CLAIMS

1. A method for isomerization of paraffins, the method comprising the steps of:

separating an isomerization effluent (42) into a product stream (44) that comprises branched and un-branched paraffins and a stabilizer vapor stream (46) that comprises HCl, H_2, and C_6- hydrocarbons;

forming a net gas vapor that comprises HCl, H_2, and C_5- hydrocarbons using the stabilizer vapor stream (46);

separating the net gas vapor into a C_5- hydrocarbons-rich phase and a HCl and H_2-rich stream (62), and wherein forming the net gas vapor comprises separating the stabilizer vapor stream (46) and the C_5- hydrocarbons-rich phase into the net gas vapor and a liquid stream (54) that comprises C_2- and C_3^+ hydrocarbon;

activating an isomerization catalyst using at least a portion of the HCl and H_2-rich stream (62) to form a chloride-promoted isomerization catalyst; and

contacting a paraffin feed stream (22) with the chloride-promoted isomerization catalyst in the presence of hydrogen for isomerization of the paraffins.

2. The method of claim 1, wherein the step of forming the net gas vapor comprises separating the stabilizer vapor stream (46) and the C_5- hydrocarbons-rich phase at a separation temperature of from about 30 to about 60°C.

3. The method of claim 1, further comprising the step of:

dividing the HCl and H_2-rich stream (62) into a recycle portion (40) and a treatment portion (72), wherein the step of activating comprises activating the isomerization catalyst using the recycle portion (40) of the HCl and H_2-rich stream (62).

4. The method of claim 3, further comprising the step of:

neutralizing the treatment portion (72) of the HCl and H_2-rich stream (62) with a caustic (106).

5. A method of claim 4, further comprising the step of:

heating the treatment portion (72) of the HCl and H_2-rich stream (62) to a temperature of from about 30 to about 70°C prior to the step of neutralizing.

6. The method of claim 1, wherein the step of separating the net gas vapor comprises separating the net gas vapor at a separation temperature of from about -40 to about 5°C.

7. The method of claim 1, further comprising the step of:

separating at least a portion of the liquid stream (54) into a C_2- hydrocarbon-rich stream (80) and a LPG stream (81) that comprises C_3 and C_4 hydrocarbons.

8. The method of claim 7, wherein the step of separating the at least a portion of the liquid stream (54) comprises separating the at least the portion of the liquid stream (54) at a separation temperature of from about 65 to about 120°C.

9. The method of claim 7, further comprising the step of:

combining the C_2- hydrocarbon-rich stream (62) with the stabilizer vapor stream (46) to form a combined stream, and wherein the step of forming the net gas vapor comprises separating the combined stream and the C_5- hydrocarbons-rich phase into the net gas vapor and the liquid stream (54).

10. An apparatus for isomerization of paraffins, the apparatus comprising:

a stabilizer (20) configured to receive an isomerization effluent (42) and to operate at stabilization conditions effective to separate the isomerization effluent (42) into a product stream (44) that comprises branched and un-branched

paraffins and a stabilizer vapor stream (46) that comprises HCl, H_2, and C_6- hydrocarbons;

a separator (52) configured to receive the stabilizer vapor stream (46) and to operate at first separation conditions effective to form a net gas vapor that comprises HCl, H_2, and C_5- hydrocarbons using the stabilizer vapor stream (46);

a chiller (82) configured to receive the net gas vapor and to operate at second separation conditions effective to separate the net gas vapor into a C_5- hydrocarbons-rich phase and a HCl and H_2-rich stream (62), and wherein the separator is further configured to receive the C_5- hydrocarbons-rich phase and to separate the stabilizer vapor stream (46) and the C_5- hydrocarbons-rich phase at the first separation conditions into the net gas vapor and a liquid stream (54) that comprises C_2- and C_3^+ hydrocarbons;

a reaction zone (12) containing an isomerization catalyst and configured to receive at least a portion of the HCl and H_2-rich stream (62) and a paraffin feed stream (22) and to operate at isomerization conditions to activate the isomerization catalyst to form a chloride-promoted isomerization catalyst for contact with the paraffin feed stream (22) in the presence of hydrogen for isomerization of the paraffins; and

a LPG stripper (74) configured to receive at least a portion of the liquid stream (54) and to operate at third separation conditions effective to separate the at least the portion of the liquid stream (54) into a C_2- hydrocarbon-rich stream (80) and a LPG stream (81) that comprises C_3 and C_4 hydrocarbons.

CLAIMS

What is claimed is:

1. A method for isomerization of paraffins, the method comprising the steps of:

separating an isomerization effluent into a product stream that comprises branched and un-branched paraffins and a stabilizer vapor stream that comprises HCl, H_2, and C_6- hydrocarbons;

separating the stabilizer vapor stream into a net gas vapor comprising HCl, H_2, and C_5- hydrocarbons and a liquid stream that comprises C_2- and C_3^+ hydrocarbon;

separating the net gas vapor into a C_5- hydrocarbons-rich phase and a HCl and H_2-rich stream in a chiller;

activating an isomerization catalyst using at least a portion of the HCl and H_2-rich stream to form a chloride-promoted isomerization catalyst, wherein at least the portion of the HCl and H_2-rich stream is directly recycled from separation of the net gas vapor to activating the isomerization catalyst; and

contacting a paraffin feed stream with the chloride-promoted isomerization catalyst in the presence of hydrogen for isomerization of the paraffins.

2. The method of claim 1, wherein the step of separating the isomerization effluent comprises separating the isomerization effluent at a stabilizer temperature of from about 65 to about 165°C.

3. The method of claim 1, wherein the step of forming the net gas vapor comprises separating the stabilizer vapor stream and the C_5- hydrocarbons-rich phase at a separation temperature of from about 30 to about 60°C.

4. The method of claim 3, wherein the step of forming the net gas vapor comprises separating the stabilizer vapor stream and the C_5- hydrocarbons-rich phase at a pressure of from about 700 to about 2,100 kPa gauge.

5. The method of claim 1, further comprising the step of:

dividing the HCl and H_2-rich stream into a recycle portion and a treatment portion, wherein the step of activating comprises activating the isomerization catalyst using the recycle portion of the HCl and H_2-rich stream.

6. The method of claim 5, further comprising the step of:

neutralizing the treatment portion of the HCl and H_2-rich stream with a caustic.

7. A method of claim 6, further comprising the step of:

heating the treatment portion of the HCl and H_2-rich stream to a temperature of from about 30 to about 70°C prior to the step of neutralizing.

8. The method of claim 1, wherein the step of separating the net gas vapor comprises separating the net gas vapor at a separation temperature of from about -40 to about 5°C.

9. The method of claim 1, wherein the step of separating the net gas vapor comprises separating the net gas vapor at a separation pressure of from about 700 to about 2,100 kPa gauge.

10. The method of claim 1, further comprising the step of:

separating at least a portion of the liquid stream into a C_2- hydrocarbon-rich stream and a LPG stream that comprises C_3 and C_4 hydrocarbons.

11. The method of claim 10, wherein the step of separating the at least a portion of the liquid stream comprises separating the at least the portion of the liquid stream at a separation temperature of from about 65 to about 120°C.

12. The method of claim 10, wherein the step of separating the at least a portion of the liquid stream comprises separating the at least the portion of the liquid stream at a separation pressure of from about 1,000 to about 2,000 kPa gauge.

13. The method of claim 10, further comprising the step of:

combining the C_2- hydrocarbon-rich stream with the stabilizer vapor stream to form a combined stream, and wherein the step of forming the net gas vapor comprises separating the combined stream and the C_5- hydrocarbons-rich phase into the net gas vapor and the liquid stream.

14. A method for isomerization of paraffins, the method comprising the steps of:

activating an isomerization catalyst in a reactor operating at isomerization conditions to form a chloride-promoted isomerization catalyst, wherein the isomerization catalyst is activated with HCl generated from a chloride promoter stream and from a HCl and H_2-rich recycle stream;

contacting a paraffin feed stream comprising un-branched paraffins with the chloride-promoted isomerization catalyst in the reactor in the presence of hydrogen to form an isomerization effluent comprising branched paraffins, HCl, H_2, and other C_7- hydrocarbons;

introducing the isomerization effluent to a stabilizer at stabilization conditions to form a product stream that comprises branched and un-branched paraffins and a stabilizer vapor stream that comprises HCl, H_2, and C_6- hydrocarbons;

separating the stabilizer vapor stream in a separator at first separation conditions into a net gas vapor that comprises HCl, H_2, and C_5- hydrocarbons and a liquid stream that comprises C_2- and C_3^+ hydrocarbons;

separating the net gas vapor in a chiller at second separation conditions into a C_5- hydrocarbons-rich phase and a HCl and H_2-rich stream; and

directly recycling at least a portion of the HCl and H_2-rich stream back to the reactor as the HCl and H_2-rich recycle stream.

15. The method of claim 14, further comprising the steps of:

dividing the HCl and H_2-rich stream into a recycle portion and a treatment portion, wherein the step of recycling comprises recycling the recycle portion of the HCl and H_2-rich stream back to the reactor; and

introducing the treatment portion of the HCl and H_2-rich stream to a scrubber to neutralize HCl with a caustic.

16. The method of claim 14, wherein the step of separating the net gas vapor comprises introducing the net gas vapor to the chiller for indirect heat exchange with a refrigerant.

17. The method of claim 16, wherein the step of introducing the net gas vapor comprises cooling the net gas vapor to a temperature of from about -40 to about 5°C.

18. The method of claim 14, further comprising the step of:

separating at least a portion of the liquid stream in a LPG stripper at third separation conditions into a C_2- hydrocarbon-rich stream and a LPG stream that comprises C_3 and C_4 hydrocarbons.

19. The method of claim 18, further comprising the step of:

introducing the C_2- hydrocarbon-rich stream to the stabilizer vapor stream upstream of the separator to form a combined stream, and wherein the step of forming the net gas vapor comprises separating the combined stream and the C_5-hydrocarbons-rich phase in the separator into the net gas vapor and the liquid stream.