remove more than 99 wt% of the halogenated by-products present in the solvent; and where the solvent is recycled to the absorber.

[0005a] In one aspect, there is provided a system for recovering olefins from a vent stream comprising:

a mixer that is operative to receiving a plurality of vent streams that contain halogenated by-products and olefin molecules; wherein the mixer mixes the respective vent streams to produce a vent stream;

an absorber located downstream of the mixer and in fluid communication with the mixer; wherein the absorber receives the vent stream from the mixer; wherein the absorber receives a solvent stream that contacts the vent stream in the absorber and preferentially absorbs the halogenated by-products over the olefin molecules from the vent stream; and wherein an olefin rich stream is discharged to a storage tank; and

a stripper; where the absorber and the stripper are in a recycle loop; where a stream discharged from the absorber to the stripper contains the halogenated by-products in addition to solvent; and where the absorber is operative to treat a vent stream with a solvent to remove more than 99 wt% of a halogenated by-product contained in the vent stream and to recover 90 to 95 wt% of olefin molecules present in the vent stream; and where the stripper is operative to remove more than 99 wt% of the halogenated by-products present in the solvent; and where the solvent is recycled to the absorber.

[0006] Disclosed herein too is a method comprising charging a vent stream that comprises 90 to 95 wt% of olefin molecules, 5 to 7 wt% of alkanes and 1.0×10^{-2} to 2×10^{-2} wt% of a halogenated by-product, based on the total weight of the vent stream to an absorber; discharging from the absorber an olefin rich stream that comprises 90 to 95 wt% of olefin molecules, 5 to 7 wt% of alkanes and 1.0×10^{-4} to 2×10^{-4} wt% of the halogenated by-product, based on a total weight of the olefin rich stream; charging a stripper with a halogen concentrated stream received from the absorber; discharging from the stripper a solvent rich stream that is recycled to the absorber; and discharging from the stripper to an incinerator a waste stream that contains a substantial portion of the halogenated by-products present in the vent stream.

[0006a] In another aspect, there is provided a method for purification of a vent stream comprising:

charging to a mixer a plurality of vent streams that contain halogenated by-products;

mixing the respective vent streams in the mixer to produce a vent stream;

charging the vent stream from the mixer to an absorber; wherein the vent stream comprises 90 to 95 wt% of olefin molecules, 5 to 7 wt% of alkanes and 1.0 x 10^{-2} to 2 x 10^{-2} wt% of a halogenated by-product, based on the total weight of the vent stream;

discharging from the absorber to a storage tank an olefin rich stream that comprises 90 to 95 wt% of olefin molecules, 5 to 7 wt% of alkanes and 1.0 x 10^{-4} to 2 x 10^{-4} wt% of the halogenated by-product, based on a total weight of the olefin rich stream;

charging a stripper with a halogen concentrated stream received from the absorber;

discharging from the stripper a solvent rich stream that is recycled to the absorber; and

discharging from the stripper to an incinerator a waste stream that contains a substantial portion of the halogenated by-products present in the vent stream.

[0007] Disclosed herein too is a composition comprising an olefin rich stream that comprises 90 to 95 wt% of olefin molecules: 5 to 7 wt% of alkanes; and 1.0 x 10^{-4} to 2 x 10^{-4} wt% of the halogenated by-product, based on a total weight of the olefin rich stream.

[0007a] In another aspect, there is provided a composition derived from the system as disclosed herein comprising an olefin rich stream that comprises 90 to 95 wt% of olefin molecules: 5 to 7 wt% of alkanes; and 1.0 x 10^{-4} to 2 x 10^{-4} wt% of the halogenated by-product, based on a total weight of the olefin rich stream.

BRIEF DESCRIPTION OF THE FIGURES

[0008] Figure 1 depicts a schematic diagram of an exemplary single stage system 100 that is used for removing halogenated by-products from a vent stream while recycling usable olefin molecules to a polymer production facility for conversion to polymers.

DETAILED DESCRIPTION

[0009] It will be understood that when an element is referred to as being “on” another element, it can be directly on the other element or intervening elements may be present therebetween. In contrast, when an element is referred to as being “directly on” another element, there are no intervening elements present. As used herein, the term “and/or” includes any and all combinations of one or more of the associated listed items.

[0010] It will be understood that, although the terms first, second, third, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section

from another element, component, region, layer or section. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the present invention.

What is claimed is:

1. A system for recovering olefins from a vent stream comprising:

a mixer that is operative to receiving a plurality of vent streams that contain halogenated by-products and olefin molecules; wherein the mixer mixes the respective vent streams to produce a vent stream;

an absorber located downstream of the mixer and in fluid communication with the mixer; wherein the absorber receives the vent stream from the mixer; wherein the absorber receives a solvent stream that contacts the vent stream in the absorber and preferentially absorbs the halogenated by-products over the olefin molecules from the vent stream; and wherein an olefin rich stream is discharged to a storage tank; and

a stripper; where the absorber and the stripper are in a recycle loop; where a stream discharged from the absorber to the stripper contains the halogenated by-products in addition to solvent; and where the absorber is operative to treat a vent stream with a solvent to remove more than 99 wt% of a halogenated by-product contained in the vent stream and to recover 90 to 95 wt% of olefin molecules present in the vent stream; and where the stripper is operative to remove more than 99 wt% of the halogenated by-products present in the solvent; and where the solvent is recycled to the absorber.

2. The system of Claim 1, further comprising a heat exchanger that lies downstream of the absorber and upstream of the stripper; where the heat exchanger is operative to transfer heat from a halogen concentrated stream discharged from the absorber to a solvent rich stream discharged from the stripper.

3. The system of Claim 1, where the absorber functions at a lower pressure than a pressure in the vent stream.

4. The system of Claim 1, further comprising a condenser and a reboiler, where the condenser and the reboiler are located downstream of the stripper and are operative to discharge a liquid stream and a gaseous stream respectively to an incinerator; where the liquid stream and the gaseous stream together contain a substantial portion of the halogenated by-products present in the vent stream.

5. The system of Claim 1, where the system is operative to convert the vent stream comprising 90 to 95 wt% of olefin molecules, 5 to 7 wt% of alkanes and 1.0×10^{-2} to 2×10^{-2} wt% of the halogenated by-product, based on the total weight of the vent stream, to produce an olefin rich stream 214 that comprises 90 to 95 wt% of olefin molecules, 5 to 7 wt% of alkanes

and 1.0 x 10^{-4} to 2 x 10^{-4} wt% of the halogenated by-product, based on a total weight of the olefin rich stream.

6. The system of Claim 1, where the olefin molecule comprises ethylene and where the halogenated by-product is pentafluoro-benzene.

7. The system of Claim 1, where the solvent comprises toluene, diesel, isoparaffinic solvents or a combination thereof.

8. A method for purification of a vent stream comprising:

charging to a mixer a plurality of vent streams that contain halogenated by-products;

mixing the respective vent streams in the mixer to produce a vent stream;

charging the vent stream from the mixer to an absorber; wherein the vent stream comprises 90 to 95 wt% of olefin molecules, 5 to 7 wt% of alkanes and 1.0 x 10^{-2} to 2 x 10^{-2} wt% of a halogenated by-product, based on the total weight of the vent stream;

discharging from the absorber to a storage tank an olefin rich stream that comprises 90 to 95 wt% of olefin molecules, 5 to 7 wt% of alkanes and 1.0 x 10^{-4} to 2 x 10^{-4} wt% of the halogenated by-product, based on a total weight of the olefin rich stream;

charging a stripper with a halogen concentrated stream received from the absorber;

discharging from the stripper a solvent rich stream that is recycled to the absorber; and

discharging from the stripper to an incinerator a waste stream that contains a substantial portion of the halogenated by-products present in the vent stream.

9. The method of Claim 8, further comprising transferring heat from the halogen concentrated stream to the solvent rich stream.

10. A composition derived from the system of Claim 1 comprising:

an olefin rich stream that comprises:

90 to 95 wt% of olefin molecules:

5 to 7 wt% of alkanes; and

1.0 x 10^{-4} to 2 x 10^{-4} wt% of the halogenated by-product, based on a total weight of the olefin rich stream.

11. The composition of Claim 10, where the olefin molecules comprise ethylene and where the halogenated by-product is pentafluoro-benzene.