CLAIMS:

1. A system for monitoring a subsea structure, the system comprising:

a sensor disposed on or about one or more tubular components of the subsea structure, wherein the one or more tubular components of the subsea structure comprise a riser, a flow-line, and a subsea umbilical; and

a controller operatively coupled to the one or more tubular components of the subsea structure and configured to detect an anomaly in the one or more tubular components of the subsea structure.

2. The system of claim 1, further comprising an energy harvesting unit operatively coupled to the sensor and configured to energize the sensor.

3. The system of claim 2, further comprising a communication unit operatively coupled to the sensor and configured to transmit or receive a parameter measured by the sensor.

4. The system of claim 3, wherein the energy harvesting unit and the communication unit are operatively coupled to the sensor using a wired connection, a wireless connection, or a combination thereof.

5. The system of claim 2, wherein the energy harvesting unit is configured to generate electricity using vibrations of the one or more tubular components of the subsea structure, a temperature variation of the one or more tubular components of the subsea structure, light, sea water motion, or combinations thereof.

6. The system of claim 1, wherein the controller is further configured to:

control operation of one or more sensors for measuring pressure, flow, and stress in the one or more tubular components of the subsea structure; and

regulate one or more of the pressure, flow, and stress in the one or more tubular components of the subsea structure.

7. The system of claim 1, wherein the sensor comprises a magnetostrictive sensor, a magnetic sensor, an acoustic transducer, a fiber optic sensor, a temperature sensor, or combinations thereof.

8. The system of claim 1, wherein the one or more tubular components of the subsea structure comprise one or more segments with sensing capability.

9. The system of claim 8, wherein the one or more segments with sensing capability comprise one or more magnetically encoded regions.

10. The system of claim 9, wherein the one or more magnetically encoded regions comprise a plurality of magnetized lines with at least two polarities formed along a length of the one or more tubular components of the subsea structure.

11. The system of claim 9, wherein the one or more magnetically encoded regions comprise a plurality of magnetized lines with at least two polarities in a spiral configuration around the one or more tubular components of the subsea structure.

12. The system of claim 11, further comprising a fiber optic sensor wound along the plurality of magnetized lines in a spiral configuration around the one or more tubular components of the subsea structure.

13. The system of claim 1, further comprising a coating disposed on the one or more tubular components of the subsea structure.

14. The system of claim 13, wherein the sensor is embedded in the coating, disposed on the coating, or a combination thereof.

15. The system of claim 1, further comprising a locking mechanism configured to operatively couple the sensor to the one or more tubular components of the subsea structure.

16. The system of claim 15, wherein the locking mechanism comprises a crawler motor, a remotely operated device, an adhesive, a mechanical belt, a mechanical fastener, or combinations thereof.

17. A method for monitoring a subsea structure, the method comprising:

disposing a sensor on or about one or more tubular components of the subsea structure, wherein the one or more tubular components of the subsea structure comprise a riser, a flow-line, and a subsea umbilical, and wherein the sensor is configured to measure a parameter;

analyzing the measured parameter using a controller; and

identifying an anomaly in one or more of the riser, the flow-line, and the subsea umbilical based on an analysis of the parameter.

18. The method of claim 17, further comprising magnetizing one or more of the riser, the flow-line, and the subsea umbilical.

19. The method of claim 18, wherein magnetizing one or more of the riser, the flow-line, and the subsea umbilical comprises magnetizing one or more of the riser, the flow-line, and the subsea umbilical in a spiral configuration.

20. The method of claim 18, wherein magnetizing one or more of the riser, the flow-line, and the subsea umbilical comprises magnetizing one or more of the riser, the flow-line, and the subsea umbilical in a longitudinal configuration.

21. The method of claim 18, wherein magnetizing one or more of the riser, the flow-line, and the subsea umbilical comprises applying a determined value of an electrical current, a determined value of a magnetic field, or a combination thereof to one or more of the riser, the flow-line, and the subsea umbilical.

22. The method of claim 17, wherein the parameter comprises a pressure, a load, compression stress, residual stress, longitudinal stress, tensional stress, bending stress, torque induced stress, a flow property of a production fluid, or combinations thereof.

23. A system, comprising:

a monitoring subsystem configured to monitor one or more tubular components of a subsea structure, wherein the one or more tubular components of the subsea structure comprise a riser, a flow-line, and a subsea umbilical, and wherein the monitoring subsystem comprises:

a sensor disposed on or about the one or more tubular components of the subsea structure and configured to measure a parameter associated with the one or more tubular components of the subsea structure;

a controller operatively coupled to the one or more tubular components of the subsea structure and configured to detect an anomaly in the one or more tubular components of the subsea structure;

an energy harvesting unit operatively coupled to the monitoring subsystem and configured to energize the sensor; and

a communication unit operatively coupled to the monitoring subsystem and configured to transmit or receive the parameter measured by the sensor.

CLAIMS:

1. A system for monitoring a subsea structure, the system comprising:

a sensor disposed on or about one or more tubular components of the subsea structure, wherein the one or more tubular components of the subsea structure comprise a riser, a flow-line, and a subsea umbilical; and wherein the sensor comprises a fiber optic sensor configured to detect a change in a magnetic field and measure a parameter based on the change in the magnetic field; and

a controller operatively coupled to the one or more tubular components of the subsea structure and configured to detect an anomaly in the one or more tubular components of the subsea structure.

2. The system of claim **1**, further comprising an energy harvesting unit operatively coupled to the sensor and configured to energize the sensor.

3. The system of claim **2**, further comprising a communication unit operatively coupled to the sensor and configured to transmit or receive the parameter measured by the sensor.

4. The system of claim **3**, wherein the energy harvesting unit and the communication unit are operatively coupled to the sensor using a wired connection, a wireless connection, or a combination thereof.

5. The system of claim **2**, wherein the energy harvesting unit is configured to generate electricity using vibrations of the one or more tubular components of the subsea structure, a temperature variation of the one or more tubular components of the subsea structure, light, sea water motion, or combinations thereof.

6. The system of claim **1**, wherein the controller is further configured to:

control operation of the sensor for measuring pressure, flow, and stress in the one or more tubular components of the subsea structure; and

regulate one or more of the pressure, flow, and stress in the one or more tubular components of the subsea structure.

7. The system of claim **1**, wherein the sensor further comprises a magnetostrictive sensor, a magnetic sensor, an acoustic transducer, a temperature sensor, or combinations thereof.

8. The system of claim **1**, wherein the one or more tubular components of the subsea structure comprise one or more segments with sensing capability.

9. The system of claim **8**, wherein the one or more segments with sensing capability comprise one or more magnetically encoded regions.

10. The system of claim **9**, wherein the one or more magnetically encoded regions comprise a plurality of magnetized lines with at least two polarities formed along a length of the one or more tubular components of the subsea structure.

11. The system of claim **9**, wherein the one or more magnetically encoded regions comprise a plurality of magnetized lines with at least two polarities in a spiral configuration around the one or more tubular components of the subsea structure.

12. The system of claim **11**, wherein the fiber optic sensor is wound along the plurality of magnetized lines in a spiral configuration around the one or more tubular components of the subsea structure.

13. The system of claim **1**, further comprising a coating disposed on the one or more tubular components of the subsea structure.

14. The system of claim **13**, wherein the sensor is embedded in the coating, disposed on the coating, or a combination thereof.

15. The system of claim **1**, further comprising a locking mechanism configured to operatively couple the sensor to the one or more tubular components of the subsea structure.

16. The system of claim **15**, wherein the locking mechanism comprises a crawler motor, a remotely operated device, an adhesive, a mechanical belt, a mechanical fastener, or combinations thereof.

17. A method for monitoring a subsea structure, the method comprising:

disposing a sensor on or about one or more tubular components of the subsea structure, wherein the one or more tubular components of the subsea structure comprise a riser, a flow-line, and a subsea umbilical, and wherein the sensor comprises a fiber optic sensor configured to detect a change in a magnetic field and measure a parameter based on the change in the magnetic field;

analyzing the measured parameter using a controller; and

identifying an anomaly in one or more of the riser, the flow-line, and the subsea umbilical based on an analysis of the measured parameter.

18. The method of claim **17**, further comprising magnetizing one or more of the riser, the flow-line, and the subsea umbilical.

19. The method of claim **18**, wherein magnetizing one or more of the riser, the flow-line, and the subsea umbilical comprises magnetizing one or more of the riser, the flow-line, and the subsea umbilical in a spiral configuration.

20. The method of claim **18**, wherein magnetizing one or more of the riser, the flow-line, and the subsea umbilical comprises magnetizing one or more of the riser, the flow-line, and the subsea umbilical in a longitudinal configuration.

21. The method of claim **18**, wherein magnetizing one or more of the riser, the flow-line, and the subsea umbilical comprises applying a determined value of an electrical current, a determined value of a magnetic field, or a combination thereof to one or more of the riser, the flow-line, and the subsea umbilical.

22. The method of claim **17**, wherein the parameter comprises a pressure, a load, compression stress, residual stress, longitudinal stress, tensional stress, bending stress, torque induced stress, a flow property of a production fluid, or combinations thereof.

23. A system, comprising:

a monitoring subsystem configured to monitor one or more tubular components of a subsea structure, wherein the one or more tubular components of the subsea structure comprise a riser, a flow-line, and a subsea umbilical, and wherein the monitoring subsystem comprises:

a sensor disposed on or about the one or more tubular components of the subsea structure, wherein the sensor comprises a fiber optic sensor configured to detect a change in the magnetic field and measure a parameter associated with the one or more tubular components of the subsea structure based on the change in the magnetic field;

a controller operatively coupled to the one or more tubular components of the subsea structure and configured to detect an anomaly in the one or more tubular components of the subsea structure;

an energy harvesting unit operatively coupled to the monitoring subsystem and configured to energize the sensor; and

a communication unit operatively coupled to the monitoring subsystem and configured to transmit or receive the parameter measured by the sensor.