distance from the distal end. Then inflating the multiple inflatable bladders, thereby centering the centering ring and the temperature measurement device within the SMR tube, and introducing catalyst into the SMR tube, thereby enclosing the temperature measurement device in catalyst.

In one aspect, there is provided a method of installing a temperature measuring device inside a reactor tube while filling the tube with catalyst, comprising a) inserting a positioning system, comprising multiple inflatable bladders connected at a central location to a centering ring, into the reactor tube, the reactor tube comprising a distal end and a proximal end, b) attaching the temperature measurement device to a distal end mesh disk, c) inserting the centering ring around the temperature measurement device, d) locating the positioning system at a first predetermined distance from the distal end, e) inflating the multiple inflatable bladders, thereby centering the centering ring and the temperature measurement device within a SMR tube, and f) introducing catalyst into the SMR tube, thereby enclosing the temperature measurement device in catalyst.

Brief Description of the Figures

For a further understanding of the nature and objects for the present invention, reference should be made to the following detailed description, taken in conjunction with the accompanying drawings, in which like elements are given the same or analogous reference numbers and wherein:

Figure 1 is a schematic representation of a cross-sectional view of a reactor tube and catalyst springs, as known to the art.

Figure 2 is a schematic representation of a cross-sectional view of a reactor tube and catalyst springs, with the multiple bladder positioning system, in accordance with one embodiment of the present invention.

Figure 3a is a schematic representation of a cross-sectional view of a reactor tube with a single temperature measurement device, in accordance with one embodiment of the present invention.

Figure 3b is a schematic representation of a cross-sectional view of a reactor tube with a strand of multiple temperature measurement devices, in accordance with one embodiment of the present invention.

Figure 4 is a schematic representation of a cross-sectional view of a reactor tube and the centering ring, accordance with one embodiment of the present invention.

Figure 5 is a schematic representation of a cross-sectional view of a reactor tube and inflated multiple bladder positioning system, accordance with one embodiment of the present invention.

Figure 6a is a schematic representation of a cross-sectional view of the uninflated multiple bladder positioning system, accordance with one embodiment of the present invention.

Figure 6b is a schematic representation of an isometric view of the uninflated multiple bladder positioning system, accordance with one embodiment of the present invention.

What is claimed is:

1. A method of installing a temperature measuring device inside a reactor tube while filling the tube with catalyst, comprising:

a) inserting a positioning system, comprising multiple inflatable bladders connected at a central location to a centering ring, into the reactor tube, the reactor tube comprising a distal end and a proximal end,

b) attaching the temperature measurement device to a distal end mesh disk,

c) inserting the centering ring around the temperature measurement device,

d) locating the positioning system at a first predetermined distance from the distal end,

e) inflating the multiple inflatable bladders, thereby centering the centering ring and the temperature measurement device within a SMR tube, and

f) introducing catalyst into the SMR tube, thereby enclosing the temperature measurement device in catalyst.

2. The method of claim 1, further comprising:

a) deflating the multiple inflatable bladders and relocating the positioning system a second predetermined distance toward the proximal end, and

b) repeating steps b) – f) until the SMR tube is filled as required.

3. The method of claim 1, wherein the positioning system comprises three inflatable bladders.

4. The method of claim 1, wherein the positioning system further comprises multiple open regions, and the catalyst passes through the multiple open regions to enclose the temperature measurement device.

5. The method of claim 4, wherein the positioning system comprises three inflatable bladders and three open regions.

6. The method of claim 1, wherein the temperature measurement device is a thermocouple.

7. The method of claim 1, wherein the temperature measurement device is a strand of multiple thermocouple sensors.

8. The method of claim 1, wherein the multiple inflatable bladders are inflated using pressurized nitrogen.

9. The method of claim 1, wherein the multiple inflatable bladders are inflated using pressurized air.

10. The method of claim 1, wherein the reactor tube is vibrated during or after step e).

11. The method of claim 1, wherein the first predetermined distance is less than 5 feet.

12. The method of claim 1, wherein the first predetermined distance is 1 foot.

13. The method of claim 2, wherein the second predetermined distance is less than 5 feet.

14. The method of claim 2, wherein the second predetermined distance is about 1 foot.