CLAIMS

WHAT IS CLAIMED:

1. A system located in a subsea environment, comprising:

a submersible pump positioned in a well,

a hydraulic motor that is operatively coupled to said submersible pump; and

a pressurized fluid supply pump that is positioned within said subsea environment, said pressurized fluid supply pump being in fluid communication with said hydraulic motor.

2. The system of claim 1, wherein said pressurized fluid supply pump is positioned in an open-loop pumping system.

3. The system of claim 1, wherein said pressurized fluid supply pump is one of a centrifugal pump or a positive displacement pump.

4. The system of claim 1, wherein said pressurized fluid supply pump is one of a multi-phase pump or a single phase pump.

5. The system of claim 1, wherein said hydraulic motor is adapted to be driven by said pressurized fluid and wherein said hydraulic motor is further adapted to drive said submersible pump.

6. The system of claim 1, wherein said pressurized fluid supply pump is positioned on a skid that is positioned on said sea floor.

7. The system of claim 1, wherein said pressurized fluid supply pump is positioned on or near a floor of said subsea environment.

8. The system of claim 1, wherein said pressurized fluid supply pump is of a size that it alone is adapted to increase a pressure of a hydrocarbon fluid such that the hydrocarbon fluid may flow from a floor of said subsea environment to a surface of said subsea environment.

9. A system located in a subsea environment, comprising:

a production tree positioned above a well, said production tree having a production outlet;

a submersible pump positioned in said well,

a hydraulic motor that is operatively coupled to said submersible pump;

a booster pump that is adapted to receive a hydrocarbon fluid from said production outlet; and

a pressurized fluid supply pump that is positioned on or near a floor of said subsea environment, said pressurized fluid supply pump being in fluid communication with said hydraulic motor.

10. The system of claim 9, wherein said hydraulic motor is adapted to be driven by said pressurized fluid and wherein said hydraulic motor is further adapted to drive said submersible pump.

11. The system of claim 9, wherein said booster pump is a multi-phase pump and said pressurized fluid supply pump is a single phase pump.

12. The system of claim 9, further comprising a separator that is adapted to receive a pressurized fluid from an outlet of said booster pump, and wherein a fluid outlet of said separator is in fluid communication with said pressurized fluid supply pump.

13. The system of claim 9, wherein said booster pump is of a size that it alone is adapted to increase a pressure of a hydrocarbon fluid such that the hydrocarbon fluid may flow from a floor of said subsea environment to a surface of said subsea environment.

14. A system located in a subsea environment, comprising:

a production tree positioned above a well, said production tree having a production outlet;

a submersible pump positioned in said well;

a hydraulic motor that is operatively coupled to said submersible pump;

a booster pump that is positioned on or near a floor of said subsea environment and adapted to receive a hydrocarbon fluid from said production outlet; and

a separator that is adapted to receive a pressurized hydrocarbon fluid from an outlet of said booster pump and wherein said separator comprises a fluid outlet that is in fluid communication with said hydraulic motor.

15. The system of claim 14, wherein said hydraulic motor is adapted to be driven by said pressurized fluid and wherein said hydraulic motor is further adapted to drive said submersible pump.

16. The system of claim 14, wherein said booster pump is a multi-phase pump.

17. The system of claim 14, wherein said booster pump is of a size that it alone is adapted to increase a pressure of a hydrocarbon fluid such that the hydrocarbon fluid may flow from a floor of said subsea environment to a surface of said subsea environment.

18. A system located in a subsea environment, comprising:

a production tree positioned above a well, said production tree having a production outlet;

a submersible pump positioned in said well,

a hydraulic motor that is operatively coupled to said submersible pump;

a booster pump that is positioned on or near a floor of said subsea environment and adapted to receive a hydrocarbon fluid from said production outlet; and

a valve that is in fluid communication with an outlet of said booster pump and adapted to receive a pressurized hydrocarbon fluid from said outlet of said booster pump and direct a portion of said pressurized hydrocarbon fluid to said hydraulic motor.

19. The system of claim 18, wherein said hydraulic motor is adapted to be driven by said pressurized fluid and wherein said hydraulic motor is further adapted to drive said submersible pump.

20. The system of claim 18, wherein said booster pump is a multi-phase pump.

21. The system of claim 18, wherein said booster pump is of a size that it alone is adapted to increase a pressure of a hydrocarbon fluid such that the hydrocarbon fluid may flow from a floor of said subsea environment to a surface of said subsea environment.

22. A system located in a subsea environment, comprising:

a production tree positioned above a well, said production tree having a production outlet;

a submersible pump positioned in said well,

a hydraulic motor that is operatively coupled to said submersible pump;

a booster pump that is adapted to receive a hydrocarbon fluid from said production outlet;

a pressurized fluid supply pump that is positioned on or near a floor of said subsea environment, said pressurized fluid supply pump being in fluid communication with said hydraulic motor; and

a turbine comprising a shaft that is operatively coupled to said pressurized fluid pump, said turbine being in fluid communication with an outlet of said booster pump and adapted to receive a pressurized hydrocarbon fluid from said outlet of said booster pump, wherein said shaft is adapted to be rotated by said pressurized hydrocarbon fluid, and wherein said shaft is further adapted to drive said pressurized fluid pump via rotation of said shaft.

23. The system of claim 22, wherein a fluid output from said pressurized fluid pump is adapted to drive said hydraulic motor, said hydraulic motor being adapted to drive said submersible pump.

24. The system of claim 22, wherein said booster pump is a multi-phase pump.

25. The system of claim 22, wherein said booster pump is of a size that it alone is adapted to increase a pressure of a hydrocarbon fluid such that the hydrocarbon fluid may flow from a floor of said subsea environment to a surface of said subsea environment.

26. A system located in a subsea environment, comprising:

a production tree positioned above a well, said production tree having a production outlet;

a submersible pump positioned in said well,

a hydraulic motor that is operatively coupled to said submersible pump;

a booster pump that is adapted to receive a hydrocarbon fluid from said production outlet;

a closed-loop system, comprising:

a pressurized fluid supply pump that is positioned on or near a floor of said subsea environment, said pressurized fluid supply pump being in fluid communication with an inlet of said hydraulic motor; and

a fluid reservoir that is in fluid communication with an outlet of said hydraulic motor and an intake of said pressurized fluid supply pump; and

a turbine comprising a shaft that is operatively coupled to said pressurized fluid pump, said turbine being in fluid communication with an outlet of said booster pump and adapted to receive a pressurized hydrocarbon fluid from said outlet of said booster pump, wherein said shaft is adapted to be rotated by said pressurized hydrocarbon fluid, and wherein said shaft is further adapted to drive said pressurized fluid pump via rotation of said shaft.

Claims

1. A system (10A, 10B) located in a subsea environment, comprising:

a production tree (20) positioned above a well (11), said production tree (20) having a production outlet (20A);

a submersible pump (30) positioned in said well (11), and

a hydraulic motor (30HM) that is operatively coupled to said submersible pump (30),

characterised in that the system further comprises:

a booster pump (102) that is positioned on or near a floor of said subsea environment and adapted to receive a hydrocarbon fluid (82) from said production outlet; and

a separator (106) that is adapted to receive a pressurized hydrocarbon fluid (82) from an outlet of said booster pump (102) and wherein said separator (106) comprises a fluid outlet that is in fluid communication with said hydraulic motor (30HM).

2. The system of claim 1, wherein said hydraulic motor (30HM) is adapted to be driven by said pressurized hydrocarbon fluid (82) and wherein said hydraulic motor (30HM) is further adapted to drive said submersible pump (30).

3. The system of claim 2, further comprising a choke that is positioned between said separator (106) and said submersible pump (30), wherein said choke is adapted to regulate one of a flow and a pressure of said portion of said pressurized hydrocarbon fluid (82) directed to said hydraulic motor (30HM) by said separator (106).

4. The system of claims 1 to 3, further comprising a pressurized fluid supply pump (104) that is positioned within said subsea environment, wherein said pressurized fluid

supply pump (104) is in fluid communication with an outlet of said separator (106) and with said hydraulic motor (30HM).

5. The system of claim 4, wherein said booster pump (102) is a multi-phase pump and said pressurized fluid supply pump (104) is a single phase pump.

6. A system (10C) located in a subsea environment, comprising:

a production tree (20) positioned above a well (11), said production tree (20) having a production outlet (20A);

a submersible pump (30) positioned in said well (11), and

a hydraulic motor (30HM) that is operatively coupled to said submersible pump (30), characterised in that the system further comprises:

a booster pump (102) that is positioned on or near a floor of said subsea environment and adapted to receive a hydrocarbon fluid (82) from said production outlet; and

a valve (112) that is in fluid communication with an outlet of said booster pump (102) and adapted to receive a pressurized hydrocarbon fluid (82) from said outlet of said booster pump (102) and direct a portion of said pressurized hydrocarbon fluid (82) to said hydraulic motor (30HM).

7. The system of claim 6, wherein said hydraulic motor (30HM) is adapted to be driven by said pressurized hydrocarbon fluid (82) and wherein said hydraulic motor (30HM) is further adapted to drive said submersible pump (30).

8. The system of claim 7, further comprising a choke that is positioned between said valve (112) and said submersible pump (30), wherein said choke is adapted to regulate one of a flow and a pressure of said portion of said pressurized hydrocarbon fluid (82) directed to said hydraulic motor (30HM) by said valve (112).

9. A system (10D, 10E) located in a subsea environment, comprising:

a production tree (20) positioned above a well (11), said production tree (20) having a production outlet (20A);

a submersible pump (30) positioned in said well (11);

a hydraulic motor (30HM) that is operatively coupled to said submersible pump (30), and

a pressurized fluid supply pump (118) that is positioned on or near a floor of said subsea environment, said pressurized fluid supply pump (118) being in fluid communication with said hydraulic motor (30HM);

characterised in that the system further comprises:

a booster pump (102) that is adapted to receive a hydrocarbon fluid (82) from said production outlet (20A); and

a turbine (116) comprising a shaft (116S) that is operatively coupled to said pressurized fluid supply pump (118), said turbine (116) being in fluid communication with an outlet of said booster pump (102) and adapted to receive a pressurized hydrocarbon fluid (82) from said outlet of said booster pump (102), wherein said shaft (116S) is adapted to be rotated by said pressurized hydrocarbon fluid (82), and wherein said shaft (116S) is further adapted to drive said pressurized fluid supply pump (118) via rotation of said shaft (116S).

10. The system of claim 9, wherein said pressurized fluid supply pump (118) comprises a closed-loop pumping system (130), said closed-loop pumping system (130) further comprising a fluid reservoir (134) that is in fluid communication with an outlet of said hydraulic motor (30HM) and an intake of said pressurized fluid supply pump (118)

11. The system of claim 9, wherein a fluid output (70) from said pressurized fluid pump (118) is adapted to drive said hydraulic motor (30HM), said hydraulic motor (30HM) being adapted to drive said submersible pump (30).

12. The system of any of claims 1, 6 or 9, wherein said booster pump (102) is a multi-phase pump.

13. The system of claim 1, 6 or 9, wherein said booster pump (102) is of a size that it alone is adapted to increase a pressure of a hydrocarbon fluid (82) such that the hydrocarbon fluid (82) may flow from a floor of said subsea environment to a surface of said subsea environment.

14. The system of claim 4 or claim 9, wherein said pressurized fluid supply pump (106, 118) is positioned in an open-loop pumping system.

15. The system of claim 4 or claim 9,

wherein said pressurized fluid supply pump (106, 118) is one of a centrifugal pump or a positive displacement pump; and/or

wherein said pressurized fluid supply pump (106, 118) is a single phase pump.