[006] There is a need for improved methods for the removal of mercury from gaseous hydrocarbon streams, and particularly methods wherein produced water can be used / recycled.

SUMMARY OF THE ~~INVENTION~~DISCLOSURE

[007] In one aspect, the ~~invention~~ disclosure relates to an improved method to treat a crude oil to reduce its mercury concentration. The method comprises: recovering a mixture of produced water and mercury-containing natural gas from an underground reservoir; separating the mercury-containing natural gas from the produced water; scrubbing the natural gas with an aqueous solution in an absorber, wherein the aqueous solution comprises a water-soluble sulfur compound to react a least a portion of the mercury in the natural gas with the water-soluble sulfur compound to produce a treated natural gas with a reduced concentration of mercury and a mercury containing sulfur-depleted solution; removing at least a portion of the mercury containing sulfur-depleted solution as a purge stream; recirculating at least a portion of the mercury containing sulfur-depleted solution as a recirculating stream; and providing a fresh source of water-soluble sulfur compound as a feed to the absorber for reaction with the mercury in the natural gas.

[008] In one embodiment, the fresh source of water-soluble sulfur compound is generated on-site by reacting .elemental sulfur with a sulfidic solution. In another embodiment, at least a portion of the purge stream is disposed by injection into an underground reservoir.

[008a] In one aspect, there is provided a method for removing a trace amount of mercury in a natural gas feed, comprising:

recovering a mercury-containing natural gas from an underground reservoir;

scrubbing the mercury-containing natural gas with an aqueous solution in an absorber, wherein the aqueous solution comprises a water-soluble sulfur compound to react a least a portion of the mercury in the natural gas with the water-soluble sulfur compound to produce a treated natural gas with a reduced concentration of mercury and a mercury-containing sulfur-depleted solution,

removing at least a portion of the mercury containing sulfur-depleted solution as a purge stream;

recirculating at least a portion of the mercury containing sulfur-depleted solution as a recirculating stream; and

providing a fresh source of water-soluble sulfur compound as a feed to the absorber for reaction with the mercury in the natural gas.

BRIEF DESCRIPTION OF THE DRAWINGS

[009] Figure 1 is a block diagram of an embodiment of a system and process to remove mercury from natural gas, wherein the scrubbing liquid needed for the mercury removal unit (MRU) contains produced water, and wastewater from the system is disposed by injection into an underground reservoir.

[010] Figure 2 is a block diagram of a second embodiment of the MRU, wherein the polysulfide needed for the mercury removal is generated on-site as part of the MRU.

DETAILED DESCRIPTION

[011] The following terms will be used throughout the specification and will have the following meanings unless otherwise indicated.