CLAIMS

1. A method for separating a feed stream in a distillation tower comprising:

maintaining a controlled freeze zone section in the distillation tower that forms solids from a feed stream, wherein the controlled freeze zone section includes one or more internally disposed elements and a controlled freeze zone wall having an internal wall surface inside of the distillation tower;

modifying at least one of the internally disposed elements, the internal wall surface, or both with a treatment mechanism that includes mechanically removing portions of the internal wall surface wherein mechanically removing material comprises sanding, grinding, sandblasting, or mechanically polishing the internal wall surface;

introducing the feed stream into the controlled freeze zone section;

forming the solids from the feed stream in the controlled freeze zone section; and

at least one of preventing and destabilizing adhesion of the solids to the internal wall surface with the treatment mechanism.

2. The method of claim 1, further comprising:

modifying a surface of at least one of at least two internally disposed elements with a treatment mechanism, wherein the two internally disposed elements comprise a melt tray assembly and a spray assembly, and wherein at least one of the melt tray assembly and the spray assembly is separate from the internal wall surface; and

at least one of preventing and destabilizing adhesion of the solids to the at least one of the melt tray assembly and the spray assembly with the treatment mechanism.

3. The method of claim 1, further comprising inserting a closing element having a closing element inner surface into a wall opening of the controlled freeze zone wall, wherein the inserted closing element inner surface is substantially flush with the internal wall surface.

4. The method of claim 1 further comprising:

producing hydrocarbons in the feed stream from the distillation tower.

5. A distillation tower that separates a contaminant in a feed stream from a hydrocarbon in the feed stream, comprising:

a stripper section constructed and arranged to separate the feed stream, comprising the contaminant and a hydrocarbon, into an enriched contaminant bottom liquid stream, comprising the contaminant, and a freezing zone vapor stream, comprising the hydrocarbon, without forming solids; and

a controlled freeze zone comprising:

a spray assembly constructed and arranged to form the solids;

a melt tray assembly constructed and arranged to melt the solids;

an internal wall surface, inside of the distillation tower, wherein at least one of the spray assembly, melt tray assembly, and internal wall surface has a substantially smooth surface, wherein the substantially smooth surface has been produced by mechanically removing material by sanding, grinding, sandblasting, or mechanically polishing the internal wall surface.

6. The distillation tower of claim 5, wherein the controlled freeze zone wall includes a wall opening that protrudes away from the inside of the distillation tower.

7. The distillation tower of claim 6, further comprising a closing element within the wall opening, wherein the closing element includes a closing element inner surface that is substantially flush with the internal wall surface.

8. The distillation tower of claim 5, wherein the spray assembly includes a spray head and a spray nozzle, and wherein at least one of the spray head and the spray nozzle- have a substantially smooth surface.

9. The distillation tower of claim 5, further comprising a rectifier section constructed and arranged to separate the feedstream without forming solids.

10. The distillation tower of claim 9, wherein at least one of the stripping section, the controlled freeze zone section and the rectifier section are in a first vessel and another of the

at least one of the stripping section, the controlled freeze zone section and the rectifier section are in a second vessel that is separate from the first vessel.

11. The distillation tower of claim 9, wherein the stripping section and the controlled freeze zone section are in a first vessel and the rectifier section is in a second vessel that is separate from the first vessel.

12. A method for separating a feed stream in a distillation tower comprising:

(a) providing a distillation tower that separates a contaminant in a feed stream from a hydrocarbon in the feed stream, wherein the distillation tower comprises:

a stripper section; and

a controlled freeze zone comprising:

a spray assembly constructed and arranged to form the solids;

a melt tray assembly constructed and arranged to melt the solids; and

an internal wall surface, inside of the distillation tower,

wherein at least one of the spray assembly and melt tray assembly have a substantially smooth surface that has been produced by electropolishing at least one of the spray assembly and melt tray assembly; and

wherein the internal wall surface of the controlled freeze zone has a substantially smooth surface that has been produced by mechanically removing material by sanding, grinding, sandblasting, or mechanically polishing the internal wall surface;

(b) introducing the feed stream into the stripper section, wherein the stripper section operates to separate the feed stream and form an enriched contaminant bottom liquid stream and a freezing zone vapor stream and wherein the stripper section operates at a temperature and pressure at which no solids form;

(c) passing the freezing zone vapor stream from the stripper section to the controlled freeze zone;

(d) forming solids comprising the contaminant from the feed stream in the controlled freeze zone section;

wherein the substantially smooth surface of the internal wall surface and the at least one of the spray assembly and melt tray assembly operate to at least prevent or destabilize adhesion of the solids to the internal wall surface and the at least one of the spray assembly and melt tray assembly in the controlled freeze zone.

13. The method of claim 12, wherein the controlled freeze zone further comprises a wall opening that extends away from the internal wall surface of the controlled freeze zone at a longitudinal axis to the distillation tower;

wherein the wall opening comprises a closing element within the wall opening, wherein the closing element includes a closing element inner surface that is substantially flush with the internal wall surface of the controlled freeze zone.