occurs, e.g., a burst or other leak in the pipeline, some or all of the valves can be closed manually or automatically to isolate the portion of the system where the failure occurred and prevent additional release of gas.

[0010] While the use of valves can greatly improve the safety of the system, the valves can also complicate the construction and/or operation of the system, increase the costs of operation and/or maintenance of the system, and introduce additional points of possible failure. Thus, a continued need exists for an improved system for transporting and processing sour fluids.

SUMMARY OF THE ~~INVENTION~~DISCLOSURE

[0011] The embodiments of the present ~~invention~~disclosure generally provide systems and methods for transporting and processing sour gas, such as sour natural gas from a naturally occurring subsurface hydrocarbon reservoir, which can be treated by introducing a solvent into the sour natural gas. In some systems and methods of the present ~~invention~~disclosure, the sour gas can be treated at the same location(s) where the sour gas is collected so that sweetened gas is transported instead of sour gas. The solvent used for the sweetening can be provided by a regeneration device, which can also be located remotely from the collection location, and which can provide solvent to multiple collectors of the sour fluid at different collection locations.

[0011a] In a first aspect, there is provided a method for transporting and processing sour gas, the method comprising:

collecting a sour gas at a collection location, the collection location having an associated sweetening device;

delivering a solvent to the sweetening device from a regeneration device remote therefrom;

treating the sour gas at the collection location with the solvent in the associated sweetening device to form a sweetened gas and a sour gas-rich solvent;

transporting the sweetened gas from the sweetening device to a gas processing plant remote therefrom; and

delivering the sour gas-rich solvent from the sweetening device to the regeneration device for regeneration therein; wherein collecting the sour gas and treating the sour gas comprises collecting the sour gas at a plurality of gas collection locations, each collection location having an associated sweetening device that receives sour gas for treatment therein; wherein delivering solvent comprises delivering the solvent from the regeneration device to each of the sweetening devices; wherein transporting the sweetened gas comprises transporting the sweetened gas from each of the collection locations to the gas processing plant via a common pipeline; and wherein delivering the sour gas-rich solvent comprises delivering the sour gas-rich solvent from each of the sweetening devices to the regeneration device.

[0012] According to a method of one embodiment of the present ~~invention~~disclosure, a sour gas is collected at a collection location that has an associated sweetening device. A solvent is delivered to the sweetening device from a regeneration device remote therefrom, and the sour gas is treated at the collection location with the solvent in the associated sweetening device to form a sweetened gas and a sour gas-rich solvent. The sweetened gas is transported from the sweetening device to a gas processing plant remote therefrom. The sour gas-rich solvent is delivered from the sweetening device to the regeneration device for regeneration therein. The regeneration device can be collocated with the gas processing plant or remote therefrom.

[0013] In some cases, the sour gas is collected at a plurality of gas collection locations, and each collection location has an associated sweetening device that receives sour gas for treatment therein. The solvent can be delivered from the regeneration device to each of the sweetening devices, the sweetened gas can be transporting from each of the collection locations to the gas processing plant via a common pipeline, and the sour gas-rich solvent from each of the sweetening devices can be delivered to the regeneration device.

[0018] The pipeline(s) can include a first pipeline fluidly connecting the sweetening device and the gas processing plant for transporting the sweetened gas from the sweetening device to the gas processing plant, a second pipeline fluidly connecting the regeneration device and the sweetening device for delivering the solvent from the regeneration device to the sweetening device, and a third pipeline fluidly connecting the sweetening device and the regeneration device for delivering the sour gas-rich solvent from the sweetening device to the regeneration device. In some cases, the system includes a common pipeline that is configured to receive the sweetened gas and the sour gas-rich solvent and transport the sweetened gas and the sour gas-rich solvent as a mixed phase fluid.

[0019] The system can also include a mixing unit at the collection location that is configured to receive and mix the sour gas and the sour gas-lean solvent to form the sweetened gas and sour gas-rich solvent. In some cases, the collector can be configured to provide the sour gas to the sweetening device with a hydrogen sulfide content of more than 5.7 milligrams per cubic meter of the sour gas and the sweetening device is configured to reduce the hydrogen sulfide content of the sour gas to less than 5.7 milligrams per cubic meter of the sweetened gas, thereby converting the sour gas to a sweetened gas. In other cases, the collector can be configured to provide the sour gas to the sweetening device with a hydrogen sulfide content of more than 10 ppm of the sour gas and the sweetening device is configured to reduce the hydrogen sulfide content of the sour gas to less than 10 ppm of the sweetened gas, thereby converting the sour gas to a sweetened gas.

[0019a] In a second aspect, there is provided a system for transporting and processing sour gas, the system comprising:

a collector at a collection location configured to collect sour gas;

a sweetening device at the collection location and fluidly connected to the collector to receive the sour gas from the collector, the sweetening device configured to treat the sour gas with a sour gas-lean solvent to form a sweetened gas and a sour gas-rich solvent;

a regeneration device remote from the collection location and configured to deliver the sour gas-lean solvent to the sweetening device; and

at least one pipeline configured to transport the sweetened gas from the sweetening device to a gas processing plant remote therefrom and deliver the sour gas-rich solvent from the sweetening device to the regeneration device for regeneration therein; wherein the system comprises a plurality of collectors and a plurality of sweetening devices, each collector having an associated one of the sweetening devices that receives sour gas therefrom; wherein the regeneration device is configured to deliver the solvent to each of the sweetening devices; wherein the pipeline fluidly connects each of the collection locations to the gas processing plant via a common pipeline; and wherein each of the sweetening devices is configured to deliver the sour gas-rich solvent to the regeneration device.

[0020] By sweetening the gas at the one or more locations of collection, the subsequent transport of the gas can be simplified since the sour nature of the gas is reduced or eliminated. In this way, the system and method can potentially be simplified, and the costs of each can be reduced. In addition, the safety of the system may be increased, e.g., by sweetening a gas before it is transported a long distance and/or through densely populated or otherwise environmentally sensitive areas to reduce any risks associated with possible leaks from the system. Further, since the sweetened gas may be less corrosive than the unsweetened gas, the pipeline requirements may be reduced, potentially reducing the costs associated with the system. For example, it may be possible to use a pipeline made of a particular material that would not be acceptable if the pipeline were instead required to transport the unsweetened gas. If the regeneration device is located remotely from the collection location and/or the regeneration device is used to provide solvent to multiple