CLAIMS

1. A pipe assembly for flow measurement, characterized by:

a fluid flow pipe;

two or more flow conditioners each having a stepped configuration and installed apart within said fluid flow pipe in an orientation substantially perpendicular to an axis of said fluid flow pipe,

wherein each of the flow conditioners comprises a perforated plate.

2. A pipe assembly according to Claim 1, characterized in that said two or more flow conditioners each comprises:

an outer ring extending from a first side of the flow conditioner and comprising a concentric ring of a plurality of holes, wherein the holes define fluid passages from the outer ring to a second side of the flow conditioner;

at least one inner ring recessed or stepped from the outer ring, said at least one inner ring comprising a concentric ring of a plurality of holes, wherein the holes define fluid passages from the at least one inner ring to the second side of the flow conditioner; and

a central hole or opening,

wherein the fluid passages defined by the plurality of holes of the outer ring and the plurality of holes of the at least one inner ring are of unequal length.

3. A pipe assembly according to Claim 2, characterized in that the central hole or opening is recessed or stepped from the at least one inner ring.

4. A pipe assembly according to any one of Claims 2-3, further characterized in that a diameter of the central hole or opening may be greater than the diameters of the plurality of holes of the at least one inner ring, and the diameters of the plurality of holes of the at least one inner ring may be greater than the diameters of the plurality of holes of the outer ring.

5. A pipe assembly according to any one of Claims 2-3, further characterized in that the central hole or opening may define a fluid length, which is less than the fluid length or passages defined by the plurality of holes of the at least one inner ring, which is less than the fluid length of passages defined by plurality of holes of the outer ring.

6. A pipe assembly according to Claim 1, characterized in that said two or more flow conditioners each comprises:

a first set of integral vanes at least partially following a contour or pattern of an outer ring of holes; and

a second set of integral vanes at least partially following a contour or pattern of an inner ring of holes, wherein the second set of integral vanes is recessed or stepped from the first set of integral vanes.

7. A pipe assembly according to any one of Claims 1-6, characterized in that the two or more flow conditioners having a stepped configuration are positioned at about 2-10 pipe diameters apart.

8. A pipe assembly according to any one of Claims 1-6, further characterized by at least one pressure transmitter.

9. A pipe assembly according to any one of Claims 1-6, further characterized by a flange connection surrounding a body of a flow conditioner.

10. A pipe assembly according to any one of Claims 1-6, further characterized by a flow meter downstream of the two or more flow conditioners having a stepped configuration.

11. A pipe assembly according to any one of Claims 1-6, further characterized in that the two or more flow conditioners having a stepped configuration each have a thickness of about 0.05D to 0.5D, wherein D is the diameter of the fluid flow pipe.

12. A method for reducing fluid swirl and noise in a pipeline, characterized by installing two or more flow conditioners each having a stepped configuration in a pipeline assembly according to any one of Claims 1-6, said two or more flow conditioners being positioned at about 2-10 pipe diameters apart in an orientation substantially perpendicular to an axis of said pipeline.

13. A method according to Claim 12, further characterized by installing at least one pressure transmitter upstream of, downstream of, or between the two or more flow conditioners each having a stepped configuration.

14. A pipe assembly according to any one of Claims 1-6, wherein the two or more flow conditioners are installed apart at different flanges that are in series in the pipeline.