FLUID INJECTION SYSTEM

BACKGROUND

[0001] 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.

[0002] Wells are often used to access resources below the surface of the earth. For instance, oil, natural gas, and water are often extracted via a well. Some wells are used to inject materials below the surface of the earth, e.g., to sequester carbon dioxide, to store natural gas for later use, or to inject steam or other substances near an oil well to enhance recovery. Due to the value of these subsurface resources, wells are often drilled at great expense, and great care is typically taken to extend their useful life.

[0003] Chemical-injection management systems are often used to maintain a well and/or enhance well output. For example, chemical-injection management systems may inject chemicals to extend the life of a well or increase the rate at which resources are extracted from a well. Typically, these materials are injected into the well in a controlled manner over a period of time by the chemical- injection management system.

SUMMARY

[0003A] According to a first aspect, there is provided a system, comprising: a fluid injection system configured to removably couple to a mineral extraction system, wherein the fluid injection system comprises: a housing having a fluid inlet, a fluid outlet, and a flow path between the fluid inlet and the fluid outlet; a fluid injection system controller disposed in the housing; a flow meter system disposed in the housing and coupled to the fluid injection system controller, wherein the flow meter system is configured to measure a fluid flow of an injection fluid along the flow path through the fluid injection system; an adjustable valve disposed in the housing, wherein the adjustable valve is configured to control the fluid flow along the flow path through the fluid injection system; and a non-return valve disposed in the housing, wherein the non-return valve is configured to allow forward fluid flow of the injection fluid and block reverse fluid flow along the flow path through the fluid injection system.

[0003B] According to a second aspect, there is provided a system, comprising: a fluid injection system configured to removably couple to a mineral extraction system, wherein the fluid injection system comprises: a housing having a fluid inlet, a fluid outlet, a flow path between the fluid inlet and the fluid outlet, and an electrical connector; a controller disposed in the housing and coupled to the electrical connector; an ultrasonic flow meter system disposed in the housing and coupled to the controller, wherein the ultrasonic flow meter system is configured to measure a fluid flow of a fluid along the flow path; and a pressure measurement system disposed in the housing and coupled to the controller, wherein the pressure measurement system is configured to measure a fluid pressure along the flow path.

[0003C] According to a third aspect, there is provided a system, comprising: an underwater apparatus configured to removably couple to an underwater mineral extraction system, wherein the underwater apparatus comprises: a housing having a fluid inlet, a fluid outlet, a flow path between the fluid inlet and the fluid outlet, and a first alignment guide, wherein the first alignment guide is configured to guide a connection between the first inlet and a first mating outlet and the first outlet and a first mating inlet of the underwater mineral extraction system; an ultrasonic flow meter system disposed along the flow path within the housing, wherein the ultrasonic flow meter system is configured to measure a fluid flow of a fluid along the flow path through the underwater apparatus; and a non-return valve configured to allow forward fluid flow of the fluid and block reverse flow of the fluid along the flow path through the underwater apparatus.

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:

CLAIMS

1. A system, comprising:

a fluid injection system configured to removably couple to a mineral extraction system, wherein the fluid injection system comprises:

a housing having a fluid inlet, a fluid outlet, and a flow path between the fluid inlet and the fluid outlet;

a fluid injection system controller disposed in the housing;

a flow meter system disposed in the housing and coupled to the fluid injection system controller, wherein the flow meter system is configured to measure a fluid flow of an injection fluid along the flow path through the fluid injection system;

an adjustable valve disposed in the housing, wherein the adjustable valve is configured to control the fluid flow along the flow path through the fluid injection system; and

a non-return valve disposed in the housing, wherein the non-return valve is configured to allow forward fluid flow of the injection fluid and block reverse fluid flow along the flow path through the fluid injection system.

2. The system of claim 1, wherein the fluid injection system comprises a first end configured to couple to a remotely operated vehicle (ROV) and a second end configured to couple to the mineral extraction system, and the second end comprises the fluid inlet and the fluid outlet.

3. The system of claim 1, wherein the housing has an electrical connector, wherein the fluid injection system is configured to selectively couple the fluid inlet with a mating fluid outlet, the fluid outlet with a mating fluid inlet, and the electrical connector with a mating electrical connector.

4. The system of claim 1, wherein the fluid inlet comprises a first coupler and the fluid outlet comprises a second coupler, wherein the first coupler and the second coupler are configured to removably couple the fluid injection system to the mineral extraction system.

5. The system of claim 4, wherein the non-return valve rests within the first coupler or the second coupler.

6. The system of claim 3, wherein the fluid injection system comprises a lockdown mechanism configured to selectively lock the housing to the mineral extraction system, and the lockdown mechanism comprises one or more radial locks.

7. The system of claim 1, wherein the fluid injection system comprises a first pressure transducer disposed in the housing, and the first pressure transducer is configured to measure a first fluid pressure at a first location along the flow path in the fluid injection system.

8. The system of claim 7, wherein the fluid injection system comprises a second pressure transducer disposed in the housing, and the second pressure transducer is configured to measure a second fluid pressure at a second location along the flow path in the fluid injection system.

9. The system of claim 1, wherein the fluid injection system comprises an actuator configured to drive the adjustable valve between open and closed positions.

10. The system of claim 1, wherein the fluid injection system comprises a position sensor coupled to the adjustable valve.

11. The system of claim 1, wherein the fluid injection system comprises a shaft rotation sensor coupled to an actuator, and the actuator is coupled to the adjustable valve.

12. The system of claim 1, wherein the fluid injection system comprises a chemical injection system, and the injection fluid comprises one or more chemicals.

13. The system of claim 1, wherein the fluid injection system comprises a water injection system, and the injection fluid comprises water.

14. A system, comprising:

a fluid injection system configured to removably couple to a mineral extraction system, wherein the fluid injection system comprises:

a housing having a fluid inlet, a fluid outlet, a flow path between the fluid inlet and the fluid outlet, and an electrical connector;

a controller disposed in the housing and coupled to the electrical connector;

an ultrasonic flow meter system disposed in the housing and coupled to the controller, wherein the ultrasonic flow meter system is configured to measure a fluid flow of a fluid along the flow path; and

a pressure measurement system disposed in the housing and coupled to the controller, wherein the pressure measurement system is configured to measure a fluid pressure along the flow path.

15. The system of claim 14, wherein the fluid injection system comprises an adjustable valve disposed in the housing along the flow path and configured to control the fluid flow in response to a measurement of the fluid flow by the ultrasonic flow meter system or the pressure measurement system.

16. The system of claim 14, wherein the fluid injection system comprises a non-return valve disposed in the housing along the flow path, and the non-return valve is configured to allow forward fluid flow of the fluid and block reverse flow of the fluid along the flow path through the fluid injection system.

17. The system of claim 14, wherein the housing comprises a first end configured to couple to a remotely operated vehicle (ROV) and a second end configured to couple to the mineral extraction system, and wherein the second end comprises the fluid inlet, the fluid outlet, and the electrical connector.

18. A system, comprising:

an underwater apparatus configured to removably couple to an underwater mineral extraction system, wherein the underwater apparatus comprises:

a housing having a fluid inlet, a fluid outlet, a flow path between the fluid inlet and the fluid outlet, and a first alignment guide, wherein the first alignment guide is configured to guide a connection between the first inlet and a first mating outlet and the first outlet and a first mating inlet of the underwater mineral extraction system;

an ultrasonic flow meter system disposed along the flow path within the housing, wherein the ultrasonic flow meter system is configured to measure a fluid flow of a fluid along the flow path through the underwater apparatus; and

a non-return valve configured to allow forward fluid flow of the fluid and block reverse flow of the fluid along the flow path through the underwater apparatus.

19. The system of claim 18, wherein the non-return valve is disposed in a first coupler of the fluid inlet or in a second coupler of the fluid outlet.

20. The system of claim 18, wherein the underwater apparatus comprises an adjustable valve disposed in the housing along the flow path.

21. The system of claim 18, wherein the ultrasonic flow meter system comprises a first ultrasonic transducer and a second ultrasonic transducer configured to measure a fluid flow rate along the flow path through the underwater apparatus.

22. The system of claim 20, wherein the underwater apparatus comprises a controller disposed in the housing and configured to control the adjustable valve in response to the ultrasonic flow meter system.