Claims:

1. An integrated hydroprocessing, steam pyrolysis and catalytic cracking process for production of olefinic and aromatic petrochemicals from a crude oil feed, the process comprising:

a. charging the crude oil and hydrogen to a hydroprocessing zone operating under conditions effective to produce a hydroprocessed effluent having a reduced content of contaminants, an increased paraffinicity, reduced Bureau of Mines Correlation Index, and an increased American Petroleum Institute gravity;

b. thermally cracking hydroprocessed effluent in the presence of steam in a steam pyrolysis zone to produce a mixed product stream;

c. catalytically cracking heavy components derived from one or more of the hydroprocessed effluent, a heated stream within the steam pyrolysis zone, or the mixed product stream, to produce catalytically cracked products;

d. separating a combined product stream including thermally cracked products and catalytically cracked products;

e. purifying hydrogen recovered in step (d) and recycling it to step (a); and

f. recovering olefins and aromatics from the separated combined product stream.

2. The integrated process of claim 1, further comprising recovering pyrolysis fuel oil from the separated combined product stream for use as at least a portion of the heavy components cracked in step (c).

3. The integrated process of claim 1, further comprising separating the hydroprocessed effluent from step (a) into a vapor phase and a liquid phase in a vapor-liquid separation zone, wherein the vapor phase is the feed to step (b), and at least a portion of the liquid phase is catalytically cracked in step (c).

4. The integrated process of claim 3, wherein the vapor-liquid separation zone is a flash separation apparatus.

5. The integrated process of claim 3, wherein the vapor-liquid separation zone comprises a flash vessel having at its inlet a vapor-liquid separation device including

a pre-rotational element having an entry portion and a transition portion, the entry portion having an inlet for receiving the hydroprocessed effluent and a curvilinear conduit,

a controlled cyclonic section having

an inlet adjoined to the pre-rotational element through convergence of the curvilinear conduit and the cyclonic section, and

a riser section at an upper end of the cyclonic member through which vapors pass,

wherein a bottom portion of the flash vessel serves as a collection and settling zone for the liquid phase prior to passage of all or a portion of said liquid phase to step (c).

6. The integrated process of claim 1, wherein the hydroprocessed effluent is the feed to step (b), and wherein step (b) further comprises

heating the hydroprocessed effluent in a convection section of the steam pyrolysis zone,

separating the heated hydroprocessed effluent into a vapor phase and a liquid phase,

passing the vapor phase to a pyrolysis section of the steam pyrolysis zone, and

discharging the liquid phase for use as at least a portion of the heavy components cracked in step (c).

7. The integrated process of claim 6 wherein separating the heated hydroprocessed effluent into a vapor phase and a liquid phase is with a vapor-liquid separation device based on physical and mechanical separation.

8. The integrated process of claim 6 wherein separating the heated hydroprocessed effluent into a vapor phase and a liquid phase is with a vapor-liquid separation device that includes

a pre-rotational element having an entry portion and a transition portion, the entry portion having an inlet for receiving the heated hydroprocessed effluent and a curvilinear conduit,

a controlled cyclonic section having

an inlet adjoined to the pre-rotational element through convergence of the curvilinear conduit and the cyclonic section,

a riser section at an upper end of the cyclonic member through which vapors pass;

and

a liquid collector/settling section through which liquid phase passes prior to conveyance of all or a portion of said liquid phase to step (c).

9. The integrated process of claim 1 wherein

step (d) comprises

compressing the thermally cracked mixed product stream with plural compression stages;

subjecting the compressed thermally cracked mixed product stream to caustic treatment to produce a thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

compressing the thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

dehydrating the compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

recovering hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide; and

obtaining olefins and aromatics from the remainder of the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

and

step (e) comprises purifying recovered hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide for recycle to the hydroprocessing zone.

10. The integrated process of claim 9, wherein recovering hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide

and carbon dioxide further comprises separately recovering methane for use as fuel for burners and/or heaters in the thermal cracking step.

11. The integrated process of claim 3, further comprising

separating hydroprocessed effluents in a high pressure separator to recover a gas portion that is cleaned and recycled to the hydroprocessing step as an additional source of hydrogen, and a liquid portion, and

separating the liquid portion derived from the high pressure separator into a gas portion and a liquid portion in a low pressure separator, wherein the liquid portion derived from the low pressure separator is the feed to the vapor-liquid separation zone and the gas portion derived from the low pressure separator is combined with the combined product stream after the steam pyrolysis zone and before separation in step (d).

12. The integrated process of claim 6, further comprising

separating hydroprocessed effluents in a high pressure separator to recover a gas portion that is cleaned and recycled to the hydroprocessing step as an additional source of hydrogen, and a liquid portion, and

separating the liquid portion derived from the high pressure separator into a gas portion and a liquid portion in a low pressure separator, wherein the liquid portion from the low pressure separator is the feed to the thermal cracking step and the gas portion from the low pressure separator is combined with the combined product stream after the steam pyrolysis zone and before separation in step (d).

CLAIMS

.1. An integrated hydroprocessing, steam pyrolysis and catalytic cracking process for production of olefinic and aromatic petrochemicals from a crude oil feed, the process comprising:

a. charging the crude oil and hydrogen to a hydroprocessing zone operating under conditions effective to produce a hydroprocessed effluent having a reduced content of contaminants, an increased paraffinicity, reduced Bureau of Mines Correlation Index, and an increased American Petroleum Institute gravity;

b. thermally cracking at least a portion of the hydroprocessed effluent in the presence of steam in a steam pyrolysis zone to produce a mixed product stream;

c. catalytically cracking residuals or bottoms derived from a combined product stream, and optionally one or more of the hydroprocessed effluent or a heated stream within the steam pyrolysis zone, to produce catalytically cracked products;

d. separating the combined product stream including thermally cracked products and catalytically cracked products;

e. purifying hydrogen recovered in step (d) and recycling it to step (a);

f. recovering olefins and aromatics from at least a portion of the separated combined product stream; and

g. recovering pyrolysis fuel oil from at least a portion of the separated combined product stream for use as at least a portion of the residuals or bottoms cracked in step (c).

2. The integrated process of claim 1, further comprising separating the hydroprocessed effluent from step (a) into a vapor phase and a liquid phase in a vapor-liquid separation zone, wherein the vapor phase is the feed to step (b), and at least a portion of the liquid phase is catalytically cracked in step (c).

3. The integrated process of claim 2, wherein the vapor-liquid separation zone is a flash separation apparatus.

4. The integrated process of claim 2, wherein the vapor-liquid separation zone comprises a flash vessel having at its inlet a vapor-liquid separation device including

a pre-rotational element having an entry portion and a transition portion, the entry portion having an inlet for receiving the hydroprocessed effluent and a curvilinear conduit,

a controlled cyclonic section having

an inlet adjoined to the pre-rotational element through convergence of the curvilinear conduit and the cyclonic section, and

a riser section at an upper end of the cyclonic member through which vapors pass,

wherein a bottom portion of the flash vessel serves as a collection and settling zone for the liquid phase prior to passage of all or a portion of said liquid phase to step (c).

5. The integrated process of claim 1, and wherein step (b) further comprises

heating the hydroprocessed effluent in a convection section of the steam pyrolysis zone,

separating the heated hydroprocessed effluent into a vapor phase and a liquid phase,

passing the vapor phase to a pyrolysis section of the steam pyrolysis zone, and

discharging the liquid phase for use as at least a portion of the residuals or bottoms cracked in step (c).

6. The integrated process of claim 5 wherein separating the heated hydroprocessed effluent into a vapor phase and a liquid phase is with a vapor-liquid separation device based on physical and mechanical separation.

7. The integrated process of claim 5 wherein separating the heated hydroprocessed effluent into a vapor phase and a liquid phase is with a vapor-liquid separation device that includes

a pre-rotational element having an entry portion and a transition portion, the entry portion having an inlet for receiving the heated hydroprocessed effluent and a curvilinear conduit,

a controlled cyclonic section having

an inlet adjoined to the pre-rotational element through convergence of the curvilinear conduit and the cyclonic section,

a riser section at an upper end of the cyclonic member through which vapors pass;

and

a liquid collector/settling section through which liquid phase passes prior to conveyance of all or a portion of said liquid phase to step (c).

8. The integrated process of claim 1 wherein

step (d) comprises

compressing the thermally cracked mixed product stream with plural compression stages;

subjecting the compressed thermally cracked mixed product stream to caustic treatment to produce a thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

compressing the thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

dehydrating the compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

recovering hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide; and

obtaining olefins and aromatics from the remainder of the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

and

step (e) comprises purifying recovered hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide for recycle to the hydroprocessing zone.

9. The integrated process of claim 8, wherein recovering hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide further comprises separately recovering methane for use as fuel for burners and/or heaters in the thermal cracking step.

10. The integrated process of claim 2, further comprising

separating hydroprocessed effluents in a high pressure separator to recover a gas portion that is cleaned and recycled to the hydroprocessing step as an additional source of hydrogen, and a liquid portion, and

separating the liquid portion derived from the high pressure separator into a gas portion and a liquid portion in a low pressure separator, wherein the liquid portion derived from the low pressure separator is the feed to the vapor-liquid separation zone and the gas portion derived from the low pressure separator is combined with the combined product stream after the steam pyrolysis zone and before separation in step (d).

11. The integrated process of claim 5, further comprising

separating hydroprocessed effluents in a high pressure separator to recover a gas portion that is cleaned and recycled to the hydroprocessing step as an additional source of hydrogen, and a liquid portion, and

separating the liquid portion derived from the high pressure separator into a gas portion and a liquid portion in a low pressure separator, wherein the liquid portion from the low pressure separator is the feed to the thermal cracking step and the gas portion from the low pressure separator is combined with the combined product stream after the steam pyrolysis zone and before separation in step (d).

12. An integrated hydroprocessing, steam pyrolysis and catalytic cracking process for production of olefinic and aromatic petrochemicals from a crude oil feed, the process comprising:

a. charging the crude oil and hydrogen to a hydroprocessing zone operating under conditions effective to produce a hydroprocessed effluent having a reduced content of contaminants, an increased paraffinicity, reduced Bureau of Mines Correlation Index, and an increased American Petroleum Institute gravity;

b. separating at least a portion of the hydroprocessed effluent into a vapor phase and a liquid phase in a vapor-liquid separation zone, wherein the vapor-liquid separation zone comprises a flash vessel having at its inlet a vapor-liquid separation device including

a pre-rotational element having an entry portion and a transition portion, the entry portion having an inlet for receiving the hydroprocessed effluent and a curvilinear conduit,

a controlled cyclonic section having

an inlet adjoined to the pre-rotational element through convergence of the curvilinear conduit and the cyclonic section, and

a riser section at an upper end of the cyclonic member through which vapors pass,

wherein a bottom portion of the flash vessel serves as a collection and settling zone for the liquid phase prior to passage of all or a portion of said liquid phase to a catalytic cracking step;

c. thermally cracking the vapor phase in the presence of steam in a steam pyrolysis zone to produce a mixed product stream;

d. catalytically cracking residuals or bottoms derived from one or more of the hydroprocessed effluent, including a portion of the liquid phase separated in step (b), a heated stream within the steam pyrolysis zone, or the mixed product stream, to produce catalytically cracked products;

e. separating a combined product stream including thermally cracked products and catalytically cracked products;

f. purifying hydrogen recovered in step (e) and recycling it to step (a); and

g. recovering olefins and aromatics from at least a portion of the separated combined product stream.

13. The integrated process of claim 12, further comprising recovering pyrolysis fuel oil from at least a portion of the separated combined product stream for use as at least a portion of the residuals or bottoms cracked in step (d).

14. The integrated process of claim 1 wherein step (c) further comprises

heating the hydroprocessed effluent in a convection section of the steam pyrolysis zone,

separating the heated hydroprocessed effluent into a vapor phase and a liquid phase,

passing the vapor phase to a pyrolysis section of the steam pyrolysis zone, and

discharging the liquid phase for use as at least a portion of the residuals or bottoms cracked in step (d).

15. The integrated process of claim 14 wherein separating the heated hydroprocessed effluent into a vapor phase and a liquid phase is with a vapor-liquid separation device based on physical and mechanical separation.

16. The integrated process of claim 14 wherein separating the heated hydroprocessed effluent into a vapor phase and a liquid phase is with a vapor-liquid separation device that includes

a pre-rotational element having an entry portion and a transition portion, the entry portion having an inlet for receiving the heated hydroprocessed effluent and a curvilinear conduit,

a controlled cyclonic section having

an inlet adjoined to the pre-rotational element through convergence of the curvilinear conduit and the cyclonic section,

a riser section at an upper end of the cyclonic member through which vapors pass;

and

a liquid collector/settling section through which liquid phase passes prior to conveyance of all or a portion of said liquid phase to step (c).

17. The integrated process of claim 12 wherein

step (e) comprises

compressing the thermally cracked mixed product stream with plural compression stages;

subjecting the compressed thermally cracked mixed product stream to caustic treatment to produce a thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

compressing the thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

dehydrating the compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

recovering hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide; and

obtaining olefins and aromatics from the remainder of the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

and

step (f) comprises purifying recovered hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide for recycle to the hydroprocessing zone.

18. The integrated process of claim 17, wherein recovering hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide further comprises separately recovering methane for use as fuel for burners and/or heaters in the thermal cracking step.

19. The integrated process of claim 12, further comprising

separating hydroprocessed effluents in a high pressure separator to recover a gas portion that is cleaned and recycled to the hydroprocessing step as an additional source of hydrogen, and a liquid portion, and

separating the liquid portion derived from the high pressure separator into a gas portion and a liquid portion in a low pressure separator, wherein the liquid portion derived from the low pressure separator is the feed to the vapor-liquid separation zone in step (b) and the gas portion derived from the low pressure separator is combined with the combined product stream after the steam pyrolysis zone and before separation in step (e).

20. An integrated hydroprocessing, steam pyrolysis and catalytic cracking process for production of olefinic and aromatic petrochemicals from a crude oil feed, the process comprising:

a. charging the crude oil and hydrogen to a hydroprocessing zone operating under conditions effective to produce a hydroprocessed effluent having a reduced content of

contaminants, an increased paraffinicity, reduced Bureau of Mines Correlation Index, and an increased American Petroleum Institute gravity;

b. thermally cracking at least a portion of the hydroprocessed effluent in the presence of steam in a steam pyrolysis zone to produce a mixed product stream, the thermal cracking process further comprising

heating the hydroprocessed effluent in a convection section of the steam pyrolysis zone,

separating the heated hydroprocessed effluent into a vapor phase and a liquid phase with a vapor-liquid separation device that includes

a pre-rotational element having an entry portion and a transition portion, the entry portion having an inlet for receiving the heated hydroprocessed effluent and a curvilinear conduit,

a controlled cyclonic section having

an inlet adjoined to the pre-rotational element through convergence of the curvilinear conduit and the cyclonic section,

a riser section at an upper end of the cyclonic member through which vapors pass,

and

a liquid collector/settling section through which liquid phase passes prior to conveyance of all or a portion of said liquid phase to a catalytic cracker,

passing the vapor phase to a pyrolysis section of the steam pyrolysis zone, and

discharging the liquid phase;

c. catalytically cracking the liquid phase from step (b) and optionally the residuals or bottoms from one or more of the hydroprocessed effluent or the mixed product stream, to produce catalytically cracked products;

d. separating a combined product stream including thermally cracked products and catalytically cracked products;

e. purifying hydrogen recovered in step (d) and recycling it to step (a); and

f. recovering olefins and aromatics from at least a portion of the separated combined product stream.

21. The integrated process of claim 20, further comprising recovering pyrolysis fuel oil from at least a portion of the separated combined product stream for use as at least a portion of the residuals or bottoms cracked in step (c).

22. The integrated process of claim 20, further comprising separating the hydroprocessed effluent from step (a) into a vapor phase and a liquid phase in a vapor-liquid separation zone, wherein the vapor phase is the feed to step (b), and at least a portion of the liquid phase is catalytically cracked in step (c).

23. The integrated process of claim 22, wherein the vapor-liquid separation zone is a flash separation apparatus.

24. The integrated process of claim 22, wherein the vapor-liquid separation zone comprises a flash vessel having at its inlet a vapor-liquid separation device including

a pre-rotational element having an entry portion and a transition portion, the entry portion having an inlet for receiving the hydroprocessed effluent and a curvilinear conduit,

a controlled cyclonic section having

an inlet adjoined to the pre-rotational element through convergence of the curvilinear conduit and the cyclonic section, and

a riser section at an upper end of the cyclonic member through which vapors pass,

wherein a bottom portion of the flash vessel serves as a collection and settling zone for the liquid phase prior to passage of all or a portion of said liquid phase to step (c).

25. The integrated process of claim 20 wherein

step (d) comprises

compressing the thermally cracked mixed product stream with plural compression stages;

subjecting the compressed thermally cracked mixed product stream to caustic treatment to produce a thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

compressing the thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

dehydrating the compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

recovering hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide; and

obtaining olefins and aromatics from the remainder of the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

and

step (e) comprises purifying recovered hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide for recycle to the hydroprocessing zone.

26. The integrated process of claim 25, wherein recovering hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide further comprises separately recovering methane for use as fuel for burners and/or heaters in the thermal cracking step.

27. The integrated process of claim 22, further comprising

separating hydroprocessed effluents in a high pressure separator to recover a gas portion that is cleaned and recycled to the hydroprocessing step as an additional source of hydrogen, and a liquid portion, and

separating the liquid portion derived from the high pressure separator into a gas portion and a liquid portion in a low pressure separator, wherein the liquid portion derived from the low pressure separator is the feed to the vapor-liquid separation zone and the gas portion derived from the low pressure separator is combined with the combined product stream after the steam pyrolysis zone and before separation in step (d).

28. The integrated process of claim 20, further comprising

separating hydroprocessed effluents in a high pressure separator to recover a gas portion that is cleaned and recycled to the hydroprocessing step as an additional source of hydrogen, and a liquid portion, and

separating the liquid portion derived from the high pressure separator into a gas portion and a liquid portion in a low pressure separator, wherein the liquid portion from the low pressure separator is the feed to the thermal cracking step and the gas portion from the low pressure separator is combined with the combined product stream after the steam pyrolysis zone and before separation in step (d).

29. An integrated hydroprocessing, steam pyrolysis and catalytic cracking process for production of olefinic and aromatic petrochemicals from a crude oil feed, the process comprising:

a. charging the crude oil and hydrogen to a hydroprocessing zone operating under conditions effective to produce a hydroprocessed effluent having a reduced content of contaminants, an increased paraffinicity, reduced Bureau of Mines Correlation Index, and an increased American Petroleum Institute gravity;

b. thermally cracking at least a portion of the hydroprocessed effluent in the presence of steam in a steam pyrolysis zone to produce a mixed product stream;

c. catalytically cracking residuals or bottoms derived from one or more of the hydroprocessed effluent, a heated stream within the steam pyrolysis zone, or the mixed product stream, to produce catalytically cracked products;

d. separating a combined product stream including thermally cracked products and catalytically cracked products, the separation step comprising

compressing the thermally cracked mixed product stream with plural compression stages;

subjecting the compressed thermally cracked mixed product stream to caustic treatment to produce a thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

compressing the thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

dehydrating the compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

recovering hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide; and

obtaining olefins and aromatics from the remainder of the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide;

e. purifying hydrogen recovered in step (d) and recycling it to step (a); and

f. recovering olefins and aromatics from at least a portion of the separated combined product stream.

30. The integrated process of claim 29, further comprising recovering pyrolysis fuel oil from at least a portion of the separated combined product stream for use as at least a portion of the residuals or bottoms cracked in step (c).

31. The integrated process of claim 29, further comprising separating the hydroprocessed effluent from step (a) into a vapor phase and a liquid phase in a vapor-liquid separation zone, wherein the vapor phase is the feed to step (b), and at least a portion of the liquid phase is catalytically cracked in step (c).

32. The integrated process of claim 31, wherein the vapor-liquid separation zone is a flash separation apparatus.

33. The integrated process of claim 31, wherein the vapor-liquid separation zone comprises a flash vessel having at its inlet a vapor-liquid separation device including

a pre-rotational element having an entry portion and a transition portion, the entry portion having an inlet for receiving the hydroprocessed effluent and a curvilinear conduit,

a controlled cyclonic section having

an inlet adjoined to the pre-rotational element through convergence of the curvilinear conduit and the cyclonic section, and

a riser section at an upper end of the cyclonic member through which vapors pass,

wherein a bottom portion of the flash vessel serves as a collection and settling zone for the liquid phase prior to passage of all or a portion of said liquid phase to step (c).

34. The integrated process of claim 29, and wherein step (b) further comprises

heating the hydroprocessed effluent in a convection section of the steam pyrolysis zone,

separating the heated hydroprocessed effluent into a vapor phase and a liquid phase,

passing the vapor phase to a pyrolysis section of the steam pyrolysis zone, and

discharging the liquid phase for use as at least a portion of the residuals or bottoms cracked in step (c).

35. The integrated process of claim 34 wherein separating the heated hydroprocessed effluent into a vapor phase and a liquid phase is with a vapor-liquid separation device based on physical and mechanical separation.

36. The integrated process of claim 34 wherein separating the heated hydroprocessed effluent into a vapor phase and a liquid phase is with a vapor-liquid separation device that includes

a pre-rotational element having an entry portion and a transition portion, the entry portion having an inlet for receiving the heated hydroprocessed effluent and a curvilinear conduit,

a controlled cyclonic section having

an inlet adjoined to the pre-rotational element through convergence of the curvilinear conduit and the cyclonic section,

a riser section at an upper end of the cyclonic member through which vapors pass;

and

a liquid collector/settling section through which liquid phase passes prior to conveyance of all or a portion of said liquid phase to step (c).

37. The integrated process of claim 29, wherein recovering hydrogen from the dehydrated compressed thermally cracked mixed product stream with a reduced content of hydrogen sulfide and carbon dioxide further comprises separately recovering methane for use as fuel for burners and/or heaters in the thermal cracking step.

38. The integrated process of claim 31, further comprising

separating hydroprocessed effluents in a high pressure separator to recover a gas portion that is cleaned and recycled to the hydroprocessing step as an additional source of hydrogen, and a liquid portion, and

separating the liquid portion derived from the high pressure separator into a gas portion and a liquid portion in a low pressure separator, wherein the liquid portion derived from the low pressure separator is the feed to the vapor-liquid separation zone and the gas portion derived from the low pressure separator is combined with the combined product stream after the steam pyrolysis zone and before separation in step (d).

39. The integrated process of claim 34, further comprising

separating hydroprocessed effluents in a high pressure separator to recover a gas portion that is cleaned and recycled to the hydroprocessing step as an additional source of hydrogen, and a liquid portion, and

separating the liquid portion derived from the high pressure separator into a gas portion and a liquid portion in a low pressure separator, wherein the liquid portion from the low pressure separator is the feed to the thermal cracking step and the gas portion from the low pressure separator is combined with the combined product stream after the steam pyrolysis zone and before separation in step (d).