comprising hydrocarbons, mercury and water, and a liquid hydrocarbon stream comprising hydrocarbons and elemental mercury; c) charging a mercury-containing gas feed, including in part at least a portion of said gaseous hydrocarbon stream, to a mercury removal unit for removal of mercury from said mercury-containing gas feed, thereby forming a treated gas stream; d) contacting a recycle gas stream comprising a portion of said treated gas stream with at least a portion of said liquid hydrocarbon stream for transfer of at least a portion of the elemental mercury contained in said liquid hydrocarbon stream to said recycle gas stream; thereby forming a mercury rich gas stream, and a treated liquid hydrocarbon stream; and e) passing said mercury rich gas stream to said mercury removal unit as a portion of said mercury-containing gas feed. The improvement comprises converting at least at portion of the mercury in the crude oil stream into volatile mercury, wherein the improvement comprising mixing into the crude oil stream an effective amount of an oxidizing agent; mixing into the crude oil stream an effective amount of a reducing agent to convert at least a portion of the mercury into a volatile mercury; and wherein the mixing into the crude oil stream is prior to separating the crude oil stream into a gaseous hydrocarbon stream and a liquid hydrocarbon stream.

[009a] In another aspect, there is provided a method for reducing a trace amount of mercury in a crude oil, comprising:

providing a crude oil having a first concentration of non-volatile mercury,

mixing into the crude oil an effective amount of an oxidizing agent;

mixing into the crude oil an effective amount of a reducing agent to convert at least a portion of the non-volatile mercury into a volatile mercury;

removing the volatile mercury by at least one of stripping, scrubbing, adsorption, and combinations thereof to obtain a crude oil have a reduced concentration of non-volatile mercury which is less than 50% of the first concentration of non-volatile mercury.

[009b] In another aspect, there is provided an improved process to removal mercury from a crude oil stream containing mercury, the process comprising: a) separating the crude oil stream into a gaseous hydrocarbon stream and a liquid hydrocarbon stream; b) removing mercury from the gaseous hydrocarbon stream to provide a treated gas stream; c) contacting the treated gas stream with the liquid hydrocarbon stream to transfer mercury from the liquid hydrocarbon stream to the treated gas stream and thereby form a treated liquid stream and a mercury rich gas stream; and d) removing mercury from the mercury rich gas stream,

wherein the improvement comprises converting at least at portion of the mercury in the crude oil stream into volatile mercury, the improvement comprising:

mixing into the crude oil stream an effective amount of an oxidizing agent;

mixing into the crude oil stream an effective amount of a reducing agent to convert at least a portion of the mercury into a volatile mercury;

wherein the mixing into the crude oil stream is prior to separating the crude oil stream into a gaseous hydrocarbon stream and a liquid hydrocarbon stream.

DETAILED DESCRIPTION

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

[011] "Crude oil" refers to petroleum crude oil that is originates from an underground or undersea reservoir. As used herein, the term crude refers to both crude oil and condensate. Crude, crude oil, crudes and crude blends are used interchangeably and each is intended to include both a single crude and blends of crudes. Crude oils can also be blended with "Hydrocarbon Material." "Hydrocarbon material" refers to a pure compound or mixtures of compounds containing hydrogen and carbon and optionally sulfur, nitrogen, oxygen, and other elements. Examples include synthetic crude oils, petroleum products such as gasoline, jet fuel, diesel fuel, lubricant base oil, solvents, and alcohols such as methanol and ethanol.

[012] In one embodiment, crude oil has a specific gravity of at least 0.75 at a temperature of 60°F. In another embodiment, the specific gravity is at least 0.85. In a third embodiment, the specific gravity is at least 0.90. In one embodiment, the crude oil to be treated is in the form of a mixture of crude oil and water produced from a hydrocarbon reservoir (or, …oil and water from an oil and gas production well). The water-to-oil ratio