minerals are found or anticipated. The tubular structure not only allows for rotation of the bit, but for injection of mud and other substances, extraction of cuttings, testing and documenting well conditions, and so forth.

[0005] During the various stages of drilling, intervention, completion and production, riser structures are commonly used that extend between the vessel or platform and equipment at the seabed. Such risers may be designed to bend and flex. In extreme conditions, however, the risers may transmit forces to the equipment on the sea floor that can cause severe damage to the equipment. Such extreme conditions or events may include, for example, the loss of control of the vessel or platform, extreme weather conditions, extreme wave events, and so forth. There has been little or no significant innovation in the art to address such events.

[0006] There is a need, therefore, for improvements in the field that may allow risers that can avoid damage to subsea equipment in case of an extreme event.

SUMMARY OF INVENTION

[0006a] According to a first aspect of the present invention, there is provided a method, including: assembling a riser to extend between a vessel and a subsea well location, the riser comprising a first riser section made of a first material and a second riser section made of a second material different from the first material, the second riser section comprising a passive fracture section that fractures passively under design loading that will not cause fracture of the first riser section, the second riser section being installed above a lower marine riser package; utilizing the assembled riser during normal operating conditions; and permitting passive fracture of the passive fracture section under design conditions that exceed the design loading; wherein the passive fracture section comprises a single wall tubular structure having a wall in which cracking initiates that is promoted during the passive facture, and wherein the passive fracture section comprises a titanium alloy or an aluminum alloy, and the first riser section comprises a steel alloy.

[0006b] According to a second aspect of the present invention, there is provided a marine riser including: first riser section extending made of a first material and extending partially between a vessel and a subsea well location; a second riser section made of a second material different from

the first material and coupled to the first riser section and extending partially between the vessel and the subsea well location, the second riser section being installed above a lower marine riser package, the second riser section comprising a passive fracture section that fractures passively under design loading that will not cause fracture of the first riser section; wherein the passive fracture section comprises a single wall tubular structure having a wall in which cracking initiates that is promoted during the passive facture, and wherein the passive fracture section is characterized by a yield strength to tensile strength ratio of at least approximately 0.9, a modulus of elasticity of at most approximately 17 Mpsi, and a fracture toughness of at most approximately 45 $KSIin^{-2}$.

[0006c] According to a third aspect of the present invention, there is provided a marine riser including: a riser section made of a material different from other riser sections of the marine riser, and extending partially between a vessel and a subsea well location, the riser section comprising a passive fracture section installed above a lower marine riser package that fractures passively under loading exceeding design loading, wherein the passive fracture section comprises a single wall tubular structure having a wall in which cracking initiates that is promoted during the passive facture; and wherein the passive fracture section comprises a titanium alloy or an aluminum alloy.

DRAWINGS

[0007] These and other features, aspects, and advantages of the present invention will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings, wherein:

[0008] FIG. 1 is a diagrammatical representation of an exemplary installation for drilling, completing, or servicing a subsea well in accordance with the present techniques;

[0009] FIG. 2 is a diagrammatical representation of a sections of a tubular riser extending from a platform or vessel to the location of a well, and into the well to a horizon of interest;

[0010] FIG. 3 is a diagrammatical representation of permitted fracture of the riser in case of an extreme event; and

CLAIMS:

1. A method, comprising:

assembling a riser to extend between a vessel and a subsea well location, the riser comprising a first riser section made of a first material and a second riser section made of a second material different from the first material, the second riser section comprising a passive fracture section that fractures passively under design loading that will not cause fracture of the first riser section, the second riser section being installed above a lower marine riser package;

utilizing the assembled riser during normal operating conditions; and

permitting passive fracture of the passive fracture section under design conditions that exceed the design loading;

wherein the passive fracture section comprises a single wall tubular structure having a wall in which cracking initiates that is promoted during the passive facture, and

wherein the passive fracture section comprises a titanium alloy or an aluminum alloy, and the first riser section comprises a steel alloy.

2. The method of claim 1, wherein the passive fracture section comprises a titanium alloy.

3. The method of claim 1, wherein the passive fracture section comprises an aluminum alloy.

4. The method of claim 1, wherein the second riser section is most costly per unit length than the first riser section.

5. The method of claim 1, wherein the passive fracture section is connected adjacent to seabed well equipment.

6. The method of claim 1, wherein the passive fracture section is characterized by a yield strength to tensile strength ratio of at least approximately 0.9, a modulus of elasticity of at most approximately 17 Mpsi, and a fracture toughness of at most approximately 45 $KSIin^{-2}$.

7. A marine riser comprising:

first riser section extending made of a first material and extending partially between a vessel and a subsea well location;

a second riser section made of a second material different from the first material and coupled to the first riser section and extending partially between the vessel and the subsea well location, the second riser section being installed above a lower marine riser package, the second riser section comprising a passive fracture section that fractures passively under design loading that will not cause fracture of the first riser section;

wherein the passive fracture section comprises a single wall tubular structure having a wall in which cracking initiates that is promoted during the passive facture, and

wherein the passive fracture section is characterized by a yield strength to tensile strength ratio of at least approximately 0.9, a modulus of elasticity of at most approximately 17 Mpsi, and a fracture toughness of at most approximately 45 $KSIin^{-2}$.

8. The marine riser of claim 7, wherein the passive fracture section comprises a titanium alloy.

9. The marine riser claim 8, wherein the first riser section comprises a steel alloy.

10. The marine riser of claim 7 wherein the passive fracture section comprises an aluminum alloy.

11. The marine riser of claim 7, wherein the second riser section is most costly per unit length than the first riser section.

12. A marine riser comprising:

a riser section made of a material different from other riser sections of the marine riser, and extending partially between a vessel and a subsea well location, the riser section comprising a passive fracture section installed above a lower marine riser package that fractures passively under loading exceeding design loading,

wherein the passive fracture section comprises a single wall tubular structure having a wall in which cracking initiates that is promoted during the passive facture; and

wherein the passive fracture section comprises a titanium alloy or an aluminum alloy.

13. The marine riser of claim 12, wherein the passive fracture section comprises a titanium alloy.

14. The marine riser of claim 12, wherein the passive fracture section comprises an aluminum alloy.

15. The marine riser of claim 12, comprising a further riser section extending partially between the vessel and the subsea well location and coupled to the riser section having the passive fracture section, wherein the further riser section will not fracture under the design loading.

16. The marine riser of claim 15, wherein the further riser section comprises a steel alloy.

17. The marine riser of claim 15, wherein the riser section having the passive fracture section is more costly per unit length than the further riser section.

18. The marine riser of claim 12, wherein the passive fracture section is characterized by a yield strength to tensile strength ratio of at least approximately 0.9, a modulus of elasticity of at most approximately 17 Mpsi, and a fracture toughness of at most approximately 45 $KSIin^{-2}$.