METHOD AND TOOL FOR UNBLOCKING A CONTROL LINE

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ABSTRACT

A method to release a control line for a safety valve removable disposed in a nipple (9) of a wellbore production tubing, comprises the steps of: — removing the safety valve from the nipple; — setting into the nipple a sealing tool (41) which sealingly connects the control line (10) and a mini tubing (42) running down into the production tubing; — increasing the pressure of a fluid into the mini tubing to cause fluid to flow into the control line through the sealing tool.
METHOD AND TOOL FOR UNBLOCKING A CONTROL LINE

BACKGROUND OF THE INVENTION

1. Field of the Invention
The present invention relates to a method to release, or unblock, a control line of a safety valve, more particularly of a subsurface safety valve configured to control fluid flow through a production tubing string as well as a well bore installation comprising a working device and arranged to implement such a method.

2. Description of the Related Art
Surface-controlled, subsurface safety valves (SCSSVs) are commonly used to shut in oil and gas wells. Such SCSSVs are typically fitted into a production tubing in a hydrocarbon producing well, and operates to block the flow of formation fluid upwardly through the production tubing should a failure or hazardous condition occurs at the well surface.

Typically SCSSVs are configured as rigidly connected to the production tubing (tubing retrievable), or may be installed and retrieved by wireline, without disturbing the production tubing (wireline retrievable). During normal production, the subsurface safety valve may be maintained in an open position by the application of hydraulic fluid pressure transmitted to an actuating mechanism. The hydraulic pressure is commonly provided by clean oil supplied from a surface fluid reservoir to the SCSSV through a control line. A pump at the surface, controlled by a control panel, delivers regulated hydraulic fluid under pressure. The control line resides within the annular region between the production tubing and a surrounding well casing. The SCSSV provides automatic shutoff of production flow in response to one or more well safety conditions that can be sensed and/or indicated at the surface. Examples of such conditions include a fire on the platform, damage to the well head, for example resulting from a truck or a boat colliding with the well head, a high/low flow line pressure condition, a high/low flow line temperature condition, and operator override. These and other conditions produce a loss of hydraulic pressure in the control line, thereby causing a flapper to close so as to block the flow of production fluids up the tubing. In other words, where a failure or hazardous condition occurs at the well surface, fluid communication between the surface reservoir and the control line is broken. This, in turn, interrupts the application of hydraulic pressure against the actuating mechanism. The actuating mechanism recedes within the valve, allowing the flapper to close against an annular seat.

Most surface controlled subsurface safety valves are “normally closed” valves, i.e., the valve is in its closed position when the hydraulic pressure is not present. The hydraulic pressure typically works against a powerful spring and/or gas charge acting through a piston. In many commercially available valve systems, the spring power is overcome by hydraulic pressure acting against the piston, producing longitudinal movement of the piston. The piston, in turn, acts against an elongated “flow tube”. In this manner, the actuating mechanism is a hydraulically actuated and longitudinally movable piston that acts against the flow tube to move it within the tubing and across the flapper.

During well production, the flapper is maintained in the open position by force of the piston acting against the flow tube downhole. Hydraulic fluid is pumped into a variable volume pressure chamber (or cylinder) and acts against a seal area on the piston. The piston, in turn, acts against the flow tube to selectively open the flapper member in the valve. Any loss of hydraulic pressure in the control line causes the piston and actuated flow tube to retract. This in turn causes the flapper to rotate about a hinge pin to its valve closed position, for example by means of a torsion spring, and in response to upwardly flowing formation fluid. In this manner, the SCSSV is able to provide a shutoff of production flow within the tubing as the hydraulic pressure in the control line is released.

During work into the well or well maintenance, for example to clean the production tubing or to take measurements, the SCSSV, which is generally removable, is removed from the production tubing by wireline in order to clear the way. The control line, which usually runs along the outside of the production tubing, has an open aperture in the production tubing. Dust, grease or sand can inopportune enter and block the control line, i.e. creating a plug or increasing significantly the resistance to movement of the fluid in the control line. Consequently, once the SCSSV is reinstalled, the regulated pressure delivered at the surface by the pump is not transmitted to the actuating mechanism and the flapper of the valve remains in the closed position.

A procedure consisting in installing an isolation sleeve facing the control line aperture before working into the well when the safety valve is removed prevents the contamination and the obstruction of the control line, but such procedure is rarely used since it is time consuming.

To prevent the control line from getting blocked, filtering systems are used to limit the contamination of the control line but do not show satisfactory results.

The only known method to clear the blocked fluid from the control line consists in creating an overpressure in the control line with the pump at the surface to expel the blockage. The efficiency of such a method is very limited and numerous control lines remain blocked.

The control line cannot be replaced because it is typically cemented into the annulus between the production tubing and the surrounding casing.

The use of a safety valve is compulsory in oil and gas wells. Therefore wells with blocked control line are:

closed, i.e. the production is stopped and an other well must be dug resulting in huge expenses;
operated without a safety valve, which is very unsafe;
inflowing using a velocity valve as a safety valve, such velocity valves having the drawbacks of being very long and difficult to adjust, and of choking the well of about 60% its diameter.

Therefore, a need exists for an improved method and a device to release a control line of a SCSSV.

SUMMARY OF THE INVENTION

The present invention is directed to a method to release a control line for a safety valve removably disposed in a nipple of a wellbore production tubing, comprising the steps of:

removing the safety valve from the nipple;
setting into the nipple a sealing tool which sealingly connects the control line and a mini tubing running down into the production tubing;
increasing the pressure of a fluid into the mini tubing to cause fluid to flow into the control line through the sealing tool.
Such a method permits pushing the blockage upwardly through the control line, i.e. reversing the fluid pressure applied to the control line that would usually maintain the valve in its open position, and then releasing the pressure applied to the control line to move, disintegrate, and eject the blockage from the control line.

In other embodiments, the method also includes the steps of:

- increasing the pressure of a fluid alternatively into the mini tubing and into the control line, thereby creating an oscillation effect on the blockage to ease its removal;
- increasing the pressure of a fluid intermittently into the mini tubing and/or into the control line;
- moving a piston into the sealing tool to provide a multiplier effect on the pressure increasing, so as to exert on the blockage a pressure higher than the pressure that can be held in a mini tubing.

The fluid used to push the blockage is more particularly an incompressible solvent liquid, such as diesel oil, in order to cause an additional cleaning and disaggregating effect on the blockage.

According to the invention, a wellbore installation comprising a production tubing with a nipple for receiving a working device is also provided. The working device comprises:

- a sealing tool having a sealed chamber defined with an inside cylindrical wall of the nipple and at least two seals spaced apart from each other according to an axial direction of the production tubing; and
- a mini tubing running down said production tubing and connected to said sealed chamber for flowing a fluid against the inside cylindrical wall of the nipple.

Said nipple is preferably fitted for receiving a safety valve actuated by a control line issuing into said sealed chamber so that the fluid flowing against the inside cylindrical wall of the nipple penetrates the control line and permits a releasing operation of the control line. But such an installation can also be used to cause perforations in the cylindrical wall of the nipple if the inside cylindrical wall of the nipple against which flows the fluid comprises for instance a weak area.

Additionally the sealing tool may further comprise a pressure intensifier with a movable piston having two end sides of different surface areas.

**BRIEF DESCRIPTION OF THE DRAWINGS**

So that the manner in which the above recited features of the present invention are attained and can be understood in detail, a more particular description of the invention, briefly summarized above, may be had by reference to the embodiments thereof which are illustrated in the appended drawings. It is to be noted, however, that the appended drawings illustrate only typical embodiments of this invention and are therefore not to be considered limiting of its scope, for the invention may admit to other equally effective embodiments.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

A detailed description will now be provided. Various terms as used herein are defined below. To the extent a term used in a claim is not defined below, it should be given the broadest definition persons in the pertinent art have given that term, as reflected in printed publications and issued patents. In the description that follows, like parts are marked throughout the specification and drawings with the same reference numerals. The drawings may be, but are not necessarily, to scale and the proportions of certain parts have been exaggerated to better illustrate details and features of the invention. One of normal skill in the art of subsurface safety valves will appreciate that the various embodiments of the invention can and may be used in all types of subsurface safety valves, including but not limited to tubing retrievable, wireline retrievable, injection valves, or subsurface controlled valves.

For ease of explanation, the invention will be described generally in relation to a cased vertical wellbore. It is to be understood, however, that the invention may be employed in an open wellbore, a horizontal wellbore, or a lateral wellbore without departing from principles of the present invention. Furthermore, a land well is shown for the purpose of illustration, however, it is understood that the invention may also be employed in offshore wells or extended reach wells that are drilled on land but completed below an ocean or lake shelf.

**FIG. 1** presents a cross-sectional view of an illustrative land wellbore installation 1. The wellbore installation 1 comprises a casing string 2 completed with a string of production tubing 3 therein. The production tubing 3 defines an elongated bore through which fluids may be pumped upward as indicated by the arrow 4.

**FIG. 2** further illustrates a wellhead 5, a master valve 6, a flow line 7, a subsurface safety valve assembly 8 mounted in a nipple 9 and connected to a control line 10, a plug seat 11 and a perforated screen 12. In operation, opening the master valve 6 allows pressurized hydrocarbons residing in a producing formation 13 to flow through the perforated screen 12 and into the production tubing 3. Cement seals an annulus between the casing and the production tubing in order to direct the flow of hydrocarbons. Hydrocarbons (illuminated by arrow 4) flow into the production tubing 3 through the open subsurface safety valve assembly 8, through the wellhead 5, and out into the flow line 7. The subsurface safety valve assembly 8, also noted safety valve 8 hereinafter, is also used for selectively controlling the flow in the production tubing 3. The safety valve 8 may be moved between an open position and closed position by providing or not hydraulic pressure, as indicated by the double arrow 14. A pump 15 actuated by a control panel 16 supply the hydraulic pressure to the safety valve through the control line 10. Hydraulic pressure holds a flapper closure mechanism within the safety valve, described in greater detail below in connection with FIGS. 2 and 3, in the open position.

During the production operation, the valve remains in the open position. However, the flow of hydrocarbons may be stopped at any time during the production operation by switching the safety valve from the open position to the closed position. This may be accomplished either intention-
ally by having the operator remove the hydraulic pressure applied through the control line, or through a catastrophic event at the surface such as an act of terrorism.

[F0043] FIG. 2 presents a cross sectional view illustrating the safety valve 8 in an open position. A bore 20 in the valve 8 allows fluids such as hydrocarbons to flow up through the valve 8 during a normal operation. The valve includes a top and bottom sub (not shown), which ones are threaded into the nipple 9 mounted in series with the production tubing 3. The safety valve 8 is consequently removable. The valve includes a chamber 21 in fluid communication with the hydraulic control line 10. The hydraulic control line carries fluid such as clean oil from a surface control reservoir down to the chamber 21.

[F0044] In the arrangement of FIG. 2, the chamber 21 is configured to receive a piston 22, the piston 22 typically defines a small diameter piston which is moveable within the chamber 21 between an upper and a lower position. Movement of the piston 22 responds to hydraulic pressure from the surface, i.e. from the control line 10. Alternatively, the piston may be a large concentric piston, which is pressure actuated.

[F0045] As illustrated in FIG. 2, the valve may also include a biasing member 23. Preferably, the biasing member defines a spring 23. The spring resides in the tubular body below the piston. A lower end of the spring 23 abuts a spacer bearing 24 and an upper end of the spring abuts a lower end 25 of the piston. The spring operates in compression to bias the piston upward. Movement of the piston from the upper position to the lower position, provided by supplying hydraulic pressure into the chamber, compresses the spring against the spacer bearing.

[F0046] Disposed below the spacer bearing 24 is a flapper 26. The flapper 26 is rotationally attached by a pin 27 to a flapper mount. The flapper pivots between an open position and a closed position in response to movement of a flow tube 28. A shoulder 29 is provided for a connection between the piston 22 and the flow tube 28. In the open position, a fluid pathway is created through the bore 20, thereby allowing the flow of hydrocarbons through the valve 8. Conversely, in the closed position, the flapper blocks the fluid pathway through the bore, thereby preventing the flow of hydrocarbons through the valve, as shown in FIG. 3.

[F0047] Further illustrated in FIG. 2, a lower portion of the flow tube 28 is disposed adjacent the flapper 26. The flow tube 28 is moveable longitudinally along the bore 20 of the valve 8 in response to axial movement of the piston 22. Axial movement of the flow tube, in turn causes the flapper to pivot between its open and closed positions.

[F0048] In the open position, as illustrated in FIG. 2, the flow tube blocks the movement of the flapper, thereby causing the flapper to be maintained in the open position. In the closed position, as illustrated in FIG. 3, the flow tube frees the flapper thereby allowing the flapper to rotate on the pin and to move to the closed position, i.e. the flapper seals off the bore.

[F0049] Typically, the flow tube remains in the open position throughout the completion operation and later production. However, if the flapper is closed during the production operation, it may be reopened by moving the flow tube back to the open position. Generally, the flow tube moves to the open position as the piston moves to the lower position and compresses the biasing member against the spacer bearing. Typically, fluid from the control line enters the chamber, thereby creating a hydraulic pressure on the piston. As more fluid enters the chamber, the hydraulic pressure continues to increase until the hydraulic pressure on the upper end of the piston becomes greater than the biasing force on the lower end of the piston. At that point, the hydraulic pressure in the chamber causes the piston to move to the lower position. Since the flow tube is operatively attached to the piston, the movement of the piston causes longitudinal movement of the flow tube in front of the flapper.

[F0050] During closure of the valve, no hydraulic pressure is supplied through the control line and fluid in the chamber exits into the control line, thereby decreasing the hydraulic pressure on the piston. As more fluid exits the chamber, the hydraulic pressure continues to decrease until the hydraulic pressure on the upper end of the piston becomes less than the opposite force on the lower end of the piston. At that point, the force created by the spring causes the piston to move to the upper position. Since the flow tube is operatively attached to the piston, the movement of the piston causes the movement of flow tube that liberates the flapper. The flapper is then forced into closed position by a spring 30 and by the overpressure generated by hydrocarbon.

[F0051] Consequently, the opening and the closure of the subsurface safety valve is controlled via the control line 10. The control line is more particularly a conduit that can be filled with fluid, more especially with clean oil, this fluid acting as a means to transmit hydraulic pressure generated and regulated at the surface up to the chamber 21 of the safety valve 8. The control line 10 extends from the hydraulic pressure supplying pump 15 controlled by a control panel 16 to the nipple 9 in which is arranged the safety valve 8, through the area between the well casing 2 and the production tubing 3. The control line comprises a surface end with a surface aperture connected to the pump 15 and a subsurface end with a subsurface aperture 31. The subsurface aperture 31 of the control line 10 issues in the nipple 9 proximate the inside cylindrical wall of the nipple. When the safety valve 8, described with reference to FIGS. 2 and 3, is secured inside the nipple 10, the subsurface aperture 31 of the control line faces the aperture of the chamber.

[F0052] If the flow of oil into the control line is interrupted, because a plug or a blockage occurs in the control line, no hydraulic pressure can be supplied to the piston and the safety valve remains closed. If this happens, the blockage can be removed from the control line using the method in accordance with the invention.

[F0053] The idea on which the invention is based consists in releasing the jamming blockage by acting on it, through the subsurface aperture.

[F0054] For that, the safety valve is removed from the production tubing and the production tubing is closed with a plug set in the plug seat 11 disposed below the nipple 9 where the blocked control line 10 issues. A control line releasing device is then introduced into the production tubing 3 and secured into the nipple 9 in which the safety valve is to be set and therefore in which the control line issues.

[F0055] FIGS. 4 to 8 illustrate the releasing device 40 in accordance with the invention secured inside the nipple 9.

[F0056] The releasing device 40 comprises a sealing tool 41 and a mini tubing 42 sealingly arranged on top of the sealing tool 41. The sealing tool is particularly run down the production tubing by snubbing or coil tubing. Snubbing consists in assembling the mini tubing with mini tubing parts, of about 10 meters length, as the sealing tool is run down the production tubing, with the use of a snubbing machine. The mini tubing parts are sealingly connected to form the mini tubing,
Coil tubing consists in unrolling and shaping the mini tubing so as to run down in straight line the mini tubing in the production tubing. In both cases the mini tubing is lengthened in the production tubing with the sealing tool connected at lower end up to the moment the sealing tool abuts against a stop 43 provided in the nipple 9, which is usually called no-go in the wellbore field.

A safety valve 8 is usually secured in such a nipple 9 after abutment against this stop 43. Securing the safety valve in the nipple after abutment permits to adjust perfectly the subsurface aperture 31 of the control line in the nipple in front of the aperture of the chamber 21. The same occurs when setting the releasing device inside the nipple.

The sealing tool 41 includes housing 44 with an abutment, i.e. a greater diameter upper end. This abutment abuts against the no-go 43 of the nipple and the releasing device is secured by well known techniques in snubbing or coil tubing. The sealing tool 41 perfectly fits the nipple bore so that it can not move. Securing the releasing device in the nipple and production tubing after abutment permits to adjust perfectly the subsurface aperture 31 of the control line 10 in front of a fluid communication aperture 45 of the sealing tool 41. The fluid communication aperture 45 is for example a recess in the outer circumference of the housing 44 that extends as illustrated on FIGS. 4 to 8 on the whole outer circumference of the sealing tool and along a large height, so as to ease the adjustment of this aperture 45 in front of the subsurface aperture 31 of the control line 10. The housing 44 of the sealing tool presents on each side of the fluid communication aperture 45 an annular location on its outer circumference in which is arranged an O-ring seal 46, also known as a packing. These two seals 46, disposed spaced apart from each other according to the axial direction A of the production tubing, prevent fluid contained in the fluid communication aperture 45 to escape between the outer circumference of the housing and the inner cylindrical wall of the nipple. The bottom 47 of the housing 44 is closed. The top of the housing is sealingly connected to the mini tubing. A fluid communication path inside the housing connects the fluid communication aperture 45 and the top of the housing. The sealing tool 41 defines consequently a sealed chamber sealingly connected on one side to the mini tubing and on the other side to the control line subsurface aperture 31. The nipple inside cylindrical wall between the two seals 46 also defines this sealed chamber.

The releasing device of FIGS. 4 to 8 consists more particularly of a pressure intensifier. But this releasing device can also be used as a pressurized fluid transmitter, which also enters the scope of the invention.

As illustrated in FIG. 4, in a first attempt to release the control line, the releasing device is used as a pressurized fluid transmitter. The releasing device comprises the mini tubing 42 extending up to the surface and a fluid communication path between this mini tubing and the control line aperture 31 through the fluid communication aperture 45.

A liquid solvent, and more particularly diesel oil is poured at the surface in the mini tubing so as to fill the mini tubing and part of the fluid communication path. The liquid solvent usually exhibits heat stability and low compressibility abilities. Pressure is then supplied to the liquid solvent using a controller connected at the surface to the mini tubing. The controller is a means for flowing fluid such as a pressure supplying pump controlled with a control panel. The liquid solvent is then urged into the fluid communication aperture 45 of the releasing device, into the control line subsurface aperture 31 and part into the control line 10. This pressure is then transmitted to the blocked fluid in the control line and provides a move of the blockage and a flow of liquid solvent in the control line 10. Removal of the blockage is achieved because of the resulting driving action which is reverse to the usual forces acting on the blockage (such usual forces are hydrostatic pressure and pressure generated through the surface aperture to open the safety valve or to flush the blocked fluid).

Furthermore, the solvent helps to dissolve and disintegrate the blockage. The blockage can also be expelled or flushed at the surface by continuing flowing solvent through the releasing device or in the well by withdrawing the releasing apparatus and applying a pressure in the control line through the surface aperture. Consequently, this method permits to move and then to unblock the blockage in order to get rid of it.

Removal of the blockage in the control line can be detected at the surface by the flow of fluid out of the control line through the surface aperture.

Hydraulic pressure from the releasing device can be pulse applied in order to unblock the blockage. Further, hydraulic pressures can be applied alternatively onto the blockage through the subsurface aperture and through the surface aperture of the control line, thereby creating an oscillation effect onto the blockage. The pressure of the fluid can also be increased intermittently into the mini tubing or into the control line for more efficiency. Additionally, higher hydraulic pressure than can be supplied through the control line subsurface aperture may be brought to bear upon the blockage by using a downhole pressure intensifier.

The burst limit of the mini tubing 42 has to be taken into account when applying pressure through the releasing device and consequently, the pressure applied this above mentioned way on the blockage is limited. To remain under this burst limit, the pressure supplied by the controller depends on how deep the nipple is placed, the pressure in the mini tubing being the sum of the hydrostatic pressure and of the pressure supplied by the controller, as it is well known in the art.

The pressure applied to the blockage might not be sufficient to move and remove the blockage. In such cases, the method according to the invention is continued, taking advantage of the pressure intensification ability of the releasing device.

The fluid communication path goes through a bored piston and is designed in order to permit the multiplication of the pressure value between the mini tubing 42 and the fluid communication aperture 45.

The releasing device comprises a piston 48 having two end sides, an upper side 49 and a lower side 50, isolated from each other by a seal assembly into the housing 44 providing at least two sealed separate chambers, an upper chamber 51 and a lower chamber 52. The piston has a T-shape profile and is arranged to allow movement, i.e. the upper and lower sides 49, 50 have parallel fluid contact surfaces S, S1 having different sizes. More particularly, the fluid contact surface S of the upper side 49 is greater than the fluid contact surface S1 of the lower side 50 and both fluid contact surfaces S and S1 are perpendicular to the translation direction of the piston. The upper and lower chambers 51, 52 have appropriate sizes to sealingly accommodate respectively the upper and the lower sides 49, 50 of the piston 48. The perfect seal between the piston and the chambers is achieved with O-ring seals 53. The piston 48 is further bored so as to permit liquid
solvent flow from the upper chamber 51 to the lower chamber 52 through an inner bore 54. The liquid solvent is prevented to flow the other way, i.e. from the lower chamber to the upper chamber, by means of a check valve 55 arranged into the piston inner bore 54. The upper chamber 51 is open on the mini tubing 42 and the lower chamber 52 is open on the fluid communication aperture 45 through a duct 56. The travel of this duct 56 is designed to minimize the size of the sealing tool 41 that must fit into the nipple 9.

During the first attempt for releasing the control line as described here in above, hydraulic pressure is applied for the blockage by fluid communication through the mini tubing 42, part of the upper chamber 51, the piston inner bore 54, the lower chamber 52, the duct 56, the apertures 45, 51 and part of the control line 10. The piston remains in the upper position because of the shearing forces caused by the O-ring seals 53 provided in the piston and bearing against the upper and lower chamber inner walls.

The solvent liquid and then the travel of the solvent liquid is highlighted on FIGS. 4 to 8 with hatched lines.

The surface controller is stops applying pressure. The pressure drops in the mini tubing, i.e. only the hydrostatic pressure remains, whereas the pressure remains equal to P downstream the check valve 55, i.e. in the lower chamber. The check valve 55 indeed prevents the downstream pressurized liquid solvent from flowing through the piston inner bore 54 to obtain a pressure balance and thus preserves the pressure P.

As illustrated in FIG. 5, an heavy ball 57, for example made of stainless steel or bronze, is then dropped in the mini tubing and sinks until it obstructs the piston inner bore 54 on the upper side 49. A hydraulic pressure P is after that applied in the upper chamber 51. This hydraulic pressure P acts on the fluid contact surface of the upper side 49 and forces the piston 48 to the lower position. On the other side of the piston 48, the pressure of the liquid solvent contained in the lower chamber 52 acts on the fluid contact surface of the lower side 50, which can be considered as a full surface because of the check valve 55 that obstructs the piston inner bore 54 that way, and forces the piston to the upper position. A balance of pressure is obtained resulting in a pressure value P1 in the lower chamber such that P1=(P*PSI)/S. Consequently, as S1 is inferior to S, P1 is superior to P. This results in a pressure multiplication effect.

The hydraulic pressure P1 in the lower chamber is greater than during the first attempt without using the pressure intensifier, and the hydraulic pressure applied on the blockage is therefore greater. The sealing tool, as well as the nipple or the control line can stand greater pressure than the mini tubing.

As a matter of example, a construction of the kind of the mini tubing can stand about 8000 PSI whereas a nipple or a control line can stand usually more than 25 000 PSI. Usable practical parameters are then a hydraulic pressure P of about 6000 PSI and an intensifier coefficient of 4, i.e. the surface S being four times larger than the surface S1. The hydraulic pressure supplied in the control line is consequently of about 24 000 PSI, which was not possible without the pressure intensifier. Such a high hydraulic pressure acting against the blockage moves this blockage. The blockage is pushed and fluid flows into the control line while the piston moves to the lower position. The piston can move in the upper chamber because this upper chamber is in air communication with the production tubing 3 through a bleed hole 58. The releasing of the blockage can be detected because of fluid flowing out of the control line surface aperture or because of a pressure drop in the mini tubing. The hydraulic pressure is maintained and the piston 48 moves down to the lower position and allows a certain volume of liquid solvent to circulate through the control line for cleaning purpose.

FIG. 6 illustrates the piston 48 having completed its stroke, which can be detected by the pressure increasing again in the mini tubing 42.

The surface controller is then controlled so as to stop applying pressure in the mini tubing and the pump 15 actuated by the control panel 16 applies pressure in the control line 10 from the surface aperture. Fluid flows through the unblocked control line 10 up to the lower chamber 52 and pushes the piston 48 up to the upper position against an abutment 59, as illustrated in FIG. 7. An increase of pressure in the control line indicates that the piston is in upper position. The blockage, if it still partly exists and obstructs the fluid flow in the control line, is then pushed downwardly.

To confirm that the control line is unblocked, the control line 10 is then flushed and cleaned. For that, as illustrated in FIG. 8, a dart 60 having a bevel tip 61 is introduced in the mini tubing so as to force the ball 57 out of the aperture of the piston inner bore 54. The piston inner bore 54 is open for fluid communication from the upper chamber 51 to the lower chamber 52. The dart 60 is preferably bored. The controller is controlled to flow liquid solvent into the mini tubing and the dart bore. Solvent flows then through the piston inner bore 54, the lower chamber 52, the duct 56, the control line aperture 31 and the control line 10 up to the surface aperture. The blockage, or parts of the disintegrated blockage, is then flushed away from the control line. This avoids the formation of an ensuing new blockage from old blockage part settlements.

The control line 10 being clean and released, the releasing device 40 can be retrieve with the snagging or coil tubing machine. The plug is removed and the safety valve reinstalled in the nipple 9 of the production tubing 3.

If the blockage does not move the first time the intensified pressure is applied, the pressure can be bled off and reapplied in the mini tubing. This operation can be repeated several times to create high-pressure impulses and a jarring action to more efficiently unblock the blockage. Further, hydraulic pressure can also be applied alternatively on the blockage from the surface aperture of control line and from the releasing device, creating an oscillation effect on the blockage to facilitate its removal.

Instead of the steps with reference to FIGS. 7 and 8, the releasing device can be retrieved of the production tubing as soon as the blockage is unblocked and the control line cleaned and flushed into the production well by applying an hydraulic pressure through the control line surface aperture.

Preferable diesel is pumped through the mini tubing before setting the releasing device in the nipple to ensure thoroughly cleaned conditions but other fluids may be used.

Although the invention has been described in part by making detailed reference to specific embodiments, such detail is intended to be and will be understood to be instructional rather than restrictive. It should be noted that while embodiments of the invention disclosed herein are described in connection with a specific safety valve, the embodiments described herein may be used with any type of control line controlled safety valve and with any type of control line used in subsurface safety valves.
For example, in some relatively deep subsurface safety valve well, to compensate for the “active” control line’s hydrostatic pressure, a “balance” control line is used to negate the affect of hydrostatic pressure from active control line. Such “balance” control line can also be released using the method and the device in accordance with the invention.

The device generating high pressure against a surface inner wall of the production tubing through a down hole can also be used for numerous other applications including communicating with a tubing retrievable safety valve, so-called TRSV. Such TRSV are safety valves incorporated into the production tubing and authorizing an inner flow identical to the flow of the production tubing, contrary for example to a wireline retrievable safety valve secured in the production tubing. The device described here in above can be used with little modification to perforate weak areas in a nipple arranged beforehand for TRSV, for example for setting an insert valve inside the tubing retrievable safety valve and still using the existing control system. For that, the fluid communication aperture of the sealing tool must be narrow and well oriented.

Whereas the present invention has been described in relation to the drawings attached hereto, it should be understood that other and further modifications, apart from those shown or suggested herein, might be made within the scope and spirit of the present invention.

1. A method to release a control line (10) for a safety valve (8) removably disposed in a nipple (9) of a wellbore production tubing (3), comprising the steps of:
   - removing the safety valve from the nipple;
   - setting into the nipple a sealing tool (41) which seallingly connects the control line (10) and a mini tubing (42) running down into the production tubing;
   - increasing the pressure of a fluid into the mini tubing to cause fluid to flow into the control line through the sealing tool.

2. The method according to claim 1, further comprising the step of increasing the pressure of a fluid alternatively into the mini tubing and into the control line.

3. The method according to claim 1, further comprising the step of increasing the pressure of a fluid intermittently into the mini tubing.

4. The method according to claim 1, further comprising the step of increasing the pressure of a fluid intermittently into the control line.

5. The method according to any of claims 1 to 4, comprising the step of moving a piston (48) into the sealing tool to provide a multiplicator effect on the pressure increasing.

6. The method according any of claims 1 to 5, wherein the fluid is a solvent liquid.

7. The method according any of claims 1 to 5, wherein the fluid is an incompressible liquid.

8. The method according to claim 6, wherein the fluid is diesel oil.

9. A wellbore installation (1) comprising a production tubing (3) with a nipple (9) for receiving a working device (40), characterized in that the working device comprises:
   - a sealing tool (41) having a sealed chamber (45, 56, 52, 54, 51) defined with an inside cylindrical wall of the nipple (9) and two seals (46) spaced apart from each other according to an axial direction (A) of the production tubing; and
   - a mini tubing (42) running down said production tubing (3) and connected to said sealed chamber for flowing a fluid against the inside cylindrical wall of the nipple (9).

10. The wellbore installation of claim 9, wherein said nipple is fitted for receiving a safety valve (8) actuated by a control line (10) issuing into said sealed chamber.

11. The wellbore installation of claim 9, wherein the inside cylindrical wall of the nipple against which flows the fluid comprises a weak area.

12. The wellbore installation according to any of claims 9 to 11, wherein the sealing tool further comprises a pressure intensifier means.

13. The wellbore installation according to any of claims 9 to 11, wherein the sealing tool comprises a movable piston (48).

14. The wellbore installation according to claim 13, wherein the piston comprises two end sides (49, 50) having different surface areas.

15. The wellbore installation according to claim 14, wherein the piston is bored with a check valve (55) disposed in a bore (54).

16. The wellbore installation according to claim 15, wherein the bore (54) in the piston (48) is obstructed with a ball (57) dropped into the mini tubing (42).

17. The wellbore installation according to claim 16, wherein a dart (60) running down into the mini tubing holds the ball out of the bore.

18. The wellbore installation according to any of claims 9 to 17, wherein the two seals (46) are O-ring packings arranged in the sealing tool (41) and bearing against the inside cylindrical wall of the nipple (9).

19. The wellbore installation according to any of claims 9 to 18, wherein the mini tubing is connected to a pressure-supplying pump.

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