Claims:

1. A catalytic reforming process comprising:

reforming a reformer feedstock that includes a naphtha stream in the presence of a catalyst to produce a gasoline reformate product stream;

splitting the gasoline reformate product stream into one or more relatively benzene-rich fractions and one or more relatively benzene-lean fractions; and

hydrogenating the one or more relatively benzene-rich fractions to produce a cyclohexane-rich effluent.

2. The process of claim 1, further comprising recycling at least a portion of the cyclohexane-rich effluent to constitute a portion of the reformer feedstock.

3. The process of claim 2, wherein the cyclohexane-rich effluent is recycled at a rate so that it constitutes from 2-60 V% of the reformer feedstock.

4. The process of claim 2, wherein the hydrogen purity is increased at a rate of 0.12 V% per V% of recycled cyclohexane-rich effluent.

5. The process of claim 1, wherein the reforming step is operated at a temperature in the range of from 260°C to 560°C.

6. The process of claim 1, wherein the step of reforming is operated at a temperature in the range of from 450°C to 560°C.

7. The process of claim 1, wherein the step of reforming is operated at a pressure in the range of from 1 bar to 50 bars.

8. The process of claim 1, wherein the step of reforming is operated at a pressure in the range of from 1 bar to 20 bars.

9. The process of claim 1, wherein the step of reforming is operated under a liquid hourly space velocity in the range of from 0.5 h^{-1} to 40 h^{-1}.

10. The process of claim 1, wherein the step of reforming is operated under a liquid hourly space velocity in the range of from 0.5 h^{-1} to 2 h^{-1}.

11. The process of claim 1, wherein the catalyst includes active metals selected from Group VIIIB of the Periodic Table.

12. The process of claim 11, wherein the catalyst is supported on alumina.

13. The process of claim 1, wherein the hydrogen used to hydrogenate the one or more benzene-rich fractions is from a hydrogen make-up or purge stream from the refinery in which the process is practiced.

14. The process of claim 1, wherein the hydrogenation step is operated at a temperature in the range of from 35°C to 200°C.

15. The process of claim 1, wherein the hydrogenation step is operated at a temperature in the range of from 95°C to 140°C.

16. The process of claim 1, wherein the hydrogenation step is operated at a pressure in the range of from 5 bars to 50 bars.

17. The process of claim 1, wherein the hydrogenation step is operated under a pressure in the range of from 5 bars to 25 bars.

18. The process of claim 1, wherein the hydrogenation step is operated under a liquid hourly space velocity in the range of from 0.5 h^{-1} to 10 h^{-1}.

19. The process of claim 1, wherein the hydrogenation step is operated under a liquid hourly space velocity in the range of from 1 h^{-1} to 4 h^{-1}.

20. The process of claim 1, wherein a catalyst is used in the hydrogenation unit.

21. The process of claim 20, wherein the catalyst includes active metals selected from Group VIIIB of the Periodic Table.

22. The process of claim 20, wherein the catalyst is supported on alumina.

23. A catalytic reforming system comprising:

a reforming unit operation including an inlet in fluid communication with a naphtha stream and an outlet for discharging a gasoline reformate product stream;

a fractionation unit operation including an inlet in fluid communication with the outlet of the reforming unit operation, one or more relatively benzene-rich fraction outlets and one or more relatively benzene-lean fraction outlets;

a hydrogenation unit operation including an inlet in fluid communication with the one or more relatively benzene-rich fraction outlets, a hydrogen inlet and a cyclohexane-rich product outlet; and

a conduit in fluid communication with the reforming unit operation inlet and the hydrogenation unit operation cyclohexane-rich product outlet for recycling at least a portion of the cyclohexane-rich product to the reforming unit operation.

Claims:

1. A catalytic reforming process comprising:

reforming a reformer feedstock that includes a naphtha stream in the presence of a catalyst to produce a gasoline reformate product stream;

splitting the gasoline reformate product stream into one or more relatively benzene-rich reformate fractions and one or more relatively benzene-lean reformate fractions;

recovering the one or more relatively benzene-lean reformate fractions as a first reformate gasoline pool component;

hydrogenating the one or more relatively benzene-rich fractions to produce a cyclohexane-rich hydrogenated effluent;

recycling a portion of the cyclohexane-rich hydrogenated reformate effluent to constitute a portion of the reformer feedstock; and

recovering the remaining portion of the cyclohexane-rich hydrogenated reformate effluent as a second gasoline pool reformate component.

2. The process of claim 1, wherein the cyclohexane-rich effluent is recycled at a rate so that it constitutes from 2-60 V% of the reformer feedstock.

3. The process of claim 1, wherein the hydrogen purity is increased at a rate of 0.12 V% to 0.15V% per V% of recycled cyclohexane-rich effluent.

4. The process of claim 1, wherein the step of reforming is operated at a temperature in the range of from 260°C to 560°C.

5. The process of claim 1, wherein the step of reforming is operated at a temperature in the range of from 450°C to 560°C.

6. The process of claim 1, wherein the step of reforming is operated at a pressure in the range of from 1 bar to 50 bars.

7. The process of claim 1, wherein the step of reforming is operated at a pressure in the range of from 1 bar to 20 bars.

8. The process of claim 1, wherein the step of reforming is operated under a liquid hourly space velocity in the range of from 0.5 h^{-1} to 40 h^{-1}.

9. The process of claim 1, wherein the step of reforming is operated under a liquid hourly space velocity in the range of from 0.5 h^{-1} to 2 h^{-1}.

10. The process of claim 1, wherein the catalyst includes active metals selected from Group VIIIB of the Periodic Table.

11. The process of claim 10, wherein the catalyst is supported on alumina.

12. The process of claim 1, wherein the hydrogen used to hydrogenate the one or more benzene-rich fractions is from a hydrogen make-up or purge stream from the refinery in which the process is practiced.

13. The process of claim 1, wherein the hydrogenation step is operated at a temperature in the range of from 35°C to 200°C.

14. The process of claim 1, wherein the hydrogenation step is operated at a temperature in the range of from 95°C to 140°C.

15. The process of claim 1, wherein the hydrogenation step is operated at a pressure in the range of from 5 bars to 50 bars.

16. The process of claim 1, wherein the hydrogenation step is operated under a pressure in the range of from 5 bars to 25 bars.

17. The process of claim 1, wherein the hydrogenation step is operated under a liquid hourly space velocity in the range of from 0.5 h^{-1} to 10 h^{-1}.

18. The process of claim 1, wherein the hydrogenation step is operated under a liquid hourly space velocity in the range of from 1 h^{-1} to 4 h^{-1}.

19. The process of claim 1, wherein a catalyst is used in the hydrogenation unit.

20. The process of claim 19, wherein the catalyst includes active metals selected from Group VIIIB of the Periodic Table.

21. The process of claim 19, wherein the catalyst is supported on alumina.

22. A catalytic reforming system comprising:

a reforming unit operation including an inlet in fluid communication with a naphtha stream and an outlet for discharging a gasoline reformate product stream;

a fractionation unit operation including an inlet in fluid communication with the outlet of the reforming unit operation, one or more relatively benzene-rich fraction outlets and one or more relatively benzene-lean fraction outlets;

a hydrogenation unit operation including an inlet in fluid communication with the one or more relatively benzene-rich fraction outlets, a hydrogen inlet and a cyclohexane-rich product outlet; and

a conduit in fluid communication with the reforming unit operation inlet and the hydrogenation unit operation cyclohexane-rich product outlet for recycling at least a portion of the cyclohexane-rich product to the reforming unit operation.