

Claims

1. Process for distillation of methanol, comprising:
 - (i) pre-treatment of a crude stream A of methanol in a stabilizing column V0 at pressure P0, for separation of volatile components, obtaining a stream of light gases L from the upper section of V0 and a liquid stream B0 comprising methanol from the lower section of V0,
 - (ii) B0 is then directed towards concentration column V1, at pressure P1,
 - (iii) gaseous stream T1 recovered from the upper section of V1 is condensed in heat exchanger E2, supplying energy to concentration column V2,
 - (iv) part of the condensed methanol obtained in step (iii) is sent to product C1, and the remaining part of the condensed methanol is added to the upper section of V1 and used as reflux flow,
 - (v) a liquid stream B1 comprising methanol is recovered from the lower section of V1 and passed on to V2, at pressure P2,
 - (vi) gaseous stream T2 recovered from the upper section of V2 is split (S) in two separate streams, one stream being condensed in a heat exchanger E0, supplying energy to V0, and the other stream being condensed in a heat exchanger E3, supplying energy to concentration column V3,
 - (vii) part of the condensed methanol obtained in step (vi) is sent to product, C2, and the remaining part of the condensed methanol is added to the upper section of V2 and used as reflux flow,
 - (viii) a liquid stream B2 comprising methanol is recovered from V2 and passed on to V3, at pressure P3,
 - (ix) gaseous stream T3, recovered from the upper section of V3, is condensed, part of the condensed methanol being sent to product, C3, and the remaining part being added to the upper section of V3 and used as reflux flow,
 - (x) one or more side streams H comprising higher alcohols and other minor biproducts is withdrawn from V3 and a liquid stream B3, is drawn from V3,
 wherein:
 - Columns V1, V2 and V3 operate at decreasing pressures, such that $P1 > P2 > P3$
 - $P0 > 0$ barg and $P3 > 0$ barg
 - each column V0, V1, V2 and V3 is correspondingly associated to a heat exchanger E0, E1, E2 and E3, which is a reboiler for the same column,
 - heat exchangers E0 and E3 are condensers for column V2;
 - heat exchanger E2 is condenser for column V1.

characterized in that:

- $P_3 < 2$ barg; and
- Heat exchanger E1 is supplied by an external energy source.

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2. Process according to claim 1, wherein the temperature in the coldest part of V2 is higher than the temperature in the warmest part of V3 and V0 and the temperature in the coldest part of V1 is higher than the temperature in the warmest part of V2.

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3. Process according to claims 1 and 2 wherein the temperature in the coldest part of V2 is preferably 4 °C higher than the temperature in the warmest part of V3 and V0 and the temperature in the coldest part of V1 is preferably 4 °C higher than the temperature in the warmest part of V2.

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4. Process according to the previous claims wherein the difference between P_1 and P_0 is greater than or equal to 7.7 bar.

5. Process according to the previous claims, wherein P_1 is higher than 9,7 bar(g), P_2 is comprised between 6,9 and 13 bar(g).

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6. Process according to the previous claims wherein P_1 is preferably 17 bar(g), P_2 is preferably 9 bar(g) and P_3 is preferably 0,98 bar(g).

7. Process according to the previous claims wherein the heat duty of E0 is at least 30% less than the duty of E1.

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8. Process according to the previous claims wherein B3 comprises the water removed from circulating streams and is recovered from the lower section of V3.

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9. Apparatus for distillation of methanol, comprising a stabilizing column V0, at pressure P_0 , connected in series with at least 3 distillation columns V1, V2 and V3 at correspondingly decreasing pressure P_1 , P_2 and P_3 wherein each column is associated to a heat exchanger E0, E1, E2 and E3, said heat exchanger being a reboiler for that column, characterized in that,

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- a) heat exchangers E0 and E3 are condensers of column V2;

- b) heat exchanger E2 is condenser of column V1;
- c) E1 has an incoming heat stream, external to said apparatus;
- d) $P3 < 2$ barg.

5 10. Apparatus according to claim 9 wherein the external heat stream to E1 is steam or a synthesis gas containing sensible heat.

11. Plant for distillation of methanol according to claims 1 to 8 comprising at least one apparatus according to claims 9-10, wherein the amount of steam required for E1 is
10 less than 1.3 kg/kg of product methanol.

12. Use of apparatus according to claims 9-10 in a plant according to claim 11, for distillation of methanol according to claims 1-8.

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