

Claims

1. A test system for a multiplexed Blow Out Preventer (BOP) control system (6), wherein said multiplexed BOP control system (6) comprises a first and a second redundant central control unit (10, 20) with respective first and second operator consoles (30, 31), and further comprises first and second redundant BOP control pods arranged for being connected to BOP valves and BOP sensors of a subsea BOP stack, wherein said central control units (10, 20) are arranged for being connected via a first signal transmission system (40) to respective said first and second redundant subsea control systems (11, 21) arranged for being connected to BOP valves (50) and BOP sensors (55) in a subsea BOP (1), and said test system comprises a control system signal simulator (42) arranged for being connected between one or more of said control units (10, 20) and one or more of said subsea control systems (11, 21), and further arranged for ~~entirely or partly~~ replacing said first signal transmission system (40) and providing simulated signals (41) calculated on basis of a model of said BOP sensors between one or more of said control units (10, 20) and one or more of said subsea control systems (11, 21), said test system further comprising a BOP valves and sensor simulator (52) arranged for being connected to one or more of said subsea control systems (11, 21) and further arranged for ~~entirely or partly~~ replacing said BOP valves (50) and/or BOP sensors (55) and providing simulated sensor signals (51) to said subsea control systems (11, 21).
2. The test system of claim 1, further comprising that said simulated signals are modified signals or nil signals simulating a broken connection.
3. The test system of claim 1, wherein said BOP valves and sensor simulator (52) is further arranged for receiving BOP control signals (53) from said subsea control systems (11, 21).

43. The test system of claim 1, further comprising that said simulated sensor signals ~~(51)~~ are modified signals, or signals calculated on basis of a model of said BOP ~~(1)~~, or nil signals simulating a broken connection.

5 | 54. The test system of claim 1, arranged for testing one or more of the following;

- redundancy handling for said first and second redundant central control units ~~(10, 20)~~,
- power loss and restart capability of said first and second redundant subsea control systems ~~(11, 21)~~,
- testing of Emergency Disconnect Sequence,
- testing of acoustic electro-hydraulic functions of said first and second redundant subsea control systems ~~(11, 21)~~,
- testing of Programmable Logic Controller (PLC) control of a Field Replaceable Unit (FRU), a Hydraulic Power Unit (HPU) and diverter,
- testing for network storm due to component failures,
- testing protocols for Input/Output (I/O), network, and operator consoles.

20 | 65. The test system of claim 1, wherein said multiplexed BOP control system ~~(6)~~ further comprises a third redundant central control unit ~~(100)~~ arranged for being connected via said first signal transmission system ~~(40)~~ to a third redundant subsea control system ~~(110)~~ arranged for being connected to said BOP valves ~~(50)~~ and said BOP sensors ~~(55)~~, and wherein said control system signal simulator ~~(42)~~ is arranged for being connected between one or more of

25 | said control units ~~(10, 20, 100)~~ and one or more of said subsea control systems ~~(11, 21, 110)~~, and further arranged for ~~entirely or partly~~ replacing said first signal transmission system ~~(40)~~ and providing simulated signals ~~(41)~~ between one or more of said control units ~~(10, 20, 100)~~ and one or more of said subsea control systems ~~(11, 21, 110)~~.

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76. A method for testing a multiplexed BOP control system ~~(6)~~ wherein said multiplexed BOP control system ~~(6)~~ comprises;

- a first and a second redundant central control unit ~~(10, 20)~~ with respective first and second operator consoles ~~(30, 31)~~, and further comprises first and second redundant BOP control pods arranged for being connected to BOP valves and BOP sensors of a subsea BOP stack, wherein said central control units ~~(10, 20)~~ are connected via a first signal transmission system ~~(42)~~ to respective said first and second redundant subsea control systems ~~(11, 21)~~ connected to BOP valves (50) and BOP sensors (55) in a subsea BOP (1),

said method comprising;

- ~~entirely or partly replacing said first signal transmission system (40) with a control system signal simulator (42) by connecting said control system signal simulator (42) between one or more of said control units (10, 20) and one or more of said subsea control systems (11, 21),~~

- providing simulated signals ~~(41)~~ calculated on a basis of a model of said BOP sensors, to one or more of said control units ~~(10, 20)~~ and one or more of said subsea control systems ~~(11, 21)~~ from said control system signal simulator ~~(42)~~, and

- connecting a BOP valves and sensor simulator ~~(52)~~ to one or more of said subsea control systems ~~(11, 21)~~ and providing simulated sensor signals ~~(51)~~ to said subsea control systems ~~(11, 21)~~ from said BOP simulator ~~(52)~~.

87. The method according to claim 79, comprising the following step;

- receiving BOP control signals ~~(53)~~ from said subsea control systems ~~(11, 21)~~ in said BOP simulator ~~(52)~~.