CLAIMS

1. A process for producing para-xylene from feed streams containing C_8 aromatics and C_9-and-heavier aromatics, comprising:

(a) a distillation process comprising two xylene columns separating C_8 aromatics from C_9-and-heavier aromatics contained in at least one lower-boiling feed stream and at least one higher-boiling feed stream, wherein the at least one higher-boiling feed stream has a higher content of C_9-and-heavier aromatics than the at least one lower-boiling feed stream, the distillation process comprising: distilling the at least one higher-boiling feed stream in a first xylene column at a first pressure to separate a first C_8-aromatics stream from a first C_9-and-heavier aromatics stream, distilling the at least one lower-boiling feed stream in a second xylene column at a second pressure to separate a second C_8-aromatics stream from a second C_9-and-heavier aromatics stream, wherein the second pressure is higher than the first pressure, and an overhead stream from the second xylene column exchanges heat with a reboiler of the first xylene column;

(b) a para-xylene separation process to recover para-xylene from one or both of the first and second C_8-aromatics streams by injecting the one or both C_8-aromatics streams and a desorbent stream into an adsorption process to obtain a first mixture comprising para-xylene and desorbent and a second mixture comprising a raffinate and desorbent; and

(c) a desorbent-recovery process to separate the second mixture of step (b) by distilling the second mixture in a prefractionator followed by a pressurized raffinate column to produce a raffinate stream and a desorbent stream, and returning the desorbent stream to the para-xylene separation process; wherein a bottoms stream of the second xylene column of step (a) provides heat to a reboiler of the pressurized raffinate column.

2. The process of claim 1 wherein the second pressure is at least 400 kPa higher than the first pressure.

3. The process of any one of claims 1 and 2 wherein the first pressure is between 100 kPa and 800 kPa.

4. The process of any one of claims 1 to 3 wherein the reboiler of the first xylene column has an enhanced nucleate boiling surface.

5. The process of any one of claims 1 to 4 wherein the at least one higher-boiling feed stream comprises more than 5 weight-% C_9-and-heavier aromatics.

6. The process of any one of claims 1 to 5 wherein the at least one lower-boiling feed stream comprises less than 5 weight-% C_9-and-heavier aromatics.

7. The process of claim 6 wherein the at least one lower-boiling feed stream comprises part or all of a bottoms stream from a deheptanization of a C_8-aromatics isomerization product.

8. The process of any of claims 1 to 7 wherein an overhead stream from the pressurized raffinate column exchanges heat with a steam generator to produce medium-pressure steam.

9. The process of any of claims 1 to 8 wherein the exchange of heat between the overhead stream from the second xylene column and the reboiler of the first xylene column condenses the overhead stream from the second xylene column.

10. The process of any of claims 1 to 9 wherein the para-xylene separation process is a simulated moving bed adsorptive separation process.

CLAIMS

The invention claimed is:

1. A process for producing para-xylene from feed streams containing C8 aromatics and C9-and-heavier aromatics, comprising:
(a) a distillation process comprising two xylene columns separating C8 aromatics from C9-and-heavier aromatics contained in at least one lower-boiling and at least one higher-boiling feed stream, wherein the at least one higher-boiling feed stream has a higher content of C9-and heavier aromatics than the at least one lower-boiling feed stream, comprising distilling the at least one higher-boiling feed stream in a first xylene column having a reboiler at a low pressure to separate a first C8-aromatics stream from a first C9-and-heavier aromatics stream, distilling the at least one lower-boiling feed stream in a second xylene column at an elevated pressure above the low pressure to separate a second C8-aromatics stream from a second C9-and-heavier aromatics stream, wherein an overhead stream from the second column exchanges heat with the reboiler of the first column;
(b) a para-xylene separation process to recover para-xylene from one or both of the first and second C8-aromatics streams by injecting the one or both C8-aromatics streams and a desorbent stream into a moving-bed adsorption process to obtain a first mixture of para-xylene and desorbent and a second mixture of a raffinate and desorbent; and,
(c) a desorbent-recovery process to separate the second mixture of step (b) by distillation in a prefractionator followed by a pressurized raffinate column into the raffinate and a desorbent stream returned to the separation process, wherein the overhead stream of the second xylene column of step (a) further provides heat to a reboiler of the raffinate column.

2. The process of claim 1 wherein the low pressure is between 100 and 800 kPa and the elevated pressure is at least about 400 kPa higher than the low pressure.

3. The process of claim 1 wherein the reboiler of the second column has an enhanced nucleate boiling surface.

4. The process of claim 1 wherein the at least one lower-boiling feed stream comprises part or all of a bottoms stream from deheptanization of a C8-aromatics isomerization product.

5. The process of claim 1 wherein overhead from the raffinate column exchanges heat with a medium-pressure steam generator to generate steam.

6. A process for producing para-xylene from feed streams containing C8 aromatics and C9-and-heavier aromatics, comprising:
(a) a distillation process comprising two xylene columns separating C8 aromatics from C9-and-heavier aromatics contained in at least one lower-boiling and at least one higher-boiling feed stream, wherein the at least one higher-boiling feed stream has a higher content of C9-and heavier aromatics than the at least one lower-boiling feed stream, comprising distilling the at least one higher-boiling feed stream in a first xylene column having a reboiler at a low pressure to separate a first C8-aromatics stream from a first C9-and-heavier aromatics stream, distilling the at least one lower-boiling feed stream in a second xylene column having a reboiler at an elevated pressure above the low pressure to separate a second C8-aromatics stream from a second C9-and heavier aromatics stream, wherein an overhead stream from the second column exchanges heat with the reboiler of the first column;
(b) a para-xylene separation process to recover para-xylene from one or both of the first and second C8-aromatics streams by injecting the one or both C8-aromatics streams and a desorbent stream into a moving-bed adsorption process to obtain a first mixture of para-xylene and desorbent and a second mixture of a raffinate and desorbent; and,
(c) a desorbent-recovery process which separates the second mixture of step (b) by distillation in a pressurized raffinate column into the raffinate and a desorbent stream returned to the separation process, wherein a reboiler effluent of the second xylene column is separated into a vapor and a liquid stream and the vapor stream provides heat to a reboiler of the raffinate column.

7. The process of claim 6 wherein the reboiler of the raffinate column of step (c) has an enhanced nucleate boiling surface.

8. The process of claim 6 wherein overhead from the raffinate column exchanges heat with a medium-pressure steam generator to generate steam.

9. A process for producing para-xylene from feed streams containing C8 aromatics and C9-and-heavier aromatics, comprising:
(a) a distillation process comprising two xylene columns separating C8 aromatics from C9-and-heavier aromatics contained in at least one lower-boiling and at least one higher-boiling feed stream, wherein the at least one higher-boiling feed stream has a higher content of C9-and heavier aromatics than the at least one lower-boiling feed stream, comprising distilling the at least one higher-boiling feed stream in a first xylene column having a reboiler at a low pressure to separate a first C8-aromatics stream from a first C9-and-heavier aromatics stream, distilling the at least one lower-boiling feed stream in a second xylene column having a reboiler at an elevated pressure above the low pressure to separate a second C8-aromatics stream from a second C9-and heavier aromatics stream, wherein an overhead stream from the second column exchanges heat with the reboiler of the first column;
(b) a para-xylene separation process to recover para-xylene from one or both of the first and second C8-aromatics streams by injecting the one or both C8-aromatics streams and a desorbent stream into a moving-bed adsorption process to obtain a first mixture of para-xylene and desorbent and a second mixture of a raffinate and desorbent; and,
(c) a desorbent-recovery process which separates the second mixture of step (b) by distillation in a prefractionator followed by a pressurized raffinate column into the raffinate and a desorbent stream returned to the separation process, wherein an overhead stream from the raffinate column provides heat to a reboiler of the prefractionator.

10. The process of claim 9 wherein the prefractionator reboiler has an enhanced nucleate boiling surface.