

CLAIMS:

1. A method for performing steam cracking, comprising:
 - desalting a hydrocarbon feed comprising hydrocarbon and 25 wppb or more of a first
 - 5 mercury material to form a desalted feed, wherein the feed comprises one or more crude oils, crude fractions, or a combination thereof;
 - heating at least a portion of the desalted feed to form a preheated, feed;
 - separating a pyrolysis feed and a higher boiling stream from at least a portion of the preheated feed, the pyrolysis feed having a final boiling point of 760°C or less;
 - 10 exposing at least a portion of the pyrolysis feed to steam cracking conditions to form a steam cracker effluent;
 - separating at least a naphtha and a process fluid comprising C₂ – C₆ olefins from the steam cracker effluent, wherein (i) the process fluid comprises a second mercury material, (ii) the naphtha comprises a third mercury material, and (iii) the second and third materials include
 - 15 forms of mercury produced from the first mercury material during the steam cracking;
 - separating from the process fluid (i) a process gas comprising C₂ – C₃ olefin and a process liquid comprising C₄ – C₆ olefin ; and
 - removing at least a portion of the second mercury material from at least a portion of one or more of (i) the process fluid, (ii) the process gas, and (iii) the process liquid.
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2. The method of claim 1, wherein at least a portion of the second mercury material is removed in at least one regenerable mercury removal stage, the method further comprising:
 - conducting at least a portion of the process fluid, at least a portion of the process gas, or at least a portion of the process liquid as a bed feed flow to the regenerable mercury removal
 - 25 stage;
 - stopping the bed feed flow to the mercury removal stage;
 - passing a regeneration gas through the mercury removal stage to form a flue gas having a mercury content of 0.1 wppm or more;
 - passing the flue gas through a fixed bed mercury trap to form a reduced-mercury flue
 - 30 gas having a mercury content of 100 wppb or less; and
 - restoring the bed feed flow to the mercury removal stage and continuing passing of at least a portion of the flue gas through the mercury trap.

3. The method of claim 1 or claim 2, wherein the regeneration gas comprises a stream separated from the processed fluid fraction.
4. The method of any of the preceding claims, further comprising removing from at least a portion of the naphtha at least a portion of the third mercury material, wherein (i) at least part of the removal of the third mercury material is carried out in a fixed-bed mercury trap to form a reduced-mercury naphtha, (ii) the fixed mercury trap contains a predetermined amount of mercury sorbent, and the predetermined amount of mercury sorbent is determined from the pyrolysis feed's mercury content.
5. The method of any of the preceding claims, further comprising hydroprocessing at least a portion of the naphtha, wherein (i) at least part of the hydroprocessing is carried out in at least one hydroprocessing reactor to form a reduced-mercury naphtha, (ii) the hydroprocessing reactor contains a predetermined amount of hydroprocessing catalyst, and the predetermined amount of hydroprocessing catalyst is determined from the pyrolysis feed's mercury content.
6. The method of any of the preceding claims, the method further comprising passing the at least a portion of the process fluid into an acid gas removal stage before the removal of at least a portion of the second mercury material from the process fluid.
7. The method of claim 6, wherein mercury sulfide is removed from that portion of the process fluid in the acid gas removal stage, the mercury sulfide being produced by contacting that portion of the process fluid with a polysulfide reagent, and wherein the mercury sulfide is removed at a location upstream of the mercury removal stage.
8. The method of any of the preceding claims, wherein the hydrocarbon feed has a mercury content of 100 wppb or more.
9. The method of any of the preceding claims, wherein the desalted feed has a mercury content in a range of from 25 wppb to 500 wppb.
10. The method of any of the preceding claims, wherein the naphtha has a mercury content in a range of from 1 wppb to 100 wppb.

11. The method of any of the preceding claims, wherein the heating of the at least a portion of the desalted feed includes heating in a convection section of a steam cracking furnace, the preheated feed having a mercury content in a range of from 25 wppb to 400 wppb.
- 5 12. The method of any of the preceding claims, wherein the one or more crude oils, crude fractions, or a combination thereof comprise one or more crude oils, crude fractions, or a combination thereof that have not been processed in a co-located refinery.
- 10 13. The method of any of the preceding claims, wherein the one or more crude oils, crude fractions, or a combination thereof comprise one or more crude oils, crude fractions, or a combination thereof that have not been previously processed in a refinery.
14. The method of any of the preceding claims, wherein the one or more crude oils, crude fractions, or a combination thereof comprise one or more raw crude oils, crude fractions, or a combination thereof.
- 15 15. The method of any of the preceding claims, wherein the pyrolysis feed has a final boiling point of 593°C or less and/or the pyrolysis feed comprises 400 wppm or less of non-volatiles.
- 20 16. The method of any of the preceding claims, further comprising separating at least one of a steam cracker gas oil fraction and a steam cracker tar fraction from the steam cracking effluent.
- 25 17. The method of any of the preceding claims, wherein the hydrocarbon feed comprises 70 wt. % or more of components having a boiling point of 150°C or more.
18. The method of claim 1, wherein at least a portion of the second mercury material is separated from the process fluid to produce an upgraded process fluid having a mercury content of 0.1 wppb or less.
- 30 19. The method of claim 1, wherein the removing at least a portion of the second mercury material includes i) exposing the process gas to a mercury removal stage that includes at least

one process gas drier, ii) exposing the process liquid to a mercury removal stage comprising a process liquid drier, or iii) a combination of i) and ii).

20. A steam cracking reaction system, comprising:
- 5 a desalter;
- a steam cracking furnace comprising a convection zone inlet, a convection zone outlet, a radiant zone inlet, and a radiant zone outlet, the desalter being in fluid communication with the convection zone inlet;
- 10 a vapor-liquid separator in fluid communication with the convection zone outlet and the radiant zone inlet;
- a cooling and fractionation stage in fluid communication with the radiant zone outlet, the cooling and fractionation stage comprising a naphtha outlet and a process fluid outlet;
- a compressor and acid gas removal stage in fluid communication with the process fluid outlet;
- 15 one or more drying stages in fluid communication with the compressor and acid gas removal stage; and
- at least one fixed bed mercury trap in fluid communication with the one or more drying stages.
- 20 21. The system of claim 20, wherein the one or more drying stages comprise a regenerable mercury removal molecular sieve.
22. The system of claim 20 or claim 21, wherein compressor and acid gas removal stage is further in fluid communication with a source of a polysulfide reagent, a source of elemental sulfur, or a combination thereof.
- 25 23. The system of any of claims 20 to 22, further comprising a fixed bed mercury trap in fluid communication with the naphtha outlet.
- 30 24. The system of any of claims 20 to 23, wherein the one or more drying stages comprise at least one process gas drier and at least one process liquid drier.

25. A steam cracking process, comprising:

- providing a hydrocarbon feed comprising hydrocarbon and mercury material,
wherein the mercury is present in an amount A_1 based on the weight of the hydrocarbon feed;
determining A_1 ;
- establishing a flow of the hydrocarbon feed into a steam cracking furnace facility to
5 produce a steam cracker effluent;
- separating from the steam cracker effluent a naphtha comprising C_{5+} hydrocarbon
and mercury;
- upgrading the naphtha, wherein
- (i) the upgrading includes both mercury removal and hydroprocessing of the
10 naphtha,
- (ii) the mercury removal and hydroprocessing are carried out in at least one
hydroprocessing reactor containing a predetermined first amount (A_2) of a first active
material and a predetermined amount (A_3) of a second active material,
- (iii) A_2 is effective for the mercury removal,
- 15 (iv) A_3 is effective for the hydroprocessing, and
- (v) A_2 and A_3 are determined from A_1 .
26. The process of claim 25, wherein the first and second active materials have the same
or different compositions.
- 20 27. The process of claim 25 or claim 26, wherein the first and second active materials
have different compositions, and first active material is located upstream of the second active
material.
- 25 28. The process of any of claims 25 to 27, wherein at least a portion of the naphtha's
mercury is removed before the hydroprocessing.
29. The process of any of claims 25 to 27, further comprising substituting a second
hydrocarbon feed for at least a portion of the first hydrocarbon feed.
- 30 30. The process of claim 29, wherein the first and second feeds are each a raw crude oil.