DIVERTER SYSTEM FOR A SUBSEA WELL

FIELD OF THE INVENTION

[0001] The present invention relates to systems for diverting the flow of hydrocarbons from a blowout preventer. More particularly, the present invention the relates to diverters that are applied to the outlet of a blowout preventer so as to provide a safety mechanism in the event of a failure of the blowout preventer. Additionally, the present invention relates to diverter systems which allow chemicals or materials to be introduced into the flow of hydrocarbons.

BACKGROUND OF THE INVENTION

[0002] As the worldwide demand for hydrocarbon fuel has increased, and known onshore reserves have not kept up with the demand, there has been increasing activity in offshore oil exploration and production. Reserves of oil known to exist in the offshore areas have steadily increased and an increasing percentage of world production is from these offshore areas. The offshore environment has presented numerous new challenges to the oil drilling industry which have been steadily overcome to allow efficient drilling and production in these areas, although the costs have been considerably higher than those of onshore operations.

[0003] Not only has the offshore environment made production more difficult to accomplish, it has also generally increased the risk of environmental damage in the event of a well blowout or other uncontrolled loss of hydrocarbons into the sea. As a result, known safety equipment, such as blowout preventers which have been used successfully in onshore operations, have been used in offshore operations also. In spite of safety precautions, blowouts of offshore oil wells are known to occur and will occur in the future.

[0004] Subsea drilling operations may experience a blowout, which is an uncontrolled flow of formation fluids into the drilling well. These blowouts are dangerous and costly, and can cause loss of life, pollution, damage to drilling equipment, and loss of well production. To prevent blowouts, blowout prevention equipment is required. This blowout prevention equipment typically includes a series of equipment capable of safely isolating and controlling the formation pressures and fluids at the drilling site. BOP functions include opening and closing hydraulically-operated pipe rams, annular seals, shear rams designed to cut the pipe, a series of remote-operated valves to allow control the flow of drilling fluids, and well re-entry equipment. In addition, process and condition

monitoring devices complete the BOP system. The drilling industry refers to the BOP system as the BOP stack.

[0005] The well and the BOP connect the surface drilling vessel to a marine riser pipe, which carries formation fluids (e.g., oil, etc.) to the surface and circulates drilling fluids. The marine riser pipe connects to the BOP through the Lower Main Riser Package (LMRP) which contains a device to connect to the BOP, an annular seal for well control, and flow control devices to supply hydraulic fluids for the operation of the BOP. The LMRP and the BOP are commonly referred to, collectively, as simply the BOP. Many BOP functions are hydraulically controlled, with piping attached to the riser supplying hydraulic fluids and other well control fluids. Typically, a central control unit allows an operator to monitor and control the BOP functions from the surface. The central control unit includes a hydraulic control system for controlling the various BOP functions, each of which has various flow control components upstream of it.

[0006] While many of the techniques used in onshore operations can be applied in the offshore environment, they often prove to be less effective and require a much longer time period for implementation. For example, while relief wells can drilled to intercept the blowout well, a great amount of time may be required in the drilling operation. In drilling the relief wells, platforms or other drilling support decks must be located and transported to the blowout site before drilling operations can begin. Due to the rugged offshore environment, more time is required to drill the relief wells than would be required in onshore operations. As a result of all of these difficulties, many months can pass between the occurrence of an offshore oil well blowout and the successful final capping of the blown-out well. In the intervening time, large quantities of oil and gas can escape into the ocean with serious environmental impact.

[0007] While a portion of the hydrocarbons lost from a subsea well blowout may be trapped and skimmed by various containment booms and oil skimmer ships, substantial quantities of hydrocarbons can still escape such containment equipment. It can be seen that once the hydrocarbons are allowed to reach the ocean, surface wave action tends to disburse the lighter hydrocarbons which may mix with water or evaporate into the air. The gaseous hydrocarbons, of course, tend to escape into the atmosphere. The heavier ends of the crude oil often form into globules or tar balls which may flow at, or just below, the water's surface so as to make it difficult

to contain or to skim up.

[0008] In the past, various patents and patent publications have issued relating to systems for the containment of oil spills and blowouts. For example, U.S. Patent No. 4,324,505, issued on April 13, 1982 to D. S. Hammett, discloses a subsea blowout containment method and apparatus. This blowout containment apparatus comprises an inverted funnel adapted for positioning over a wellhead to receive fluids from the well and direct them into a conduit extending from the funnel to surface support and processing equipment. The funnel and conduit are supported from the sea's surface, preferably by a vessel such as a barge. The barge carries the equipment to receive the full flow of fluids from the well, to process the fluids, and to conduct the liquids to a nearby tanker where the recovered liquid hydrocarbons may be stored.

[0009] U.S. Patent No. 4,405,258, issued on September 20, 1983 to O'Rourke et al., describes a method for containing oil and/or gas within a blow-out cover dome. This method includes the steps of deploying a containment dome in shallow water near the location of the seabed where the containment dome is to be located. The containment dome has an upper expanded dome-like fluid impervious membrane, a fluid impervious hollow peripheral ring attached to the periphery of the membrane to provide a depending bag-like container, and discrete water drainage means within the bag-like container for connection to pump conduit means therefrom. Wet sand from the seabed is then pumped into the bag-like container. Water is then drained from the wet sand through the water drainage means so as to provide a body of drained sand disposed within the bag-like container and providing a hollow peripheral ring as a hollow peripheral torus acting as a self-supporting structure and as an anchor for the dome-like structural unit. The dome is then charged with a buoyant amount of air and the buoyed dome is floated out to the site where the dome is to be deployed. It is then submerged by controllably releasing the air while substantially simultaneously filling the dome with water, thereby sinking the dome until the lighter-than-water fluid is captured within the dome.

[0010] U.S. Patent No. 4,828,024, issued on May 9, 1989 to J. R. Roche, describes a diverter system and blowout preventer. The system comprises a blowout preventer attached above a spool having a hydraulically-driven sleeve/piston. An outlet flow passage exists in the spool. This outlet flow passage can be connected to a vent line. The outlet flow passage is closed off by the sleeve wall when the spool piston is at rest. Hydraulic ports are connected above and below the blowout

preventer annular piston and above and below the spool annular piston. The ports below the blowout preventer piston and above the spool piston are in fluid communication with each other. A hydraulic circuit is provided having two valves between a source of pressurized hydraulic fluid and a drain.

[0011] U.S. Patent No. 5,984,012, issued on November 16, 1999 to Wactor et al., provides an emergency recovery system for use in a subsea environment. This emergency recovery system has a casing that is open at each end with a shackle connected to one end of the casing with the opposite end of the shackle designed for connection to appropriate points on the main stack and lower marine riser package in any orientation. A flexible sling with a closed loop formed at each end is used with one of the closed loops releasably connected to the shackle and the end of the casing. The other end of the sling has a flotation member attached to the sling adjacent the closed loop. The sling is fan folded as it is lowered into the casing. The flotation member is shaped to fit inside the other end of the casing with the closed end loop of the sling protruding from the casing. The flotation member is constructed of synthetic foam and is sized to provide sufficient buoyancy to fully extend the sling when the release ring is released by a remotely operated vehicle in a subsea environment.

[0012] U.S. Patent No. 7,165,619, issued on January 23, 2007 to Fox et al., teaches a subsea intervention system that includes a BOP module and CT module. A tool positioning system is used for positioning a selected subsea tool stored within a rack with a tool axis in line with the BOP axis, while a marinized coiled string injector is moved by positioning system to an inactive position. Power to the subsea electric motors is supplied by an electrical line umbilical extending from the surface for powering the pumps. An injector is provided that includes a pressure compensator roller bearing and a pressure-compensated drive system case.

[0013] U.S. Patent No. 7,597,811, issued on October 6, 2009 to D. Usher, provides a method and apparatus for subsurface oil recovery using a submersible unit. The submersible vehicle is positioned above the bed of a diver supported on a platform above the pollutant. A wand at one end of a pipe evacuated by a centrifugal pump is manipulated to draw the pollutant to the surface for treatment or disposal.

[0014] U.S. Patent No. 7,921,917, issued on April 12, 2011 to Kotrla et al., shows a multi-deployable subsea stack system. This subsea stack system includes a lower marine riser package, a blowout preventer stack with a first ram blowout preventer, and an additional blowout

preventer package releasably coupled to the blowout preventer stack and comprising a second ram blowout preventer. The subsea blowout preventer stack assembly can be deployed by coupling a drilling riser to the lower marine riser package that is releasably connected to the blowout preventer stack. The lower marine riser package and blowout preventer stack are then attached to a subsea wellhead and then landed on the additional blowout preventer package that is coupled to the subsea wellhead.

[0015] U.S. Patent Publication No. 2009/0095464, published on April 16, 2009 to McGrath et al., provides a system and method for providing additional blowout preventer control redundancy. This system has backup or alternate fluid flow routes around malfunctioning BOP control components using a remotely-installed removable hydraulic hose connection. The backup fluid flow route sends pressure-regulated hydraulic fluid to a BOP operation via an isolation valve rigidly attached to the BOP, then to a hose connected to an intervention panel on the BOP, and finally through a valve that isolates the primary flow route and establishes a secondary flow route to allow continued operation.

[0016] U.S. Patent Publication No. 2009/0260829, published on October 22, 2009 to D. J. Mathis, provides a subsea tree safety control system that limits the probability of failure on demand of a subsea test tree . A safety shut-in system is provided for actuating a safety valve of the subsea test tree. The safety shut-in system includes a surface control station positioned above a water surface connected via an umbilical to a subsea control system positioned below the water surface so as to actuate the safety valve.

[0017] It is an object of the present invention to provide an apparatus for containing the flow of fluids resulting in a subsea oil well blowout.

[0018] It is another object of the present invention to provide a system that is attachable to a blowout preventer so as to contain the flow of fluids in the event of a failure of the blowout preventer.

[0019] It is another object of the present invention to provide a method and apparatus that can recover substantially all of the fluids flowing from the blowout preventer and for preventing the mixing of such fluids with seawater.

[0020] It is still another object of the present invention to provide a diverter system for a subsea well in which various liquids and anti-icing chemicals can be introduced so as to prevent frozen methane from blocking the operation of the diverter system.

[0021] It is still a further object of the present invention to provide a diverter system for a subsea well which facilitates the ability to choke-and-kill the well.

[0022] It is still a further object of the present invention to provide a diverter system for a subsea well that can be easily secured between the lower marine riser package and the blowout preventer.

[0023] These and other objects and advantages of the present invention will become apparent from a reading of the attached specification and appended claims.

BRIEF SUMMARY OF THE INVENTION

[0024] The present invention is a diverter system for a subsea well that comprises a blowout preventer and a diverter affixed to an outlet of the blowout preventer. The blowout preventer has an interior passageway with an inlet at a bottom thereof and an outlet at a top thereof. The diverter has a flow passageway extending therethrough and communication with the interior passageway of the blowout preventer. The diverter has a valve means therein for changing a flow rate of a fluid flowing through the flow passageway of the diverter. The diverter has at least one channel opening in valved relation to the flow passageway so as to allow the fluid from the flow passageway to pass outwardly of the diverter.

[0025] In the present invention, the valve can includes a ram that extends in transverse relationship to the flow passageway. The ram can be actuatable so as to change the flow rate and, ultimate, to block the flow of fluid through the flow passageway. This ram is positioned above the channel.

[0026] In the present invention, the channel includes a first channel in valve communication with the flow passageway, and a second channel in valved communication with the flow passageway. Each of the first and second channels are suitable for passing a fluid from the flow passageway to a location away from the diverter. There is at least one flow line in valve communication with the flow passageway. This flow line is suitable for passing fluids and chemicals into the hydrocarbons of the flow passageway.

[0027] The diverter has an inlet affixed to the outlet of the blowout preventer. The diverter has an outlet at an opposite end of the flow passageway from the inlet. The diverter further includes a containment cap that is affixed to the diverter and over the outlet thereof to block the flow of the fluid through the outlet. A manifold can be connected by a line to the channel of the diverter. This manifold is suitable for collecting the fluid passing through the channel. A choke-and-kill manifold

is connected by a line to the flow line of the diverter. This choke-and-kill manifold is suitable for passing a material into the flow passageway of the diverter. A lower riser package can be affixed to the outlet of the diverter.

[0028] The present invention is also a method of diverting fluid passing from an outlet of a blowout preventer. This method includes the steps of: (1) forming a body having an inlet and an outlet and valve cooperative with the flow passageway extending between the inlet and the outlet; (2) affixing the body to the outlet of the blowout preventer while the valve is opened such that fluid from the outlet of the blowout preventer passes through the flow passageway; (3) closing the valve such that the fluid passes through the channels extending from the flow passageway and below the valve; and (4) discharging the fluid from the channel away from the body.

[0029] The method of the present invention further includes the steps of closing the valve such that the fluid is prevented from passing outwardly of the outlet of the body and affixing a containment cap over the outlet of body. Further, the channel can be connected to a manifold such that the fluid passes from the flow passageway through the channel and into the manifold. The manifold can then be used so as to collect and/or distribute the fluid. Still further, the body can have a flow line in fluid communication with the flow passageway. A fluid can be injected into the flow passageway through the flow line.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] FIGURE 1 is perspective view showing the diverter system of the present invention as secured in a frame between a lower marine riser package and a blowout preventer.

[0031] FIGURE 2 is a perspective view of the diverter system of the present invention.

[0032] FIGURE 3 is a side elevational view of the diverter system of the present invention.

[0033] FIGURE 4 is perspective view showing the passage of hydrocarbons through the outlet of the diverter system of the present invention.

[0034] FIGURE 5 is an illustration showing the passage of the hydrocarbons through the channels of the diverter of the present invention while the outlet is closed.

[0035] FIGURE 6 is a perspective view showing the connection of the flow lines of the present invention to a choke-and-kill manifold.

[0036] FIGURE 7 is an illustration showing the connection of the channels of the diverter system

of the present invention to a production manifold.

[0037] FIGURE 8 is a perspective view showing the application of a containment cap onto the outlet of the diverter system of the present invention.

[0038] FIGURE 9 is a flow diagram showing the relationship between the flow passageway of the diverter and the channels and the flow lines.

DETAILED DESCRIPTION OF THE INVENTION

[0039] Referring to FIGURE 1, there is shown the diverter system 10 in accordance with the preferred embodiment of the present invention. The diverter system 10 includes a blowout preventer 12, a diverter 14, and a lower marine riser package 16. It can be seen that the blowout preventer 12 has an inlet 18 at a bottom thereof and an outlet 20 at a top thereof. The diverter 14 is secured to the outlet 20 of the blowout preventer 12. Similarly, the diverter 14 will have an inlet 22 and an outlet 24. The outlet 24 is opposite to the inlet 22. The diverter 14 has a flow passageway extending between the inlet 22 and the outlet 24. The inlet 22 is affixed to the outlet 20 of the blowout preventer 12. The lower marine riser package 16 is secured to the outlet 24 of the diverter 14. A frame 26 is illustrated as generally surrounding the blowout preventer 12, the diverter 14 and the lower marine riser package 16.

[0040] The blowout preventer 12 is in the nature of a standard blowout preventer. Typically, blowout preventers will have a plurality of rams extending across an interior passageway. As such, in the event of a blowout, the rams will close so as to prevent the well from suffering a blowout. In certain circumstances, the blowout preventer 12 may fail. As such, the diverter system 10 of the present invention has a diverter 14 which is secured to the outlet 20 of the blowout preventer 12 so as to provide redundancy to the system and to collect hydrocarbons that would otherwise be released from the blowout preventer 12.

[0041] As can be seen in FIGURE 1, the diverter 14 has a diverter spool 28 that is directly affixed to the outlet 20 of the blowout preventer 12. Channels 30 and 32 will extend from the spool 28. Channels 30 and 32 are located on opposite sides of the spool 28. Within the concept of the present invention, a single channel can be employed instead of a pair of channels illustrated in FIGURE 1. The channel 30 has an outlet 34. The channel 32 has an outlet 36. A plurality of valves such as valve 38 can be employed along the respective channels 30 and 32 so as to allow for the opening

and/or closing of the channels 30 and 32. Additionally, suitable flow lines such as flow lines 40 can be incorporated within the diverter 14 so as to allow fluids to be introduced into the flow passageway of the diverter 14.

[0042] FIGURE 2 is a detailed view of the diverter 14. As can be seen, the diverter 14 includes a body 40 having an upper frame 42 and a lower frame 44. Importantly, there is a ram 46, in the nature of a blowout preventer ram, which will extend in transverse relationship to the flow passageway 48. As such, the ram 46 will act in the nature of a valve for the opening and closing of the flow passageway 48.

[0043] In FIGURE 2, it can be seen that the interior passageway 48 will extend vertically from the inlet 22 of the diverter 14 to the outlet 24. The diverter 14 has an upper mandrel 50 that is suitable for the connection to the lower marine riser package 16. In FIGURE 2, it can be seen that a spreader bar 52 is affixed to the upper frame 42. The spreader bar 52 is utilized for movement of the diverter 14 on surface locations. Of course, the spreader bar 52 is removed for the installation of the diverter 14. A suitable running tool can be applied over the threaded portion of the outlet 48 of the mandrel 50 so as to allow the diverter 14 to be installed subsea. The mandrel 50 is secured by a flange connection 54 to the upper frame 42.

[0044] A plurality of legs, such as legs 56, extend from the upper frame 42 to the lower frame 44. Each of these legs 56 will have an anode 58 affixed thereto. The anode 58 will serve to avoid electrolytic deterioration of the legs and other components of the diverter 14.

[0045] In FIGURE 2, it can be seen that the channels 36 and 38 are particularly illustrated. Typically, when the channels are connected to other pieces of equipment, a suitable elbow will be secured to the outlet of these channels. Additionally, there is a flow line 39 that is cooperative with the interior of the diverter 14 and in fluid communication therewith. A plurality of such flow lines can be secured in valved relationship with the diverter 14. A connector control panel 60 is supported upon the lower frame 40. Similarly, an ROV control panel 62 is also affixed to the lower frame 44. The ROV control panel 62 is suitable for allowing a remotely operated vehicle (ROV) to control the opening and closing of the various valves associated with the diverter 14. A shackle 64 will extend from the lower frame 44 so as to allow for proper horizontal manipulation by the ROV such that the diverter 14 can be properly secured upon the outlet of the blowout preventer 12.

[0046] FIGURE 3 is a side view of the diverter 14 of the present invention. In particular, in FIGURE 3, it can be seen that the diverter 14 includes a flange connection 70 at a lower end thereof suitable for connection to the outlet of the blowout preventer 12. A connection spool 72 is connected to flange 70. Connection spool 72 can be in a flange connection, such as flange connection 74, to the lower frame 44 of the diverter 14. The blowout preventer spool 72 allows the diverter 14 to be rapidly and easily adapted to the various flanges associated with particular blowout preventers.

[0047] In FIGURE 3, it can be seen that the connector control panel 60 and the ROV control panel 62 are supported upon the lower frame 44 in a proper position at the periphery of the lower frame 44 for manipulation and control by an ROV. The diverter spool 28 is secured by flange connections to the lower frame 44. The diverter spool 28 will have a flow passageway that is in-line with the flow passageway associated with the blowout preventer 12 and the lower marine riser package 16. The ram 46 is illustrated as extending generally transverse to the flow passageway 48 of the diverter 14. The ram 46 is connected by a flange connection above the channels and flow lines associated with the diverter spool 28.

[0048] FIGURE 3 illustrates that the channels 36 and 38 extend generally upwardly from the diverter spool 28. Each of the channels 36 and 38 are in valved fluid communication with the flow passageway of the diverter spool 28. As such, if the ram 46 is closed and hydrocarbons are prevented from flowing outwardly of the outlet 24 of the flow passageway 48, the channels 36 and 38 will serve to divert this flow of hydrocarbons outwardly of the flow passageway.

[0049] In FIGURE 3, the legs 56 are illustrated as extending upwardly in generally transverse relationship to the lower frame 44. The upper frame 42 is supported on the upper end of the legs 56. The upper mandrel 50 extends upwardly above the upper frame. The spreader bar 52 is connected to the upper frame 42.

[0050] FIGURES 4 - 8 show the various configurations of the present invention in operation. In FIGURE 4, it can be seen that the diverter 14 is illustrated as having a hydrocarbon flow 80 flowing outwardly of the flow passageway 48 at the outlet 24 of the diverter 14. FIGURE 4 further shows that the valve or ram 46 will extend generally transverse to the flow passageway 48. Also in FIGURE 4 it can be seen that the channels 36 and 38 have elbows connected thereto and that these channels 36 and 38 are closed.

[0051] In order to properly install the diverter 14 upon the blowout preventer 12, it is important that an open flow of hydrocarbons be allowed to pass through the flow passageway 48. If the flow passageway 48 were in any way restricted, then the pressure of the hydrocarbon release from the blowout preventer would prevent the ROV from securing the diverter 14 upon the blowout preventer. In FIGURE 4, the lower marine riser package 16 has not been connected to the outlet 24 of the flow passageway 48. The configuration of FIGURE 4 will allow the hydrocarbon flow 80 to be released into the seawater until such time as the diverter 14 is properly installed upon the blowout preventer. In the configuration of FIGURE 4, a tophat and riser can run to the capture vessel, as available. Methane hydrate or glycol can be introduced through the flow line 39 after the tophat is installed. The methane hydrates or glycol will prevent methane crystal formation and potential blockage of the flow passageway 48. Additionally, dispersant can also be introduced through the channel 38 so as to allow from the dispersing of the hydrocarbon flow in an effort to avoid an oil slick on the surface of the water.

[0052] FIGURE 5 illustrates that the ram 46 has been closed so as to prevent hydrocarbon flow from passing through the flow passageway 48 and through the outlet 24. The valves are closed slowly while pressures are monitored. The hydrocarbon flow 80 will now pass through the chokes 82. Methane hydrates, glycol and dispersants can be introduced through the flow line 39. Additionally, pressures can be closely monitored so that the pressures affecting the system will not damage the equipment. If the pressure in the interior passageway 48 should increase to an unacceptable level, then the valve associated with the flow passageway 48 can be released so as to avoid unnecessarily high pressures.

[0053] In FIGURE 6, it can be seen how the "top kill" of the well can be achieved through the use of a choke-and-kill manifold 100. The choke-and-kill manifold 100 is connected by lines 102 and 104 to the flow lines 39 of the diverter 14. In this situation, the flow of hydrocarbons through the passageway 48 at outlet 24 has been closed by the ram 46. Similarly, the valve has closed the flow of hydrocarbons at the chokes 82. In this situation, various materials, such as muds and cements, can be introduced through lines 102 and 104 through the flow lines 39 and into the flow passageway of the diverter 14. The necessary materials can be delivered from the surface of the choke-and-kill manifold 100 by way of lines 106 and 108.

[0054] FIGURE 7 illustrates a scenario in which the channels 36 and 38 are connected by lines 110 and 112 to a production manifold 114. As such, when a containment cap 116 is applied over the outlet 24 of the flow passage 48 of diverter 14, the channels 36 and 38 can be suitably opened so as to allow the flow of hydrocarbons from the well through the lines 110 and 112 to the production manifold 114. The hydrocarbons that are received within the production manifold 114 can be distributed elsewhere by use of lines 116, 118, 120 and 122.

[0055] FIGURE 8 is an illustration showing the containment cap 116 as affixed over the outlet 24 of the flow passageway 48. When the flow of hydrocarbons 80 is stopped from flowing through the flow passageway 48, the containment cap 116 can be applied so as to prevent further release of hydrocarbons therethrough. The chokes 82 are suitably closed so as to prevent the flow of hydrocarbons therethrough. As such, the diverter 14, as illustrated in FIGURE 8, is suitable for closing the well.

[0056] FIGURE 9 is a flow diagram illustrating the operation of the various valves, channels and flow lines associated with the present invention. In particular, it can be seen that the well 130 has tubing 132 extending therefrom. The tubing 132 will pass through a blowout preventer 134. A temperature sensor 136 and a pressure sensor 138 are cooperative with the tubing 132 so as to provide suitable information for the operation of the diverter 14 of the present invention. It can be seen that the diverter 14 has the outlet 24 at an upper end thereof. The ram 46 is located below the outlet 24. The channels 36 and 38 and the flow lines 39 communicate in valved relationship with the tubing 132. It can be seen that the channels 36 and 38 pass through a valve and toward suitable respective outlets 140 and 142. As such, when the ram 46 is closed, and the valves associated with the channels 36 and 38 are opened, the flow of hydrocarbons can pass through the outlets 140 and 142. The valves associated with the channels 36 and 38 can be closed so as to contain the oil within the tubing 132. The flow lines 39 also have a valve associated with the flow lines adjacent to the diverter 14. Additional injector valves and chokes 142 and 144 can be provided at the other end of the flow lines 36 so as to allow for the introduction of chemicals into the tubing 132. Of course, the various valves associated with the channels 36 and 38 and the flow lines 39 can be manipulated and operated in various manners so as to optimize the control of hydrocarbon flow. Of example, in order to install the diverter 14, it is important that the ram 46 be opened. In order to control the release

of hydrocarbons, the various chokes can be opened while the ram 46 closes the flow passageway. Ultimately, the chokes can be closed so that production can occur by the passage of the hydrocarbons through the channels 36 and 38 and to a production manifold. Alternatively, all of the valves and rams can be closed so as to close in the well.

[0057] The foregoing disclosure and description of the invention is illustrative and explanatory thereof. Various changes in the details of the illustrated construction can be made within the scope of the appended claims without departing from the true spirit of the invention. The present invention should only be limited by the following claims and their legal equivalents.

CLAIMS

I claim:

1. A diverter system for a subsea well comprising:

a blowout preventer having an interior passageway with an inlet at a bottom thereof and an outlet at a top thereof; and

a diverter affixed to an outlet of said blowout preventer, said diverter having a flow passageway extending therethrough and communicating with said interior passageway of said blowout preventer, said diverter having a valve means therein for changing a flow rate of a fluid flowing through said flow passageway, said diverter having at least one channel opening in valved relation to said flow passageway so as to allow the fluid from said flow passageway to pass outwardly of said diverter.

2. The diverter system of Claim 1, said valve means comprising:

a ram extending in transverse relationship to said flow passageway, said ram being actuatable so as to change the flow rate.

3. The diverter system of Claim 2, said ram positioned above said at least one channel.

4. The diverter system of Claim 1, said at least one channel comprising:

a first channel in valved communication with said flow passageway; and

a second channel in valved communication with said flow passageway, each of said first and second channels suitable for passing a fluid from said flow passageway to a location away from said diverter.

5. The diverter system of Claim 1, further comprising:

at least one flow line in valved communication with said flow passageway, the flow line suitable for passing a fluid into the fluid within said flow passageway.

6. The diverter system of Claim 1, said diverter having an inlet affixed to said outlet of said blowout preventer, said diverter having an outlet at an opposite end of said flow passageway from said inlet, the diverter system further comprising:

a containment cap affixed to said diverter and over said outlet thereof so as to block a flow of the fluid through said outlet.

7. The diverter system of Claim 1, further comprising:

a manifold connected by a line to the channel of said diverter, said manifold suitable

for collecting the fluid passing through the channel.

8. The diverter system of Claim 5, further comprising:

a choke-and-kill manifold connected by a line to said flow line of said diverter, said choke-and-kill manifold suitable for passing a material into said flow passageway of said diverter.

9. The diverter system of Claim 1, said diverter having an inlet affixed to said outlet of said blowout preventer, said diverter having an outlet at an opposite end of said flow passageway from said inlet thereof, the diverter system further comprising:

a lower riser package affixed to said outlet of said diverter.

10. A diverter for application to a blowout preventer of a subsea well, the diverter comprising:

a body having a flow passageway extending therethrough, said body having an inlet end and an outlet end, said inlet end suitable for application to an outlet of the blowout preventer;

a ram affixed to said body and extending in transverse relationship to said flow passageway, said ram being actuatable so as to change a flow rate of a fluid passing through said flow passageway;

at least one channel in valved fluid communication with said flow passageway so as to allow a fluid in said flow passageway to pass outwardly of said body; and

at least one flow line in valved fluid communication with said flow passageway of said body so as to selectively allow a fluid to be introduced into said flow passageway.

11. The diverter of Claim 10, said at least one channel comprising:

a first channel in valved communication with said flow passageway; and

a second channel in valved communication with said flow passageway, each of said first and second channels suitable for passing a fluid from said flow passageway to a location away from said diverter.

12. The diverter of Claim 10, further comprising:

a containment cap affixed to said body and over said outlet thereof so as to block a flow of the fluid through said outlet.

13. The diverter of Claim 10, further comprising:

a manifold connected by a line to the channel of said body, said manifold suitable for

collecting the fluid passing through the channel.

14. A method of passing fluid through an outlet of a blowout preventer, the method comprising:

forming a body having an inlet and an outlet, said body having a flow passageway extending between said inlet and said outlet, said body having a valve cooperative with said flow passageway, said body having a channel in communication with said flow passageway and a flow line in communication with said flow passageway;

affixing said body to the outlet of the blowout preventer while said valve is opened such that fluid from the outlet of the blowout preventer passes through said flow passageway;

closing said valve such that the fluid passes through said channel; and

discharging the fluid away from said body.

15. The method of Claim 14, the step of closing comprising:

closing said valve such that the fluid is prevented from passing outwardly of said outlet of said body; and

affixing a containment cap over said outlet of body.

16. The method of Claim 14, further comprising:

connecting said channel to a manifold;

passing the fluid from said flow passageway through said channel and into said manifold; and

collecting the fluid in said manifold.

17. The method of Claim 14, said body having a flow line in fluid communication with said flow passageway, the method further comprising:

injecting a fluid into said flow passageway through said flow line.

18. The method of Claim 14, the step of closing comprising:

maneuvering an ROV into proximity to said valve; and

manipulating said valve by said ROV so as to close said valve.

19. The method of Claim 14, further comprising:

affixing a lower riser package to an outlet of said flow passageway of said body.

20. The method of Claim 14, said body having a pair of channels in fluid communication with said flow passageway and a pair of flow lines in fluid communication with said fluid passageway.