CLAIMS

1. A heater, comprising:

a convection section, including:

a plurality of columns arranged in pairs of columns spaced from each other along a longitudinal direction of the convection section, and the pairs of columns including a first column and a second column spaced from each other in a lateral direction of the convection section;

a plurality of tube sheets coupled to the plurality of columns, including pairs of tube sheets coupled to corresponding pairs of columns, the pairs of tube sheets each including a first tube sheet and a second tube sheet;

a plurality of tube bundles coupled to the plurality of tube sheets;

a gap between the first tube sheet and the second tube sheet in each pair of tube sheets; and

a structural frame in the gap, including:

a plurality of beams coupled to corresponding pairs of columns of the plurality of columns and extending through the gap; and

a first catalyst support bed removably coupled to the plurality of beams and positioned in the gap, the first catalyst support bed being slidable with respect to the plurality of beams to enable loading or unloading of a catalyst into the convection section through at least one lateral side of the convection section.

2. The heater of claim 1, wherein a first one of the plurality of beams includes a first flange with a rail and a second flange with a guide element.

3. The heater of claim 2, wherein the first flange and the second flange are each normal to a web of the first one of the plurality of beams.

4. The heater of claim 3, wherein the rail is normal to the first flange and extends from the first flange in a first direction, and the guide element is normal to the second flange and extends from the second flange in a second direction opposite to the first direction.

5. The heater of claim 2, wherein the first catalyst support bed includes a plurality of struts coupled together, first ones of the plurality of struts including a channel interfacing with the rail of the first flange of the first one of the plurality of beams to assist with sliding of the first catalyst support bed relative to the plurality of beams.

6. The heater of claim 5, wherein the structural frame further includes a support bar disposed on the second flange of the first one of the plurality of beams and including a slot configured to interface with the guide element of the second flange of the first one of the plurality of beams to assist with sliding of the first catalyst support bed relative to the plurality of beams.

7. The heater of claim 6, wherein the support bar is configured to prevent movement of the first catalyst support bed in the longitudinal direction of the convection section.

8. The heater of claim 5, wherein the convection section further includes a first gasket between the support bar and at least one of the plurality of struts of the first catalyst support bed, and a second gasket between the second flange of the first one of the plurality of beams and at least a first one of the plurality of tube sheets.

9. The heater of claim 8, wherein the second gasket is configured to compress in response to expansion of the at least the corresponding one of the plurality of tube sheets under an operational temperature of the convection section.

10. The heater of claim 1, wherein the structural frame includes the first catalyst support bed being slidable to enable loading or unloading of the catalyst into the convection section through a first lateral side of the convection section, the heater further comprising:

a second catalyst support bed positioned in the gap and configured to enable loading or unloading of the catalyst into the convection section through a second lateral side of the convection section opposite to the first lateral side.

11. The heater of claim 10, wherein each of the plurality of beams include a first flange with a rail and a second flange with a guide element, and the second catalyst support bed includes a plurality of struts coupled together, first ones of the plurality of struts including a

channel interfacing with the rail of the first flange of corresponding ones of the plurality of beams to assist with sliding of the second catalyst support bed relative to the plurality of beams.

12. The heater of claim 11, further comprising:

a support bar disposed on the second flange of the corresponding ones of the plurality of beams and including a slot configured to interface with the guide element of the second flange of the corresponding ones of the plurality of beams to assist with sliding of the second catalyst support bed.

13. The heater of claim 1, further comprising:

an interlocking seal plate between modules of the catalyst on the first catalyst support bed.

14. The heater of claim 1, wherein the gap between the first tube sheet and the second tube sheet is less than 460mm, and the structural frame has a height less than 460mm.

15. The heater of claim 1, wherein the structural frame further includes:

a plurality of frame elements coupled to the plurality of columns at the at least one lateral side of the convection section; and

a removable access door coupled to the plurality of frame elements.

16. The heater of claim 15, further comprising:

an insulation layer between an end face of the first catalyst support bed and an internal face of the removable access door.

17. The heater of claim 15, wherein the structural frame further includes a plurality of brackets coupled to the plurality of columns, each of the plurality of brackets having a channel that receives at least a portion of a corresponding one of the plurality of beams to assist in coupling the plurality of beams to the plurality of columns.

18. The heater of claim 17, wherein the plurality of brackets are coupled to the plurality of frame elements to assist in coupling the plurality of frame elements to the plurality of columns.

19. A heater, comprising:

a convection section including a plurality of subsections arranged in parallel over an entire longitudinal length of the convection section with the plurality of subsections separated from each other by supports of the convection section, each subsection of the plurality of subsections including a respective at least one lateral side corresponding to at least one lateral side of the convection section;

a plurality of tubes coupled to the supports of the convection section;

a gap between outer tubes of the plurality of tubes; and

a plurality of SCR modules positioned in the gap and each configured to carry one or more catalyst modules, the plurality of SCR modules associated with respective ones of the plurality of subsections of the convection section and configured to be installed in parallel through the respective at least one lateral side of the plurality of subsections.

20. The heater of claim 19, wherein each subsection of the plurality of subsections includes a single SCR module of the plurality of SCR modules being slidable with respect to the convection section.

21. The heater of claim 19, wherein each subsection of the plurality of subsections includes at least two SCR modules of the plurality of SCR modules with each SCR module of the at least two SCR modules being slidable with respect to the convection section.

22. The heater of claim 21, wherein the at least two SCR modules are slidable with respect to a front lateral side and a rear lateral side of each respective subsection of the plurality of subsections.