CLAIMS

1. A restriction orifice plate comprising:

a plate configured to be positioned in a conduit through which a fluid passes, in which the plate includes two or more openings therethrough that are positioned on the plate to induce a pressure loss of the fluid passing therethrough;

each of the two or more openings include an inlet and an outlet, the inlets of the two or more openings are the same diameter and the outlets of the two or more openings are the same diameter;

in which the two or more openings are positioned on the plate to satisfy the flow-based relationship, $K\rho AV^N$ = Constant, so that N = 0 as the fluid passes through the two or more openings, where

K = constant;

ρ = fluid density;

A = area of the two or more openings;

V = fluid velocity;

N = velocity exponent; and

in which the two or more openings of the plate are configured to equally satisfy the relationship, $\Delta P = k\rho V^n/2G_c$, where,

ΔP = pressure loss across the plate;

n = velocity exponent;

k = velocity head loss;

ρ = fluid density;

V = fluid velocity; and

G_c = Newton's conversion constant.

2. A restriction orifice plate according to Claim 1, in which the plate includes a non-perforated central region about which the two or more openings are positioned.

3. A restriction orifice plate according to Claim 1 or 2, in which the values for n range between 1.8 to 2, inclusive of 1.8 and 2.

4. A restriction orifice plate according to Claim 1, 2 or 3, in which the inlet of each of the two or more openings has an edge selected from the group consisting of blunt, knife, tapered / beveled and contoured edges.

5. A restriction orifice plate according to any preceding claim, in which the outlet of each of the two or more openings has an edge selected from the group consisting of blunt, knife, tapered / beveled and contoured edges.

6. A restriction orifice plate according to Claim 1, 2 or 3, in which the inlet of each of the two or more openings has a contoured edge and in which the outlet of each of the two or more openings has a contoured edge.

7. A method of using a plurality of restriction orifice plates constructed in accordance with any of Claims 1 to 6, the method comprising:

placing at least a first restriction orifice plate according to any of Claims 1 to 6 and a second restriction orifice plate according to any of Claims 1 to 6 in series;

rotating at least the first restriction orifice plate so that the two or more openings of the first restriction orifice plate are out of phase with the two or more openings of the second restriction orifice plate; and

installing the series of restriction orifice plates between two portions of a conduit.

8. A method according to Claim 7, which further comprises rotating at least the first restriction orifice plate so that the two or more openings of the first restriction orifice plate are 90 degrees out of phase with the two or more openings of the second restriction orifice plate.

9. A restriction orifice plate comprising:

a plate configured to be positioned in a conduit through which a fluid passes, in which the plate includes two or more openings therethrough that are positioned on the plate to induce a pressure loss of the fluid passing therethrough;

each of the two or more openings include an inlet and an outlet;

in which the two or more openings are positioned on the plate to satisfy the flow-based relationship, $K\rho AV^N$ = Constant, so that N>0 as the fluid passes through the two or more openings, where,

K = constant;

ρ = fluid density;

A = area of the two or more openings;

V = fluid velocity;

N = velocity exponent; and

in which the two or more openings of the plate are configured to equally satisfy the relationship, $\Delta P = k\rho V^n/2G_c$, where,

ΔP = pressure loss across the plate;

n = velocity exponent;

k = velocity head loss;

ρ = fluid density;

V = fluid velocity; and

G_c = Newton's conversion constant.

10. A restriction orifice plate according to Claim 9, in which the plate includes a non-perforated central region about which the two or more openings are positioned.

11. A restriction orifice plate according to Claim 9 or 10, in which the values for n range between 1.8 to 2, inclusive of 1.8 and 2.

12. A restriction orifice plate according to Claim 9, 10 or 11, in which the inlet of each of the two or more openings has an edge selected from the group consisting of blunt, knife, tapered / beveled and contoured edges.

13. A restriction orifice plate according to any of Claims 9 to 12, in which the outlet of each of the two or more openings has an edge selected from the group consisting of blunt, knife, tapered / beveled and contoured edges.

14. A restriction orifice plate according to Claim 9, 10 or 11, in which the inlet of each of the two or more openings has a contoured edge and in which the outlet of each of the two or more openings has a contoured edge.

15. A method of using a plurality of restriction orifice plates constructed in accordance with any of Claims 9 to 14, the method comprising:

placing at least a first restriction orifice plate according to any of Claims 9 to 14 and a second restriction orifice plate according to any of Claims 9 to 14 in series;

rotating at least the first restriction orifice plate so that the two or more openings of the first restriction orifice plate are out of phase with the two or more openings of the second restriction orifice plate; and

installing the series of restriction orifice plates between two portions of a conduit.

16. A method according to Claim 15, which further comprises rotating at least the first restriction orifice plate so that the two or more openings of the first restriction orifice plate are 90 degrees out of phase with the two or more openings of the second restriction orifice plate.

17. A restriction orifice plate comprising:

a plate configured to be positioned in a conduit through which a fluid passes, in which the plate includes two or more openings therethrough that are positioned on the plate to induce a pressure loss of the fluid passing therethrough;

each of the two or more openings include an inlet and an outlet;

in which the two or more openings are positioned on the plate to satisfy the flow-based relationship, $K\rho AV^N$ = Constant, so that $N<0$ as the fluid passes through the two or more openings, where,

K = constant;

ρ = fluid density;

A = area of the two or more openings;

V = fluid velocity;

N = velocity exponent; and

in which the two or more openings of the plate are configured to equally satisfy the relationship, $\Delta P = k\rho V_n/2G_c$, where,

ΔP = pressure loss across the plate;

n = velocity exponent;

k = velocity head loss;

ρ = fluid density;

V = fluid velocity; and

G_c = Newton's conversion constant.

18. A restriction orifice plate according to Claim 17, in which the plate includes a non-perforated central region about which the two or more openings are positioned.

19. A restriction orifice plate according to Claim 17 or 18, in which the values for n range between 1.8 to 2, inclusive of 1.8 and 2.

20. A restriction orifice plate according to Claim 17, 18 or 19, in which the inlet of each of the two or more openings has an edge selected from the group consisting of blunt, knife, tapered / beveled and contoured edges.

21. A restriction orifice plate according to any of Claims 17 to 20, in which the outlet of each of the two or more openings has an edge selected from the group consisting of blunt, knife, tapered / beveled and contoured edges.

22. A restriction orifice plate according to Claim 17, 18 or 19, in which the inlet of each of the two or more openings has a contoured edge and in which the outlet of each of the two or more openings has a contoured edge.

23. A method of using a plurality of restriction orifice plates constructed in accordance with any of Claims 17 to 22, the method comprising:

placing at least a first restriction orifice plate according to any of Claims 17 to 22 and a second restriction orifice plate according to any of Claims 17 to 22 in series;

rotating at least the first restriction orifice plate so that the two or more openings of the first restriction orifice plate are out of phase with the two or more openings of the second restriction orifice plate; and

installing the series of restriction orifice plates between two portions of a conduit.

24. A method according to Claim 23, which further comprises rotating at least the first restriction orifice plate so that the two or more openings of the first restriction orifice plate are 90 degrees out of phase with the two or more openings of the second restriction orifice plate.