CLAIMS

1. A system, comprising:

a drive shaft of a valve, wherein the drive shaft is made with a first metal;

a fluid control component of the valve, wherein the fluid control component is made with a second metal, and the fluid control component is configured to rotate within a fluid flow path; and

an interface material at a joint with bonding between the drive shaft and the fluid control component, wherein the joint comprises one or more protrusions configured to transfer torque between the drive shaft and the fluid control component.

2. The system of claim 1, wherein the joint has the one or more protrusions spaced apart from one another circumferentially about the drive shaft.

3. The system of claim 1, wherein the second metal is different from the first metal, and the interface material is different from both the first metal and the second metal.

4. The system of claim 1, wherein the interface material is a layer at least substantially or entirely separating the first metal of the drive shaft and the second metal of the fluid control component.

5. The system of claim 1, wherein the interface material forms an intermetallic bond with the first metal of the drive shaft and the second metal of the fluid control component.

6. The system of claim 1, wherein the interface material consists essentially of tin.

7. The system of claim 1, wherein the interface material comprises zinc, tin, lead, aluminum, brass, gold, cadmium, or cobalt, or any combination thereof.

8. The system of claim 1, wherein the interface material has a thickness of less than about 50 microns.

9. The system of claim 1, wherein the drive shaft is made of steel, and the fluid control component is made of a cast iron.

10. The system of claim 9, wherein the interface material comprises tin.

11. The system of claim 1, wherein an end of the drive shaft at the joint is inset into the fluid control component by an offset distance from an interior surface of the fluid control component, and the drive shaft does not extend through the interior surface.

12. The system of claim 1, comprising a mineral extraction system coupled to the valve, wherein the mineral extraction system is configured to extract a mineral deposit from below the surface of the earth.

13. A system, comprising:

a drive shaft of a valve;

a fluid control component of a valve; and

an interface material at the joint with bonding between the fluid control component and the drive shaft, wherein the interface material comprises zinc, tin, lead, aluminum, brass, gold, cadmium, or cobalt, or any combination thereof.

14. The system of claim 13, wherein drive shaft is made of steel, the fluid control component is made of a cast iron, and the interface material comprises tin.

15. The system of claim 13, comprising the valve having a manual actuator coupled to the drive shaft, wherein the manual actuator enables an operator to manually move the fluid control component within the fluid flow path.

16. The system of claim 13, wherein second metal is different from the first metal, the interface material is different from both the first metal and the second metal, and the interface material forms an intermetallic bond with the first metal of the drive shaft and the second metal of the fluid control component.

17. The system of claim 13, wherein the interface material forms a metallurgical bond, phase, amalgam, or any combination thereof, with the first metal of the drive shaft and the second metal of the fluid control component.

18. The system of claim 13, wherein the interface material further comprises copper, nickel, or silver, or any combination thereof.

19. The system of claim 13, wherein the interface material consists essentially of tin.

20. The system of claim 13, wherein the fluid control component comprises a drive shaft receptacle extending into the fluid control component to an end position inset from an interior surface of the fluid control component, and the drive shaft receptacle does not extend through the interior surface.

21. The system of claim 13, wherein the interface material has a thickness of about 5 microns to about 15 microns.

22. The system of claim 13, wherein the fluid control component consists essentially of iron.

23. The system of claim 13, wherein the joint comprises a mechanical anchor between the drive shaft and the fluid control component, and the mechanical anchor is configured to transfer torque between the drive shaft and the fluid control component.

24. The system of claim 13, wherein the drive shaft consists essentially of steel.

25. A system, comprising:

a valve, comprising:

a drive shaft made with a first metal;

a fluid control component coupled to the drive shaft at a joint, wherein the fluid control component is made with a second metal different from the first metal;

an interface material at the joint and bonded with the metal drive shaft, the metal fluid control component, or a combination thereof; and

an actuator coupled to the drive shaft, wherein the actuator is disposed external to the valve to enable operation of the fluid control component.

26. The system of claim 25, wherein the interface material comprises zinc, tin, lead, aluminum, brass, gold, cadmium, cobalt, or any combination thereof.

27. The system of claim 25, wherein the interface material consists essentially of tin.

28. The system of claim 25, wherein the joint comprises a plurality of protrusions spaced apart from one another circumferentially about the drive shaft.

29. The system of claim 25, wherein the first metal comprises steel and the second metal comprises iron.

30. A method of manufacturing a valve, comprising:

covering a portion of a drive shaft having a plurality of protrusions with a layer of an interface material;

casting a fluid control component about the portion of the drive shaft having the interface material and the plurality of protrusions to create a joint with bonding between the drive shaft and the fluid control component, wherein the drive shaft is made of a first metal, the fluid control component is made of a second metal different from the first metal, the second metal comprises iron, the interface material is different from both the first metal of the drive shaft and the second metal of the fluid control component.

31. The method of claim 30, wherein the interface material comprises tin.

32. The method of claim 30, wherein the interface material comprises zinc, tin, lead, aluminum, brass, gold, cadmium, cobalt, or any combination thereof.

33. The method of claim 30, wherein the plurality of protrusions is configured to transfer torque between the drive shaft and the fluid control component.

34. The method of claim 30, comprising insetting an end of the drive shaft in the fluid control component at an offset distance from an interior surface of the fluid control component, and the drive shaft does not extend through the interior surface.

35. The method of claim 30, comprising plating a layer of the interface material over the portion of the drive shaft having the plurality of protrusions, or a drive shaft receptacle in the fluid control component, or a combination thereof, wherein the layer at least substantially or entirely separates the first metal of the drive shaft and the second metal of the fluid control component .

36. The method of claim 30, comprising coupling a manual actuator to the drive shaft, wherein the manual actuator enables an operator to manually move the fluid control component within a fluid flow path.

37. The method of claim 30, comprising bonding the interface material with the first metal of the drive shaft and the second metal of the fluid control component.

CLAIMS

1. A valve, comprising:

a valve body;

a fluid control component disposed in the valve body;

a shaft coupled to the fluid control component, wherein the shaft extends through the valve body;

an interface material bonding the fluid control component and the shaft, wherein a third material composition of the interface material is disposed directly between a first material composition of the shaft and a second material composition of the fluid control component such that the interface material directly contacts the first material composition and the second material composition, wherein the first, second, and third material compositions are different from one another, wherein the third material composition of the interface material comprises zinc, tin, lead, aluminum, brass, gold, cadmium, or cobalt, or any combination thereof.

2. The valve of claim 1, wherein the interface material forms an intermetallic bond with a first metal of the shaft and a second metal of the fluid control component.

3. The valve of claim 1, wherein the interface material forms a metallurgical bond, phase, amalgam, or any combination thereof, with a first metal of the shaft and a second metal of the fluid control component.

4. The valve of claim 1, wherein the interface material isolates the first material composition of the shaft from the second material composition of the fluid control component.

5. The valve of claim 1, wherein the interface material has a thickness of about 5 microns to about 15 microns.

6. The valve of claim 1, wherein the third material composition of the interface material consists essentially of tin.

7. The valve of claim 1, wherein the third material composition of the interface material further comprises copper, nickel, or silver, or any combination thereof.

8. The valve of claim 1, wherein the first material composition of the shaft consists essentially of steel.

9. The valve of claim 1, wherein the second material composition of the fluid control component consists essentially of iron.

10. The valve of claim 1, wherein first material composition of the shaft is steel, the second material composition of the fluid control component is a cast iron, and the third material composition of the interface material comprises tin.

11. The system of claim 1, wherein the third material composition of the interface material comprises the lead.

12. The system of claim 1, wherein the third material composition of the interface material comprises the aluminum.

13. The system of claim 1, wherein the third material composition of the interface material comprises the brass.

14. The system of claim 1, wherein the third material composition of the interface material comprises the gold.

15. The system of claim 1, wherein the third material composition of the interface material comprises the cadmium.

16. The system of claim 1, wherein the third material composition of the interface material comprises the cobalt.

17. The valve of claim 1, comprising an actuator coupled to the shaft.

18. The valve of claim 17, wherein the actuator comprises a manual actuator.

19. The valve of claim 1, wherein the shaft is coupled to the fluid control component at a male-female joint, and the third material composition of the interface material is disposed at the male-female joint directly between the first material composition of the shaft and the second material composition of the fluid control component.

20. The valve of claim 19, wherein the male-female joint comprises a shaft receptacle extending into the fluid control component to an end position inset from an interior surface of the fluid control component, and the shaft receptacle does not extend through the interior surface.

21. The valve of claim 19, wherein the male-female joint comprises a spline, and the interface material is disposed on the spline.

22. A method, comprising:

bonding a shaft to a fluid control component of a valve at a joint having an interface material, wherein the interface material is disposed directly between a first material of the shaft and a second material of the fluid control component such that the interface material directly contacts the first and second materials, wherein the first and second materials are different from one another, wherein the interface material comprises zinc, tin, lead, aluminum, brass, gold, cadmium, or cobalt, or any combination thereof.

23. The method of claim 22, wherein shaft is made of steel, the fluid control component is made of a cast iron, and the interface material comprises tin.

24. The method of claim 22, comprising covering a spline of the joint with the interface material.

25. The method of claim 22, comprising casting the fluid control component over a portion of the shaft having the interface material.

26. The method of claim 22, comprising coupling a manual actuator to the shaft, wherein the manual actuator is disposed external to a body of the valve containing the fluid control component.

27. A system, comprising:

a shaft; and

an interface material disposed circumferentially about an outer perimeter of the shaft, wherein the interface material is configured to facilitate bonding between a component and the shaft wherein the interface material directly contacts the shaft and is configured to directly contact the component, wherein the interface material is different from a first material of the shaft, and the interface material comprises zinc, tin, lead, aluminum, brass, gold, cadmium, or cobalt, or any combination thereof.

28. The system of claim 27, comprising a valve having the shaft with the interface material.

29. The system of claim 27, wherein the shaft comprises a spline, and the interface material is disposed over the spline.

30. The system of claim 1, wherein the third material composition of the interface material consists essentially of tin, lead, aluminum, brass, gold, cadmium, or cobalt.

31. The system of claim 27, comprising the component, wherein the shaft comprises a plurality of protrusions configured to transfer torque between the shaft and the component, and the interface material is disposed over the plurality of protrusions between the shaft and the component.

32. The system of claim 31, wherein the interface material comprises tin.