What is claimed is:

1. A wellbore assembly, the wellbore assembly comprising:

an outer wellhead housing (100) having a sidewall (122) and an aperture (120) extending through the sidewall (122);

an inner wellhead housing (124) concentrically located within the outer wellhead housing (100) to define a first annulus (128) therebetween;

a first wellbore member (130) concentrically located within the inner wellhead housing (124) to define a second annulus (134) therebetween;

a signal receiver (112) secured in the aperture (120) such that at least a portion of the signal receiver (112) is located in the first annulus (128); and

an outer sensor assembly (108) located in the second annulus (134) and axially aligned with the signal receiver (112), the outer sensor assembly (108) being capable of sensing a second annulus condition and transmitting data representing the second annulus condition through a sidewall (126) of the inner wellhead housing (124) to the signal receiver (112).

2. The wellbore assembly according to claim 1, further comprising:

a second wellbore member (142), the second wellbore member being concentrically located within the first wellbore member (130) to define a third annulus (144) therebetween; and

an inner sensor assembly (110) located in the third annulus (144) and being capable of sensing a third annulus condition and transmitting data representing the third annulus condition through a sidewall (132) of the first wellbore member to the signal receiver (112).

3. The wellbore assembly according to claim 1, wherein the outer sensor assembly (108) is located on an outer diameter of a sidewall (132) of the first wellbore member (130), and further comprising a centralizer (136) protruding from the outer diameter of the sidewall (132) of the first wellbore member (130) the centralizer (136) protruding into the second annulus (134) a greater distance than the outer sensor assembly (108).

4. The wellbore assembly according to claim 1, wherein the outer sensor assembly (108) comprises a sensor (156), a transmitter (160), and a power supply (158).

5. The wellbore assembly according to claim 4, wherein the signal receiver (112) includes an electromagnetic field generator (178), the power supply (158) comprises a battery and a charger, and the charger inductively charges the battery in response to the electromagnetic field (180).

6. The wellbore assembly according to claim 1, wherein the outer sensor assembly (108) includes a memory and stores the data representing the second annulus condition at least until the data representing the second annulus condition is transmitted to the signal receiver (112).

7. The wellbore assembly according to claim 1, wherein the signal receiver (112) transmits the data to a computer (114).

8. The wellbore assembly according to claim 1, further comprising a current generator (182) in contact with seawater outside of the housing member and connected to the signal receiver (112), the current generator (182) producing electric current in response to movement of the seawater and transmitting the electric current to the signal receiver (112).

9. The wellbore assembly according to claim 8, wherein the current generator comprises a turbine (184), the turbine rotating in response to movement of the seawater to cause the current generator (182) to produce the electric current.

10. The wellbore assembly according to claim 1, wherein the outer sensor assembly (108) is one of a plurality of sensor assemblies spaced apart around the outer diameter of the first wellbore member (130), each sensor assembly (108) having a transmitter (160), wherein the transmitter (160) of the sensor assembly (108) nearest the signal receiver (112) can transmit data from one or more of the plurality of sensor assemblies.

11. The wellbore assembly according to claim 1, wherein the first annulus condition includes at least one of pressure and temperature.

12. A method for monitoring conditions within a wellbore assembly, the method comprising the steps of:

(a) connecting an outer wellhead housing (100) to a wellbore (102), the outer wellhead housing having a sidewall (122) and an aperture (120)through the sidewall;

(b) positioning an inner wellhead housing (124) concentrically within the outer wellhead housing (100) to define a first annulus (128) therebetween;

(c) positioning a first wellbore member (130) concentrically within the inner wellhead housing (124) to define a second annulus (134) therebetween, with a sensor assembly (108) located in the second annulus, the sensor assembly (108) having a sensor element (156), a power supply (158), and a transmitter (160);

(d) positioning a signal receiver (112) in the aperture (120); and

(e) sensing a second annulus condition with the sensor assembly (108) and transmitting data representing the second annulus condition through a sidewall (126) of the inner wellhead housing (124) to the signal receiver (112).

13. The method according to Claim 12, further comprising the step of generating an electromagnetic field (180) by the signal receiver (112) to inductively charge the power supply (158).

14. The method according to Claim 13, wherein a current generator (182) generates electric current in response to movement of seawater and the electric current is used to power the signal receiver (112).

15. The method according to Claim 12, wherein the sensor assembly (108) is one of a plurality of sensor assemblies, wherein step (e) further comprises the step of transmitting data from the one of the plurality of sensor assemblies (108) nearest the signal receiver (112) to the signal receiver (112).

CLAIMS

What is claimed is:

1. A wellbore assembly, the wellbore assembly comprising:

an outer wellhead housing having a sidewall and an aperture extending through the sidewall;

an inner wellhead housing concentrically located within the outer wellhead housing to define a first annulus therebetween;

a first wellbore member concentrically located within the inner wellhead housing to define a second annulus therebetween;

a signal receiver secured in the aperture such that at least a portion of the signal receiver is located in the first annulus; and

an outer sensor assembly located in the second annulus and axially aligned with the signal receiver, the outer sensor assembly being capable of sensing a second annulus condition and transmitting data representing the second annulus condition through a sidewall of the inner wellhead housing to the signal receiver.

2. The wellbore assembly according to claim 1, further comprising:

a second wellbore member, the second wellbore member being concentrically located within the first wellbore member to define a third annulus therebetween; and

an inner sensor assembly located in the third annulus and being capable of sensing a third annulus condition and transmitting data representing the third annulus condition through a sidewall of the first wellbore member to the signal receiver.

3. The wellbore assembly according to claim 1, wherein the outer sensor assembly is located on an outer diameter of a sidewall of the first wellbore member, and further comprising upper and lower centralizers above and below the sensor assembly and protruding from the outer diameter of the sidewall of the first wellbore member, the centralizers protruding into the second annulus a greater distance than the outer sensor assembly.

4. The wellbore assembly according to claim 1, wherein the signal receiver comprises a corrosion resistant outer housing, the outer housing being able to withstand exposure to concrete.

5. The wellbore assembly according to claim 1, wherein the outer sensor assembly comprises a sensor, a transmitter, and a power supply.

6. The wellbore assembly according to claim 5, wherein the signal receiver includes an electromagnetic field generator, the power supply comprises a battery and a charger, and the charger inductively charges the battery in response to the electromagnetic field.

7. The wellbore assembly according to claim 1, wherein the outer sensor assembly includes a memory and stores the data representing the second annulus condition at least until the data representing the second annulus condition is transmitted to the signal receiver.

8. The wellbore assembly according to claim 1, wherein the signal receiver transmits the data to a computer.

9. The wellbore assembly according to claim 1, further comprising a current generator disposed subsea and operated by seawater outside of the housing member and connected to the signal receiver, the current generator producing electric current in response to movement of the seawater and transmitting the electric current to the signal receiver.

10. The wellbore assembly according to claim 9, wherein the current generator comprises a turbine, the turbine rotating in response to movement of the seawater to cause the current generator to produce the electric current.

11. The wellbore assembly according to claim 1, wherein the outer sensor assembly is one of a plurality of sensor assemblies spaced apart around the outer diameter of the first wellbore member, each sensor assembly having a transmitter, wherein the transmitter of

the sensor assembly nearest the signal receiver can transmit data from one or more of the plurality of sensor assemblies.

12. The wellbore assembly according to claim 1, wherein the first annulus condition includes at least one of pressure and temperature.

13. A method for monitoring conditions within a wellbore assembly, the method comprising the steps of:

(a) connecting an outer wellhead housing to a wellbore, the outer wellhead housing having a sidewall and an aperture through the sidewall;

(b) positioning an inner wellhead housing concentrically within the outer wellhead housing to define a first annulus therebetween;

(c) positioning a first wellbore member concentrically within the inner wellhead housing to define a second annulus therebetween, with a sensor assembly located in the second annulus, the sensor assembly having a sensor element, a power supply, and a transmitter;

(d) positioning a signal receiver in the aperture; and

(e) sensing a second annulus condition with the sensor assembly and transmitting data representing the second annulus condition through a sidewall of the inner wellhead housing to the signal receiver.

14. The method according to claim 13, further comprising the step of generating an electromagnetic field by the signal receiver to inductively charge the power supply.

15. The method according to claim 14, wherein a current generator disposed subsea generates electric current in response to movement of seawater and the electric current is used to power the signal receiver.

16. The method according to claim 13, further comprising the step of sending data representing the second annulus condition from the signal receiver to a computer.

17. The method according to claim 13, wherein the sensor assembly is one of a plurality of sensor assemblies, wherein step (e) further comprises the step of transmitting data from the one of the plurality of sensor assemblies nearest the signal receiver to the signal receiver.

18. The method according to claim 17, wherein at least one of the plurality of sensor assemblies transmits data representing a second annulus condition to at least another one of the plurality of sensor assemblies.

19. A wellbore assembly, the wellbore assembly comprising:

an outer wellhead housing having a sidewall and an aperture through the sidewall;

an inner wellhead housing concentrically located within the outer wellhead housing to define a first annulus therebetween;

a first wellbore member concentrically located within the inner wellhead housing to define a second annulus therebetween;

a signal receiver secured in the aperture such that at least a portion of the signal receiver is located in the first annulus;

an outer sensor assembly positioned in the second annulus and axially aligned with the signal receiver, the outer sensor assembly comprising a sensor, a transmitter, and a power supply, and being capable of sensing a second annulus condition and transmitting data representing the second annulus condition through a sidewall of the inner wellhead housing to the signal receiver; and

a second wellbore member, the second wellbore member being concentrically located within the first wellbore member to define a third annulus therebetween, and an inner sensor assembly positioned in the third annulus and being capable of sensing a third annulus condition and transmitting data representing the third annulus condition through a sidewall of the first wellbore member to the signal receiver.

20. The wellbore assembly according to claim 19, wherein the signal receiver can generate an electromagnetic field and wherein the power supply comprises a battery and a charger and the charger inductively charges the battery in response to the electromagnetic field.