Claims

What is claimed is:

1. A method for processing an alkylation reaction product, comprising:

splitting the alkylation reaction product into a first portion and a second portion;

feeding the first portion into a benzene column, the first portion being mostly liquid, the benzene column being configured to separate at least benzene from the alkylation reaction product;

at least partially vaporizing the second portion in a heater;

feeding the at least partially vaporized second portion into the benzene column; and

separating at least benzene from the alkylation reaction product in the benzene column.

2. The method of claim 1, further comprising feeding a transalkylation reaction product into the benzene column, wherein the transalkylation reaction product is fed into the benzene column at a location between a first location at which the mostly liquid first portion is fed into the benzene column and a second location at which the at least partially vapor second portion is fed into the benzene column.

3. The method of claim 1, further comprising:

forming a purified cumene vapor in a cumene column; and

directing at least a portion of the formed purified cumene vapor to the heater to at least partially vaporize the second portion.

4. The method of claim 1, further comprising:

forming a purified cumene vapor in a cumene column; and

thermally coupling the benzene column with the cumene column.

5. The method of claim 4, wherein the thermal coupling comprises:

- directing a liquid side draw from the benzene column to the cumene column, the liquid side draw being a liquid substantially free of DIPB, the liquid side draw acting as a reflux to the cumene column; and

- returning a benzene enriched vapor from the cumene column to the benzene column using an overhead line, wherein the benzene enriched vapor has a higher concentration of benzene than the drawn liquid side draw.

6. The method of claim 3, wherein the purified cumene vapor is at least partially condensed in the heater, and further comprising:

forming the at least partially condensed cumene vapor into a first portion and a second portion;

drawing the first portion as a purified cumene product; and

returning the second portion to the cumene column.

7. A system for purifying cumene, the system comprising:

- a split feed assembly configured to receive an alkylation reaction product from an alkylation reactor, wherein the split feed assembly is configured to form the alkylation reaction product into a mostly liquid first portion, and wherein the split feed assembly comprises a heater configured to at least partially vaporize the second portion to form an at least partially vapor second portion; and

- a benzene column configured to separate at least benzene from the mostly liquid first portion and the at least partially vapor second portion.

8. The system of claim 7, further comprising a transalkylation feed line configured to feed a transalkylation reaction product into the benzene column, wherein the transalkylation reaction product is fed into the benzene column at a location between a first location at which the mostly

liquid first portion is fed into the benzene column and a second location at which the at least partially vapor second portion is fed into the benzene column.

9. The system of claim 7, further comprising:

a cumene column configured to form at least a purified cumene stream;

a cumene draw line configured to direct the purified cumene stream from the cumene column to the heater, wherein the purified cumene stream is at least partially condensed in the heater.

10. The system of claim 7, further comprising:

a cumene column configured to form at least a purified cumene stream; and

a thermal coupling configured to thermally couple the benzene column with the cumene column.

11. The system of claim 10, wherein the thermal coupling comprises a first side draw and an overhead line, wherein:

- the first side draw is configured to draw a liquid substantially free of DIPB from the benzene column and direct the drawn liquid to the cumene column, the drawn liquid being a reflux to the cumene column; and

- the overhead line configured to return a benzene enriched vapor from the cumene column to the benzene column, wherein the benzene enriched vapor has a higher concentration of benzene than the drawn liquid.

12. The system of claim 11, wherein the overhead line is configured to direct the benzene enriched vapor to a same stage as where the first side draw draws the liquid substantially free of DIPB.

13. The system of claim 9, wherein the cumene draw line is configured to form the at least partially condensed purified cumene stream into a first portion and a second portion, wherein the

first portion leaves as a purified cumene product and a second portion is returned to the cumene column at the draw stage.

14. A method for purifying cumene, comprising:

- providing a benzene column and a cumene column;

- directing a liquid side draw from the benzene column to the cumene column, the liquid side draw being a liquid substantially free of DIPB, the liquid side draw acting as a reflux to the cumene column;

- returning a benzene enriched vapor from the cumene column to the benzene column using an overhead line, wherein the benzene enriched vapor has a higher concentration of benzene than the liquid side draw; and

- drawing a purified cumene stream from the cumene column.

15. The method of claim 14, further comprising an overhead draw line configured to take an overhead vapor from the cumene column and direct the taken over head vapor to a same fractionating internals location as the liquid side draw.

16. A system for purifying cumene, comprising:

- a benzene column and a cumene column;

- a liquid side draw configured to direct a liquid substantially free of DIPB from the benzene column to the cumene column, the directed liquid being a reflux to the cumene column;

- an overhead line from the cumene column configured to return a benzene enriched vapor to the benzene column, wherein the benzene enriched vapor has a higher concentration of benzene than the drawn liquid; and

- a product side draw configured to draw the purified cumene from the cumene column,

the system further comprising:

a split feed assembly configured to receive an alkylation reaction product from an alkylation reactor, wherein the split feed assembly is configured to form the alkylation reaction product into a mostly liquid first portion, wherein the split feed assembly comprises a heater configured to at least partially vaporize the second portion to form an at least partially vapor second portion, and wherein the mostly liquid first portion and the at least partially vapor are fed into the benzene column.

17. The system of claim 16, further comprising an overhead draw line configured to take an overhead vapor from the cumene column and direct the taken over head vapor to a same fractionating internals location as the liquid side draw.

18. A system for purifying cumene comprising:

- a split feed assembly configured to at least partially vaporize a first portion of an alkylation reaction product, and feed the at least partially vaporized first portion of the alkylation reaction product to a benzene column; and

- a thermal coupling configured to thermally couple the benzene column to a cumene column.

19. The system of claim 18, the split feed assembly comprising a heater to at least partially vaporize the first portion of the alkylation reaction product, and wherein the split feed assembly is further configured to feed a second portion of the alkylation reaction product in a mostly liquid form to the benzene column.

20. The system of claim 18, wherein the thermal coupling comprises:

- a first side draw is configured to draw a liquid substantially free of DIPB from the benzene column and direct the drawn liquid to the cumene column, the drawn liquid being a reflux to the cumene column; and

- an overhead line configured to return a benzene enriched vapor from the cumene column to the benzene column, wherein the benzene enriched vapor has a higher concentration of benzene than the drawn liquid.