Claims

1. Method for disposing of amine-containing waters of reaction from an amine-catalytic process in which propanal is reacted with formaldehyde to give methacrolein,
wherein the disposal is effected by combustion in a thermal oxidizer,
wherein the thermal oxidizer consists of a first zone including the burner, the fuel supply and air supply, a second, oxidative zone, and a third, reductive zone having an oxygen content less than 3% by volume,
wherein the transition between the first and second zone is at the point in the thermal oxidizer where the temperature in the thermal oxidizer falls below 1100°C,
wherein the transition between the second and third zone is at the point in the thermal oxidizer where the oxygen content within the thermal oxidizer falls below 3% by volume and
wherein the amine-containing water of reaction is sprayed into the second, oxidative zone.

2. Method according to Claim 1, wherein the reaction to give methacrolein is conducted continuously in the presence of 0.1 to 20 mol% of amine, preferably a secondary amine, and 0.1 to 20 mol% of acid, based in each case on propanal, at a temperature of 100 to 300°C and at a pressure of 5 to 100 bar.

3. Method according to Claim 1 or 2, wherein the amine-containing water of reaction is taken from the bottom of a distillation column and the rest of the bottoms is passed into the reaction space of the plant.

4. Method according to at least one of Claims 1 to 3, wherein the amine-containing water of reaction is the retentate from the bottoms of a distillation column which have been passed through a membrane separation stage.

5. Method according to at least one of Claims 1 to 4, wherein a temperature between 850 and 1100°C and an oxygen content between 5 and 21% by volume are present in the oxidative zone of the thermal oxidizer.

6. Method according to at least one of Claims 1 to 5, wherein ammonia, urea or an amine is additionally metered into the reductive zone of the thermal oxidizer.

7. Method according to at least one of Claims 1 to 6, wherein at least one liquid to be combusted, comprising organic constituents, from another process is additionally metered into the first or second zone of the thermal oxidizer.

8. Method according to Claim 7, wherein the other process is a process for converting methacrolein to methyl methacrylate or methacrylic acid.

9. Method according to Claim 7, wherein the other process is a process for preparing propionaldehyde proceeding from ethylene and synthesis gas, which gives rise to a liquid waste phase comprising the by-products and high boilers which is combusted in the thermal oxidizer.

10. Method according to at least one of Claims 1 to 6, wherein at least one gaseous phase to be combusted, comprising organic constituents and/or hydrogen, from another process is additionally metered into the first or second zone of the thermal oxidizer.

11. Method according to Claim 10, wherein the other process is a process for preparing formalin proceeding from methanol, which gives rise to a hydrogenous offgas which is combusted in the thermal oxidizer.

12. Method according to at least one of Claims 1 to 11, wherein the amine-containing water of reaction, based on the natural gas rate of the burner, is metered into the oxidative zone in an amount between 0.3 and 3.6 mol/m^3 (STP).

Claims

1. Method for disposing of amine-containing waters of reaction from an amine-catalytic process in which propanal is reacted with formaldehyde to give methacrolein, characterized in that the disposal is effected by combustion in a thermal oxidizer.

2. Method according to Claim 1, characterized in that the Mannich reaction is conducted continuously in the presence of 0.1 to 20 mol% of organic base, preferably a secondary amine, and 0.1 to 20 mol% of acid, based in each case on propanal, at a temperature of 100 to 300°C and at a pressure of 5 to 100 bar.

3. Method according to Claim 1 or 2, characterized in that the amine-containing water of reaction is taken from the bottom of a distillation column and the rest of the bottoms is passed into the reaction space of the plant.

4. Method according to at least one of Claims 1 to 3, characterized in that the amine-containing water of reaction is the retentate from the bottoms of a distillation column which have been passed through a membrane separation stage.

5. Method according to at least one of Claims 1 to 4, wherein the amine-containing water of reaction is combusted in a thermal oxidizer consisting of a first zone including the burner, the fuel supply and air supply, a second, oxidative zone, and a third, reductive zone having an oxygen content less than 3% by volume, characterized in that the transition between the first and second zone is at the point in the thermal oxidizer where the temperature in the thermal oxidizer falls below 1100°C, and in that the transition between the second and third zone is at the point in the thermal oxidizer where the oxygen content within the thermal oxidizer falls below 3% by volume.

6. Method according to Claim 5, characterized in that the amine-containing water of reaction is sprayed into the second, oxidative zone.

7. Method according to Claim 5, characterized in that a temperature between 850 and 1100°C and an oxygen content between 5 and 21% by volume are present in the oxidative zone of the thermal oxidizer.

8. Method according to Claim 5, characterized in that the amine-containing water of reaction is sprayed directly into the flame of the first zone.

9. Method according to Claim 5, characterized in that the amine-containing water of reaction is sprayed into the third, reductive zone of the thermal oxidizer.

10. Method according to at least one of Claims 5 to 9, characterized in that ammonia, urea or an amine is additionally metered into the reductive zone of the thermal oxidizer.

11. Method according to at least one of Claims 5 to 10, characterized in that at least one liquid to be combusted, comprising organic constituents, from another process is additionally metered into the first or second zone of the thermal oxidizer.

12. Method according to Claim 11, characterized in that the other process is a process for converting methacrolein to methyl methacrylate or methacrylic acid.

13. Method according to Claim 11, characterized in that the other process is a process for preparing propionaldehyde proceeding from ethylene and synthesis gas, which gives rise to a liquid waste phase comprising the by-products and high boilers which is combusted in the thermal oxidizer.

14. Method according to at least one of Claims 5 to 10, characterized in that at least one gaseous phase to be combusted, comprising organic constituents

and/or hydrogen, from another process is additionally metered into the first or second zone of the thermal oxidizer.

15. Method according to Claim 14, characterized in that the other process is a process for preparing formalin proceeding from methanol, which gives rise to a hydrogenous offgas which is combusted in the thermal oxidizer.

16. Method according to at least one of Claims 5 to 15, characterized in that the amine-containing water of reaction, based on the natural gas rate of the burner, is metered into the oxidative zone in an amount between 0.3 and 3.6 mol/m^3 (STP).