vessel, a gas handler may be attached to at least a riser assembly of the riser system 40. Such a riser assembly 50 having a riser 51 with a gas handler 52 is shown in Figure 2. The riser 51 has a top end 54a and a lower end 54b configured to connect to other risers. Figure 2 also shows the various lines (pipes) 56a to 56d that run along an outside of the riser 50. Because of the size limitations of the deck of the vessel, Figure 2 shows that the lines 56a to 56d are bent and provided at a single side 58 of the gas handler 52 in order to reduce an overall exterior diameter of the riser assembly 50 to fit through the deck.

[0007] However, from a manufacturing point of view, bending the pipes 56a to 56d as shown in Figure 2 is time consuming and adds to the overall cost of the riser assembly. Accordingly, it would be desirable to provide systems and methods that avoid the afore-described problems and drawbacks.

SUMMARY

[0007a] According to one aspect, there is provided, a riser assembly to be used in underwater oil and gas exploration, the riser assembly comprising: a riser having a lower end and an upper end and a central conduit extending from the lower end to the upper end; a gas handler connected to the riser and provided between the lower end and the upper end, the gas handler having an external casing, a central passage within the external casing in fluid communication with the central conduit, an elastomeric body surrounding the central passage that is movable by a piston to a closed position blocking upward flow through the central passage that selectively blocks and opens fluid communication between the central passage and the gas vent conduit; plural pipes attached to an outside of the riser such that at least one of the plural pipes has a flow path that passes within and through the external casing alongside the central passage; and a gas vent pipe configured to start at the gas vent conduit of the gas handler and extend towards the upper end of the riser, and the gas vent pipe is further configured to divert a gas from the gas handler through the outside of the riser.

[0007b] According to another aspect, there is provided a riser assembly to be used in underwater oil and gas exploration, the riser assembly comprising: a riser having a first end and a second end and a conduit extending from the first end to the second end; a gas handler connected to the riser and provided between the first end and the second end, the gas handler having an external casing; plural pipes attached to an outside of the riser such that at least one pipe of the plural pipes enters through the external casing; a gas vent pipe configured to start at the gas handler and extend towards the second end of the riser and the gas vent pipe is further configured to divert a gas from the gas handler through the outside of the riser, and wherein the gas handler further comprises: a lower cap and an upper cap configured to be attached to the external casing; and the at least one pipe is made of a first portion and a second portion that are not in direct contact with each other.

[0007c] According to still another aspect, there is provided a riser system configured to connect an undersea well to a vessel, the riser system comprising: plural riser assemblies configured to be connected to each other to form a main conduit from the vessel to the well, the main conduit being configured to accommodate a drill line, at least one riser assembly comprising: a riser having a lower end and an upper end and a central conduit extending from the lower end to the upper end; a gas handler connected to the riser and provided between the lower end and the upper end, the gas handler having an external casing, a central passage within the external casing in fluid communication with the central conduit, an elastomeric body surrounding the central passage that is movable by a piston to a closed position blocking upward flow through the central passage, a gas vent conduit in fluid communication with the central passage, and a valve sleeve that is moved by the piston to block and open fluid communication between the central passage and the gas vent conduit; plural pipes attached to an outside of the riser, each of the pipes having a lower portion joining a lower end of the gas handler, and upper portion joining and extending upward from an upper end of the gas handler, and a pipe passage extending through the external casing alongside the central passage and communicating the lower portion of each of the pipes with the upper portion of one of the pipes; and a gas vent pipe configured to start at the gas vent conduit of the gas handler and extend towards the upper end of the riser and the gas vent pipe is further configured to divert a gas from the gas handler through the outside of the riser.

[0007d] According to yet another aspect, there is provided a method for assembling and operating a riser assembly, the method comprising: attaching a gas handler to a riser having an upper end at a drilling vessel and a lower end at a subsea wellhead, the riser having a central conduit extending from the lower end to the upper end, the gas handler having a central passage in fluid communication with the central conduit; attaching plural pipes to an outside of the riser; connecting at least one pipe of the plural pipes to a pipe conduit formed in an external casing of the gas handler alongside the central passage; connecting a gas vent pipe to the gas handler such that the gas vent pipe extends towards the upper end of the riser and the gas vent pipe is configured to divert a gas from the gas handler through the outside of the riser; flowing drilling fluid up the central conduit from the subsea wellhead; and if a sufficient quantity of gas within the drilling fluid is detected, with the gas handler, closing the central passage and directing the gas out the gas vent pipe.

[0008] According to one exemplary embodiment, there is a riser assembly to be used in underwater oil and gas exploration. The riser assembly includes a riser having a first end and a second end and a conduit extending from the first end to the second end; a gas handler connected to the riser and provided between the first end and the second end, the gas handler having an external casing; plural pipes attached to an outside of the riser such that at least one pipe of the plural pipes enters through the external casing; and a gas vent pipe configured to start at the gas handler and extend towards the second end of the riser and the gas vent pipe is further configured to divert a gas from the gas handler through the outside of the riser.

WHAT IS CLAIMED IS:

1. A riser assembly to be used in underwater oil and gas exploration, the riser assembly comprising:

a riser having a first end and a second end and a conduit extending from the first end to the second end;

a gas handler connected to the riser and provided between the first end and the second end, the gas handler having an external casing;

plural pipes attached to an outside of the riser such that at least one pipe of the plural pipes enters through the external casing; and

a gas vent pipe configured to start at the gas handler and extend towards the second end of the riser and the gas vent pipe is further configured to divert a gas from the gas handler through the outside of the riser.

2. The riser assembly of Claim 1, wherein the gas vent pipe does not extend towards the first end of the riser.

3. The riser assembly of Claim 1, wherein all the plural pipes enter through the external casing of the gas handler.

4. The riser assembly of Claim 1, wherein the gas handler further comprises:

a lower cap and an upper cap configured to be attached to the external casing; and

the at least one pipe is made of a first portion and a second portion that are not in direct contact with each other.

5. The riser assembly of Claim 4, wherein

the first portion enters through the lower cap and the second portion enters through the upper cap and a conduit formed in a wall of the external casing fluidly communicates the first portion with the second portion.

6. The riser assembly of Claim 4, further comprising:

a receptacle region provided in the upper cap for receiving the at least one pipe, the receptacle region being configured to partially enter into a wall of the external casing of the gas handler and to fluidly communicate with a conduit formed in a wall of the external casing of the gas handler.

7. The riser assembly of Claim 6, wherein a portion of the at least one pipe has a collar configured to enter into the receptacle region.

8. The riser assembly of Claim 6, further comprising:

at least one seal between the receptacle region and the external casing for preventing a fluid inside the at least one pipe to escape outside.

9. The riser assembly of Claim 1, further comprising:

bumper plates attached to the riser and spaced between the plural lines to protect the plural lines from being damaged.

10. The riser assembly of Claim 1, wherein an external diameter of the casing is larger than a diameter of an imaginary cylinder that encompasses all of the plural lines.

11. The riser assembly of Claim 1, wherein the plural lines include a choke line, a kill line, and hydraulic fluid conduits.

12. A riser system configured to connect an undersea well to a vessel, the riser system comprising:

plural riser assemblies configured to be connected to each other to form a main conduit from the vessel to the well, the main conduit being configured to accommodate a drill line, at least one riser assembly comprising:

a riser having a first end and a second end and a conduit extending from the first end to the second end;

a gas handler connected to the riser and provided between the first end and the second end, the gas handler having an external casing;

plural pipes attached to an outside of the riser such that at least one pipe of the plural pipes enters through the external casing; and

a gas vent pipe configured to start at the gas handler and extend towards the second end of the riser and the gas vent pipe is further configured to divert a gas from the gas handler through the outside of the riser.

13. A gas handler configured to remove gas from a riser, the gas handler comprising:

an external casing having first and second ends;

a wall provided inside the external casing and configured to define an elongated cavity;

a piston configured to move along the elongated cavity;

a sleeve configured to move along the elongated cavity, wherein the piston and the sleeve form a chamber for the hydraulic control fluid around the elongated cavity;

an elastomeric body configured to be pressed by the piston to close the elongated cavity;

a gas vent conduit formed in a wall of the external casing and configured to output the gas; and

a conduit formed in a wall of the external casing and configured to extend from the first end to the second end.

14. The gas handler of Claim 13, further comprising:

a first cap configured to be attached to the external casing at the first end; and

a second cap configured to be attached to the external casing to the second end.

15. The gas handler of Claim 14, further comprising:

a receptacle region provided in the first cap or the second cap and partially into the wall of the external casing, wherein the receptacle region is configured to

receive a pipe, external to the gas handler and to fluidly connect the pipe to the conduit.

16. The gas handler of Claim 14, wherein at least one pipe is made of a first portion and a second portion that are not in direct contact with each other and the first portion enters through the first cap and the second portion enters through the second cap and the conduit formed in the wall of the external casing fluidly communicates the first portion with the second portion.

17. The gas handler of Claim 13, further comprising:

a receptacle region provided in the external casing for receiving at least one pipe, the receptacle region being configured to partially enter into the wall of the external casing of the gas handler and to fluidly communicate with the conduit formed in the wall of the external casing of the gas handler.

18. The gas handler of Claim 17, wherein a portion of the at least one pipe has a collar configured to enter into the receptacle region.

19. The gas handler of Claim 17, further comprising:

at least one seal between the receptacle region and the external casing for preventing a fluid inside the at least one pipe to escape outside.

20. A method for assembling a riser assembly, the method comprising:

attaching a gas handler to a riser having a first end and a second end and a conduit extending from the first end to the second end;

attaching plural pipes to an outside of the riser;

connecting at least one pipe of the plural pipes to a conduit formed in an external casing of the gas handler; and

connecting a gas vent pipe to the gas handler such that the gas vent pipe extends towards the second end of the riser and the gas vent pipe is configured to divert a gas from the gas handler through the outside of the riser.

What is claimed is:

1. A riser assembly to be used in underwater oil and gas exploration, the riser assembly comprising:

a riser having a lower end and an upper end and a central conduit extending from the lower end to the upper end;

a gas handler connected to the riser and provided between the lower end and the upper end, the gas handler having an external casing, a central passage within the external casing in fluid communication with the central conduit, an elastomeric body surrounding the central passage that is movable by a piston to a closed position blocking upward flow through the central passage that selectively blocks and opens fluid communication between the central passage and the gas vent conduit;

plural pipes attached to an outside of the riser such that at least one of the plural pipes has a flow path that passes within and through the external casing alongside the central passage; and

a gas vent pipe configured to start at the gas vent conduit of the gas handler and extend towards the upper end of the riser, and the gas vent pipe is further configured to divert a gas from the gas handler through the outside of the riser.

2. The riser assembly of claim 1, wherein the gas vent pipe does not extend towards the lower end of the riser.

3. The riser assembly of claim 1, wherein all the plural pipes have flow paths that pass through the external casing of the gas handler alongside the central passage.

4. The riser assembly of claim 1, further comprising: bumper plates attached to the riser and spaced between the plural pipes to protect the plural pipes from being damaged.

5. The riser assembly of claim 1, wherein an external diameter of the casing is larger than a diameter of an imaginary cylinder that encompasses all of the plural pipes.

6. The riser assembly of claim 1, wherein the plural pipes include a choke line, a kill line, and hydraulic fluid conduits.

7. A riser assembly to be used in underwater oil and gas exploration, the riser assembly comprising:

a riser having a first end and a second end and a conduit extending from the first end to the second end;

a gas handler connected to the riser and provided between the first end and the second end,

the gas handler having an external casing; plural pipes attached to an outside of the riser such that at least one pipe of the plural pipes enters through the external casing;

a gas vent pipe configured to start at the gas handler and extend towards the second end of the riser and the gas vent pipe is further configured to divert a gas from the gas handler through the outside of the riser, and wherein the gas handler further comprises:

a lower cap and an upper cap configured to be attached to the external casing; and the at least one pipe is made of a first portion and a second portion that are not in direct contact with each other.

8. The riser assembly of claim 7, wherein the first portion enters through the lower cap and the second portion enters though the upper cap and a conduit formed in a wall of the external casing fluidly communicates the first portion with the second portion.

9. The riser assembly of claim 7, further comprising: a receptacle region provided in the upper cap for receiving the at least one pipe, the receptacle region being configured to partially enter into a wall of the external casing of the gas handler and to fluidly communicate with a conduit formed in a wall of the external casing of the gas handier.

10. The riser assembly of claim 9, wherein a portion of the at least one pipe has a collar configured to enter into the receptacle region.

11. The riser assembly of claim 9, further comprising: at least one seal between the receptacle region and the external casing for preventing a fluid inside the at least one pipe to escape outside.

12. A riser system configured to connect an undersea well to a vessel, the riser system comprising:

plural riser assemblies configured to be connected to each other to form a main conduit from the vessel to the well, the main conduit being configured to accommodate a drill line, at least one riser assembly comprising:

a riser having a lower end and an upper end and a central conduit extending from the lower end to the upper end;

a gas handler connected to the riser and provided between the lower end and the upper end, the gas handler having an external casing, a central passage within the external casing in fluid communication with the central conduit, an elastomeric body surrounding the central passage that is movable by a piston to a closed position blocking upward flow through the central passage, a gas vent conduit in fluid communication with the central passage, and a valve sleeve that is moved by the piston to block and open fluid communication between the central passage and the gas vent conduit;

plural pipes attached to an outside of the riser, each of the pipes having a lower portion joining a lower end of the gas handler, and upper portion joining and extending upward from an upper end of the gas handler, and a pipe passage extending through the external casing alongside the central passage and communicating the lower portion of each of the pipes with the upper portion of one of the pipes; and a gas vent pipe configured to start at the gas vent conduit of the gas handler and extend towards the upper end of the riser and the gas vent pipe is further configured to divert a gas from the gas handler through the outside of the riser.

13. A method for assembling and operating a riser assembly, the method comprising: attaching a gas handler to a riser having an upper end at a drilling vessel and a lower end at a subsea wellhead, the riser having a central conduit extending from the lower end to the upper end, the gas handler having a central passage in fluid communication with the central conduit;

attaching plural pipes to an outside of the riser; connecting at least one pipe of the plural pipes to a pipe conduit formed in an external casing of the gas handler alongside the central passage;

connecting a gas vent pipe to the gas handler such that the gas vent pipe extends towards the upper end of the riser and the gas vent pipe is configured to divert a gas from the gas handler through the outside of the riser;

flowing drilling fluid up the central conduit from the subsea wellhead; and

if a sufficient quantity of gas within the drilling fluid is detected, with the gas handler, closing the central passage and directing the gas out the gas vent pipe.