

Summary of the Invention

The present invention provides a section of a contacting column, the section comprising:

- at least one feed inlet to an interior portion of said column section;
- at least one feed distribution device located in said interior portion of the column,
- and
- each feed distribution device is being formed by a plurality of plates with voids between them;

wherein a first feed distribution device is arranged substantially in front of at least a first feed inlet such that the plates are capable of deflecting at least a portion of a feed flow introduced from the first feed inlet and the voids between the plates are capable of allowing another portion of the feed flow introduced from the first feed inlet through the feed distribution device with no, or significantly lower, angle of deflection.

The present invention also provides a method of operating a contacting column, the contacting column having walls, at least one separation section and at least one feed inlet to a section of said column, the method comprising the steps of

- introducing a feed flow to the section of the column through a feed inlet; and
- using a feed distribution device for causing a portion of the feed flow that contacts the at least one feed distribution device to be deflected,

wherein

- using a distribution device comprised of a plurality of plates with voids between them being orientated in such a way that the plates deflect at least a portion of the feed flow in a direction substantially parallel to that of the column walls and the voids between the plates allow another portion of the feed flow introduced from the first feed inlet through the feed distribution device with no, or significantly lower, angle of deflection.

~~An object~~Some embodiments of the present invention ~~is to~~may facilitate the distribution of feed as it is introduced to a contacting device column.

~~The object is~~Such embodiments may achieve ~~this~~ by providing a column section with a feed distribution device as herein described and claimed.

- More specifically, ~~it is an object~~some embodiments may provide a feed distribution device which can be used to distribute the gas or vapor portion of the feed more evenly along the cross-sectional area of a separation section above the feed location compared to the distribution without a feed distribution device. ~~An additional object is to~~Some embodiments may also enable, alone or in conjunction with distributing the feed more evenly, ~~to use of a the~~ feed distribution device ~~is to~~ reduce the maximum magnitude of local velocity of at least a portion of the feed as it is introduced to the separation section above the feed location.
- ~~A further object~~Some embodiments of the invention ~~is to~~may provide a solution for distributing the feed without causing a significant pressure drop in the system.
- The above-mentioned ~~objects~~advantages may be achieved by arranging at least one series of plates, with voids between them, known as a feed distribution device substantially in front of one or more feed inlets. The series of plates being arranged in such a position and formation as to sufficiently alter the flow of the inlet feed so that it is more evenly distributed along the cross-sectional area of the separation section above the feed location, and the maximum local velocity of the feed flow entering the separation section is reduced.
- A section of a column for the separation of a feed product into its components according to the invention comprises at least one feed inlet to an interior portion of the column section and at least one feed distribution device located substantially in front of at least one feed inlet. The dimensions of the preferred feed distribution device are such that the vertical dimension of each plate is at least that of the vertical dimension of the feed inlet and the horizontal dimension of the series of plates and voids between the plates is at least that of the horizontal dimension of the feed inlet. However, the vertical dimension of each plate need not be at least

that of the vertical dimension of the feed inlet as long as the vertical dimension is sufficient to achieve the goals of the design. The same applies to the horizontal dimension of the series of plates and voids.

- 5 During operation, the plates of the at least one feed distribution device deflect at least a part of a feed flow introduced to the section from said first feed inlet from its original direction defined by said feed inlet, to another direction, typically approaching a direction substantially parallel to the walls of the column, i.e. vertical. Another part of the feed flow is directed through the voids with no or significantly lower angle of deflection. Thus, a more even
10 distribution of flow to the separation section above the feed inlet is achieved as compared with a situation with no feed distribution device in front of the feed inlet.

- According to one embodiment, the separation column comprises at least one feed inlet from a reboiler introducing a flashed feed to a lower or bottom section of the column and having at
15 least one feed distribution device located in the flow path of the flashed feed.

- The method for altering flow properties of an input feed to a separation column, or a gas/liquid contacting column, according to the invention comprises introducing a feed with a vapor portion to section of a separation column having a feed distribution device substantially in the
20 path of the feed flow so that at least the portion of the feed flow which is directed to a separation section above the feed inlet has the magnitude of its maximum local velocity reduced and the said portion of the feed flow is distributed substantially more evenly to the cross-sectional area of the said separation section.

- 25 In contrast to the arrangements disclosed in WO 2007/089888 and US 5,972,171 referred to above, the flow distribution device of the present invention is arranged so as to deflect, diffuse and distribute the flow. Preferably, the flow, which can be a non-flashing feed flow or a flash feed flow, is deflected at an angle away from the original feed flow and not substantially parallel to the original as is the case with the de-entrainment devices.

- 30 More specifically, the invention is characterized by what is stated in the characterizing parts of claims 1 and 13.

- Considerable advantages ~~are~~ may potentially be achieved by means of the invention. With the addition of one or more feed distribution devices at the point feed is introduced to the system, feed flow properties that are harmful to the interior portion of the system, mainly high velocity, can be mitigated. Additionally, by diverting the direction of the flow so that it is distributed evenly to the cross-sectional area of the separation section above the said feed distribution device increases the efficiency of said separation section and simultaneously allows for minimizing the vertical dimension of column section. By minimizing the vertical dimension of the column section it allows for more cost effective column design and maintenance. Additional advantages to the present invention are that it allows multiple feed inlets to be located closer together, if desired for maintenance and design purposes while maintaining substantially even distribution of the portion of the feed directed to a separation section located above the column section in question as well as minimizing pressure loss in said section the column.
- The feed distribution devices typically contain elongated plates and voids which are oriented are along the longitudinal axis of the column.

- The column is preferably one of distillation, vacuum distillation, stripping, absorption, extraction, washing column or a combination thereof.
- According to one embodiment, the plates of the feed distribution device or, in the case of a plurality of devices in series each of the feed distribution devices, is arranged in a linear formation, that is, along a straight line. Alternatively, the formation can a staggered line, regular arc, irregular arc or, for example, a V-formation. According to simulations and tests, a particularly advantageous formation is an arc having a center of curvature away from the feed inlet.

- According to one embodiment, there is, in addition to a first feed distribution device, at least one second feed distribution device separate from and arranged in series, parallel or concentric to the first feed distribution device. The plates of the one or more second feed distribution devices in series with the first feed distribution device are preferably arranged at least partially in-line with the voids of the first feed distribution device. That is, the devices have at least one void in line in the direction of the feed stream as seen from the feed inlet.

Claims:

1. A section of a contacting column, the section comprising;
 - at least one feed inlet to an interior portion of said column section;
 - 5 – at least one feed distribution device located in said interior portion of the column, and
 - each feed distribution device is being formed by a plurality of plates with voids between them;
- 10 ~~characterized in that~~wherein
 - a first feed distribution device is arranged substantially in front of at least a first feed inlet such that the plates are capable of deflecting at least a portion of a feed flow introduced from the first feed inlet and the voids between the plates are capable of allowing another portion of the feed flow introduced from the first feed inlet through the feed distribution device with no, or significantly lower, angle of
 - 15 deflection.
2. A section according to claim 1, wherein the plates of each of the feed distribution devices have dimensions sufficient to disperse the feed evenly throughout the section and being arranged in a formation chosen from the following group; straight line, staggered line, regular
- 20 arc, irregular arc and V.
3. A section according to claim 1 or 2, wherein one or more second feed distribution devices are separate from, and arranged parallel or concentric to, the first feed distribution device in a series of such devices.
- 25 4. A section according to claim 3, wherein the plates of the one or more second feed distribution devices, in series with the first feed distribution device, are arranged at least partially in-line with the voids of the first feed distribution device.
- 30 5. A section according to any one of the preceding claims, wherein there is a separation section above and/or below the one or more feed distribution devices.

6. A section according to any one of the preceding claims, wherein the first feed inlet is separate from each feed distribution device.
7. A section according to claim 5, wherein the separation section is one of a section for separation, distillation, heat transfer, extraction, wash operation or absorption.
8. A section according to any one of the preceding claims, wherein the section has two feed inlets separated by, or less than, 180 degrees, and the at least one feed distribution device is arranged in a formation, and with sufficient horizontal dimension to be substantially in front of both feed inlets.
9. A section according to any one of the preceding claims, wherein the plates of the at least one feed distribution device are arranged to deflect at least a part of a feed flow introduced to the section from said first feed inlet from its original direction defined by said feed inlet, to a direction substantially normal to the original direction and substantially parallel to the walls of the column.
10. A section according to any one of the preceding claims, wherein the section is used in one of a distillation column, vacuum distillation column, stripping column, absorption column, extraction column, washing column or a column that is a combination thereof.
11. A section according to any one of the preceding claims, wherein the section is used in a column where the feed is a flashing feed, and the plates of the at least one feed distribution device are arranged to reduce the magnitude of the local velocity of at least a portion of the flash feed entering the separation section above the feed inlet.
12. A section according to any one of the preceding claims, wherein the feed distribution device is arranged substantially in front of the first feed inlet in such a way that the feed will meet at least a part of the feed distribution device at a position closer to the feed inlet than to the center of the column section.

13. A method of operating a contacting column, the contacting column having walls, at least one separation section and at least one feed inlet to a section of said column, the method comprising the steps of

- introducing a feed flow to the section of the column through a feed inlet; and
- 5 – using a feed distribution device for causing a portion of the feed flow that contacts the at least one feed distribution device to be deflected,
| ~~characterized by wherein~~
- using a distribution device comprised of a plurality of plates with voids between them being orientated in such a way that the plates deflect at least a portion of the
- 10 feed flow in a direction substantially parallel to that of the column walls and the voids between the plates allow another portion of the feed flow introduced from the first feed inlet through the feed distribution device with no, or significantly lower, angle of deflection.

- 15 14. A method in accordance with claim 13, wherein the feed distribution device is a feed
| distribution device of any one of claims 1-12.