to the inner tubular surface.

18. The method of claim 16, wherein inserting of the elongate injector is performed by a drive mechanism.

19. The method of claim 18, wherein the drive mechanism engages an end of the wellbore screen and positions the inner bore of the wellbore screen about the elongate injector.

20. The method of claim 16 further comprising scraping excess coating material from a surface of the wellbore screen.

21. The method of claim 16 further comprising withdrawing the elongate injector from the wellbore screen.

22. The method of claim 16 further comprising rotating the wellbore screen during the introduction of the coating material.

23. The method of claim 17, wherein the port is formed in an injector head and the injector head is selectively rotatable about a long axis of the elongate injector.

24. The method of claim 23, further comprising rotating the injector head during the introduction of the coating material.

25. The method of claim 16, wherein distributing includes spraying the coating material.

26. The method of claim 16, wherein the coating material is introduced during the insertion of the elongate injector.

27. The method of claim 21, wherein the coating material is introduced during the withdrawal of the elongate injector.

28. The method of claim 17 further comprising heating a portion of the wellbore screen or a portion of the delivery line.