Patent claims

1. A process for recovery of a light boiler and a heavy boiler from a vapor stream, comprising:

A1) introducing a vapor stream (1) comprising a light boiler and a heavy boiler into a column (2) at a point at the bottom of the column,

A2) withdrawing a vapor stream (3), enriched in the light boiler, from the top of the column (2),

A3) withdrawing a liquid stream (4), enriched in the heavy boiler, from the bottom of the column (2), and splitting the stream (4) into a partial stream (5) and a partial stream (6), enriched in the heavy boiler,

A4) recycling the partial stream (5) back into the column (2) at a point above the bottom of the column, wherein the partial stream (5) is not cooled during the recycling,

A5) withdrawing a stream (7), enriched in a middle boiler, from a middle section of the column (2) and splitting the stream (7) into a partial stream (8) and a partial stream (9),

A6) cooling the partial stream (9) in a heat exchanger (10) to provide a cooled stream (11) and recycling the cooled stream (11) as stream (12) back into the column (2) at an introduction point below the top of said column, and

A7) withdrawing a volume of the partial stream (6) and withdrawing a volume of the partial stream (8),

wherein the volume of the partial stream (8) withdrawn is equal to the volume of the partial stream (6) withdrawn and the flow of partial stream (5) is maintained.

2. The process according to claim 1, wherein the stream (7) is withdrawn at a middle section of the column (2) which contains packings.

3. The process according to any of claims 1 to 2, further comprising:

B1) splitting at least one additional partial stream (13) from the cooled stream (11), and

B2) introducing the additional partial stream (13) into the column (2) at a lower point of the column (2) than a point where the stream (7) is withdrawn.

4. The process according to any of claims 1 to 3, wherein the stream (12) and/or the additional partial stream (13) after being introduced into column (2) is/are led in counter-flow to the rising vapor.

5. The process according to claim 3 or 4, wherein the stream (12) is introduced into the column (2) at a higher point than the point where the stream (7) is withdrawn and the additional partial stream (13) is introduced at a lower point than the withdrawn stream (7).

6. The process according to any of claims 1 to 5, further comprising:

C1) introducing the partial stream (6) into a heavy boiler purification column (14) at a point below the top of said heavy boiler purification column,

C2) purging the partial stream (6) with a gas stream (15) inside the column (14) to recover residual light boiler from the partial stream (6),

C3) withdrawing a light boiler comprising stream (16) from the top of the column (14) and introducing said stream (16) into the column (2) at a point above the bottom of said column, and

C4) withdrawing a stream (17) depleted in the light boiler from the bottom of the column (14).

7. The process according to any of claims 1 to 6, further comprising:

D1) introducing the partial stream (8) into a middle boiler purification column (18) at a point below the top of said middle boiler purification column (18),

D2) purging the partial stream (8) with a gas stream (19) inside the column (18) to recover residual light boiler from the partial stream (8),

D3) withdrawing a light boiler comprising stream (20) from the top of the column (18), and

D4) withdrawing a stream (21) depleted in the light boiler from the bottom of the column (18).

8. The process according to any of claims 1 to 7, wherein the vapor stream (1) is from oxidation of an organic compound selected from the group consisting of an olefin, an aliphatic alcohol, an aliphatic aldehyde, an allylic alcohol, an allylic aldehyde, and an allylic ketone.

9. The process according to claim 8, wherein the stream (7) withdrawn in step A5) comprises water.

10. The process according to any of claims 1 to 9, wherein the light boiler comprises acrolein and the heavy boiler comprises acrylic acid.

11. The process according to claim 10, wherein a temperature in the bottom of the column (2) is in a range from 70 to 85°C.

12. The process according to claim 11, wherein the temperature of the stream (5) is maintained at the temperature of the bottom of the column (2).

13. The process according to any of claims 10 to 12, wherein the stream (11) has a temperature of 20°C or less.

14. The process according to any one of claims 1 to 13, wherein the vapor stream (1) further comprises water.