

1 Claims

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- 3 1. An apparatus for introducing a fluid into a subsea production flow system, the
4 apparatus comprising:
5 a first flow path through the apparatus for fluidly coupling a subsea well to a subsea
6 production flow system;
7 an inlet for receiving the introduced fluid;
8 a second flow path fluidly connecting the inlet and the subsea production flow
9 system;
10 a valve operable to control the flow of the introduced fluid through the inlet to the
11 subsea production flow system; and
12 at least one flow barrier in the first flow path, preventing the passage of the
13 introduced fluid from the inlet to the subsea well.
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- 15 2. The apparatus according to claim 1, wherein the apparatus is connected to the flow
16 system directly.
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- 18 3. The apparatus according to claim 1, wherein the apparatus is connected to one or
19 more flow access apparatus located on the flow system.
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- 21 4. The apparatus according to any of claims 1 to 3, wherein the apparatus is configured
22 to be connected to an external flowline connector of the flow system or a manifold
23 thereof, at a location selected from the group consisting of: a jumper flow line
24 connector; upstream of a jumper flow line or a section of a jumper flow line;
25 downstream of a jumper flow line or a section of a jumper flow line; a Christmas tree;
26 a subsea collection manifold system; subsea Pipe Line End Manifold (PLEM); a
27 subsea Pipe Line End Termination (PLET); a subsea Flow Line End Termination
28 (FLET); and a subsea in-line tee (ILT).
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- 30 5. The apparatus according to any of claims 1 to 3, wherein the apparatus is configured
31 to be connected to a production riser, such that it is in fluid communication with the
32 production riser.
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- 1 6. The apparatus according to any preceding claim, wherein the second flow path
2 connects the inlet to the subsea production flow system via at least a part of the first
3 flow path.
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- 5 7. The apparatus according to any preceding claim, wherein the at least one flow
6 barrier is a flow barrier selected from the group comprising: a check valve, a flow
7 restrictor, a choke valve and an adjustable choke valve.
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- 9 8. The apparatus according to any preceding claim, wherein the apparatus comprises
10 at least one sensor which is operable to detect a condition indicative of a first
11 treatment chemical in the apparatus.
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- 13 9. The apparatus according to claim 8, wherein the at least one flow barrier is disposed
14 between the inlet and the at least one sensor.
15
- 16 10. The apparatus according to claim 8 or claim 9, wherein the at least one sensor is
17 operable to transmit a signal to a control module and wherein the valve is operable
18 to control the flow of a second treatment chemical through the inlet to the subsea
19 production flow system in response to a control signal from the control module.
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- 21 11. The apparatus according to any preceding claim, wherein the first and/or second
22 flow path comprises additional instrumentation for monitoring fluid and/or flow
23 properties such as pressure, temperature, flow rate and fluid composition.
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- 25 12. The apparatus according to claim 11, wherein the instrumentation within the first
26 and/or second flow paths is operable to feedback to a control module, and wherein
27 properties of the flow operation are operable to be adjusted based on said feedback.
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- 29 13. A method of introducing a fluid to a subsea production flow system, the method
30 comprising:
31 providing an apparatus fluidly connected to a subsea well and a subsea production
32 flow system, the apparatus comprising an inlet for receiving the introduced fluid and
33 at least one flow barrier preventing passage of the introduced fluid from the inlet to
34 the subsea well;
35 flowing a production fluid from the subsea well into the apparatus;

1 controlling flow of the introduced fluid into the apparatus, through the inlet and in to
2 the subsea production flow system; and
3 flowing the production fluid and introduced fluid to the subsea production flow
4 system.

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6 14. The method according to claim 13, comprising preventing or reducing flow of a first
7 treatment chemical into the subsea production flow system.

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9 15. The method according to claim 14, comprising detecting in the production fluid a
10 condition indicative of a first treatment chemical by using at least one sensor in the
11 apparatus.

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13 16. The method according to claim 14 or claim 15, wherein the introduced fluid is a
14 second treatment chemical and the method comprises controlling the flow of the
15 second treatment chemical into the apparatus for the purpose of dosing the
16 production fluid to counteract an effect of the first treatment chemical.

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18 17. The method according to claim 15 or 16, wherein the condition indicative of a first
19 treatment chemical is a pH outside of a desired pH range, and wherein the second
20 treatment chemical is a base substance, and/or an alkaline or caustic chemical
21 selected to bring the pH of the production fluid to into a desired range.

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23 18. The method according to any of claims 15 to 17, comprising transmitting a signal
24 from the at least one sensor to a control module.

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26 19. The method according to claim 18, comprising controlling the valve to control the
27 flow of the second treatment chemical through the inlet to the subsea production flow
28 system in response to a control signal from the control module.

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30 20. The method according to claim 13, comprising injecting a gas into the subsea
31 production flow system.

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33 21. The method according to claim 20, wherein the introduced fluid is gas, and wherein
34 the method comprises controlling flow of the gas into the apparatus, through the inlet
35 and into the subsea production flow system.

- 1 22. A system for introducing a fluid to a subsea production flow system, the system
2 comprising:
3 a subsea well;
4 a subsea production flow system;
5 an apparatus fluidly coupling the subsea well to the subsea production flow system
6 via a first flow path, wherein the apparatus further comprises an inlet for receiving
7 the introduced fluid and a second flow path between the inlet and the subsea
8 production flow system;
9 wherein the apparatus further comprises a valve operable to control the flow of the
10 introduced fluid through the inlet to the subsea production flow system; and
11 wherein the apparatus further comprises at least one flow barrier in the first flow
12 path, preventing the passage of the introduced fluid from the inlet to the subsea well.
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- 14 23. The system according to claim 22, wherein the apparatus is connected to a flow
15 access apparatus.
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- 17 24. The system according to claim 23, wherein the flow access apparatus is connected
18 to a jumper flowline connector in the jumper flowline envelope of a subsea tree and a
19 jumper flowline of the production flow system.
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- 21 25. The system according to claim 22, wherein the apparatus is fluidly connected to a
22 production riser.
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