the downhole equipment, the time required to properly pressure test the well, the time required to convey the sampler to the predetermined depth, and the time required to condition the sample flow to suitable conditions, if necessary. Since the time to complete these routine operations is oftentimes an unknown and varies from job to job, the general rule is to program the timing mechanism with a large enough window that compensates for overly long prep time. However, in cases where prep operations are completed without any setback or delays, the slickline tool can sit at the bottom of the well for hours until the timer finally triggers the sampler as programmed. The time waiting for the timer to trigger equates to several hours of lost rig time which, in turn, equates to substantial losses in operator profits.

SUMMARY OF THE INVENTION

[0005] The present invention relates to wellbore servicing systems and methods, and in particular, to systems and methods for remotely activating a downhole tool.

[0006] In some aspects of the disclosure, a method of servicing a wellbore is disclosed. The method may include arranging an assembly within a lubricator coupled to a tree. The assembly may include at least one downhole tool and a signal receiver subassembly. The method may also include communicating a signal to the signal receiver subassembly while the assembly is arranged within the lubricator. The method may further include perceiving the acoustic signal with a transceiver communicably coupled to the signal receiver subassembly and thereby ~~may be configured to~~ activatinge a timer disposed within the lubricator and communicably coupled to the signal receiver subassembly. The method may also further include introducing the assembly into the wellbore and advancing the assembly until reaching a target depth, and transmitting a trigger signal with the signal receiver subassembly to the at least one downhole tool by an operation of the timer corresponding to the assembly reaching the target depth and thereby actuating the at least one downhole tool.

[0007] In other aspects of the disclosure, a method of triggering a downhole tool is disclosed. The method may include programming a timer with a finite time period corresponding to a time required for an assembly to reach a target depth within a wellbore. The assembly may include a signal receiver subassembly and at least one downhole tool, and the timer may be disposed within the lubricator and communicably coupled to the signal receiver subassembly. The method may also include arranging the assembly within a lubricator and communicating an acoustic signal to the signal receiver subassembly to activate~~ing~~ the timer while the assembly is positioned in the lubricator, recognizing with the

signal receiver subassembly an expiration of the finite time period, and actuating the at least one downhole tool in response to the expiration of the finite time period.

[0008] In yet other aspects of the disclosure, another method of servicing a wellbore is disclosed. The method may include arranging an assembly within a lubricator, where the assembly includes at least one downhole tool and a signal receiver subassembly. The method may also include communicating an acoustic ~~first~~ signal to the signal receiver subassembly while the assembly is arranged within the lubricator. The acoustic~~first~~ signal may be perceived with a transceiver communicably coupled to the signal receiver subassembly and thereby activating a timer disposed within the lubricator and communicably coupled to the signal receiver subassembly while the assembly is arranged within the lubricator. The method may further include communicating a confirmation~~second~~ signal with the transceiver while the assembly is arranged within the lubricator. The confirmation~~second~~ signal may confirm that the acoustic~~first~~ signal was received. The method may yet further include introducing the assembly into the wellbore and advancing the assembly until reaching a target depth, and transmitting a trigger signal with the signal receiver subassembly to the at least one downhole tool by an operation of the timer corresponding to the assembly reaching the target depth and thereby actuating the at least one downhole tool.

[0008a] In further aspects of the disclosure, an assembly is disclosed. The assembly may comprise at least one downhole tool positionable within a lubricator coupled to a tree. The assembly may also comprise a signal receiver subassembly communicably coupled to the at least one downhole tool. The assembly may further comprise a timer disposed within the lubricator and communicably coupled to the signal receiver subassembly, the timer being preprogrammed with a finite time period corresponding to a time required for the assembly to reach a target depth, and a transceiver communicably coupled to the signal receiver subassembly to receive an acoustic signal while positioned within the lubricator to activate the timer.

[0009] The features and advantages of the present invention will be readily apparent to those skilled in the art upon a reading of the description of the preferred embodiments that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The following figures are included to illustrate certain aspects of the present invention, and should not be viewed as exclusive embodiments. The subject matter disclosed is capable of considerable modifications, alterations, combinations, and equivalents in form and function, as will occur to those skilled in the art and having the benefit of this disclosure.

[0011] FIG. 1 illustrates a wellbore system having an assembly, according to one or more embodiments disclosed.

[0012] FIG. 2 illustrates an exemplary signal receiver subassembly as used in the assembly shown in FIG. 1, according to one or more embodiments.

[0013] FIG. 3 illustrates a flowchart schematic of a method for servicing a wellbore, according to one or more embodiments disclosed.

[0014] FIG. 4 illustrates flowchart schematic of a method of triggering a downhole tool, according to one or more embodiments

CLAIMS

The invention claimed is:

1. A method of servicing a wellbore, comprising:

arranging an assembly within a lubricator coupled to a tree, the assembly including at least one downhole tool and a signal receiver subassembly;

communicating a signal to the signal receiver subassembly while the assembly is arranged within the lubricator, the signal being configured to activate a timer communicably coupled to the signal receiver subassembly;

introducing the assembly into the wellbore and advancing the assembly until reaching a target depth; and

transmitting a trigger signal with the signal receiver subassembly to the at least one downhole tool and thereby actuating the at least one downhole tool.

2. The method of claim 1, wherein communicating the signal to the signal receiver subassembly comprises communicating an acoustic signal to the signal receiver subassembly.

3. The method of claim 2, further comprising striking the lubricator or the tree in order to generate the acoustic signal.

4. The method of claim 2, further comprising generating vibrations using a transducer in order to generate the acoustic signal.

5. The method of claim 2, further comprising perceiving the acoustic signal with a transceiver communicably coupled to the signal receiver subassembly.

6. The method of claim 1, further comprising preprogramming the timer with a finite time period corresponding to a time required for the assembly to reach the target depth from the lubricator or tree.

7. The method of claim 6, wherein transmitting the trigger signal is preceded by recognizing with the signal receiver subassembly an expiration of the finite time period.

8. The method of claim 1, wherein communicating the signal to the signal receiver subassembly comprises:

passing the signal receiver subassembly past one or magnets arranged about the lubricator or other wellbore surface component; and

activating the timer using magnetic forces emanating from the one or more magnets.

9. The method of claim 1, wherein communicating the signal to the signal receiver subassembly comprises:

bleeding an amount of pressure from the lubricator such that the lubricator contains a predetermined pressure;

holding the predetermined pressure within the lubricator for a predetermined period of time; and

sensing and recognizing with a transceiver the predetermined pressure and predetermined period of time, the transceiver being communicably coupled to the signal receiver and configured to communicate the signal to the signal receiver subassembly.

10. A method of triggering a downhole tool, comprising:

programming a timer with a finite time period corresponding to a time required for an assembly to reach a target depth within a wellbore, the assembly including a signal receiver subassembly and at least one downhole tool, wherein the timer is communicably coupled to the signal receiver subassembly;

arranging the assembly within a lubricator and activating the timer;

recognizing with the signal receiver subassembly an expiration of the finite time period; and

actuating the at least one downhole tool in response to the expiration of the finite time period.

11. The method of claim 10, further comprising communicating an acoustic signal to the signal receiver subassembly to activate the timer.

12. The method of claim 11, further comprising perceiving the acoustic signal with a transceiver communicably coupled to the signal receiver subassembly.

13. The method of claim 10, wherein activating the timer comprises:

passing the signal receiver subassembly past one or magnets arranged about the lubricator or other wellbore surface component; and

activating the timer using magnetic forces emanating from the one or more magnets.

14. The method of claim 10, wherein activating the timer comprises:

bleeding an amount of pressure from the lubricator such that the lubricator contains a predetermined pressure;

holding the predetermined pressure within the lubricator for a predetermined period of time;

sensing and recognizing with a transceiver the predetermined pressure and predetermined period of time, the transceiver being communicably coupled to the signal receiver and configured to communicate a signal to the signal receiver subassembly which activates the timer.

15. A method of servicing a wellbore, comprising:

arranging an assembly within a lubricator, the assembly including at least one downhole tool and a signal receiver subassembly;

communicating a first signal to the signal receiver subassembly while the assembly is arranged within the lubricator, the first signal being perceived with a transceiver communicably coupled to the signal receiver subassembly;

communicating a second signal with the transceiver while the assembly is arranged within the lubricator, the second signal confirming that the first signal was received;

introducing the assembly into the wellbore and advancing the assembly until reaching a target depth; and

transmitting a trigger signal with the signal receiver subassembly to the at least one downhole tool and thereby actuating the at least one downhole tool.

16. The method of claim 15, wherein arranging the assembly within the lubricator is preceded by programming a timer with a finite time period corresponding to a time required for the assembly to reach the target depth, the timer being communicably coupled to the signal receiver subassembly.

17. The method of claim 16, further comprising activating the timer in response to the first signal.

18. The method of claim 17, further comprising perceiving the second signal with a listening device, the second signal being indicative of whether the timer has been properly activated.

19. The method of claim 16, wherein transmitting the trigger signal is preceded by recognizing with the signal receiver subassembly an expiration of the finite time period.

20. The method of claim 15, wherein the first signal is an acoustic signal or electronic signal.

21. The method of claim 20, further comprising striking a surface component of the wellbore in order to generate the acoustic signal.

22. An assembly, comprising:

at least one downhole tool;

a signal receiver subassembly communicably coupled to the at least one downhole tool;

a timer communicably coupled to the signal receiver subassembly, the timer being preprogrammed with a finite time period corresponding to a time required for the assembly to reach a target depth; and

a transceiver communicably coupled to the signal receiver subassembly and configured to receive a signal that activates the timer.

23. The assembly of claim 22, wherein the signal is an acoustic signal.

24. The assembly of claim 23, further comprising a transducer configured to generate vibrations in order to generate the acoustic signal.

25. The assembly of claim 22, wherein, upon expiration of the finite time period, the signal receiver subassembly transmits a trigger signal to the at least one downhole tool and thereby actuates the at least one downhole tool.

26. The assembly of claim 22, further comprising a listening device configured to receive a second signal from the transceiver, the second signal being indicative of whether the timer has been properly activated.

CLAIMS

The invention claimed is:

1. A method of servicing a wellbore, comprising:

arranging an assembly within a lubricator coupled to a tree, the assembly including at least one downhole tool and a signal receiver subassembly;

communicating an acoustic signal to the signal receiver subassembly while the assembly is arranged within the lubricator;

perceiving the acoustic signal with a transceiver communicably coupled to the signal receiver subassembly and thereby activating a timer disposed within the lubricator and communicably coupled to the signal receiver subassembly while the assembly is arranged within the lubricator;

introducing the assembly into the wellbore and advancing the assembly until reaching a target depth; and

transmitting a trigger signal with the signal receiver subassembly to the at least one downhole tool by an operation of the timer corresponding to the assembly reaching the target depth and thereby actuating the at least one downhole tool.

2. The method of claim 1, wherein communicating the acoustic signal comprises striking the lubricator or the tree.

3. The method of claim 1, wherein communicating the acoustic signal comprises generating vibrations using a transducer.

4. The method of claim 1, further comprising preprogramming the timer with a finite time period corresponding to a time required for the assembly to reach the target depth from the lubricator or tree.

5. The method of claim 4, wherein transmitting the trigger signal is preceded by recognizing with the signal receiver subassembly an expiration of the finite

time period.

6. A method of triggering a downhole tool, comprising:

programming a timer with a finite time period corresponding to a time required for an assembly to reach a target depth within a wellbore, the assembly including a signal receiver subassembly and at least one downhole tool, wherein the timer is disposed within the lubricator and communicably coupled to the signal receiver subassembly;

arranging the assembly within a lubricator and communicating an acoustic signal to the signal receiver subassembly to activate the timer while the assembly is positioned in the lubricator;

recognizing with the signal receiver subassembly an expiration of the finite time period; and

actuating the at least one downhole tool in response to the expiration of the finite time period.

7. The method of claim 6, further comprising perceiving the acoustic signal with a transceiver communicably coupled to the signal receiver subassembly.

8. An assembly, comprising:

at least one downhole tool positionable within a lubricator coupled to a tree;

a signal receiver subassembly communicably coupled to the at least one downhole tool;

a timer disposed within the lubricator and communicably coupled to the signal receiver subassembly, the timer being preprogrammed with a finite time period corresponding to a time required for the assembly to reach a target depth; and

a transceiver communicably coupled to the signal receiver subassembly to receive an acoustic signal while positioned within the lubricator to activate the

timer.

9. The assembly of claim 8, further comprising a transducer that produces vibrations to generate the acoustic signal.

10. The assembly of claim 8, wherein, upon expiration of the finite time period, the signal receiver subassembly transmits a trigger signal to the at least one downhole tool and thereby actuates the at least one downhole tool.

11. The assembly of claim 8, further comprising a listening device configured to receive a second signal from the transceiver while positioned within the lubricator, the second signal being indicative of whether the timer has been properly activated.

12. A method of servicing a wellbore, comprising:

arranging an assembly within a lubricator, the assembly including at least one downhole tool and a signal receiver subassembly;

communicating an acoustic signal to the signal receiver subassembly while the assembly is arranged within the lubricator;

perceiving the acoustic signal with a transceiver communicably coupled to the signal receiver subassembly and thereby activating a timer disposed within the lubricator and communicably coupled to the signal receiver subassembly while the assembly is arranged within the lubricator;

communicating a confirmation signal with the transceiver while the assembly is arranged within the lubricator, the confirmation signal confirming that the acoustic signal was received;

introducing the assembly into the wellbore and advancing the assembly until reaching a target depth; and

transmitting a trigger signal with the signal receiver subassembly to the at least one downhole tool by an operation of the timer corresponding to the assembly reaching the target depth and thereby actuating the at least one

downhole tool.

13. The method of claim 12, wherein arranging the assembly within the lubricator is preceded by programming the timer with a finite time period corresponding to a time required for the assembly to reach the target depth, the timer being communicably coupled to the signal receiver subassembly.

14. The method of claim 12, further comprising perceiving the confirmation signal with a listening device, the confirmation signal being indicative of whether the timer has been properly activated.

15. The method of claim 13, wherein transmitting the trigger signal is preceded by recognizing with the signal receiver subassembly an expiration of the finite time period.

16. The method of claim 1, wherein the acoustic signal comprises an ordered sequence of vibrations and communicating the acoustic signal to the signal receiver subassembly comprises:

communicating the ordered sequence of vibrations within a distinct time interval;

recognizing the ordered sequence of vibrations within the distinct time interval with the signal receiver subassembly; and

converting the ordered sequence of vibrations within the distinct time interval into an electrical signal that activates the timer.

17. The method of claim 1, wherein perceiving the acoustic signal with the transceiver communicably coupled to the signal receiver subassembly comprises:

processing the acoustic signal with the signal receiver subassembly; and

performing frequency selective filtering with the signal receiver subassembly to determine if the acoustic signal matches a predetermined frequency or vibration required to activate the timer.

18. The method of claim 12, wherein the acoustic signal comprises an ordered sequence of vibrations and communicating the acoustic signal to the signal receiver subassembly comprises:

communicating the ordered sequence of vibrations within a distinct time interval;

recognizing the ordered sequence of vibrations within the distinct time interval with the signal receiver subassembly; and

converting the ordered sequence of vibrations within the distinct time interval into an electrical signal that activates the timer.

19. The method of claim 12, wherein perceiving the acoustic signal with the transceiver communicably coupled to the signal receiver subassembly comprises:

processing the acoustic signal with the signal receiver subassembly; and

performing frequency selective filtering with the signal receiver subassembly to determine if the acoustic signal matches a predetermined frequency or vibration required to activate the timer.