hardband material may be susceptible to cracking and spalling over extended use in the harsh downhole environment.

[0007] Accordingly, there remains a need in the art for improved hardband materials for downhole equipment such as tubulars, tools, and tool joints. Such hardband materials would be particularly well received if they were both shearable and casing friendly. Moreover, there remains a need in the art for improved BOP shear rams capable of reliably shearing downhole equipment. Such shear rams would be particularly well-received if they were capable of reliably shearing downhole equipment that included hardfacing and hardbanding.

BRIEF SUMMARY OF THE DISCLOSURE

[0008] ~~These and other needs in the art are addressed in one embodiment by a tool joint. In an embodiment, the~~Disclosed herein is a tool joint ~~comprises~~comprising a body having a central axis, a first end, and a second end opposite the first end, wherein the body is made of a first material having a first hardness. In addition, the tool joint comprises an annular hardband disposed about the body. The hardband is made of a second material. The second material comprises a base material and a plurality of discrete pellets dispersed throughout the base material. The base material has a second hardness and the pellets have a third hardness. The second hardness is substantially the same as the first hardness. The third hardness is greater than the second hardness and less than the hardness of tungsten carbide.

[0009] ~~These and other needs in the art are addressed in another embodiment by a system. In an embodiment, the system comprises a blowout preventer including a body, a throughbore in fluid communication with a wellbore, a shear ram, and an actuator configured to move the shear ram from a first positioned retracted from the throughbore and a second position extending across the throughbore. In addition, the system comprises a tool joint disposed in the throughbore of the blowout preventer radially adjacent the shear ram. The tool joint comprises a body and an annular hardband disposed about the body. The body is made from a first material and the hardband is made from a second material. The second material includes a base material and a plurality of discrete pellets dispersed throughout the base material. The base material has substantially the same hardness as the first material, and the pellets have a hardness greater than 35 HRC and less than 2300 HV.~~

According to an aspect, there is provided a system, comprising: a blowout preventer including a body, a throughbore in fluid communication with a wellbore, a shear ram, and an actuator configured to move the shear ram from a first positioned retracted from the throughbore and a second position extending across the throughbore; a tool joint disposed in the throughbore of the blowout preventer radially adjacent the shear ram; wherein the tool joint comprises a body and an annular hardband disposed about the body; wherein the body is made

from a first material and the hardband is made from a second material; wherein the second material includes a base material and a plurality of discrete pellets dispersed throughout the base material; wherein the base material has substantially the same hardness as the first material, and the pellets have a hardness greater than 35 HRC and less than 2300 HV; wherein the pellets are spherical, each having a diameter between 707 micron and 2000 micron and a density between 7.5 and 8.0 g/cm3.

[0010] ~~These and other needs in the art are addressed in another embodiment by~~ Disclosed herein is a method for forming a hardband on a downhole tool, the downhole tool being made of a first material~~. In an embodiment~~, the method ~~comprises~~comprising: (a) applying a molten base material onto the downhole tool. The base material has a coefficient of thermal expansion that is within 10% of the coefficient of thermal expansion of the first material. In addition, the method comprises (b) dispersing a plurality of solid pellets throughout the molten base material. The pellets have a

Claims:

1. A system, comprising:

a blowout preventer including a body, a throughbore in fluid communication with a wellbore, a shear ram, and an actuator configured to move the shear ram from a first positioned retracted from the throughbore and a second position extending across the throughbore;

a tool joint disposed in the throughbore of the blowout preventer radially adjacent the shear ram;

wherein the tool joint comprises a body and an annular hardband disposed about the body;

wherein the body is made from a first material and the hardband is made from a second material;

wherein the second material includes a base material and a plurality of discrete pellets dispersed throughout the base material;

wherein the base material has substantially the same hardness as the first material, and the pellets have a hardness greater than 35 HRC and less than 2300 HV;

wherein the pellets are spherical, each having a diameter between 707 micron and 2000 micron and a density between 7.5 and 8.0 g/cm3.

2. The system of claim 1, wherein the pellets are spherical, each pellet having a diameter between 707 micron and 2000 micron.

3. The system of claim 1, wherein the first material has a coefficient of thermal expansion, and wherein the base material has a coefficient of thermal expansion that is within 10% of the coefficient of thermal expansion of the first material.

4. The system of claim 3, wherein the first material and the base material comprise the same metal or metal alloy.

5. The system of claim 1, wherein the first material and the base material are both low alloy carbon steels having a hardness between 25 HRC and 40 HRC.

6. The system of claim 5, wherein each pellet is made of a material selected from a ceramic, niobium carbide, chromium carbide, and nickel-chromium carbide.

7. The system of claim 1, wherein the pellets have a density that is within 10% of the density of the base material in a liquid state.

Claims:

1. A system, comprising:

a blowout preventer including a body, a throughbore in fluid communication with a wellbore, a shear ram, and an actuator configured to move the shear ram from a first positioned retracted from the throughbore and a second position extending across the throughbore;

a tool joint disposed in the throughbore of the blowout preventer radially adjacent the shear ram;

wherein the tool joint comprises a body and an annular hardband disposed about the body;

wherein the body is made from a first material and the hardband is made from a second material;

wherein the second material includes a base material and a plurality of discrete pellets dispersed throughout the base material;

wherein the base material has substantially the same hardness as the first material, and the pellets have a hardness greater than 35 HRC and less than 2300 HV.

2. The system of claim 1, wherein the pellets are spherical, each pellet having a diameter between 707 micron and 2000 micron.

3. The system of claim 1, wherein the first material has a coefficient of thermal expansion, and wherein the base material has a coefficient of thermal expansion that is within 10% of the coefficient of thermal expansion of the first material.

4. The system of claim 3, wherein the first material and the base material comprise the same metal or metal alloy.

5. The system of claim 1, wherein the first material and the base material are both low alloy carbon steels having a hardness between 25 HRC and 40 HRC.

6. The system of claim 5, wherein each pellet is made of a material selected from a ceramic, niobium carbide, chromium carbide, and nickel-chromium carbide.

7. The system of claim 1, wherein the pellets have a density that is within 10% of the density of the base material in a liquid state.