

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
18 June 2009 (18.06.2009)

PCT

(10) International Publication Number
WO 2009/076014 A2

(51) International Patent Classification:
E21B 43/04 (2006.01)

(21) International Application Number:
PCT/US2008/083930

(22) International Filing Date:
18 November 2008 (18.11.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/950,814 5 December 2007 (05.12.2007) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report

(54) Title: REMOTE-CONTROLLED GRAVEL PACK CROSSOVER TOOL UTILIZING WIRED DRILLPIPE COMMUNICATION AND TELEMETRY

(57) Abstract: A downhole system employing a crossover tool includes an actuator in operable communication with the crossover tool; a controller in operable communication with the actuator; a wired pipe in operable communication with the controller; and a control device in operable communication with the wired pipe and method.



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REMOTE-CONTROLLED GRAVEL PACK CROSSOVER TOOL UTILIZING WIRED DRILLPIPE COMMUNICATION AND TELEMETRY

BACKGROUND

[0001] In the hydrocarbon recovery industry, increasingly, there is a demand for better instrumented downhole tools. Such tools, if possible to create, provide greater information to a well operator thereby enhancing the potential for greater certainty about well conditions and tools conditions, greater production returns and therefore higher profit margin on the well. While efforts have been made in a large number of individual areas of well equipment, some areas have not lent themselves to instrumentation, and have therefore either been left to the tried and true methods without efforts to enhance them through instrumentation or such efforts have failed. One such area of wellbore technology is crossover tools for gravel packs. Crossover tools are actuated by manipulating the tubing string using reciprocation thereabove, to direct the fluid flow path within the tool. Based upon the position of the crossover tool relative to the gravel pack packer, the tool is in different flow modes. Due to the frequency of manipulation, the overall possibility of the string becoming stuck in the gravel pack packer increases. Moreover, because a seasoned field engineer is needed to run the equipment, cost associated with the operation are necessarily increased. The skill of the seasoned engineer are, however, unequivocally required for conventional systems to ensure proper positioning to the crossover tool so that slurry is in fact being guided to the desired location rather than to an erroneous one, where significant damage to the system and the well could result. Further, it is noted that conventional systems are difficult, if not impossible, to use on floating rigs (an ever more common configuration for deep sea platforms) because conventional tools do not lend themselves to the use of positive stops. With the absence of positive stops, there is no way to verify position or compensate for heave of the floating platform. Heretofore, there has been no advanced method and apparatus available to actuate and/or monitor a crossover tool.

SUMMARY

[0002] A downhole system employing a crossover tool includes an actuator in operable communication with the crossover tool; a controller in operable communication with the actuator; a wired pipe in operable communication with the controller; and a control device in operable communication with the wired pipe. A method for operating a crossover tool in a downhole environment includes sending a command signal from a control device through a wired pipe to a controller in operable communication with the crossover tool; and activating an actuator in operable communication with the crossover tool; and actuating the crossover tool with the actuator to a desired position of the crossover tool.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] Referring now to the drawings wherein like elements are numbered alike in the several Figures:

[0004] Figure 1 is a schematic view of a gravel packing system in accordance with the present disclosure.

DETAILED DESCRIPTION

[0005] Referring to Figure 1, a gravel packing system 10 having a cross over tool 12 capable of remote actuation and optionally communication of a confirmation of actuation signal is illustrated. The system includes a cross over tool 12 having a number of operable positions such as "squeeze", "circulate", "reverse", etc. It will be understood that the positions indicated are exemplary positions and that potentially all positions available in crossover tools are contemplated. Such crossover tool includes a valve 14 that is alignable in any one of these positions to flow fluid in a direction consonant with the desired operation at the time. The crossover tool is repositionable as many times as is desired or required for a given operation. For example, one pathway for which the crossover tool can be set to direct fluid flow is to the annulus of the gravel packing system to place a gravel pack in an annular space (not shown) between the system 10 and a formation (not shown) for such purpose as to structurally enhance an unconsolidated formation, for example. The cross over tool 12 is in operable communication with an

actuator 16 to move the valve 14 between the various noted positions. A power source is provided for the actuator in one of a number of configurations. In one configuration, the power source is local to the crossover tool and actuator. Such source may be an electrochemical source such as a battery or another type of local source such as a generator 18 that may be separate from the actuator as shown or may be integral therewith. In another embodiment, the power source may be located more remotely from the actuator 16 and supplied to the actuator (and other power using components of the crossover tool) via pathways such as those schematically illustrated in Figure 1. Where power is supplied from a surface location, for example, the power may be supplied along a signal conduit described more fully hereunder.

[0006] The actuator 16 is also in operable communication with a controller 20. The controller may be configured as one or more individual units as required or desired. In Figure 1, the controller 20 is configured as two units 20a and 20b, in operable communication with one another. Unit 20b is also in operable communication with a wired pipe 22, commercially available from Intelliserve Inc. The wired pipe 22 may extend over a long distance to a remote transmitter 24 that itself is in operable communication with a control device 26. The control device may be at surface and may be an automatic processor or may require a human operator. The control device is capable of sending a signal to the downhole control unit 20b, thereby communicating with control unit 20a where the signal received is interpreted and consequently the actuator 16 to execute the desired action. The actuator 16 actuates the crossover tool to the position requested by the control device 26, thereby facilitating wellbore operations.

[0007] In one embodiment, the downhole control unit 20a, further, is in operable communication with a sensor 28 positioned to effectively monitor and verify the position of the valve 14. In specific embodiments, the sensor 28 is also capable of generating a signal readable by the control unit 20a. Unit 20a then relays the signal to the control device 26 confirming the desired action at the crossover tool 12 and indeed providing real time indication of the current position of the valve 14 so that subsequent operator shift personnel at the surface or other remote location need not be informed of the position of the valve 14 by outgoing personnel but rather can easily check. The communication

between the control device 26 and the crossover tool 12 is entirely facilitated by the wired pipe. This ensures that the communication pathway is protected from the gravel slurry being pumped to the gravel packing location while still affording the operator real time confirmation that the downhole components are in desired positions long before a traditional configuration would provide indication of an improperly positioned valve 14.

[0008] While preferred embodiments have been shown and described, modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustrations and not limitation.

CLAIMS

- Claim 1.** A downhole system employing a crossover tool comprising:
- an actuator in operable communication with the crossover tool;
 - a controller in operable communication with the actuator;
 - a wired pipe in operable communication with the controller; and
 - a control device in operable communication with the wired pipe.
- Claim 2.** The system as claimed in claim 1 further comprising a sensor in operable communication with the crossover tool and configured to monitor a valve position of the crossover tool.
- Claim 3.** The system as claimed in claim 2 wherein the controller is in operable communication with the sensor and is capable of transmitting a signal received from the sensor to a remote location.
- Claim 4.** The system as claimed in claim 1 wherein the controller includes a downhole control unit and a microprocessor.
- Claim 5.** The system as claimed in claim 1 wherein the actuator is in operable communication with a power source.
- Claim 6.** The system as claimed in claim 5 wherein the power source is a downhole power source.
- Claim 7.** The system as claimed in claim 5 wherein the power source is an electrochemical source.
- Claim 8.** The system as claimed in claim 5 wherein the power source is a generator.
- Claim 9.** The system as claimed in claim 1 wherein the control device includes a transmitter/receiver in operable communication with the wired pipe to transmit and receive signals therefrom.

Claim 10. A method for operating a crossover tool in a downhole environment comprising:

 sending a command signal from a control device through a wired pipe to a controller in operable communication with the crossover tool; and

 activating an actuator in operable communication with the crossover tool;
and

 actuating the crossover tool with the actuator to a desired position of the crossover tool.

Claim 11. The method of claim 10 further comprising:

 monitoring a position of the crossover tool with a sensor.

Claim 12. The method of claim 11 further comprising:

 communicating the position of the crossover tool valve with the wired pipe to the control device.

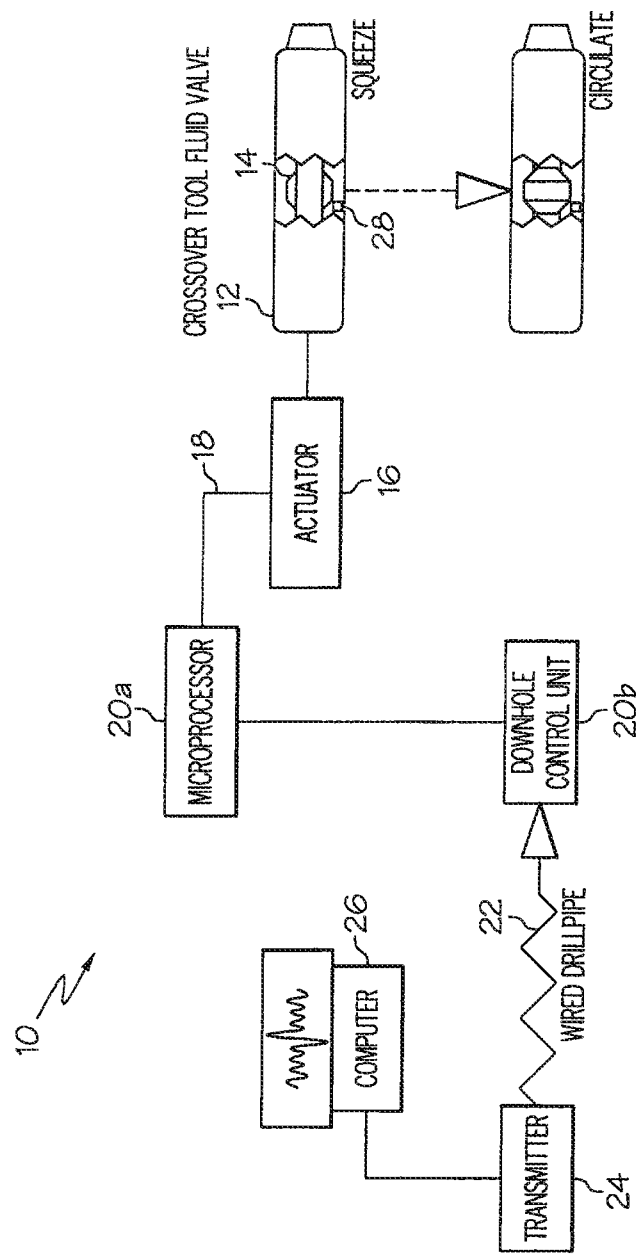


FIG. 1