CLAIMS

1. A process for upgrading crude oil comprising:

mixing a crude oil stream with a hydrogen stream to yield a crude oil and hydrogen mixture;

passing the crude oil and hydrogen mixture to a hydroprocessing reactor operating at a temperature from 300 to 450 °C and a pressure from 30 to 200 bars, the hydroprocessing reactor comprising hydroprocessing catalysts which desulfurize and demetallize the crude oil and hydrogen mixture to produce a hydrotreated mixture;

passing the hydrotreated mixture to a separator unit to separate the hydrotreated mixture into a lower boiling point fraction and a higher boiling point fraction, where the higher boiling fraction has a greater concentration of aromatics and a greater boiling point than the lower boiling point fraction, and where the higher boiling point fraction has a boiling point of at least 500 °C, where separation by the separator unit comprises:

a flash vessel which separates the hydrotreated mixture into a first lower boiling point fraction and a first higher boiling point fraction, where the first lower boiling point fraction has a boiling point range of less than 350 °C , and the first higher boiling point fraction has a boiling range of greater than 350° C ; and

a distillation vessel which separates the first higher boiling point fraction into a second lower boiling point fraction and the higher boiling point fraction, where the second lower boiling point fraction has a boiling point range of greater than 350 °C to less than 500 °C and the higher boiling point fraction has a boiling point range of greater than 500 °C, where the lower boiling point fraction comprises the first lower boiling point fraction and/or the second lower boiling point fraction;

thermally cracking the lower boiling point fraction in a steam cracking furnace operating at a temperature from 700 to less than 850 °C to yield a cracking effluent comprising olefins and aromatics; and

recycling the entirety of the higher boiling point fraction for mixing with the crude oil and hydrogen mixture upstream of the hydroprocessing reactor to facilitate further upgrading of the crude oil..

2. The process of claim 1, further comprising combining the first lower boiling point fraction and the second lower boiling point fraction to yield the lower boiling point fraction.

3. The process of claim 1, further comprising preheating the crude oil stream to a temperature of at least 300 °C prior to mixing with the hydrogen stream.

4. The process of claim 1, where the hydroprocessing catalysts comprise at least one Group VIII metal, at least one Group VI metal, or combinations thereof.

5. The process of claim 4, where the hydroprocessing catalysts comprise Co and Ni.

6. The process of claim 1, where the hydroprocessing catalysts comprise Mo and W supported on a support material.

7. The process of claim 6, where the support material comprises alumina.

8. The process of claim 1, where the crude oil stream has an API Gravity (°) of 25° to 50°.

9. The process of claim 1, where the hydrogen stream comprises a hydrogen and recycled hydrogen.

10. The process of claim 1, where the hydroprocessing reactor comprises a plurality of catalyst layers.

11. The process of claim 1, where a liquid hourly space velocity (LHSV) of the hydroprocessing reactor is from 0.1 to 2.0 h^{-1}.

12. The process of claim 1, where the steam cracking furnace comprises a convection section and a pyrolysis section downstream of the convection section.

13. The process of claim 12, where the convection section has a steam to light fraction ratio of 0.3:1 to 2:0.1, the light fraction representing a stream of the lower boiling point fraction.

14. The process of claim 12, where the convection section allows for a reaction residence time of 0.05 to 2 seconds.

15. The process of claim 1, where the aromatics of the cracking effluent comprise one or more of benzene, toluene, and xylene.

16. The process of claim 1, further comprising cooling the cracking effluent to a temperature less than 200 °C.

17. The process of claim 1, further comprising delivering the cracking effluent to gas-liquid separators, oil-liquid separators, or combinations thereof.

18. The process of claim 1, further comprising separating olefins from the cracking effluent in a fractionator.

19. The process of claim 1, where thermally cracking the lower boiling point fraction is completed in the steam cracking furnace operating at a temperature from 700 to less than 800 °C to yield the cracking effluent comprising olefins and aromatics.