[0010] Many commercial alkylene oxide processes are operated to achieve a targeted value of an alkylene oxide production parameter, such as the concentration of the alkylene oxide in the reaction product, alkylene oxide production rate, alkylene oxide production rate/catalyst volume, alkylene oxide yield, alkylene conversion, and oxygen conversion. In order to maximize conversion of the alkylene, many known processes maintain the maximum reactor feed gas oxygen concentration that is allowable based on feed gas flammability considerations. Neither the alkylene nor oxygen is stoichiometrically limiting, and some amount of each is contained in the reaction product. When a reduction in the alkylene oxide production parameter is desired, reaction temperature is frequently reduced. The reduction in reaction temperature reduces the overall rate of consumption of alkylene and oxygen. However, it can also cause a significant shift in the efficiency of the process, resulting in the excessive generation of unwanted byproducts such as carbon dioxide and water.

[0011] Because of the strong influence that reaction temperature may have on efficiency, the gas phase promoter concentration is often varied to counteract any efficiency decreases from the maximum attainable level that result from a reduction in reaction temperature. To coordinate the variations in reaction temperature and gas phase promoter concentration, it has been proposed to use the temperature differential to first calculate the new gas phase promoter concentration. The gas phase promoter concentration changes are made whenever the reaction temperature is changed (U.S. Patent No. 7,193,094; European Patent No. 1,458,699). However, this technique may impose significant swings in the process variables and may require an excessive amount of time before the desired results are observed. It also requires knowledge of a mathematical relationship between temperature and efficiency, which may be difficult or costly to obtain. Thus, a need has arisen for a process of reducing the value of an alkylene oxide production parameter which addresses the foregoing issues.

SUMMARY

[0012] In accordance with ~~a first aspect~~an embodiment of the present disclosure, a method for reducing the value of an alkylene oxide production parameter in a process for making the alkylene oxide by reacting a feed gas comprising an alkylene, oxygen, and at least one

organic chloride over a high-efficiency silver catalyst is provided. The method comprises operating the process at a first reaction temperature, a first overall chloriding effectiveness, and a first concentration of oxygen in the feed gas to yield a first value of the alkylene oxide production parameter. The method further comprises selecting a target value of the alkylene oxide production parameter which is less than the first value of the alkylene oxide production parameter. At least one process parameter is adjusted such that the alkylene oxide production parameter decreases, wherein the step of adjusting at least one alkylene oxide production parameter comprises first decreasing the concentration of oxygen in the feed gas.

[0012a] In a first aspect, there is provided a method for reducing the value of an alkylene oxide production parameter in a process for making the alkylene oxide by reacting a feed gas comprising an alkylene, oxygen, and at least one organic chloride over a high-efficiency silver catalyst, the method comprising the steps of:

operating the process at a first reaction temperature, a first overall chloriding effectiveness, and a first concentration of oxygen in the feed gas to yield a first value of the alkylene oxide production parameter, wherein the alkylene oxide production parameter is selected from the group consisting of alkylene oxide concentration, alkylene oxide yield, alkylene oxide production rate, alkylene oxide production rate/catalyst volume, alkylene conversion, and oxygen conversion;

selecting a target value of the alkylene oxide production parameter, wherein the target value of the alkylene oxide production parameter is less than the first value of the alkylene oxide production parameter; and

adjusting at least one process parameter such that the alkylene oxide production parameter decreases, wherein the step of adjusting at least one process parameter comprises first decreasing the concentration of oxygen in the feed gas.

[0013] In accordance with another ~~aspect~~embodiment of the present disclosure, a process for reducing the value of an alkylene oxide production parameter is provided. The process comprises reacting a feed gas comprising an alkylene, oxygen, and at least one organic chloride over a high efficiency silver catalyst to yield a reaction product having a first value of the alkylene oxide production parameter, wherein the feed gas has a first overall catalyst

chloriding effectiveness value and a first oxygen concentration, and the reaction is carried out at a first reaction temperature and a first feed gas pressure. The method further comprises selecting a target value of the alkylene oxide production parameter and decreasing the concentration of oxygen in the feed gas to a second oxygen concentration while maintaining the overall chloriding effectiveness value at the first overall chloriding effectiveness value until the alkylene oxide production parameter is no greater than the target value or the reaction temperature decreases by a pre-selected maximum amount.

[0013a] In a second aspect, there is provided a process for reducing the value of an alkylene oxide production parameter, comprising the steps of:

reacting a feed gas comprising an alkylene, oxygen, and an at least one organic chloride over a high efficiency silver catalyst to yield a reaction product having a first value of the alkylene oxide production parameter, wherein the feed gas has a first overall catalyst chloriding effectiveness value and a first oxygen concentration, the reaction is carried out at a first reaction temperature and a first feed gas pressure, and the alkylene oxide production parameter is selected from the group consisting of alkylene oxide concentration, alkylene oxide yield, alkylene oxide production rate, alkylene oxide production rate/catalyst volume, alkylene conversion, and oxygen conversion;

selecting a target value of the alkylene oxide production parameter;

decreasing the concentration of oxygen in the feed gas to a second oxygen concentration while maintaining the overall chloriding effectiveness at the first overall chloriding effectiveness value until the alkylene oxide production parameter is no greater than the target value or the reaction temperature decreases by a pre-selected maximum amount.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Referring now to the drawings, illustrative embodiments are shown in detail. Although the drawings represent some embodiments, the drawings are not necessarily to scale and certain features may be exaggerated, removed, or partially sectioned to better illustrate and explain the present invention. Further, the embodiments set forth herein are exemplary and are not intended to be exhaustive or otherwise limit or restrict the claims to the precise forms and configurations shown in the drawings and disclosed in the following detailed description.

[0015] FIG. 1A is a process flow diagram depicting an embodiment of a process for making an alkylene oxide by epoxidizing an olefin over a high efficiency catalyst;

CLAIMS ~~REPLACEMENT SHEET~~

1. A method for reducing the value of an alkylene oxide production parameter in a process for making the alkylene oxide by reacting a feed gas comprising an alkylene, oxygen, and at least one organic chloride over a high-efficiency silver catalyst, the method comprising the steps of:

operating the process at a first reaction temperature, a first overall chloriding effectiveness, and a first concentration of oxygen in the feed gas to yield a first value of the alkylene oxide production parameter, wherein the alkylene oxide production parameter is selected from the group consisting of alkylene oxide concentration, alkylene oxide yield, alkylene oxide production rate, alkylene oxide production rate/catalyst volume, alkylene conversion, and oxygen conversion;

selecting a target value of the alkylene oxide production parameter, wherein the target value of the alkylene oxide production parameter is less than the first value of the alkylene oxide production parameter; and

adjusting at least one process parameter such that the alkylene oxide production parameter decreases, wherein the step of adjusting at least one process parameter comprises first decreasing the concentration of oxygen in the feed gas.

2. The method of claim 1, wherein the step of adjusting at least one process parameter comprises second adjusting the concentration of the alkylene in the feed gas.

3. The method of claim 1, wherein the step of adjusting at least one process parameter comprises third adjusting the feed gas pressure.

4. The method of claim 1, wherein the step of adjusting at least one process parameter comprises fourth adjusting the concentration of carbon dioxide in the feed gas.

5. The method of claim 1, wherein the overall chloriding effectiveness of the process is held constant during the step of adjusting at least one process parameter.

6. The method of claim 1, wherein during the step of adjusting at least one process parameter, the reaction temperature varies by no more than 5°C.

7. The method of claim 1, wherein the process has an optimum efficiency that varies with both the reaction temperature and the concentration of the alkylene oxide in the reaction product under a constant pressure, and the step of adjusting at least one process parameter yields an efficiency to the alkylene oxide that varies from the optimum efficiency by no more than 0.5%.

8. The method of claim 1, wherein the first overall chloriding effectiveness and the first reaction temperature are selected to provide the maximum efficiency toward the alkylene oxide at the first value of the alkylene oxide production parameter.

9. The method of claim 1, wherein the concentration of the alkylene in the feed gas is no less than 20 mole percent.

10. The method of claim 1, wherein the concentration of oxygen in the feed gas is no greater than 95% of the oxygen flammability concentration.

11. The method of claim 1, wherein the concentration of oxygen in the feed gas is no less than 1.0 mole percent.

12. A process for reducing the value of an alkylene oxide production parameter, comprising the steps of:

reacting a feed gas comprising an alkylene, oxygen, and an at least one organic chloride over a high efficiency silver catalyst to yield a reaction product having a first value of the alkylene oxide production parameter, wherein the feed gas has a first overall catalyst chloriding effectiveness value and a first oxygen concentration, the reaction is carried out at a first reaction temperature and a first feed gas pressure, and the alkylene oxide production parameter is selected from the group consisting of alkylene oxide concentration, alkylene oxide yield, alkylene oxide production rate, alkylene oxide production rate/catalyst volume, alkylene conversion, and oxygen conversion;

selecting a target value of the alkylene oxide production parameter;

decreasing the concentration of oxygen in the feed gas to a second oxygen concentration while maintaining the overall chloriding effectiveness at the first overall chloriding effectiveness value until the alkylene oxide production parameter is no greater than the target value or the reaction temperature decreases by a pre-selected maximum amount.

13. The process of claim 12, wherein the second oxygen concentration is no less than 1.0 mole percent.

14. The process of claim 12, wherein the first oxygen concentration is no greater than 95% of the oxygen flammability concentration.

15. The process of claim 12, wherein the pre-selected maximum reaction temperature decrease is no more than 5°C.