

WHAT IS CLAIMED IS:

1. A subsea wellhead assembly having a completion landing string inside a drilling riser and comprising:

a power source for generating an alternating electrical current;

a connector for connecting the power source to a receptacle in the subsea well assembly;

a first inductor electrically connected to the power source through the connector;

a subsea control module delivering power and control signals to the subsea well assembly; and

a second inductor spaced from the first inductor, and located in the subsea control module, the second inductor positioned so that an EMF is produced on the second inductor when the alternating electrical current is passed through the first inductor to thereby generate an alternating current signal on the second inductor.

2. A well head assembly of Claim 1, wherein the subsea control module further includes:

a power pack having the inductor disposed therein, the power pack adapted to receive the alternating current signal from the second inductor and to convert part of the alternating current signal generated thereon into a direct current signal; and

a subsea electronics module, powered by the power pack and receiving the direct current signal, the subsea electronics module monitoring various measurements in the well head assembly, including temperatures and pressures of various hydraulic lines and actuating directional control valves to control a flow of hydraulic fluid to functions on the well head assembly and/or landing string.

3. A well-head assembly of Claim 2, wherein the subsea control module further includes:
a fluid reservoir, connected to the directional control valves and a pump, the pump being driven by the electrical supply and supplying hydraulic fluid to the well head assembly or landing string from the fluid reservoir..
4. A well-head assembly of Claim 3, wherein the subsea electronics module controls the pump to supply hydraulic fluid to the well-head assembly and/or landing string.
5. A well head assembly of Claim 4, wherein the well head assembly further comprises a emergency reservoir of hydraulic fluid, the emergency reservoir including a valve that is opened when pressure readings by the subsea electronics module indicate pressure has dropped in at least one of the hydraulic lines.
6. A well-head assembly of Claim 5, wherein a choke and kill line pressure is used to activate the emergency reservoir.
7. A well-head assembly of Claim 1, wherein a surface control signal is modulated onto the current supplied to the first inductor and the power pack demodulates the alternating current signal produced on the second inductor to supply the subsea electronics module with the surface control signal.
8. A well-head assembly of Claim 1, further comprising:

an adapter disposed on the well-head, around a tubing hanger, the adapter including a tubing hanger orientation pin,

wherein the receptacle is located in the adapter, and is aligned to the tubing hanger orientation pin to align the receptacle for the first inductor with the second inductor mounted on the tubing hanger running tool.

9. A subsea well-head assembly having a completion landing string inside a drilling riser and comprising:

a power source for generating an alternating electrical current;

a connector for connecting the power source to a receptacle in the subsea well assembly;

a first inductor electrically connected to the power source through the connector;

a subsea control module delivering power to the underground well assembly; and

a second inductor spaced from the first inductor, and located in the subsea control module, the second inductor positioned so that an EMF is produced on the second inductor when the alternating electrical current is passed through the first inductor to thereby generate an alternating current signal on the second inductor..

10. A well head assembly of Claim 9, wherein the subsea control module further includes:

a power pack having the inductor disposed therein, the power pack adapted to receive the alternating current signal from the second inductor and to convert alternating current signal generated thereon into a direct current signal; and

a subsea electronics module, powered by the power pack and receiving the direct current signal, the subsea electronics module monitoring various measurements in the well head

assembly, including temperatures and pressures of various hydraulic lines and actuating directional control valves to control a flow of hydraulic fluid through the lines and valves of the well head assembly.

11. A well-head assembly of Claim 10, wherein the subsea control module further includes:
a fluid reservoir, connected to the directional control valves and a pump it being driven by the electrical supply and supplying hydraulic fluid to the well head assembly and/or landing string from the fluid reservoir.

12. A well-head assembly of Claim 11, wherein the subsea electronics module controls the pump to supply hydraulic fluid to the well-head assembly and/or landing string.

13. A well head assembly of Claim 12, wherein the well head assembly further comprises a emergency reservoir of hydraulic fluid, the emergency reservoir including a valve that is open when pressure readings by the subsea electronics module indicate pressure has dropped in at least one of the hydraulic lines.

14. A well-head assembly of Claim 13, wherein a choke and kill line pressure is used to activate the emergency reservoir, and the emergency reservoir is activated.

15. A well-head assembly of Claim 9, further comprising:
an adapter disposed on the well-head, around a tubing hanger, the adapter including a tubing hanger orientation pin,

wherein the receptacle is located in the adapter, and is aligned to the tubing hanger orientation pin to align the receptacle for the first inductor with the second inductor mounted on the tubing hanger running tool.

16. A well-head assembly of Claim 10 wherein the power source is an umbilical connected to a control station on a well platform, the umbilical providing power and control signals to the subsea control module.

17. A well-head assembly of Claim 16, wherein the control signals are communicated to the subsea control module by modulating the control signal on an alternating current signal supplied to the inductor.

18. A well head assembly of Claim 17, wherein an ROV modulates the control signal onto the current supplied to the first inductor and the power pack demodulates the alternating current signal produced on the second inductor to supply the subsea electronics module with the control signal.

CLAIMS

What is claimed is:

1. A subsea wellhead assembly having a completion landing string inside a drilling riser and comprising:

a power source for generating an alternating electrical current;

a connector for connecting the power source to a receptacle in the subsea wellhead assembly;

a first inductor electrically connected to the power source through the connector;

a subsea control module delivering power and control signals to the subsea well assembly;

a second inductor spaced from the first inductor, and located in the subsea control module, the second inductor positioned so that an electromotive force (EMF) is produced on the second inductor when the alternating electrical current is passed through the first inductor to thereby generate an alternating current signal on the second inductor;

a power pack having the second inductor disposed therein, the power pack adapted to receive the alternating current signal from the second inductor and to convert part of the alternating current signal generated thereon into a direct current signal; and

a subsea electronics module, powered by the power pack and receiving the direct current signal, the subsea electronics module monitoring various measurements in the well head assembly, including temperatures and pressures of various hydraulic lines and actuating directional control valves to control a flow of hydraulic fluid to functions on the well head assembly and/or landing string.

2. A well-head assembly of claim 1, wherein the subsea control module further includes:

a fluid reservoir, connected to the directional control valves and a pump, the pump being driven by the electrical supply and supplying hydraulic fluid to the well head assembly or landing string from the fluid reservoir.

3. A well-head assembly of claim 2, wherein the subsea electronics module controls the pump to supply hydraulic fluid to the well-head assembly and/or landing string.

4. A well head assembly of claim 3, wherein the well head assembly further comprises a emergency reservoir of hydraulic fluid, the emergency reservoir including a valve that is

opened when pressure readings by the subsea electronics module indicate pressure has dropped in at least one of the hydraulic lines.

5. A well head assembly of claim 4, wherein a choke and kill line pressure is used to activate the emergency reservoir.

6. A subsea wellhead assembly having a completion landing string inside a drilling riser and comprising:

a power source for generating an alternating electrical current:

connector for connecting the power source to a receptacle in the subsea wellhead assembly:

a first inductor electricity connected to the power source through the connector;

subsea control module delivering power and control signals to the subsea well-head assembly; and

a power pack comprising a second inductor, the second inductor spaced from the first inductor and located in the subsea control module, the second inductor positioned so that an electromotive force (EMF) is produced on the second inductor when the alternating electrical current is passed through the first inductor to thereby generate an alternating current signal on the second inductor, the power pack adapted to receive the alternating current signal from the second inductor;

wherein the subsea well-head assembly is configured so that when a surface control signal is modulated onto the current supplied to the first inductor, the power pack demodulates the alternating current signal produced on the second inductor to supply a subsea electronics module with the surface control signal.

7. A well-head assembly of claim 6, further comprising:

an adapter disposed on the well-head, around a tubing hanger, the adapter including a tubing hanger orientation pin,

wherein the receptacle is located, in the adapter, and is aligned to the tubing hanger orientation pin to align the receptacle for the first inductor with the second inductor mounted on a tubing hanger running tool.

8. A subsea well-head assembly having, a completion landing string inside a drilling riser and comprising:

a power source for generating an alternating electrical current;

a connector for connecting the power source to a receptacle in the subsea well assembly;

a first inductor electrically connected to the power source through the connector;

a subsea control module delivering power to the subsea well assembly; and

a power pack composing a second inductor, the second inductor spaced from the first inductor, and located in the subsea control module, the second inductor positioned so that an electromotive (EMF) is produced on the second inductor. When the alternating electrical current is passed through the first inductor to thereby generate an alternating current signal on the second inductor, the power pack adapted to receive the alternating current signal from the second inductor;

wherein the subsea well-head assembly is configured so that when a surface control signal is modulated onto alternating electrical current supplied to the first inductor, the power pack demodulates the alternating current signal produced on the second inductor to supply a subsea electronics module powered by the power pack with the surface control signal.

9. A well-head assembly of claim 8, further comprising;

an adapter disposed on the well-head, around a tubing, hanger, the adapter including a tubing hanger orientation pin,

wherein the receptacle is located in the adapter, and is aligned to the tubing hanger orientation pin to align the receptacle for the first inductor with the second inductor mounted on a tubing hanger running tool.

10. A subsea well-head assembly having a completion landing string inside a drilling riser and comprising:

power source for generating an alternating electrical current:

a connector for connecting the power source to a receptacle in the subsea well-head assembly:

a first inductor electrically connected to the power source through the connector:

a subsea control module delivering power to an underground well assembly:

a power pack having a second inductor disposed therein, the second inductor spaced from the first inductor and located in the subsea control module, the second inductor positioned so that an electromotive force (EMF) is produced on the second inductor when the alternating electrical current is passed through the first inductor to thereby generate an

alternating current signal on the second inductor, the power pack adapted to receive the alternating current signal from the second inductor and to convert alternating current signal generated thereon into a direct current signal; and

a subsea electronics module, powered by the power pack and receiving the direct current signal, the subsea electronics module monitoring various measurements in the well head assembly, including temperatures and pressures of various hydraulic lines and actuating directional control valves to control a flow of hydraulic fluid through the lines and valves of the well head assembly.

11. A well-head assembly of claim 10, wherein the subsea control module further includes:

a fluid reservoir, connected to the directional control valves and a pump it being driven by the electrical supply and supplying hydraulic fluid to the well head assembly and/or landing string from the fluid reservoir.

12. A well-head assembly of claim 11, wherein the subsea electronics module controls the pump to supply hydraulic fluid to the well-head assembly and/or landing string.

13. A well head assembly of claim 12, wherein the well head assembly further comprises a emergency reservoir of hydraulic fluid, the emergency reservoir including a valve that is open when pressure readings by the subsea electronics module indicate pressure has dropped in at least one of the hydraulic lines.

14. A well-head assembly of claim 13, wherein a choke and kill line pressure is used to activate the emergency reservoir, and the emergency reservoir is activated.

15. A well-head assembly of claim 10 wherein the power source is an umbilical connected to a control station on a well platform, the umbilical providing power and control signals to the subsea control module.

16. A well-head assembly of claim 15, wherein the control signals are communicated to the subsea control module by modulating the control signal on an alternating current signal supplied to the second inductor.

17. A well head assembly of claim 16, wherein an ROV modulates the control signal onto the current supplied to the first inductor and the power pack demodulates the alternating current signal produced on the second inductor to supply the subsea electronics module with the control signal.