CLAIMS

What is claimed is:

1. An apparatus for redirecting fluid flow in a plenum from a first flow direction to a second flow direction, said apparatus comprising a transverse array of flat blades positioned at an angle oblique to the first flow direction to redirect the fluid flow from the first flow direction to the second flow direction.

2. The apparatus of claim 1, wherein the apparatus is configured for redirecting the fluid flow at corner junction between first and second plenum sections, said first plenum section conveying the fluid flow in the first flow direction and said second plenum section conveying the fluid flow in the second flow direction, and wherein a plane defined by the transverse array is aligned along a diagonal line of the corner junction.

3. The apparatus of claim 2, wherein the plane is defined by upstream edges of the blades in the transverse array and wherein the oblique angle represents a measure of the angle between the first flow direction and the plane.

4. The apparatus of claim 3, wherein the transverse array is positioned with the plane aligned on a diagonal line extending from inside to outside corners of the corner junction.

5. The apparatus of claim 3, wherein a blade height as measured from an upstream blade edge to a downstream blade edge is in a range from about six inches to about eighteen inches and a blade spacing between adjacent blades in the transverse array is in a range from about three inches to about twenty-four inches, and wherein the oblique angle is selected to place the blades in the transverse array at a blade angle in a range from about fifteen degrees to about twenty-five degrees.

6. The apparatus of claim 5, wherein the blade height is at or about twelve inches, the blade spacing is at or about six inches, and the blade angle is at or about nineteen degrees.

7. The apparatus of claim 1, wherein a blade height as measured from an upstream blade edge to a downstream blade edge is configured to be about two times a blade spacing as measured between adjacent blades in the transverse array.

8. The apparatus of claim 7, wherein the oblique angle is selected to position each blade in the transverse array at a blade angle of between minus twenty-five degrees and plus twenty-five degrees with respect to the second flow direction, wherein the blade angle is measured relative to the second flow direction using a line connecting the upstream and downstream blade edges.

9. The apparatus of claim 1, wherein one or more of the blades includes a structural stiffener integrated or otherwise mounted on a leeward face of the blade, wherein the leeward face of the blade is the side of the blade away from the first flow direction.

10. The apparatus of claim 1, wherein the transverse array includes at least a partial perimeter frame for structurally fixing the transverse array within the plenum.

11. The apparatus of claim 1, wherein the transverse array comprises two or more sub-arrays.

12. The apparatus of claim 1, wherein the blades are uniformly spaced within the transverse array.

13. The apparatus of claim 1, wherein the blades are non-uniformly spaced within the transverse array.

14. The apparatus of claim 1, wherein the plenum comprises an upstream element of a selective catalytic reactor (SCR), and wherein the transverse array is configured for redirecting a gas flow into the SCR.

15. A method of designing a transverse array of flat blades for use in redirecting fluid flow in a plenum from a first flow direction to a second flow direction, said method comprising:

defining a transverse blade length as a function of an interior cross section at a position within the plenum where the transverse array is to be mounted; and

adjusting at least one of a blade height, blade spacing, and blade angle as needed to achieve a desired flow quality for the fluid flow.

16. The method of claim 15, further comprising adjusting the blade angle by adjusting a planned mounting angle of the transverse array within the plenum.

17. The method of claim 15, wherein adjusting at least one of a blade height, blade spacing, and blade angle as needed to achieve a desired flow quality for the fluid flow comprises simulating fluid flow in a simulation model of the transverse array, assessing a modeled flow quality against one or more quality requirements, and adjusting one or more of a modeled blade height, modeled blade spacing, and modeled blade angle until the modeled flow quality meets the one or more flow quality requirements.

18. The method of claim 17, wherein adjusting at least one of a blade height, blade spacing, and blade angle as needed to achieve a desired flow quality for the fluid flow comprises

initializing a transverse array design using a default blade height, a default blade spacing, and a default blade angle.

19. The method of claim 18, further comprising setting the default blade height and the default blade spacing according to a blade height to blade spacing ratio of about two-to-one.

20. The method of claim 18, further comprising setting the default blade height to about twelve inches and correspondingly setting the default blade spacing to about six inches.

21. The method of claim 18, further comprising setting the default blade angle to about nineteen degrees relative to the second flow direction.

22. The method of claim 17, wherein initializing the transverse array design using a default blade height, a default blade spacing, and a default blade angle comprises setting the default blade height to a value in a range from six inches to eighteen inches, setting the default blade spacing in a range from three inches to about twenty-four inches, and setting the default blade angle from about minus twenty-five degrees to about plus twenty-five degrees.

23. The method of claim 15, further comprising adjusting the actual blade spacing away from a default blade spacing to reduce an aggregate blade count for the transverse array, while compensating for the increased blade spacing by correspondingly adjusting one or both of the blade height and blade angle.

CLAIMS

What is claimed is:

1. An apparatus for redirecting fluid flow in a plenum from a first flow direction to a second flow direction, said plenum comprising an upstream element of a selective catalytic reactor and further including an inside plenum corner and an outside plenum corner and a corner diagonal line running from the inside plenum corner to the outside plenum corner, said inside and outside plenum corners being rectangular corners, said apparatus comprising a transverse array of flat blades positioned at an angle oblique to the first flow direction to redirect the fluid flow from the first flow direction to the second flow direction, wherein the upstream edges of the blades define a plane aligned along the corner diagonal line, wherein the array is configured for redirecting the fluid flow into the selective catalytic reactor, wherein the apparatus is adapted to position each blade at a non-zero blade angle between minus twenty-five degrees and plus twenty-five degrees with respect to the second flow direction.

2. The apparatus of claim 1, wherein the apparatus is configured for redirecting the fluid flow at corner junction between first and second plenum sections, said first plenum section conveying the fluid flow in the first flow direction and said second plenum section conveying the fluid flow in the second flow direction, and wherein a plane defined by the transverse array is aligned along a diagonal line of the corner junction.

3. The apparatus of claim 2, wherein the plane is defined by upstream edges of the blades in the transverse array and wherein the oblique angle represents a measure of the angle between the first flow direction and the plane.

4. The apparatus of claim 3, wherein the transverse array is positioned with the plane aligned on a diagonal line extending from inside to outside corners of the corner junction.

5. The apparatus of claim 3, wherein a blade height as measured from an upstream blade edge to a downstream blade edge is in a range from about six inches to about eighteen inches and a blade spacing between adjacent blades in the transverse array is in a range from about three inches to about twenty-four inches, and wherein the oblique angle is selected to place the blades in the transverse array at a blade angle in a range from about fifteen degrees to about twenty-five degrees.

6. The apparatus of claim 5, wherein the blade height is at or about twelve inches, the blade spacing is at or about six inches, and the blade angle is at or about nineteen degrees.

7. The apparatus of claim 1, wherein a blade height as measured from an upstream blade edge to a downstream blade edge is configured to be about two times a blade spacing as measured between adjacent blades in the transverse array.

8. The apparatus of claim 7, wherein the oblique angle is selected to position each blade in the transverse array at a blade angle of between minus twenty-five degrees and plus twenty-five degrees with respect to the second flow direction, wherein the blade angle is measured relative to the second flow direction using a line connecting the upstream and downstream blade edges.

9. The apparatus of claim 1, wherein one or more of the blades includes a structural stiffener integrated or otherwise mounted on a leeward face of the blade, wherein the leeward face of the blade is the side of the blade away from the first flow direction.

10. The apparatus of claim 1, wherein the transverse array includes at least a partial perimeter frame for structurally fixing the transverse array within the plenum.

11. The apparatus of claim 1, wherein the transverse array comprises two or more sub-arrays.

12. The apparatus of claim 1, wherein the blades are uniformly spaced within the transverse array.

13. The apparatus of claim 1, wherein the blades are non-uniformly spaced within the transverse array.

14. The apparatus of claim 1, wherein the plenum comprises an upstream element of a selective catalytic reactor (SCR), and wherein the transverse array is configured for redirecting a gas flow into the SCR.

15. A method of designing a transverse array of flat blades for use in redirecting fluid flow in a plenum from a first flow direction to a second flow direction, said plenum comprising an upstream element of a selective catalytic reactor and further including an inside plenum corner and an outside plenum corner and a corner diagonal line running from the inside plenum corner to the outside plenum corner, said inside and outside plenum corners being rectangular corners, said method comprising:

defining a transverse blade length as a function of an interior cross section at a position within the plenum where the transverse array is to be mounted;

adjusting at least one of a blade height, blade spacing, and blade angle as needed to achieve a desired flow quality for the fluid flow; and

aligning the upstream edges of the blades along the corner diagonal line, the array redirecting the fluid flow into the selective catalytic reactor,

wherein the method allows each blade to be positioned at a non-zero blade angle between minus twenty-five degrees and plus twenty-five degrees with respect to the second flow direction.

16. The method of claim 15, further comprising adjusting the blade angle by adjusting a planned mounting angle of the transverse array within the plenum.

17. The method of claim 15, wherein adjusting at least one of a blade height, blade spacing, and blade angle as needed to achieve a desired flow quality for the fluid flow comprises simulating fluid flow in a simulation model of the transverse array, assessing a modeled flow quality against one or more quality requirements, and adjusting one or more of a modeled blade height, modeled blade spacing, and modeled blade angle until the modeled flow quality meets the one or more flow quality requirements.

18. The method of claim 17, wherein adjusting at least one of a blade height, blade spacing, and blade angle as needed to achieve a desired flow quality for the fluid flow comprises initializing a transverse array design using a default blade height, a default blade spacing, and a default blade angle.

19. The method of claim 18, further comprising setting the default blade height and the default blade spacing according to a blade height to blade spacing ratio of about two-to-one.

20. The method of claim 18, further comprising setting the default blade height to about twelve inches and correspondingly setting the default blade spacing to about six inches.

21. The method of claim 18, further comprising setting the default blade angle to about nineteen degrees relative to the second flow direction.

22. The method of claim 17, wherein initializing the transverse array design using a default blade height, a default blade spacing, and a default blade angle comprises setting the default blade height to a value in a range from six inches to eighteen inches, setting the default blade spacing in a range from three inches to about twenty-four inches, and setting the default blade angle from about minus twenty-five degrees to about plus twenty-five degrees.

23. The method of claim 15, further comprising adjusting the actual blade spacing away from a default blade spacing to reduce an aggregate blade count for the transverse array, while compensating for the increased blade spacing by correspondingly adjusting one or both of the blade height and blade angle.