CLAIMS

1. A method of improving flow distribution of one or more streams in a process vessel comprising:

passing the one or more streams through an upstream processing zone and a downstream processing zone within the process vessel, the upstream processing zone and downstream processing zone each containing one or more beds of processing materials, wherein the processing materials comprise catalyst;

passing the one or more streams through a redistribution zone located between, and adjacent to both of, the upstream processing zone and downstream processing zone, wherein the entire depth of the redistribution zone comprises a plurality of individual, packed treating elements, and wherein one or more of the treating elements comprise ceramic reticulates and the processing materials include reaction promoting catalyst; and

prior to passing the one or more streams through the upstream processing zone, passing the one or more streams through a bed zone, wherein the bed zone comprises one or more of filtration materials, treating elements and processing materials,

wherein the redistribution treating zone is directly adjacent to the upstream processing zone such that certain of the processing materials from the upstream processing zone are capable of migrating into the redistribution treating zone to create a combo-zone having both processing zone functionality and treating zone functionality; and

wherein the processing materials occupy at least 20% of the volume of that portion of the layer of treating elements (contained in the redistribution treating zone into which the processing materials have migrated.

2. The method of claim 1, wherein the bed zone comprises one or more materials capable of mitigating undesired species in a process stream prior to the process stream entering the upstream processing zone and facilitating distribution of the process stream across a cross section of the upstream processing zone.

3. The method of claim 1, wherein the one or more streams comprise a liquid stream, a vapor stream, a combination of a liquid stream and a vapor stream, or a mixture of a liquid stream and a vapor stream.

4. The method of claim 1, wherein the interior volume of the redistribution zone comprises a mix of treating elements and processing elements, such that the redistribution zone comprises a combo-zone having both processing zone functionality and treating zone functionality, and wherein no space between the upstream processing zone and the downstream processing zone is consumed by an engineered equipment structure internal to the process vessel.

5. The method of claim 1, wherein the treating elements comprise reticulated ceramics.

6. A method of improving flow distribution of one or more streams in a process vessel comprising:

passing the one or more streams through an upstream processing zone and a downstream processing zone within the process vessel, the upstream processing zone and downstream processing zone each containing one or more beds of processing materials;

passing the one or more streams through a redistribution zone located between, and adjacent to both of, the upstream processing zone and downstream processing zone, wherein the entire depth of the redistribution zone comprises a plurality of individual, packed treating elements, and wherein one or more of the treating elements comprise ceramic reticulates and the processing materials include reaction promoting catalyst; and

prior to passing the one or more streams through the upstream processing zone, passing the one or more streams through a bed zone,

wherein the redistribution treating zone is directly adjacent to the upstream processing zone such that certain of the processing materials from the upstream processing zone are capable of migrating into the redistribution treating zone to create a combo-zone having both processing zone functionality and treating zone functionality; and

wherein the processing materials occupy at least 20% of the volume of that portion of the layer of treating elements (contained in the redistribution treating zone into which the processing materials have migrated.

7. A method of improving flow distribution of one or more streams in a process vessel comprising:

passing the one or more streams through an upstream processing zone and a downstream processing zone within the process vessel, the upstream processing zone and downstream processing zone each containing one or more beds of processing materials;

passing the one or more streams through a redistribution zone located between, and adjacent to both of, the upstream processing zone and downstream processing zone, wherein the entire depth of the redistribution zone comprises a plurality of individual, packed treating elements; and

prior to passing the one or more streams through the upstream processing zone, passing the one or more streams through a bed zone,

wherein the treating elements in the redistribution zone are larger in size than the processing materials in the upstream processing zone and downstream processing zone,

wherein the redistribution treating zone is directly adjacent to the upstream processing zone such that certain of the processing materials from the upstream processing zone are capable of migrating into the redistribution treating zone to create a combo-zone having both processing zone functionality and treating zone functionality; and

wherein the processing materials occupy at least 20% of the volume of that portion of the layer of treating elements (contained in the redistribution treating zone into which the processing materials have migrated.

8. The method of claim 7, wherein the depth of the redistribution zone is also less than the depth of the upstream processing zone.

9. A method of improving flow distribution of one or more streams in a process vessel comprising:

passing the one or more streams through an upstream processing zone and a downstream processing zone within the process vessel, the upstream processing zone and downstream processing zone each containing one or more beds of processing materials;

passing the one or more streams through a redistribution zone located between, and adjacent to both of, the upstream processing zone and downstream processing zone, wherein the entire depth of the redistribution zone comprises a plurality of individual, packed treating elements; and

prior to passing the one or more streams through the upstream processing zone, passing the one or more streams through a bed zone, wherein the bed zone can mitigate undesired species contained in the one or more streams,

wherein the treating elements are randomly packed in the redistribution zone and have openings passing therethrough, and wherein a stream passing through the redistribution zone is capable of passing around and through the treating elements,

wherein the redistribution treating zone is directly adjacent to the upstream processing zone such that certain of the processing materials from the upstream processing zone are capable of migrating into the redistribution treating zone to create a combo-zone having both processing zone functionality and treating zone functionality; and

wherein the processing materials occupy at least 20% of the volume of that portion of the layer of treating elements (contained in the redistribution treating zone into which the processing materials have migrated.

10. The method of claim 9, wherein a plurality of channeled liquid streams exit the upstream processing zone, and wherein the treating elements facilitate redistribution of the channeled liquid streams, and wherein the redistributed streams enter the downstream processing zone as laterally dispersed streams such that there is improved contact between the laterally dispersed streams and the processing elements in the downstream processing zone.