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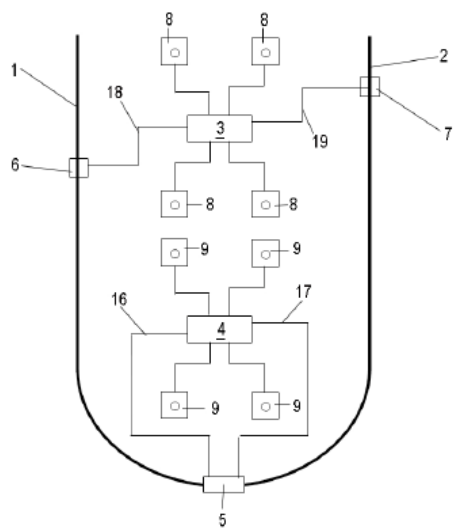
(54) Title **A hydrocarbon production field layout**

(57) Abstract

The present invention relates to a hydrocarbon production field layout. The layout comprises a first pipeline 1 with a first inner diameter and a second pipeline 2 with the first inner diameter. A cut off valve 20 with an inner bore with the first diameter, is arranged in a connecting arrangement between an end of the first pipeline 1 and an end of the second pipeline 2. At least one manifold 3 is in fluid connection with at least one hydrocarbon well 8, 9. A first branch pipe 16, 18 with a first valve 5, 6 is branched off from the first pipeline 1 and a second branch pipe 17, 19 with a second valve 5, 7 is branched off from the second pipeline 2. The branch pipes are connected to the at least one manifold 3, 4.



The present application relates to a field configuration or layout of a pipeline in fluid connection with manifolds utilised in connection with wells, in particular for producing hydrocarbons. The present invention is utilized for round trip pigging, and includes the use of dual header manifolds.

When producing hydrocarbons and conveying the hydrocarbon fluids through a pipeline, it is sometimes required to perform various tasks inside the pipeline. One way of performing such tasks involves using a “pig” that is a plug that is pumped through the pipeline to perform the task. Tasks that are performed includes cleaning and inspecting the pipeline. The operation running a plug involves inserting the pig into a launching station and applying a pressure difference over the plug to run the plug. The pipeline must run in a loop to allow the plug to be ran through the pipeline and to return the plug.

Wax and deposits from the hydrocarbon fluids have a tendency to stick to the inner walls of the pipeline in cold areas of the pipeline at some distance from the wells, as the pipeline has cooled the fluid sufficiently for the wax to build up. Wax deposits are therefore typically not a problem in the wellheads and in the manifolds and the other equipment close to the wells as the fluids are sufficiently hot to prevent wax deposits.

The pipeline cannot be round trip pigged if it includes equipment/sections with a reduced diameter, if the pipeline is not in a loop, or if the pipeline cannot be turned into a loop.

Traditional systems with pipelines extending from manifolds on a seabed typically includes two pipelines. Using two or more pipelines provide flow paths with low flow resistance, provide a failsafe system if one pipeline or equipment in relation to this pipeline should fail, and allow service while maintaining production.

Having two pipelines also enables the pipelines to be arranged in a loop to allow a pig to perform a complete run through both pipelines.

Providing such a loop typically involves installing a pipeline loop connecting two separate bores of a manifold conveying well fluids to the pipelines. The pipeline loop may be installed specifically at the time of the pigging operation. Alternatively, the loop is permanently installed between the manifold bores and includes a full bore cut off valve. The pig must run through the manifold or manifolds in both situations, and the inner diameter of the main bores of the manifolds must be dimensioned to the pipelines to allow pigging.

Pigging of manifolds is superfluous as manifolds operate at temperatures where waxing not is an issue.

In the above pipeline and manifold configurations, the well fluids typically also flow through several manifolds such that the manifolds additionally must be dimensioned to the maximum flow of well fluids from several wells.

Accordingly, it is a purpose of the present invention to provide a well configuration where the manifolds not need to be dimensioned to the pipeline (not being full bore), but only need to be dimensioned to the flow from the wells the manifolds are connected to.

Furthermore, for subsea fields productions fields, there is a continuous demand for simplification. All equipment used on a subsea field needs to be shipped out and lowered to a seabed, where after further operations are necessary to connect the equipment and infrastructure to arrive at a functional field. The completion of a subsea production field is time consuming and cost driving and the level of complexity may for remote fields be decisive for the viability of the field.

It is therefore also a purpose of the present invention to present a simplified structure for a subsea production field. It is also a purpose to avoid header valves on the manifolds and to reduce the number of jumpers and connections. Furthermore, is an advantage that a main flowline can be completely installed in one run and commission pigging can be performed without any manifolds installed.

Accordingly, the present invention relates to a hydrocarbon conveying pipeline layout. The layout comprises a first pipeline with a first inner diameter and a second pipeline with the first inner diameter. A connecting arrangement with a cut off valve includes an inner bore with the first diameter, connecting an end of the first pipeline and an end of the second pipeline. At least one manifold is in fluid connection with at least one hydrocarbon well. A first branch pipe with a first valve is branched off from the first pipeline and is connected to the at least one manifold. A second branch pipe with a second valve is branched off from the second pipeline connecting the second pipeline to the at least one manifold.

The connecting arrangement with a cut off valve, connecting the end of the first pipeline and the second pipeline may include just one bore, and one valve. The pipelines may be permanently welded to the connecting arrangement. The at least one manifold must then be connected to In –Line Tees on the pipelines. The connecting arrangement is considered to be without ports when the pipelines are permanently welded to the connecting arrangement.

The first pipeline and the second pipeline provide a redundant system as the flow of fluids selectively can flow through either pipeline. The ends of the first and second pipeline represent a termination of each pipeline.

The connecting arrangement with a cut off valve connecting the first pipeline and the second pipeline may be a dual in-line tee (ILT), and the first valve controlling a flow in the first branch pipe may then be located in the dual ILT. The second valve controlling a flow in the second branch pipe may also be located in the dual ILT.

The in-line tees and the dual in-line tees may include integrated equipment packages that create a branched line tie-in point along the pipeline. By adding in-line tees along the pipeline, an operator can plan for future tie-in points for further manifolds.

The ILTs and the dual ILT may include a skid with necessary valves, lifting and support structures, mud mats and piping components. This facilitates simple installation into the line during launching and pipe-lay operations. The ILTs and the dual ILT may include standard ROV-interface panels.

The dual ILT includes two branched line tie-in points and a full bore cut-off valve at the junction between the first pipeline and the second pipeline as defined in this specification.

The dual ILT may include at least two ports (in addition to the connections with the first and second pipeline) and three valves.

The first valve controlling a flow in the first branch pipe may be located in a first ILT, and the second valve controlling a flow in the second branch pipe may be located in a second ILT.

The hydrocarbon conveying pipeline layout may include a first and a second manifold. The first branch pipe of the first manifold may then be branched off from a dual ILT, connecting the first manifold to the first pipeline, and the second branch pipe of the first manifold may be is branched off from the dual ILT, connecting the first manifold to the second pipeline. The first branch pipe of the second manifold is then branched off from a first ILT, connecting the second manifold to the first pipeline. The second branch pipe of the second manifold may be branched off from a second ILT, connecting the second manifold to the second pipeline.

The hydrocarbon conveying pipeline layout may include a plurality of manifolds. Each additional manifold beyond two may be branched off from the two pipelines with two additional ILTs for each additional manifold.

The diameters in the pipelines may be larger than the diameters in the bores of the manifolds and in the branch pipes, i.e. the first diameter may be larger than the second diameter.

Short description of the drawings:

Fig. 1 is a schematic representation of a pipeline configuration of the present invention;

Fig. 2 is a schematic representation of a pipeline configuration of the prior art;

Fig . 3 is a schematic representation of a portion of the pipeline configuration of the invention as shown in fig. 1; and

Fig. 4 is a detail of the Dual In-Line Tee of fig. 1

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Detailed description of an embodiment of the invention with reference to the drawings:

Fig. 1 is a schematic representation of a pipeline configuration of the present invention. A first pipeline 1 from a remote location is interrupted by a first In-line Tee (ILT) 6 and terminates in a connecting arrangement with a cut off valve shown as a dual In-line Tee (ILT) 5. A second pipeline 2 from the remote location is interrupted by a second In-line Tee (ILT) 7 and terminates in the dual In-line Tee (ILT) 5. The dual ILT include two ports for connection to the branch pipes. The first and second pipeline are permanently welded to the Dual ILT.

Four jumpers connect a first manifold 3 with four wells 8 through wellheads. A flow path is provided by a branch pipe 18 between the first ILT 6 and the first manifold 3, and by a branch pipe 19 between the second ILT 7 and the manifold 3.

Four further jumpers connect a second manifold 4 with four further wells 9 through wellheads. Two individual flow paths are provided by two branch pipes 16, 17 between the dual ILT 5 and the second manifold 4.

The dual ILT 5 is a full bore ILT allowing a pig to pass from the first pipeline 1 to the second pipeline 2 when a cut-off valve in the dual ILT is open. The first ILT 6 and the second ILT 7 are also full bore ILTs allowing a pig to pass.

Accordingly, a pig can be circulated through the pipeline 1, past the first ILT 6 further through the first pipeline 1, through the dual ILT 5 into the second pipeline 2, through the second ILT 7 and further through the second pipeline 2. The first and the second ILTs 6, 7 also include cut-off valves to cut the flow of fluids between the pipelines 1, 2 and the branch pipes 18, 19 while maintaining the flow through the pipelines.

The pig will not be circulated through any of the manifolds, and each manifold will only handle fluids from the wells that specific manifold is connected to.

During normal operation (not pigging), the valve connecting the first pipeline 1 and the second pipeline 2 in the dual ILT is closed, isolating first pipeline 1 from the second pipeline 2.

Fig. 1 shows two manifolds 3, 4, each connected to four wells. Clearly, the number of wells connected to each manifold can depart from four. Similarly can also the pipeline configuration be used with only one or more than two manifolds.

Fig. 2 is a schematic representation of a pipeline configuration of the prior art. In this configuration, the first pipeline 1 and the second pipeline 2 are connected to their respective first pipeline end terminations 10 (PLET) and then to two bores in a first manifold 3. Four jumpers connect the first manifold 3 with four wells 8 through wellheads.

Four further jumpers connect a second manifold 4 with four further wells 9 through wellheads. Two individual flow paths are provided between the first manifold 3 and the second manifold 4 through second pipeline end terminations (PLET) 11.

A loop 12 across the two bores of the second manifold 4 allows a pig to pass between a first and a second bore in the second manifold 4. The second manifold 4 or the bypass pipeline 12 includes one or several valves to isolate the first and second bore in the second manifold 4 during normal operation.

The flow of fluids from the second manifold 4 flows through the first manifold 3 before the fluids are brought further. Accordingly, the first manifold 3 handles fluids from both of the manifolds 3,4. The pigable configuration in fig. 2 require headers and header valves with the same inner diameter as the flowlines.

Fig . 3 is a schematic representation of a portion of the pipeline configuration of the invention, including a manifold 3, ILTs 6, 7 and wells 8. Cut off valves 13 and two main bores 14, 15 in the manifold 3 enables the manifold 3 to selectively connect any of the two bores 14, 15 with any of the wells 8. The cut off valves 13 in the ILTs 6, 7 allow the manifold 3 to be isolated from any of the two pipelines 1, 2. A first branch pipe 18 conveys well fluid form the manifold 3 and to the first ILT 6, and a second branch pipe 19 conveys well fluid form the manifold 3 and to the second ILT 7.

Fig. 4 is a schematic representation of the Dual In-line Tee (Dual ILT) 5 shown in fig. 1. The Dual ILT connects the ends of the first pipeline 1 and the second pipeline 2. The Dual ILT 5 is a full bore ILT with a cut off valve 20 selectively opening or closing the bore connecting the pipelines 1 and 2. A first branch valve 21 selectively connects the first branch pipe 16 to the first pipeline 1, and a second branch valve 22 selectively connects the second branch pipe 17 to the second pipeline 2. The bores and the valves 21, 22 for the first and second branch pipes 16, 17 in the Dual ILT may be of a smaller diameter than the diameter of the pipelines 1, 2.

In the above description, the well fluid has been considered to flow from the wells and into the pipelines. In some cases, however manifolds and pipelines are used for injecting fluids into the wells, and the present invention does not exclude such injection of fluids.

CLAIMS

1. A hydrocarbon production field layout comprising;

a first pipeline (1) with a first inner diameter;

a second pipeline (2) with the first inner diameter;

a cut off valve (20) with an inner bore with the first diameter, arranged in a connecting arrangement between an end of the first pipeline (1) and an end of the second pipeline (2);

at least one manifold (3), in fluid connection with at least one hydrocarbon well (8, 9);

a first branch pipe (16, 18) with a first valve (5, 6) branched off from the first pipeline (1) to the at least one manifold (3, 4); and

a second branch pipe (17, 19) with a second valve (5, 7) branched off from the second pipeline (2) to the at least one manifold (3, 4).

2. The hydrocarbon conveying pipeline layout, of claim 1, wherein the connecting arrangement comprising the cut off valve (20) is a dual ILT (5);

wherein the first valve (21) controlling a flow in the first branch pipe (16) is located in the dual ILT (5); and

wherein the second valve (22) controlling a flow in the second branch pipe (17) is located in the dual ILT (5).

3. The hydrocarbon conveying pipeline layout, of claim 1, wherein

the first valve controlling a flow in the first branch pipe (18) is located in a first ILT (6); and

wherein the second valve controlling a flow in the second branch pipe (19) is located in a second ILT (7).

4. The hydrocarbon conveying pipeline layout of one of the claims 1-3, including a first and a second manifold (3, 4);

wherein the first branch pipe (16) of the first manifold (4) is branched off from a dual ILT (5), connecting the first manifold (4) to the first pipeline (1);

wherein the second branch pipe (17) of the first manifold (4) is branched off from the dual ILT (5), connecting the first manifold (4) to the second pipeline (2);

wherein the first branch pipe (18) of the second manifold (3) is branched off from a first ILT (6), connecting the second manifold (3) to the first pipeline (1); and

wherein the second branch pipe (19) of the second manifold (3) is branched off from a second ILT (7), connecting the second manifold (3) to the second pipeline (2).

5. The hydrocarbon conveying pipeline layout of one of the claims 1-4, including a plurality of manifolds, wherein each additional manifold beyond two is branched off from the two pipelines (1, 2) with two additional ILTs.

6. The hydrocarbon conveying pipeline layout of one of the claims 1-5, wherein the first diameter is larger than the second diameter.

7. The hydrocarbon conveying pipeline layout of one of the claims 1-6, wherein each well includes a Xmas tree and a wellhead.

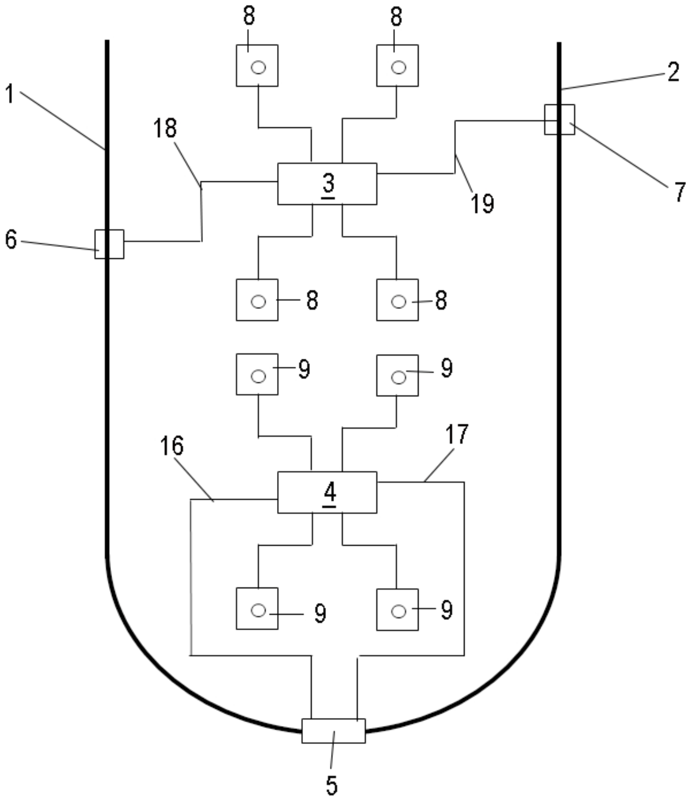

Fig. 1

Prior art

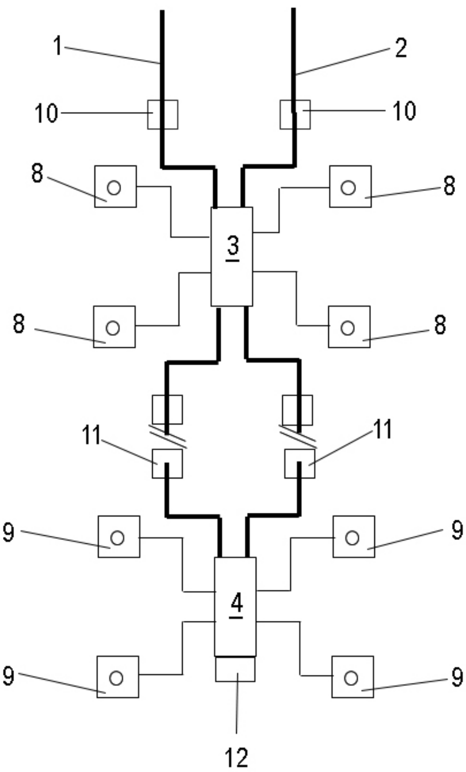

Fig. 2

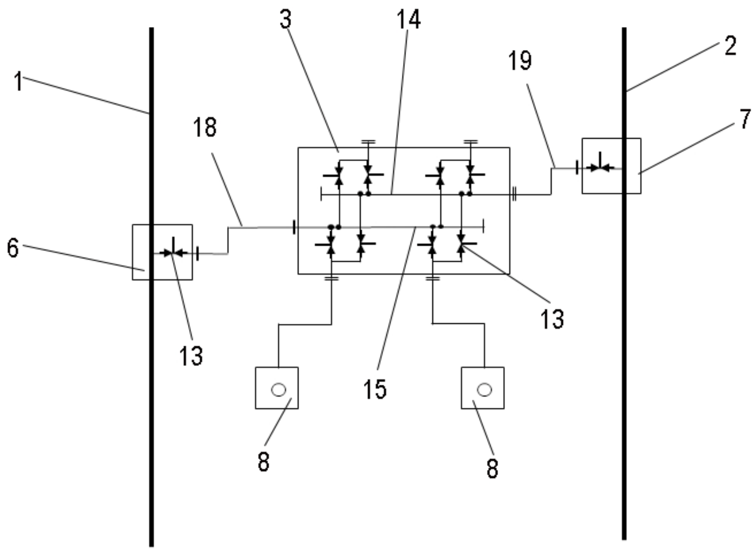

Fig. 3

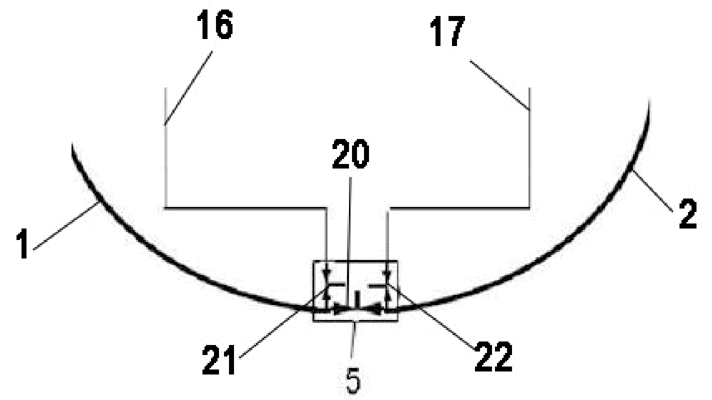

Fig. 4