In the case of adding a further conventional control mechanism for devices, such as a valve, or sensor downhole; the inventors of the present invention also note limitations since, in the event of a blow-out, the ability to function these devices may be lost due to the inability to fluctuate pressure to control pressure activated devices, or due to the loss of control lines.

Thus it is difficult for a skilled person to design a further safety system which can practically add to the safety systems already provided in oil wells.

~~An object of~~Embodiments the present invention ~~is~~ are to mitigate problems with the prior art, and preferably to improve the safety of wells.

According to a first aspect of the present invention there is provided a well comprising a safety mechanism comprising:
an obstructing member moveable between, ~~normally from,~~ a first position where fluid flow is permitted, and, ~~normally to,~~ a second position where fluid flow is restricted;
a movement mechanism;
and a wireless receiver ~~normally a transceiver~~, adapted to receive~~, and normally transmit,~~ a wireless signal;
wherein the movement mechanism is operable to move the obstructing member from one of the first and second positions to the other of the first and second positions in response to a change in the signal being received by the wireless transceiver~~.~~, the obstructing member being a valve in a casing sub of a casing; characterized in that the valve communicates between an inner and outer side of the casing; and wherein the valve is adapted to move from one of the first and second positions to the other of the first and second positions and then back to the first and second positions.

The obstructing member can in certain embodiments therefore start at either the first or second positions.

Claims

1. A safety mechanism comprising:
(i) an obstructing member moveable between a first position where fluid flow is permitted, and a second position where fluid flow is restricted;
(ii) a movement mechanism;
(iii) a wireless receiver, adapted to receive a wireless signal; wherein the movement mechanism is operable to move the obstructing member from one of the first and second positions to the other of the first and second positions in response to a change in the signal being received by the wireless receiver; and,
(iv) a valve in a casing sub;
and wherein the valve is adapted to move from one of the first and second positions to the other of the first and second positions, and then back to the first of the first and second positions.

2. A safety mechanism as claimed in claim 1, wherein the valve comprises a sleeve moveable between the first and the second position.

3. A safety mechanism as claimed in claims 1 and 2, comprising a wireless transceiver.

4. A safety mechanism as claimed in any preceding claim, wherein the second position is a closed position where fluid flow is stopped.

5. A safety mechanism as claimed in any preceding claim, wherein the receiver is an acoustic receiver and the signal is an acoustic signal.

6. A safety mechanism as claimed in anyone of claims 1 to 4, wherein the receiver is an electromagnetic receiver and the signal is an electromagnetic signal.

7. A safety mechanism as claimed in claim 6, wherein an acoustic receiver is also provided and the signal is transmitted over part of its distance by the electromagnetic receiver and part of its distance by the acoustic receiver.

8. A safety mechanism as claimed in any preceding claim, wherein the receiver is spaced apart from the movement mechanism and connected by a hydraulic line or an electric cable.

9. A safety mechanism as claimed in any preceding claim, adapted to move the obstructing member to/from the first position from/to the second position automatically in response to a level of a parameter detected by a sensor.

10. A safety mechanism as claimed in claim 9, wherein the level of the parameter at which the safety mechanism is adapted to move the obstructing member to/from the first position from/to the second position is variable by an operator.

11. A safety mechanism as claimed in any one of claims 9 or 10, wherein the information provided by the sensor is retrieved wirelessly.

12. A safety mechanism as claimed in any preceding claim, adapted to move the obstructing member to/from the first position from/to the second position automatically in the absence of a signal over a pre-determined period of time.

13. A safety mechanism as claimed in any preceding claim, wherein the safety mechanism is adapted to activate the transceiver to send signals after an emergency situation has occurred.

14. A well comprising at least one safety mechanism as claimed in any preceding claim.

15. A well as claimed in claim 14, further comprising a subsurface safety valve.

16. A well as claimed in any one of claims 14 or 15, wherein the receiver is up to 100m, optionally less than 50m, more optionally less than 20m below the top of the well.

17. A well as claimed in any one of claims 14 to 16, comprising a casing having a casing sub with the safety mechanism in the form of the valve therein, the valve communicating between an inner and outer side of the casing; wherein the valve is adapted to move from one of the first and second positions to the other of the first and second positions, and then back to the first of the first and second positions.

18. A well apparatus comprising a well as claimed in any one of claims 14 to 17, and a sonar receiver and preferably a sonar transmitter.

19. A well apparatus as claimed in claim 18, wherein a satellite device is provided, the device comprising a satellite communication mechanism and configured to relay information received between the sonar receiver and transmitter and the satellite.

Claims

1. A well (10) comprising a safety mechanism (401), the safety mechanism (401) *comprising:*
(i) an obstructing member (412,414) moveable between a first position where fluid flow is permitted, and a second position where fluid flow is restricted;
(ii) a movement mechanism (416,418); and
(iii) a wireless receiver (360), adapted to receive a wireless signal; wherein the movement mechanism (416,418) is operable to move the obstructing member (412,414) from one of the first and second positions to the other of the first and second positions in response to a change in the signal being received by the wireless receiver (360);
the obstructing member being a valve in a casing sub (400) of a casing; characterized in that the valve communicates between an inner and outer side of the casing; and wherein the valve is adapted to move from one of the first and second positions to the other of the first and second positions, and then back to the first of the first and second positions.

2. A well (10) as claimed in claim 1, wherein the valve (401) comprises a sleeve moveable between the first and the second position.

3. A well (10) as claimed in claims 1 and 2, comprising a wireless transceiver (250,360).

4. A well (10) as claimed in any preceding claim, wherein the second position is a closed position where fluid flow is stopped.

5. A well (10) as claimed in any preceding claim, wherein the receiver (360) is an acoustic receiver and the signal is an acoustic signal.

6. A well (10) as claimed in anyone of claims 1 to 4, wherein the receiver (360) is an electromagnetic receiver and the signal is an electromagnetic signal.

7. A well (10) as claimed in claim 6, wherein an acoustic receiver (360) is also provided and the signal is transmitted over part of its distance by the electromagnetic receiver (360) and part of its distance by the acoustic receiver (360).

8. A well (10) as claimed in any preceding claim, wherein the receiver (360) is spaced apart from the movement mechanism (416,418) and connected by a hydraulic line or an electric cable.

9. A well as claimed in any preceding claim, adapted to move the obstructing member to/from the first position from/to the second position automatically in response to a parameter detected by a sensor.

10. A well as claimed in any preceding claim, wherein at a trip point the safety mechanism is adapted to close the well, and wherein the trip point can be varied by sending instructions to a receiver coupled to or integral with, sensors and/or the safety mechanism.

11. A well (10) as claimed in any preceding claim, adapted to move the obstructing member (412,414) to/from the first position from/to the second position automatically in the absence of a signal over a pre-determined period of time.

12. A well (10) as claimed in any preceding claim, wherein the safety mechanism (401) is adapted to activate the transceiver (250,360) to send signals after an emergency situation has occurred.

13. A well (10) as claimed in any preceding claim, further comprising a subsurface safety valve (401).

14. A well (10) as claimed in any preceding claim, wherein the receiver (360) is up to 100m, optionally less than 50m, more optionally less than 20m below the top of the well (10).

15. A well apparatus comprising a well (10) as claimed in any preceding claim, and a sonar receiver (360) and preferably a sonar transmitter (250).

16. A well apparatus as claimed in claim 15, wherein a satellite device is provided, the device comprising a satellite communication mechanism and configured to relay information received between the sonar receiver (360) and transmitter (250) and the satellite.

17. A method of inhibiting fluid flow from a well (10) as claimed in any one of claims 11 to 13 or a well apparatus as claimed in claim 15 or 16 in an emergency situation, the method comprising: in the event of an emergency situation, sending a wireless signal into the well (10) to the safety mechanism(401).

18. A method as claimed in claim 17, wherein the wireless signal is sent during a phase where a BOP (30) is provided on the well (10).

19. A method as claimed in claim 17 or claim 18, wherein the wireless signal is sent from a device provided at a wellhead apparatus of the well (10) or proximate thereto.

20. A method as claimed in claim 18, wherein the wireless signal is sent from a platform, optionally with wireless repeaters provided on risers and/or downhole.

21. A method as claimed in any one of claims 17 or 18, wherein the wireless signal is sent from the seabed wellhead apparatus, after receiving sonar signals from a surface installation or an ROV.

22. A method as claimed in anyone of claims 17 to 18 wherein an ROV connects to the seabed wellhead apparatus and send or receives signals via a hot-stab connection.