Claims

1. Process for continuous operation of a Mannich reaction, wherein an aqueous phase which contains at least one amine catalyst is separated by at least one membrane separation stage into a stream consisting predominantly of water and a stream of reduced water content.

2. Process according to Claim 1, wherein the reaction product is at least partially separated off in a column and in that a water-containing effluent is withdrawn underneath the feedpoint for this column and is subsequently separated at least partially by at least one membrane separation stage.

3. Process according to Claim 2, wherein the water-containing effluent is divided and one portion is directed onto the membrane separation stage and the other portion is directed back into the reaction space.

4. Process according to at least one of Claims 1 to 3, wherein the stream which consists predominantly of water is the permeate of the membrane separation stage and the stream of reduced water content is the retentate of the membrane separation stage.

5. Process according to at least one of Claims 1 to 4, wherein an aldehyde of 2 to 6 carbon atoms, preferably propanal, is reacted with formaldehyde in a reaction space to form an unsaturated aldehyde, preferably methacrolein.

6. Process according to Claim 5, wherein the reaction is carried out in the presence of 0.1 to 20 mol% of an organic base, preferably a secondary amine, and 0.1 to 20 mol% of an acid, each based on the aldehyde of 2 to 6 carbon atoms, at a temperature of 100 to 300°C and a pressure of 5 to 100 bar.

7. Process according to at least one of Claims 1 to 6, wherein the stream which consists predominantly of water is separated by a second

membrane separation stage into a second stream consisting predominantly of water and a second stream of reduced water content.

8. Process according to at least one of Claims 1 to 7, wherein the membranes comprise a separation-active layer of polyamide, cellulose acetate or polyether sulphone.

9. Process according to at least one of Claims 1 to 8, wherein the local temperature at the membrane is between 10 and 70°C and the transmembrane pressure is between 20 and 100 bar.

10. Process according to at least one of Claims 1 to 9, wherein the first stream of reduced water content is wholly or partly returned into the reaction space.

11. Process according to Claim 10, wherein the water content and/or catalyst content in the production plant is determined and the additional water and/or catalyst is as necessary fed into the reaction space.

12. Process according to Claim 11, wherein the water content and/or catalyst content is determined using an on-line probe or by measuring the water removed by the membrane separation stages.

13. Process according to at least one of Claims 1 to 12, wherein the water content in the inlet to the reaction space is not greater than 75% of the overall mass.

14. Process according to at least one of Claims 1 to 12, wherein at least one stream removed by the membrane separation stages which consists predominantly of water is sent for a biological work-up.

15. Process according to Claim 7, wherein the stream which was removed by the second membrane separation stage and consists predominantly of water is sent for a biological work-up.

16. Process according to at least one of Claims 1 to 15, wherein a stream of reduced water content is sent for incineration.

17. Process according to Claim 1 to 16, wherein the second stream of reduced water content is sent either for incineration and/or to the first membrane separation stage and/or to the reaction space.

18. Process according to Claim 1 to 17, wherein the first stream of reduced water content is directed either back into the reaction space and/or into an incineration.

19. Process according to at least one of Claims 1 to 18, wherein the aqueous effluent from the bottom part of the distillation column is directed either to the first membrane separation stage and/or back into the reaction space.