purity is obtained. The plant for performance of this process should entail a minimum level of capital costs.

This problem is solved by a process having the features of claim 1.

The disclosure therefore provides a process for removing a cyclododecanone-rich fraction from a dehydrogenation mixture comprising low boilers, cyclododecanone, medium boilers, cyclododecanol and high boilers, which comprises the following steps:

a) providing the dehydrogenation mixture;

b) distillatively removing the low boilers from the dehydrogenation mixture to obtain a first mixture comprising cyclododecanone, medium boilers, cyclododecanol and high boilers;

c) feeding the first mixture into a dividing wall column having a left-hand column section and a right-hand column section, in which the two column sections are partly divided by a dividing wall which extends along the dividing wall column such that the top and bottom of the two column sections are combined, and in which a permeable connection between the two column sections which bypasses the dividing wall is provided at a separation stage disposed between the top and bottom;

d) drawing off the cyclododecanone-rich fraction from the top of the dividing wall column;

e) drawing off a second mixture comprising cyclododecanone, cyclododecanol and medium boilers from a side draw of the dividing wall column;

f) drawing off a fraction comprising cyclododecanol and high boilers from the bottom of the dividing wall column.

According to an aspect, there is provided a process for removing a cyclododecanone-rich fraction (A) from a dehydrogenation mixture (O), the dehydrogenation mixture (O) comprising:

components having a boiling point less than cyclododecanone (CDON) (LB);
cyclododecanone (CDON);
components having a boiling point between CDON and cyclododecanol (CDOL) (MB);
cyclododecanol (CDOL); and
components having a boiling point above CDOL (HB);
the process comprising:

a) feeding the dehydrogenation mixture (O) to a preliminary separator column;

b) distillatively removing the LB components from the dehydrogenation mixture (O) to obtain a first mixture (ABC1) comprising the cyclododecanone (CDON), the MB components, the cyclododecanol (CDOL) and the HB components;

c) feeding the first mixture (ABC1) into a dividing wall column (DWC), which comprises:
a left-hand column section (LHS);
a right-hand column section (RHS),
a dividing wall (W) which separates the left-hand column section (LHS) and the right-hand column section (RHS) and extends along the dividing wall column (DWC) such that a top and a bottom of the two column sections (LHS, RHS) are combined, and

a liquid connection (V) between the two column sections (LHS, RHS) which bypasses the dividing wall (W) and is located at a separation stage disposed between the top and bottom;

d) drawing off the cyclododecanone-rich fraction (A) from the top of the dividing wall column (DWC);

e) drawing off a second mixture (ABC2) comprising cyclododecanone (CDON), cyclododecanol (CDOL) and the MB components from a side draw (S) of the dividing wall column (DWC);

f) drawing off a fraction (C) comprising cyclododecanol (CDOL) and the HB components from the bottom of the dividing wall column (DWC).

According to another aspect, there is provided a dividing wall column for the process as defined above comprising:

a space which is surrounded by a shell and is divided into a left-hand column section (LHS), a right-hand column section (RHS), a bottom and a top,

a dividing wall (W) which separates the left-hand column section (LHS) from the right-hand column section (RHS) and extends through the shell between the bottom and top,

a feed for the introduction of the first mixture (ABC1),

a draw at the top for the removal of the CDON fraction (A),

a draw at the bottom for the removal of the CDOL fraction (C);

a side draw (S) for the removal of ABC2 fraction; and

a liquid connection (V) between the LHS and RHS column sections located between the top and bottom.

The core of the present disclosure is the use of a "holed" dividing wall column having a permeable connection between the two column sections. The term "hole" in this

connection should not be understood in such a way that the dividing wall necessarily has an orifice. Instead, the term "hole" should be understood in the figurative sense, as a connection between the two column sections which allows mass transfer from a point in one column section to the other, which is otherwise prevented by the dividing wall.

Because of this connection, the holed dividing wall column constitutes an integrated construction of two series-connected side draw columns with combined tops and bottoms. The advantage of this combination is the possibility of dispensing with one condenser and one vaporizer overall, such that the holed dividing wall column entails lower capital costs than an equivalent combination of two individual columns. The comparison between the inventive dividing wall column with a "hole" and an arrangement of two sidestream columns with combined top and bottom streams, which is equivalent for separation purposes but more costly, is illustrated in detail by Figures 3 and 4.

In a preferred embodiment of the disclosure, the first mixture is fed into the left-hand column section of the dividing wall column and the second mixture is drawn off in the right-hand column section from a side draw therein. The connection therefore constitutes a withdrawal on the feed side and an additional feed on the withdrawal side.

In a further preferred embodiment of the disclosure, the permeable connection is designed to transport liquid medium boilers between the two column sections. The

The invention claimed is:

1. A process for removing a cyclododecanone-rich fraction (A) from a dehydrogenation mixture (O), the dehydrogenation mixture (O) comprising:
components having a boiling point less than cyclododecanone (CDON) (LB);
cyclododecanone (CDON);
components having a boiling point between CDON and cyclododecanol (CDOL) (MB);
cyclododecanol (CDOL); and
components having a boiling point above CDOL (HB);
the process comprising:

a) feeding the dehydrogenation mixture (O) to a preliminary separator column;

b) distillatively removing the LB components from the dehydrogenation mixture (O) to obtain a first mixture (ABC1) comprising the cyclododecanone (CDON), the MB components, the cyclododecanol (CDOL) and the HB components;

c) feeding the first mixture (ABC1) into a dividing wall column (DWC), which comprises:
a left-hand column section (LHS);
a right-hand column section (RHS),
a dividing wall (W) which separates the left-hand column section (LHS) and the right-hand column section (RHS) and extends along the dividing wall column (DWC) such that a top and a bottom of the two column sections (LHS, RHS) are combined, and
a liquid connection (V) between the two column sections (LHS, RHS) which bypasses the dividing wall (W) and is located at a separation stage disposed between the top and bottom;

d) drawing off the cyclododecanone-rich fraction (A) from the top of the dividing wall column (DWC);

e) drawing off a second mixture (ABC2) comprising cyclododecanone (CDON), cyclododecanol (CDOL) and the MB components from a side draw (S) of the dividing wall column (DWC);

f) drawing off a fraction (C) comprising cyclododecanol (CDOL) and the HB components from the bottom of the dividing wall column (DWC).

2. The process according to claim 1, wherein
the first mixture (ABC1) is fed into the left-hand column section (LHS), and
the second mixture (ABC2) is drawn off from the side draw (S) present in the right-hand column section (RHS).

3. The process according to claim 2, wherein the liquid connection (V) between the LHS and RHS column sections transports liquid comprising MB components from the left-hand column section (LHS) to the right-hand column section (RHS).

4. The process according to claim 3, wherein the LHS comprises a liquid collector and the liquid connection (V) originates at the liquid collector.

5. The process according to claim 3, wherein
the liquid connection (V) originates at a separation plane of the left-hand column section (LHS) having a maximum concentration of the MB components, and
the liquid connection (V) opens at a separation plane of the right-hand column section (RHS) having a MB component composition corresponding to the MB components concentration of the left-hand column.

6. The process according to claim 1, wherein a pressure of the dividing wall column (DWC) is below 1 bar absolute.

7. The process according to claim 1, wherein the dehydrogenation mixture (O) comprises:
LB components: 1 to 8% by weight;
Cyclododecanone (CDON): 60 to 90% by weight;
MB components: 0 to 1.5% by weight;
Cyclododecanol (CDOL): 10 to 40% by weight;
HB components: 0.1 to 2.5% by weight;
wherein a sum of the weight % values is 100%.

8. The process according to claim 1, wherein a content of cyclododecanone (CDON) in the cyclododecanone-rich fraction (A) is at least 98% by weight.

9. The process according to claim 1, wherein the fraction (C) comprising cyclododecanol (CDOL) and HB components is free of cyclododecanone (CDON).

10. The process according to claim 1, wherein the dehydrogenation mixture (O) is obtained by a process comprising:

g) oxidation of cyclododecane (CDAN) with oxygen to obtain an oxidation mixture comprising the LB components, cyclododecanone (CDON), the MB components, cyclododecanol (CDOL) and the HB components;

h) distillatively removing a cyclododecanol-rich fraction (CBOL technical quality) (CDOL t.q.) from the oxidation mixture;

i) removing the HB components from the CDOL t.q. to obtain a fraction (C) comprising cyclododecanol (CDOL) and high boilers (HB);

removing the HB components from the CDOL to obtain a cyclododecanol-rich fraction; and

j) dehydrogenating the cyclododecanol-rich fraction from which the high boilers are removed to obtain the dehydrogenation mixture (O).

11. The process according to claim 10, wherein the fraction (C) comprising cyclododecanol (CDOL) and the HB components is recycled into h).

12. The process according to claim 1, further comprising:

oximating the cyclododecanone-rich fraction (A) to obtain an oxime of cyclododecanone; and

reacting the cyclododecane oxime with sulfuric acid to obtain laurolactam.

13. A dividing wall column for the process of claim 1, comprising:

a space which is surrounded by a shell and is divided into a left-hand column section (LHS), a right-hand column section (RHS), a bottom and a top,

a dividing wall (W) which separates the left-hand column section (LHS) from the right-hand column section (RHS) and extends through the shell between the bottom and top,

a feed for the introduction of the first mixture (ABC1),

a draw at the top for the removal of the CDON fraction (A),

a draw at the bottom for the removal of the CDOL fraction (C);

a side draw (S) for the removal of ABC2 fraction; and

a liquid connection (V) between the LHS and RHS column sections located between the top and bottom.