PRESSURE RELIEF-ASSISTED PACKER

BACKGROUND

[0001] Oil and gas wells are often cased from the surface location of the wells down to and sometimes through a production formation. Casing, (e.g., steel pipe) is lowered into the wellbore to a desired depth. Often, at least a portion of the space between the casing and the wellbore, i.e. the annulus, is then typically filled with cement (e.g., cemented). Once the cement sets in the annulus, it holds the casing in place and prevents flow of fluids to, from, or between earth formations (or portions thereof) through which the well passes (e.g., aquifers).

[0002] It is sometimes desirable to complete the well or a portion there-of as an open-hole completion. Generally, this means that at least a portion of the well is not cased, for example, through the producing zone or zones. However, the well may still be cased and cemented from the surface location down to a depth just above the producing formation. It is desirable not to fill or contaminate the open-hole portion of the well with cement during the cementing process.

[0003] Sometimes, a second casing string or liner may be later incorporated with the previously installed casing string. In order to join the second casing string to the first casing string, the second casing string may need to be fixed into position, for example, using casing packers, cement, and/or any combination of any other suitable methods. One or more methods, systems, and/or apparatuses which may be employed to secure a second casing string with respect to (e.g., within) a first casing string are disclosed herein.

SUMMARY

[0004] Disclosed herein is a wellbore completion method comprising disposing a pressure relief-assisted packer comprising two packer elements within an axial flow bore of a first tubular string disposed within a wellbore so as to define an annular space between the pressure relief-assisted packer and the first tubular string, wherein the pressure relief-assisted packer further comprises a pressure relief volume fully enclosed within a pressure relief chamber and sealed by a rupture disc disposed between the annular space and the pressure relief chamber; and setting the pressure relief-assisted packer such that a portion of the annular space between the two packer elements comes into fluid communication with ~~a~~ the pressure relief volume during the setting of the pressure relief-assisted packer.

[0005] Also disclosed herein is a wellbore completion system comprising a pressure relief-assisted packer, wherein the pressure relief-assisted packer is disposed within an axial flow bore of a first casing string disposed within a wellbore penetrating a subterranean formation, and wherein the pressure relief-assisted packer comprises a first packer element, a second packer

element, and a pressure relief chamber~~, the pressure relief chamber at least partially defining~~ for fully enclosing a pressure relief volume, wherein the pressure relief chamber comprises a rupture disc for sealing the pressure relief chamber, the rupture disc being disposed between the pressure relief chamber and an annular space between the first and second packer elements, wherein the pressure relief volume relieves a pressure between the first packer element and the second packer element, and a second casing string, wherein the pressure relief-assisted packer is incorporated within the second casing string.

[0006] Further disclosed herein is a wellbore completion method comprising disposing a pressure relief-assisted packer within an axial flow bore of a first tubular string disposed within a wellbore, wherein the pressure relief-assisted packer comprises a first packer element, a second packer element, and a pressure relief chamber~~, the pressure relief chamber at least partially defining~~ fully enclosing a pressure relief volume, wherein the pressure relief chamber comprises a rupture disc for sealing the pressure relief chamber, the rupture disc being disposed between the pressure relief chamber and an annular space between the first and second packer elements, causing the first packer element and the second packer element to expand radially so as to engage the first tubular string, wherein causing the first packer element and the second packer element to expand radially causes an increase in pressure in ~~an~~ the annular space between the first packer element and the second packer element, wherein the increase in pressure in the annular space causes the pressure relief volume to come into fluid communication with the annular space.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] For a more complete understanding of the present disclosure and the advantages thereof, reference is now made to the following brief description, taken in connection with the accompanying drawings and detailed description:

[0008] Figure 1 is a partial cut-away view of an operating environment of a pressure relief-assisted packer depicting a wellbore penetrating the subterranean formation, a first casing string positioned within the wellbore, and a second casing string positioned within the first casing string;

[0009] Figure 2A is a cut-away view of an embodiment of a pressure relief-assisted packer in a first configuration;

[0010] Figure 2B is a cut-away view of an embodiment of a pressure relief-assisted packer in a second configuration;

[0011] Figure 2C is a cut-away view of an embodiment of a pressure relief-assisted packer in a third configuration; and

[0012] Figured 3 is a cut-away view of an embodiment of a pressure relief chamber.

CLAIMS

What is claimed is:

1. A wellbore completion method comprising:

disposing a pressure relief-assisted packer comprising two packer elements within an axial flow bore of a first tubular string disposed within a wellbore so as to define an annular space between the pressure relief-assisted packer and the first tubular string, wherein the pressure relief-assisted packer further comprises a pressure relief volume fully enclosed within a pressure relief chamber and sealed by a rupture disc disposed between the annular space and the pressure relief chamber; and

setting the pressure relief-assisted packer such that a portion of the annular space between the two packer elements comes into fluid communication with ~~a~~ the pressure relief volume during the setting of the pressure relief-assisted packer.

2. The method of claim 1, wherein disposing the pressure relief-assisted packer within the axial flow bore of the first tubular string comprises disposing at least a portion of a second tubular string within the axial flow bore of the first tubular string, wherein the pressure relief-assisted packer is incorporated within the second tubular string.

3. The method of claim 2, wherein the first tubular string, the second tubular string, or both comprises a casing string.

4. The method of any of claims 1-3, wherein setting the pressure relief-assisted packer comprises longitudinally compressing the two packer elements.

5. The method of claim 4, wherein longitudinally compressing the two packer elements causes the two packer elements to expand radially.

6. The method of claim 5, wherein radial expansion of the two packer elements causes the two packer elements to engage the first tubular string.

~~7. The method of any of claims 1-6, wherein the pressure relief volume is at least partially defined by a pressure relief chamber.~~

~~8~~7. The method of any of claims 1-~~7~~6, wherein the portion of the annular space between the two packer elements comes into fluid communication with the pressure relief volume upon the portion of the annular space reaching at least a threshold pressure.

~~9~~8. The method of any of claims 2-3, further comprising:

introducing a cementitious slurry into an annular space surrounding at least a portion of the second tubular string and relatively downhole from the two packer elements; and

allowing the cementitious slurry to set.

~~10~~9. The method of any of claims 2-3, further comprising:

introducing a cementitious slurry into an annular space between the second tubular string and the first tubular string and relatively uphole from the two packer elements; and

allowing the cementitious slurry to set.

~~11~~10. A wellbore completion system comprising:

a pressure relief-assisted packer, wherein the pressure relief-assisted packer is disposed within an axial flow bore of a first casing string disposed within a wellbore penetrating a subterranean formation, and wherein the pressure relief-assisted packer comprises:

a first packer element;

a second packer element; and

a pressure relief chamber~~, the pressure relief chamber at least partially defining~~ for fully enclosing a pressure relief volume, wherein the pressure relief chamber comprises a rupture disc for sealing the pressure relief chamber, the rupture disc being disposed between the pressure relief chamber and an annular space between the first and second packer elements, wherein the pressure relief volume relieves a pressure between the first packer element and the second packer element; and

a second casing string, wherein the pressure relief-assisted packer is incorporated within the second casing string.

~~12~~11. The wellbore completion system of claim ~~11~~10, ~~wherein the pressure relief chamber comprises a rupture disc,~~ wherein the rupture disc controls fluid communication to the pressure relief volume.

~~13~~12. The wellbore completion system of claim ~~12~~11, wherein the rupture disc allows fluid communication to the pressure relief volume upon experiencing at least a threshold pressure.

~~14~~13. The wellbore completion system of claim ~~13~~12, wherein the threshold pressure is in the range of from about 1,000 p.s.i. to about 10,000 p.s.i.

~~15~~14. The wellbore completion system of any of claims ~~13~~12-~~14~~13, wherein the threshold pressure is in the range of from about 4,000 p.s.i. to about 8,000 p.s.i.

~~16~~15. The wellbore completion system of any of claims ~~11~~10-~~15~~14, wherein the pressure relief chamber comprises one or more ramped surfaces.

~~17~~16. The wellbore completion system of any of claims ~~11~~10-~~16~~15, wherein the pressure relief chamber is positioned between the first packer element and the second packer element.

~~18~~17. A wellbore completion method comprising:

disposing a pressure relief-assisted packer within an axial flow bore of a first tubular string disposed within a wellbore, wherein the pressure relief-assisted packer comprises:

a first packer element;

a second packer element; and

a pressure relief chamber~~, the pressure relief chamber at least partially defining~~ fully enclosing a pressure relief volume~~;~~, wherein the pressure relief chamber comprises a rupture disc for sealing the pressure relief chamber, the rupture disc being disposed between the pressure relief chamber and an annular space between the first and second packer elements,

causing the first packer element and the second packer element to expand radially so as to engage the first tubular string, wherein causing the first packer element and the second packer element to expand radially causes an increase in pressure in ~~an~~ the annular space between the first packer element and the second packer element, wherein the increase in pressure in the annular space causes the pressure relief volume to come into fluid communication with the annular space.

~~19~~18. The wellbore completion method of claim ~~18~~17, ~~wherein the pressure relief chamber comprises a rupture disc,~~ wherein the rupture disc controls fluid communication to the pressure relief volume.

~~20~~19. The wellbore completion method of claim ~~19~~18, wherein the rupture disc allows fluid communication to the pressure relief volume upon experiencing at least a threshold pressure.

~~21~~20. The wellbore completion method of any of claims ~~18~~17-~~20~~19, wherein the pressure relief-assisted packer is incorporated within a second tubular string.

~~22~~21. The wellbore completion method of claim ~~21~~20, further comprising:

introducing a cementitious slurry into an annular space surrounding at least a portion of the second tubular string and relatively downhole from the first and second packer elements; and

allowing the cementitious slurry to set.

~~23~~22. The wellbore completion method of claim ~~21~~20, further comprising:

introducing a cementitious slurry into an annular space between the second tubular string and the first tubular string and relatively uphole from the first and second packer elements; and

allowing the cementitious slurry to set.