OIL RECLAMATION APPARATUS

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ABSTRACT
An oil reclamation apparatus comprising a central panel, a plurality of side panels extending downwardly from the central panel, and at least one discharge pipe extending through the central panel so as to establish fluid communication through the central panel. At least one of the side panels has an opening formed therein, and a relief door is connected to one of the side panels so as to be movable between an open position wherein the relief door is positioned to permit fluid to pass through the opening and a closed position wherein the relief door is positioned about the opening to form a fluid tight seal about the opening.
OIL RECLAMATION APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The inventive concepts disclosed herein relate generally to containment systems, and more particularly, but not by way of limitation, to an apparatus for capturing and reclaiming crude oil from an open source within a body of water.

2. Brief Description of Related Art

Considerable volumes of crude oil are produced from off-shore facilities, whether from platforms or from subsea wellheads. Many of these production sites are located in deep water, such as that exceeding 2,000 feet. Production equipment used in deep water is designed and installed to operate with a low probability of failure because of the high cost of repairing such failures and because of the desire to minimize any environmental impact resulting from the failures. In spite of this low probability of failure, failures nevertheless can occur, which in turn can result in high volumes of crude oil spilling into the water.

Because of the depth of water in which many wells are located, access to the oil leak so that repairs can be made is difficult, if not impossible. As such, to minimize impact to the environment, it is desirable to contain or capture the crude oil spilling from the production equipment until such time as the leak can be repaired or the flow of crude oil shut off.

Containment systems have been proposed for capturing crude oil in deep water. Such containment systems typically include a box structure with an open bottom and a discharge pipe extending from an otherwise full enclosed top such that the containment system is capable of being lowered over the source of the oil leak. Once positioned over the leak, oil and gas flowing from the leak source will flow into the box structure and in turn be transported to the surface via a pipe system connected to the discharge pipe of the box structure. At the surface, the oil and gas is collected on a tanker or other suitable processing and storage system.

While the prior art containment system may successfully capture oil in conditions found around many offshore wells, numerous problems have been encountered when placing the prior art containment system into operation under more harsh conditions, such as found at depths of around 5,000 feet. More particularly, because the top of the box structure is closed, (except for a single pipe that extends from the top) the inflow of oil and gas into the box structure may be at pressures and temperatures that result in the formation of gas hydrates in the top of the box structure. Gas hydrates are ice-like crystalline solids formed from mixtures of water and natural gas, usually methane. They occur where pressure, temperature, gas saturation, and local chemical conditions combine to make them stable. The gas hydrates accumulate in the top of the box structure and in the discharge pipe blocking the flow of oil and gas through the discharge conduit of the box structure and rendering the containment system inoperable. The accumulation of gas hydrates can also cause the structure to become buoyant, causing the structure to have a tendency to rise from, or drift along, the floor of the body of water.

Thus, a need exists for an improved reclamation apparatus that overcomes the problems of gas hydrate accumulation in the oil reclamation apparatus and pipes of the apparatus, as well as mitigation of the formation of gas hydrates within the apparatus due to high pressure, dwell time of oil and gas in the apparatus, and restricted or slow flow of oil and gas through the apparatus to enable spilled oil to be reclaimed in deep water. It is to such an apparatus that the present invention is directed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an oil reclamation apparatus constructed in accordance with the presently disclosed inventive concepts.

FIG. 2 is a sectional view taken along line 2-2 of FIG. 1.

FIG. 3 is a sectional view taken along line 3-3 of FIG. 1.

FIG. 4 is a sectional view taken along line 4-4 of FIG. 1.

FIG. 5 is a perspective view of another embodiment of an oil reclamation apparatus constructed in accordance with the presently disclosed inventive concepts.

FIG. 6 is a schematic representation of a prior art containment cap shown positioned over a blowout preventer.

FIG. 7 is a fragmented, top view plan of the oil reclamation apparatus of FIG. 5.

FIG. 8 is a perspective view of the oil reclamation apparatus of FIG. 5 illustrating a vertical door and a top panel in an open position.

FIG. 9 is a schematic representation of the oil reclamation apparatus of FIG. 5 shown positioned over the prior art oil containment cap and the blowout preventer.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Referring now to the drawings, and more particularly to FIG. 1, an oil reclamation apparatus 10 constructed in accordance with the inventive concepts disclosed herein is shown. The purpose of the reclamation apparatus 10 is to provide an improved containment structure which contains oil and gas from an underwater well when such underwater well is spilling oil at a location on or near the floor of a body of water. Such reclamation apparatus 10 is designed to be positioned over the site of the oil spill and to accumulate oil and gas from the leak. The accumulated oil and gas is transported to the surface through a transport pipe (not shown) which extends between the reclamation apparatus 10 and a storage device (also not shown) located at the surface of the body of water, such as an oil tanker. The reclamation apparatus 10 may be utilized to accept the oil and gas from an oil spill at the well site which is the source of the spill. Then the reclamation apparatus 10 will route the oil and gas through pipes attached to the reclamation apparatus 10 to the surface where it can be processed and stored in an appropriate vessel.

The reclamation apparatus 10 generally includes a body assembly 12 and a top assembly 14. The body assembly 12 is shown to have a generally rectangular sidewall structure 15 with a top end 16 and a bottom end 18. The top end 16 is
intended to be closed by the top assembly 14 while the bottom end 18 is intended to remain open. The sidewall structure 15 generally includes a plurality of planar sides 20.

[0021] It will be appreciated that while the bottom assembly 12 has been shown as being rectangular in shape, the body assembly 12 may be configured to be any size or shape so long as the bottom assembly 12 has a sufficient internal capacity to receive the spilling oil and gas, sufficient weight when combined with the top assembly 12 to be positioned onto the floor of the body of water and to remain in position on the floor of the body of water, and sufficient structural integrity to withstand the extreme pressures experienced in deep water. To this end, the body assembly 12 may be constructed of a variety of materials. Examples of suitable materials for fabricating the body assembly 12 include steel, reinforced concrete, and combinations thereof.

[0022] The top assembly 14 extends over the top end 16 of the body assembly 12 so as to enclose the top end 16 of the body assembly 12 and function to funnel accumulated oil and gas to one or more discharge pipes. The top assembly 14 generally includes a panel structure 26 which is shown in FIG. 1 to be generally configured of a plurality of panels arranged in the shape of a frustum. More specifically, the panel structure 26 has a central panel 28, a pair of angled side panels 30 extending from opposing sides of the central panel 28, and a pair of vertical side panels 32 which are shown to be substantially perpendicularly to the central panel 28. Like the body assembly 12, the panel structure 26 may be constructed of a variety of materials, such as steel, reinforced concrete, and combinations thereof. While a specific arrangement of the panel structure 26 has been shown herein for the purpose of this disclosure, it will be appreciated that a variety of arrangements may be employed in constructing the top assembly 14.

[0023] The top assembly 14 further includes one or more discharge pipes 34 extending from the central panel 28 so as to establish fluid communication with the interior of the reclamation apparatus 10. In the embodiment shown herein, four discharge pipes 34 are provided. However, it will be appreciated that the number of discharge pipes employed may be varied depending on conditions encountered at the leak site. Each of the discharge pipes 34 is adapted to be connected to the transport pipe system extended from the surface for transporting the oil and gas accumulated by the reclamation apparatus 10. The sizes of the discharge pipes 34 can vary, but should be sufficient so as not to create a back pressure. By way of example, the discharge pipes 34 may have an internal diameter of about twenty-two inches.

[0024] As discussed above, one of the problems encountered when employing prior containment systems is that when gas hydrates form or accumulate in the top of the reclamation apparatus, unwanted buoyancy may be created and the discharge pipes may become clogged so as to render the containment system inoperable.

[0025] To control the pressure of oil and gas within the reclamation apparatus 10, the top assembly 14 is provided with one or more relief doors 36 which can be remotely opened and closed from the surface of the body of water with hydraulic actuators 38 mounted between the relief doors 36 and the top panel structure 26 so as to relieve varying amounts of pressure and volume from the reclamation apparatus 10. The relief doors 36 are shown to be hinged to the angled panel 30 and positioned over openings 40 formed in the angled panels 30. The relief doors 36 include a seal 41 positioned about the opening 40 to create a fluid tight seal when the relief doors 36 are in a closed position. It will be appreciated that while the relief doors 36 have been shown to be hinged, the relief doors may be attached to the panel structure 26 in a number of ways. For example, the relief doors may be configured to move between an open position and a closed position by sliding in a parallel relationship to the angled panels 30.

[0026] Referring now to FIG. 2, the discharge pipes 34 are shown to be provided with a cap assembly 42 on a lower end thereof for selectively closing and opening the discharge pipes 34. The upper end of the discharge pipes 34 are shown to be provided with a temporary cap 44. As such, when the reclamation apparatus 10 is lowered to the floor of the body of water, the discharge pipes 34 will be fully capped. The cap assembly 42 includes a cap 46 positioned over the bottom of the discharge pipes 34 and hinged to the central panel 28 so as to be movable between a closed position and an open position. In one embodiment, the cap 46 is held in the closed position by an electromagnet 48. The electromagnet 48 may be deactivated which will cause a spring 50 to open the cap 46 to the open position where the open cap 46 will activate a switch which will signal that the cap 46 is fully open. If the switch does not activate indicating the cap 46 is fully open, then a push type solenoid 52 can be activated as many times as necessary to break any hydrate crystallization that might be holding the cap 46 from fully opening. The cap 46 is held in the open position with the spring 50, which is preferably covered with an insulation jacket 53 to prevent the accumulation of gas hydrates which may interfere with the upward ability of the spring 50.

[0027] When initially installing the reclamation apparatus 10, the relief doors 36 would preferably be fully opened. This will prevent pressure from the oil and gas which will enter the reclamation apparatus 10 as it is lowered over the well site from creating buoyancy of the reclamation apparatus 10 which can prevent the reclamation apparatus 10 from being fully lowered to the floor of the body of water. Having the relief doors 36 fully opened initially will prevent the reclamation apparatus 10 from experiencing high pressures which can cause reduction of temperature which can contribute to the formation of gas hydrates. Having the relief doors 36 fully opened will minimize any restriction to the flow of the oil and gas within the reclamation apparatus 10 which reduces the dwell time of the oil and gas within the reclamation apparatus 10. Restriction of flow and increased dwell times of the oil and gas in the reclamation apparatus 10 contributes to the formation of gas hydrates. Hydrate crystals in the reclamation apparatus 10 can totally or partially block flow out of the discharge pipes 34 of the reclamation apparatus 10. Hydrate crystals in the reclamation apparatus 10 can cause the reclamation apparatus 10 to become buoyant and prevent it from being able to be fully lowered to the floor of the body of water. After the reclamation apparatus 10 is in position on the floor of the body of water, the relief doors 36 would be commanded to slowly incrementally close so there can be a slow transfer of oil and gas escaping through the relief doors 36 in favor of flow through one or more of the discharge pipes 34 extending from the top assembly 14.

[0028] When the reclamation apparatus 10 is positioned on the floor of the body of water, the temporary cap 44 will be removed prior to making the connection with the transport pipe system extended from the surface. Then, one or more of the cap assemblies 42 at the bottom of the discharge pipes 34 will be remotely opened from the surface. Depending on the
circumstances, one discharge pipe 34 could be opened so that oil and gas could flow through such discharge pipe 34, then the relief doors 36 could be slowly incrementally closed which would transfer to one discharge pipe 34 a small portion of the pressure and flow, thereby preventing high pressures within the reclamation apparatus 10, preventing restriction of flow, minimizing dwell time of the oil and gas while in the reclamation apparatus 10, thereby tending to prevent hydrate formation in the reclamation apparatus 10 and buoyancy of the reclamation apparatus 10. Then after some additional period of time, the relief doors 36 could be further incrementally closed, transferring even more pressure and flow to the discharge pipes 34. Eventually, the relief doors 36 could be fully closed, transferring all the flow and pressure to the open discharge pipes 34. If it is determined during the above process that the amount of pressure and flow that can be handled by one discharge pipe 34 is causing the reclamation apparatus 10 to build up too much pressure or that hydrates are detected to be forming or that the reclamation apparatus 10 is becoming buoyant, then the relief doors 36 may be partially or fully opened to relieve excessive pressure in the reclamation apparatus 10 or to prevent gas hydrates to wash out of the reclamation apparatus 10 under pressure of the oil and gas flow. Excessive pressure in the reclamation apparatus 10 can also be relieved by opening another one of the discharge pipes 34 of the reclamation apparatus 10. A pressure detector can be installed within the reclamation apparatus 10.

[0029] An advantage of the reclamation apparatus 10 is that as the reclamation apparatus 10 is lowered to the floor of the body of water and the reclamation apparatus 10 begins to fill with oil and gas, the water in the reclamation apparatus 10 is displaced through the relief doors 36 by the pressure and volume of oil and gas that enters the reclamation apparatus 10. Since gas hydrates are formed by components of natural gas being trapped in microscopic cages of water molecules, the above advantage of the reclamation apparatus 10 is clear.

[0030] Another advantage of the reclamation apparatus 10 is that the size of the openings of the relief doors 36 can be computed and therefore the flow that is reduced as the relief doors are incrementally closed can be computed. Similarly, the flow through the intake of any one of the discharge pipes 34 can be similarly computed. Therefore, when one or more discharge pipes 34 are opened, the relief doors 36 can be incrementally closed so that the amount of flow that is restricted by the relief doors 36 closing can be compensated by the flow permitted by the number of discharge pipes 34 opened. This permits the pressure of the reclamation apparatus 10 to always remain at a low pressure inasmuch as the flow and resultant pressures are systematically transferred from flowing through the relief doors 36 into a flow through the open discharge pipes 34. Maintaining low pressure in the reclamation apparatus 10 will likely prevent gas hydrates from forming in the container apparatus 10 and will prevent buoyancy of the reclamation apparatus 10.

[0031] To mitigate adherence of gas hydrates to the interior surfaces of the reclamation apparatus 10, the interior surfaces of the body assembly 12 and the top assembly 14 (including the relief doors 36) may be coated with a non-stick surface, such as a polytetrafluoroethylene. In addition, the interior surfaces may contain heat strips 70 (FIGS. 3 and 4) to cause the temperature of the interior surfaces of the reclamation apparatus 10 to release any gas hydrates that might have adhered to the interior panels of the reclamation apparatus 10. Because natural gas is lighter than both oil and water, it would be expected that any natural gas hydrates that might be formed within the reclamation apparatus 10 would accumulate toward the top of the reclamation apparatus 10. The geometrical configuration of the invention will permit any such gas hydrates which form to be washed out of the reclamation apparatus 10 when the relief doors 36 are fully opened if such hydrates are not adhering to the interior panels. The heat tape 70 prohibits such hydrate crystals from adhering to the interior panels. Hydrate crystal detectors can be installed in the interior of the invention which can signal hydrate formation to the surface of the body of water. Also, it should be appreciated that the heat tape need be activated only when it is detected that hydrates have formed and the relief doors 36 are to be opened to expel such hydrates.

[0032] It will be appreciated by those of ordinary skill in the art that the reclamation apparatus 10 described herein will generally be hydraulically and electrically operated. To this end, the reclamation apparatus 10 will require a suitable submersible electro-hydraulic power system, such as the submersible electro-hydraulic power system 72 (FIG. 1), that is supported on the top assembly 14 and operated from the surface, either wirelessly or via a cable routed from the surface. Electro-hydraulic power and control systems are well known in the art. Thus, no further description of their components, construction, or operation is believed necessary in order for one skilled in the art to understand and implement the apparatus of the present invention.

[0033] In one embodiment, the electro-hydraulic power and control system 72 may be able to detect the position of the piston of the hydraulic actuators relative to the cylinder of the hydraulic actuator, the position of the cap 46 of the cap assembly 42 for the discharge pipes 34, whether the relief doors 36 are tightly shut, whether the heat tape 70 is activated, and the remaining power level of the power source. Hydrate detectors (not shown) may be employed to detect the presence of gas hydrates. Furthermore, buoyancy detectors (not shown) may be installed on the reclamation apparatus 10 such that the buoyancy detectors are able to sense the amount of buoyancy affecting the reclamation apparatus 10. The buoyancy detectors and the hydraulic detectors may be capable of transmitting signals to the surface and transmitting a signal to the electro-hydraulic power and control system 72 to control the movement of the relief doors 36 so as to command the relief doors 36 to be opened sufficiently to eliminate the buoyancy and the gas hydrates, and when the buoyancy ceases and the gas hydrates are removed, such buoyancy detectors and gas hydrate detectors can send a signal to the electro-hydraulic system 72 to close the relief doors 36.

[0034] FIG. 5 illustrates another embodiment of an oil reclamation apparatus 100 constructed in accordance with the presently disclosed inventive concepts. The oil reclamation apparatus 100 is adapted to be used alone in a manner described above in reference to the oil reclamation apparatus 10, or in conjunction with a prior art containment cap 102 (FIG. 6). FIG. 6 is a schematic representation of a prior art oil containment cap 102 positioned over a blowout preventer 104 situated on the floor of a body of water. The blowout preventer 104 represents a source of oil spillage and the oil containment cap 102 is positioned over the blowout preventer 104 to direct the spilled oil to a pipe 106 connected to the surface. It will also be appreciated that the cap 102 may include additional pipes or hoses (not shown) for circulating methanol and/or hot water to reduce the formation of gas hydrates.
In the event that the oil containment cap 102 in place is not reclaiming all or a satisfactory amount of the oil, the oil reclamation apparatus 100 can be used in conjunction with the cap 102 that is already in place to recover a greater percentage of the oil not being recovered by the cap 102 which is already in place. The oil reclamation apparatus 100 can be placed over the cap 102 which is already in place, even though there may already be a pipe connection from the cap already in place to the surface of the body of water (or perhaps to a quick disconnect device below the surface of the water). In order to use the oil reclamation apparatus 100 where the cap 102 is already in place over the blowout preventer 104 and the pipe 106 is connected to the cap 102 and transporting oil to the surface, the reclamation apparatus 100 is designed to be positioned over the cap 102 and the blowout preventer 104 to accumulate oil and gas from the source of the leak. The accumulated oil and gas is transported to the surface through a transport pipe (not shown) which extends between the reclamation apparatus 100 and a storage device (also not shown) located at the surface of the body of water, such as an oil tanker. The reclamation apparatus 100 may be utilized to accept the oil and gas from an oil spill at the well site which is the source of the spill. Then the reclamation apparatus 100 will route the oil and gas through pipes attached to the reclamation apparatus 100 to the surface where it can be processed and stored in an appropriate vessel.

The reclamation apparatus 100 is similar to the reclamation apparatus 10 described above except as described below. Because the reclamation apparatus 100 is similar in construction to the oil reclamation apparatus 10, only those components that are modified will be described in detail below and like numerals will be used throughout to describe like components. More specifically, the reclamation apparatus 100 includes a body assembly 112 and a top assembly 114. The body assembly 112 is shown to have a generally rectangular sidewall structure 115 with a top end 116 and a bottom end 118. The top end 116 is intended to be closed by the top assembly 114 while the bottom end 118 is intended to remain open. The sidewall structure 115 generally includes a plurality of planar sides 120.

It will be appreciated that while the bottom assembly 112 has been shown as being rectangular in shape, the body assembly 112 may be configured to be any size or shape so long as the bottom assembly 112 has a sufficient internal capacity to receive the cap 102 and the blowout preventer 104, as well as the spilling oil and gas, sufficient weight when combined with the top assembly 112 to be positioned onto the floor of the body of water and to remain in position on the floor of the body of water, and sufficient structural integrity to withstand the extreme pressures experienced in deep water. To this end, the body assembly 112 may be constructed of a variety of materials. Examples of suitable materials for fabricating the body assembly 112 include steel, reinforced concrete, and combinations thereof. It will be further appreciated that the bottom assembly 112 may be provided with slots or openings (not shown) extending from the bottom to accommodate objects, such as pipes and hoses, extending to or from the blowout preventer 104.

The top assembly 114 extends over the top end 116 of the body assembly 112 so as to enclose the top end 116 of the body assembly 112 and function to funnel accumulated oil and gas to one or more discharge pipes. The top assembly 114 generally includes a panel structure 126 which is shown in FIG. 5 to be generally configured of a plurality of panels arranged in the shape of a frustum. More specifically, the panel structure 126 has a central panel 128, a pair of angled panels 130 extending from opposing sides of the central panel 128, and a pair of side panels 132 which are shown to be substantially perpendicular to the central panel 128. Like the body assembly 112, the panel structure 126 may be constructed of a variety of materials, such as steel, reinforced concrete, and combinations thereof. While a specific arrangement of the panel structure 126 has been shown herein for the purpose of this disclosure, it will be appreciated that a variety of arrangements may be employed in constructing the top assembly 114.

The top assembly 114 further includes one or more discharge pipes 134 extending from the central panel 128 so as to establish fluid communication with the interior of the reclamation apparatus 100. In the embodiment shown herein, four discharge pipes 134 are provided. However, it will be appreciated that the number of discharge pipes employed may be varied depending on conditions encountered at the leak site. Each of the discharge pipes 134 is adapted to be connected to the transport pipe system extended from the surface for transporting the oil and gas accumulated by the reclamation apparatus 100. The sizes of the discharge pipes 134 can vary, but should be sufficient so as not to create a back pressure. By way of example, the discharge pipes 134 may have an internal diameter of about twenty-two inches.

To control the pressure of oil and gas within the reclamation apparatus 100, the top assembly 114 is provided with one or more relief doors 136 which can be remotely opened and closed from the surface of the body of water with hydraulic actuators 138 mounted between the relief doors 136 and the top panel structure 126 so as to relieve varying amounts of pressure and volume from the reclamation apparatus 100. The relief doors 136 are shown to be hinged to the angled panel 130 and positioned over openings 140 formed in the angled panels 130. The relief doors 136 include a seal 141 positioned about the opening 140 to create a fluid tight seal when the relief doors 136 are in a closed position. It will be appreciated that while the relief doors 136 have been shown to be hinged, the relief doors may be attached to the panel structure 126 in a number of ways. For example, the relief doors may be configured to move between an open position and a closed position by sliding in a parallel relationship to the angled panels 130.

To allow the oil reclamation apparatus 100 to be lowered to the floor of the body of water and then positioned over the cap 102 and the blowout preventer 104, the body assembly 112 and the top assembly 114 are provided with a vertical door 180 which can be remotely opened and closed from the surface of the body of water with hydraulic actuators 182 mounted between the vertical door 180 and the bottom assembly 112 and the top assembly 114 so as to provide a vertical opening for receiving the discharge pipe 106. The vertical door 180 is shown to be hinged to the exterior side of the bottom assembly 112 and the top assembly 114 and positioned over an opening 184 formed in one side of the bottom assembly 112 and the top assembly 114. A lower end of the vertical door 180 intersects the lower end of the bottom assembly 112, and an upper end of the vertical door 180 intersects one of the openings 140 such that the discharge pipe 106 may be passed through the side of the bottom assembly 112 and the top assembly 114 so that the discharge pipe 106 passes through the opening 140 with the relief door 136 in an open position.
[0043] To further accommodate the discharge pipe 106 connected to the cap 102, the top assembly 114 is provided with an opening 190. The opening 190 is defined by a portion of the central panel 128 and a door assembly 192. The door assembly 192 is moveable between a closed position (FIG. 5) wherein the top assembly 114 is positioned to cooperate with the central panel 128 to provide a seal about the discharge pipe 106 and an open position (FIG. 8) wherein the door assembly 192 is open to provide a passageway 193 for receiving the discharge pipe 106 which remains connected to the cap 102 into the opening 190. As best shown in FIG. 7, the door assembly 192 includes a panel 194 with a notch 196 defining a portion of the opening 190. The panel 194 has one side 195 that is in communication with at least one of the openings 140 so that the discharge pipe 106 extending through the opening 140 may be passed laterally from the opening 140 into the opening 190. The panel 194 may be moved between the open position and the closed position with an actuator 198. To seal between the discharge pipe 106 and the top assembly 114, a seal 200 is provided about the notch 196 and a seal 202 is provided about the corresponding notch of the central panel 128. The seals 200 and 202 are shown to utilize an air bladder seal which is selectively activated via a switch interposed between the seals 200 and 202 and an fluid source (not shown), such as compressed air.

[0044] When initially installing the reclamator apparatus 100 with the cap 102 positioned over the blowout preventer 104 and the discharge pipe 106 connected to the cap 102, the relief doors 136 are preferably fully opened. As described above, this will prevent pressure from the oil and gas which will enter the reclamator apparatus 100 as it is lowered over the well site from creating buoyancy of the reclamator apparatus 100 which can prevent the reclamator apparatus 100 from being fully lowered to the floor of the body of water. Having the relief doors 136 fully opened initially will prevent the reclamator apparatus 100 from experiencing high pressures which can cause reduction of temperature and in turn contribute to the formation of gas hydrates. Having the relief doors 136 fully opened will minimize any restriction to the flow of the oil and gas within the reclamator apparatus 100 which reduces the dwell time of the oil and gas within the reclamator apparatus 100.

[0045] In addition to the relief doors 136 being opened, the vertical door 180 and the panel 194 are open so as to provide an access path to the opening 190 in the top assembly 114 via the opening 184 and the opening 140. The oil reclamator apparatus 100 is positioned adjacent the discharge pipe 106 near the upper end of the cap 102. The oil reclamator apparatus 100 is then moved laterally with the opening 184 aligned with the discharge pipe 106 so the oil reclamator apparatus 100 is positioned about the discharge pipe 106. The oil reclamator apparatus 100 is then maneuvered so as to position the discharge pipe 106 in the opening 190. With the discharge pipe 106 positioned in the opening 190, the panel 194 is closed, and the oil reclamator apparatus 100 is lowered to the floor of the body of water thereby encapsulating the cap 102 and the blowout preventer 104. Thereafter, the seals 200 and 202 are activated to provide a seal about the discharge pipe 106.

[0046] After the reclamator apparatus 100 is in position on the body of water, the relief doors 136 are operated in a manner discussed above to slowly transfer the oil and gas escaping through the relief doors 136 in favor of flow through one or more of the discharge pipes 134 extending from the top assembly 114.

[0047] From the above description, it is clear that the present inventive concept is well adapted to carry out the objects and to attain the advantages mentioned herein as well as those inherent in the invention. While exemplary embodiments of the invention have been described for purposes of this disclosure, it will be understood that numerous changes may be made which will readily suggest themselves to those skilled in the art and which are accomplished within the spirit of the inventive concept disclosed and claimed herein.

What is claimed is:

1. A reclamator apparatus comprising:
   a plurality of panels arranged to form a panel structure having an open bottom end and a top end, the plurality of panels including a central panel and a plurality of side panels extending downwardly from the central panel;
   and
   at least one discharge pipe extending through the central panel so as to establish fluid communication through the central panel, at least one of the side panels having an opening formed therein; and
   at least one relief door connected to one of the side panels so as to be moveable between an open position wherein the relief door is positioned to permit fluid to pass through the opening and a closed position wherein the relief door is positioned about the opening to form a fluid tight seal about the opening.

2. The reclamator apparatus of claim 1, wherein the side panels extend downwardly from the central panel so as to form a frustum.

3. The reclamator apparatus of claim 2, further comprising:
   at least two angled side panels extending downwardly from the central panel, each of the angled side panels provided with an opening; and
   at least one relief door connected to one of the side panels so as to be moveable between an open position wherein the relief door is positioned to permit fluid to pass through the opening and a closed position wherein the relief door is positioned about the opening to form a fluid tight seal about the opening.

4. The reclamator apparatus of claim 1, wherein at least one of the central panel, the side panels, and the relief door is coated with a non-stick coating.

5. The reclamator apparatus of claim 1, further comprising:
   at least one heat strip positioned on an interior surface of at least one of the central panel, the side panels, and the relief door.

6. The reclamator apparatus of claim 1, further comprising:
   a cap assembly positioned on a lower end of the discharge pipe, the cap assembly selectively moveable between an open pipe position and a closed pipe position.

7. The reclamator apparatus of claim 1, wherein at least one of the side panels has a vertical opening, the vertical opening extending from a bottom end of the side to one of the openings of the side panels, and wherein the reclamator apparatus further comprises a vertical door connected to side panel so as to be moveable between an open position wherein the vertical door is positioned to permit a vertical pipe to pass through the vertical opening and a closed position wherein the vertical door is positioned about the vertical opening to form a fluid tight seal about the vertical opening.
8. The reclamation apparatus of claim 7, wherein the central panel has an opening intersecting the opening of the side panel so as to provide a passage between the vertical opening and the opening of the central panel, and wherein the reclamation apparatus further comprises a door assembly connected to the central panel so as to be movable between an open position wherein the door assembly is positioned to provide a passage for receiving the vertical pipe in the opening of the central panel from the opening of the side panel and a closed position wherein the door assembly is positioned to cooperate with the central panel to form a seal about the vertical pipe when the vertical pipe is positioned in the opening of the central panel.

9. The reclamation apparatus of claim 8, wherein the opening of the central panel is defined by a portion of the central panel and the door assembly, and wherein each of the central panel and the door assembly has an arch shaped notch configured to substantially conform to the contour of the vertical pipe when the vertical pipe is positioned in the opening of the central panel and the door assembly is in the closed position.

10. A reclamation apparatus, comprising:
   a body assembly having an open bottom end, a top end, and a sidewall structure extending between the top end and the bottom end; and
   a top assembly extending upwardly from the top end of the body assembly, the top assembly comprising a panel structure with a central panel and a plurality of side panels extending downwardly from the central panel; and
   at least one discharge pipe extending through the central panel so as to establish fluid communication through the central panel, at least one of the side panels having an opening formed therein and the top assembly further comprising at least one relief door connected to one of the side panels so as to be movable between an open position wherein the relief door is positioned to permit fluid to pass through the opening and a closed position wherein the relief door is positioned about the opening to form a fluid tight seal about the opening.

11. The reclamation apparatus of claim 10, wherein the top assembly is configured as a frustum.

12. The reclamation apparatus of claim 11, wherein the top assembly includes at least two angled side panels extending downwardly from the central panel, wherein each of the angled side panels is provided with an opening, and wherein the top assembly further includes a relief door connected to each of the angled side panels so as to be movable between an open position wherein the relief door is positioned away from the opening of the angled side panel to permit fluid to pass through the opening and a closed position wherein the relief door is positioned about the opening to form a fluid tight seal about the opening.

13. The reclamation apparatus of claim 10, wherein at least a portion of an interior surface of the panel structure of the top assembly is coated with a non-stick coating.

14. The reclamation apparatus of claim 10, wherein the top assembly further comprises at least one heat strip positioned on an interior surface of the panel structure.

15. The reclamation apparatus of claim 10, wherein the top assembly further comprises a cap assembly positioned on a lower end of the discharge pipe, the cap assembly selectively movable between an open pipe position and a closed pipe position.

16. The reclamation apparatus of claim 10, wherein the body assembly and the top assembly each have a vertical opening, the vertical opening of the bottom assembly extending from the bottom end to the to the top end and the vertical opening of the top assembly vertically aligned with the vertical opening of the bottom assembly and extending from a lower end of the panel structure of the top assembly to one of the openings of the side panels, and wherein the top assembly and the top assembly further include a vertical door connected to the sidewall structure of the bottom assembly and one of the side panels of the top assembly so as to be movable between an open position wherein the vertical door is positioned to permit a vertical pipe to pass through the vertical opening and a closed position wherein the vertical door is positioned about the vertical opening to form a fluid tight seal about the vertical opening.

17. The reclamation apparatus of claim 16, wherein the central panel has an opening intersecting the opening of the side panel so as to provide a passage between the vertical opening and the opening of the central panel, and wherein the top assembly further comprises a door assembly connected to the central panel so as to be movable between an open position wherein the door assembly is positioned to provide a passage for receiving the vertical pipe in the opening of the central panel from the opening of the side panel and a closed position wherein the door assembly is positioned to cooperate with the central panel to form a seal about the vertical pipe when the vertical pipe is positioned in the opening of the central panel.

18. The reclamation apparatus of claim 17, wherein the opening of the central panel is defined by a portion of the central panel and the door assembly, and wherein each of the central panel and the door assembly has an arch shaped notch configured to substantially conform to the contour of the vertical pipe when the vertical pipe is positioned in the opening of the central panel and the door assembly is in the closed position.

19. A method for capturing a fluid over an offshore well site, comprising:
   obtaining a reclamation apparatus, comprising:
   a plurality of panels arranged to form a panel structure having an open bottom end and a top end, the plurality of panels including a central panel and a plurality of side panels extending downwardly from the central panel; and
   at least one discharge pipe extending through the central panel so as to establish fluid communication through the central panel, at least one of the side panels having an opening formed therein; and
   at least one relief door connected to one of the side panels so as to be movable between an open position wherein the relief door is positioned to permit fluid to pass through the opening and a closed position wherein the relief door is positioned about the opening to form a fluid tight seal about the opening.
   lowering the reclamation apparatus over a well site with the relief door in the open position;
   connecting a transport pipe system to the discharge pipe; and
   closing the relief door while concurrently opening the door assembly covering the bottom end of the discharge pipe so as to transfer the flow of fluid passing through opening of the side panel to the discharge pipe.
20. The method of claim 19, further comprising heating at least one of the central panel, the side panels, and the relief door.

21. The method of claim 19, wherein the well site further includes a containment cap positioned over the well site and a pipe extending upwardly from the containment cap, and wherein step of lowering the reclamation apparatus over the well site further comprises:

opening a vertical door connected to one of the side to permit the pipe to pass through a vertical opening in the side panel extending from a lower end of the side panel to the opening of the side panel;

opening a door assembly connected to the central panel to permit the pipe to pass through an opening in the central panel intersecting the opening of the side panel so as to provide a passage between the vertical opening and the opening of the central panel; maneuvering the reclamation apparatus around the pipe and the containment cap such that the pipe passes through the vertical opening and the opening of the central panel;

continuing to lower the reclamation apparatus over the well site;

closing the vertical door; and

closing the door assembly so that the door assembly is positioned to cooperate with the central panel to form a seal about the pipe.