VALVE INSERT SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 62/073,739, filed October 31, 2014, entitled "VALVE INSERT SYSTEM," which is incorporated by reference herein in its entirety.

BACKGROUND

[0002] This section is intended to introduce the reader to various aspects of art that may be related to various aspects of the present invention, which are described and/or claimed below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present invention. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

[0003] Valves are used in a variety of applications to manage and transmit flows of materials. Valves generally can be placed in an open position that enables fluid flow through a primary flow path and a closed position that reduces or completely shuts off that flow path. However, when transporting a proppant containing fluid (e.g., frac fluid), proppant may enter crevices or affect interfaces of the valve, causing undesirable wear and/or a reduction in the useful life of the valve.

SUMMARY

[0003A] Herein disclosed is a system, comprising: a valve, comprising: a valve body having an interior volume and a bore along a first axis; a stem extending along a second axis; and a flow control element coupled to the stem, wherein the stem is configured to selectively move the flow control element through the interior volume between a closed position

and an open position relative to the bore; and a valve insert system configured reduce a size of the interior volume and to guide a lubricant to reduce wear on the flow control element.

[0003B] Also disclosed is a system, comprising: a valve insert system configured to rest within a valve, wherein the valve insert system comprises: a first valve insert configured to rest within a first chamber of the valve to reduce a first volume of the first chamber, wherein the first valve insert comprises a first groove configured to guide a lubricant through the first chamber; and a second valve insert configured to rest within a second chamber of the valve to reduce a second volume of the second chamber, wherein the second insert comprises a second groove configured to guide the lubricant through the second chamber.

[0003C] Further disclosed is a system, comprising: a frac system configured to flow a proppant laden fluid, comprising: a valve, comprising: a valve body having an interior volume and a bore along a first axis; a stem extending along a second axis; and a flow control element coupled to the stem, wherein the stem is configured to selectively move the flow control element through the interior volume between a closed position and an open position relative to the bore; and a valve insert system configured reduce a size of the interior volume and to guide a lubricant to reduce wear on the flow control element from the proppant laden fluid.

[0003D] According to a first aspect, there is provided a system, comprising: a valve, comprising: a valve body having an interior volume and a bore along a first axis; a first valve seat disposed about the bore; a stem extending along a second axis; and a flow control element coupled to the stem, wherein the stem is configured to selectively move the flow control element along a path of travel through the interior volume between a closed position and an open position relative to the bore, and a first surface of the flow control element faces the first valve seat along the path of travel; and a valve insert system configured to reduce a size of the interior volume, wherein the valve insert system comprises a first insert disposed between the valve body and the flow control element in the interior volume in a first stationary position relative to the valve body, and at least

one groove extending along a first interface between the flow control element and the first insert and configured to guide a lubricant in a first flow direction along the flow control element to the first surface or the first valve seat to reduce wear on the flow control element.

[0003E] According to a second aspect, there is provided a system, comprising: a valve insert system configured to mount within a valve having a flow control element that selectively moves between open and closed positions relative to a bore through a valve body of the valve, wherein the valve insert system comprises: a first valve insert configured to mount between the valve body and the flow control element within a first chamber of the valve in a first stationary position relative to the valve body, wherein the first valve insert is configured to reduce a first volume of the first chamber, wherein the first valve insert comprises a first groove configured to guide a lubricant through the first chamber in a first flow direction extending along the flow control element and the first valve insert to a first area; and a second valve insert configured to mount between the valve body and the flow control element within a second chamber of the valve in a second stationary position relative to the valve body, wherein the second valve insert is configured to reduce a second volume of the second chamber, wherein the second valve insert comprises a second groove configured to guide the lubricant through the second chamber in a second flow direction extending along the flow control element and the second valve insert to a second area, wherein the first and second areas are configured to be adjacent at least one valve seat about the bore or at least one surface of the flow control element that faces the at least one valve seat.

[0003F] According to a third aspect, there is provided a system, comprising: a frac system configured to flow a proppant laden fluid, comprising: a valve, comprising: a valve body having an interior volume and a bore along a first axis; a first valve seat disposed about the bore; a stem extending along a second axis; and a flow control element coupled to the stem, wherein the stem is configured to selectively move the flow control element through the interior volume along a path of travel between a closed position and an open position relative to the bore,

and a first surface of the flow control element faces the first valve seat along the path of travel; and a valve insert system configured to reduce a size of the interior volume, wherein the valve insert system comprises a first insert disposed between the valve body and the flow control element in the interior volume in a first stationary position relative to the valve body, and at least one groove configured to guide a lubricant in a first flow direction along the flow control element and the first insert to the first surface or the first valve seat to reduce wear on the flow control element from the proppant laden fluid.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Various features, aspects, and advantages of the present invention will become better understood when the following detailed description is read with reference to the accompanying figures in which like characters represent like parts throughout the figures, wherein:

[0005] FIG. 1 is a schematic view of a frac system;

CLAIMS

1. A system, comprising:

a valve, comprising:

a valve body having an interior volume and a bore along a first axis;

a first valve seat disposed about the bore;

a stem extending along a second axis; and

a flow control element coupled to the stem, wherein the stem is configured to selectively move the flow control element along a path of travel through the interior volume between a closed position and an open position relative to the bore, and a first surface of the flow control element faces the first valve seat along the path of travel; and

a valve insert system configured to reduce a size of the interior volume, wherein the valve insert system comprises a first insert disposed between the valve body and the flow control element in the interior volume in a first stationary position relative to the valve body, and at least one groove extending along a first interface between the flow control element and the first insert and configured to guide a lubricant in a first flow direction along the flow control element to the first surface or the first valve seat to reduce wear on the flow control element.

2. The system of claim 1, comprising a frac system having the valve.

3. The system of claim 1, wherein the interior volume comprises a first chamber and a second chamber.

4. The system of claim 3, wherein the valve body comprises a first lubricant passageway in fluid communication with the first chamber and a second lubricant passageway in fluid communication with the second chamber.

5. The system of claim 3, wherein the first insert is disposed within the first chamber in the first stationary position relative to the valve body, wherein the first insert reduces a volume of the first chamber, and the first insert comprises the at least one groove.

6. The system of claim 1, wherein the at least one groove comprises a plurality of grooves configured to guide the lubricant in the first flow direction along the flow control element to the first surface or the first valve seat.

7. The system of claim 1, wherein the at least one groove extends lengthwise along a side of the first insert such that the at least one groove is open along a corresponding side of the flow control element.

8. The system of claim 5, wherein the valve insert system comprises a second insert disposed within the second chamber in a second stationart position relative to the valve body, wherein the second insert reduces a volume of the second chamber.

9. The system of claim 8, wherein the second insert comprises at least one groove extending along a second interface between the flow control element and the second insert and configured to guide the lubricant in a second flow direction along the flow control element to at least one of the first surface, the first valve seat, a second valve seat, or a second surface of the flow control element that faces the second valve seat along the path of travel.

10. The system of claim 9, wherein the at least one groove extends lengthwise along a side of the second insert such that the at least one groove is open along a corresponding side of the flow control element.

11. A system, comprising:

a valve insert system configured to mount within a valve having a flow control element that selectively moves between open and closed positions relative to a bore through a valve body of the valve, wherein the valve insert system comprises:

a first valve insert configured to mount between the valve body and the flow control element within a first chamber of the valve in a first stationary position relative to the valve body, wherein the first valve insert is configured to reduce a first volume of the first chamber, wherein the first valve insert comprises a first groove configured to guide a lubricant through the first chamber in a first flow direction extending along the flow control element and the first valve insert to a first area; and

a second valve insert configured to mount between the valve body and the flow control element within a second chamber of the valve in a second stationary position relative to the valve body, wherein the second valve insert is configured to reduce a second volume of the second chamber, wherein the second valve insert comprises a second groove configured to guide the lubricant through the second chamber in a second flow direction extending along the flow control element and the second valve insert to a second area, wherein the first and second areas are configured to be adjacent at least one valve seat about the bore or at least one surface of the flow control element that faces the at least one valve seat.

12. The system of claim 11, wherein the first groove extends from a first axial end to a second axial end of the first valve insert.

13. The system of claim 11, wherein the second groove extends from a first axial end to a second axial end of second valve insert.

14. The system of claim 11, wherein the first groove comprises a primary groove that fluidly connects to a plurality of secondary grooves.

15. The system of claim 11, wherein the first valve insert comprises a coating configured to facilitate the flow of the lubricant.

16. The system of claim 11, wherein the first valve insert comprises a first flat surface having the first groove extending lengthwise along the first flat surface, and the second valve insert comprises a second flat surface having the second groove extending lengthwise along the second flat surface.

17. The system of claim 11, wherein the first and second areas are configured to be adjacent the at least one valve seat and the at least one surface, the valve comprises a gate valve, and the flow control element comprises a gate of the gate valve.

18. A system, comprising:

a frac system configured to flow a proppant laden fluid, comprising:

a valve, comprising:

a valve body having an interior volume and a bore along a first axis;

a first valve seat disposed about the bore;

a stem extending along a second axis; and

a flow control element coupled to the stem, wherein the stem is configured to selectively move the flow control element through the interior volume along a path of travel between a closed position and an open position relative to the bore, and a first surface of the flow control element faces the first valve seat along the path of travel; and

a valve insert system configured to reduce a size of the interior volume, wherein the valve insert system comprises a first insert disposed between the valve body and the flow control element in the interior volume in a first stationary position relative to the valve body, and at least one groove configured to guide a lubricant in a first flow direction along the flow control element and the first insert to the first surface or the first valve seat to reduce wear on the flow control element from the proppant laden fluid.

19. The system of claim 18, wherein the interior volume comprises a first chamber and a second chamber, and wherein the valve insert system comprises the first insert disposed within the first chamber in the first stationary position relative to the valve body and configured to reduce a first volume of the first chamber, and a second insert disposed between the valve body and the flow control element within the second chamber in a second stationary position relative to the valve body and configured to reduce a second volume of the second chamber.

20. The system of claim 19, wherein the first insert comprises the at least one groove, and the second insert comprises at least one additional groove configured to guide lubricant in a second flow direction along the flow control element and the second insert to at least one of the first surface, the first valve seat, a second valve seat, or a second surface of the flow control element that faces the second valve seat along the path of travel.