What is claimed is:

1. A single shell open interstage reactor for producing acrylic acid from propylene comprising, in process-flow order:

a) a first shell-and-tube reaction stage comprising a plurality of reaction tubes, wherein the reaction tubes of the first reaction stage comprise a first catalyst for oxidizing propylene to produce acrolein;

b) an interstage heat exchanger;

c) an open interstage region; and

d) a second shell-and tube reaction stage comprising a plurality of reaction tubes, wherein the reaction tubes of the second reaction stage comprise a second catalyst for oxidizing acrolein to produce acrylic acid; and

wherein the reaction tubes of the second reaction stage have a diameter greater than 22.3 mm.

2. The reactor of claim 1, wherein said open interstage region comprises a supplemental oxidant supply line.

3. The reactor of claim 2, wherein said open interstage region further comprises a supplemental oxidant mixing assembly.

4. The reactor of claim 3, wherein said supplemental oxidant mixing assembly comprises a supplemental oxidant supply line, optionally an oxidant heat exchanger, and a venturi mixer.

5. The reactor of claim 4, wherein said venturi mixer comprises:

a) an inlet contracting section;

b) an intermediate throat section comprising at least one blending element; and

c) an outlet expansion section.

6. The reactor of claim 5, wherein the at least one blending element is selected from the group consisting of nozzles, injectors, gas-gas mixing elements, distributors, aspirators, coanda-effect mixing elements, spargers, static mixing elements, eductors, lances, and combinations thereof.

7. The reactor of claim 5, wherein said inlet contracting section comprises particulate inert material having a bulk void fraction of less than 50%.

8. The reactor of claim 1, wherein said open interstage region is at least partially filled with at least one inert material.

9. The reactor of claim 8, wherein said at least one inert material has a surface area to bulk volume ratio of at least 78.7 m^2/cubic m.

10. The reactor of claim 8, wherein said at least one inert material is present in an amount sufficient to provide at least 2790 m^2 of total surface area.

11. The reactor of claim 1, wherein said first catalyst comprises at least one compound chosen from oxides of molybdenum, bismuth, and iron.

12. The reactor of claim 1, wherein said second catalyst comprises at least one compound chosen from oxides of molybdenum and vanadium.

13. The reactor of claim 1, wherein said interstage heat exchanger comprises inserts having a void fraction of at least 85%.

14. The reactor of claim 1, wherein the mass of said second catalyst is 0.95 to 1.65 times the mass of said first catalyst.

15. The reactor of claim 14, wherein the mass of said second catalyst 1.25 to 1.6 times the mass of said first catalyst.

16. The reactor of claim 1, wherein said interstage heat exchanger is capable of maintaining a process gas leaving the interstage heat exchanger at a temperature ranging from 240 °C to 280 °C.

17. A method of making acrylic acid, comprising oxidizing propylene in the reactor of claim 1.

18. The reactor of claim 1, wherein the reaction tubes of the first and second reaction stages have a diameter greater than 22.3 mm.