What is claimed is:

1. A hydrodynamic cavitation unit for a hydrodynamic cavitation device provided in fluid communication with an inlet conduit and an outlet conduit, the hydrodynamic cavitation unit comprising:

a body; and

at least one lumen through the body, the at least one lumen configured for fluid communication from the inlet conduit, through the body, and to the outlet conduit,

wherein a ratio of a total cross-sectional area of the at least one lumen to a cross-sectional area of the inlet conduit is about 1:1, ~~and~~

wherein a ratio of a cross-sectional area of the hydrodynamic cavitation unit to the cross-sectional area of the inlet conduit is about 4:1,

wherein the at least one lumen has a frustoconical shape, and

wherein the at least one lumen having the frustoconical shape is disposed at a pitch angle greater than about 2° and less than about 5°.

~~2. The hydrodynamic cavitation unit of claim 1, wherein the at least one lumen has a frustoconical shape.~~

~~3. The hydrodynamic cavitation unit of claim 2, wherein the at least one lumen having the frustoconical shape is disposed at a pitch angle greater than about 2° and less than about 5°.~~

~~4.~~ 2. The hydrodynamic cavitation unit of claim ~~3~~ 1, wherein the pitch angle is about 3°.

3. The hydrodynamic cavitation unit of claim 1, wherein the hydrodynamic cavitation unit configured with the 1:1 ratio and the 4:1 ratio generates hydrodynamic cavitation in response to the fluid communication at a rate of greater than about 10 gallons per minute and less than about 110 gallons per minute.

4. The hydrodynamic cavitation unit of claim 1,

wherein the hydrodynamic cavitation unit excludes a catalyst, and

wherein the hydrodynamic cavitation device excludes the catalyst.

5. The hydrodynamic cavitation unit of claim ~~2~~ 1,

wherein the at least one lumen includes an inlet opening,

wherein the at least one lumen includes an outlet opening,

wherein the inlet opening has an inlet area,

wherein the outlet opening has an outlet area, and

wherein a ratio of the outlet area to the inlet area is about 0.75.

6. The hydrodynamic cavitation unit of claim 5, wherein the 1:1 ratio of the total cross-sectional area of the at least one lumen to the cross-sectional area of the inlet conduit occurs at an intermediate point of the at least one lumen between the inlet opening and the outlet opening.

7. The hydrodynamic cavitation unit of claim 6,

wherein the intermediate point is located a first spaced distance apart from the inlet opening, and a second spaced distance apart from the outlet opening,

wherein a ratio of the first spaced distance to the second spaced distance is about 4:1.

8. The hydrodynamic cavitation unit of claim ~~2~~ 1, wherein the area within the at least one lumen linearly decreases from an inlet side of the hydrodynamic cavitation unit to an outlet side of the hydrodynamic cavitation unit.

~~9. The hydrodynamic cavitation unit of claim 2,~~

~~wherein the frustoconical shape has an inlet maximum cross-sectional dimension, an outlet maximum cross-sectional dimension, and a length in a direction perpendicular to the inlet maximum cross-sectional dimension and the outlet maximum cross-sectional dimension, and~~

~~wherein a ratio of the inlet maximum cross-sectional dimension to the outlet cross-sectional dimension to the length is about 212:160:1000, respectively.~~

~~10. The hydrodynamic cavitation unit of claim 1, wherein the at least one lumen has a Venturi shape.~~

~~11. The hydrodynamic cavitation unit of claim 10,~~

~~wherein the Venturi shape has an inlet opening, an inlet region, an outlet region, a throat region between the inlet region and the outlet region, and an outlet opening,~~

~~wherein the inlet region is disposed at a first pitch angle greater than about 8° and less than about 12°, and~~

~~wherein the outlet region is disposed at a second pitch angle greater than about 2° and less than about 5°.~~

~~12. The hydrodynamic cavitation unit of claim 11,~~

~~wherein the first pitch angle is about 10°, and~~

~~wherein the second pitch angle is about 3°.~~

~~13. The hydrodynamic cavitation unit of claim 10,~~

~~wherein the Venturi shape has an inlet opening, an inlet region, an outlet region, a throat region between the inlet region and the outlet region, and an outlet opening,~~

~~wherein the 1:1 ratio of the total cross-sectional area of the at least one lumen to the cross-sectional area of the inlet conduit occurs at a first intermediate point of the at least one lumen in the inlet region, and~~

~~wherein the 1:1 ratio of the total cross-sectional area of the at least one lumen to the cross-sectional area of the inlet conduit occurs at a second intermediate point of the at least one lumen in the outlet region.~~

~~14. The hydrodynamic cavitation unit of claim 13,~~

~~wherein the first intermediate point is located a first spaced distance apart from the inlet opening, and a second spaced distance apart from the throat region,~~

~~wherein a first ratio of the first spaced distance to the second spaced distance is between about 3:1 to about 4:1,~~

~~wherein the second intermediate point is located a third spaced distance apart from the outlet opening, and a fourth spaced distance apart from the throat region, and~~

~~wherein a second ratio of the third spaced distance to the fourth spaced distance is about 1:3.~~

~~15. The hydrodynamic cavitation unit of claim 9,~~

~~wherein the Venturi shape has an inlet region, an outlet region, and a throat region between the inlet region and the outlet region,~~

~~wherein a ratio of a first length of the inlet region to a second length of the throat region to a third length of the outlet region is about 300:300:350, respectively, and~~

~~wherein a ratio of a first cross-sectional area of the inlet region to a second cross-sectional area of the throat region to a third cross-sectional area of the outlet region is about 212:160:175, respectively.~~

~~16. The hydrodynamic cavitation unit of claim 1, wherein the hydrodynamic cavitation unit configured with the 1:1 ratio and the 4:1 ratio generates hydrodynamic cavitation in response to the fluid communication at a rate of greater than about 10 gallons per minute and less than about 110 gallons per minute.~~

~~17. The hydrodynamic cavitation unit of claim 1,~~

~~wherein the hydrodynamic cavitation unit excludes a catalyst, and~~

~~wherein the hydrodynamic cavitation device excludes the catalyst.~~

~~18. A hydrodynamic cavitation device provided in fluid communication with an inlet conduit and an outlet conduit, the hydrodynamic cavitation device comprising:~~

~~a hydrodynamic cavitation unit comprising:~~

~~a body; and~~

~~at least one lumen through the body, the at least one lumen configured for fluid communication from the inlet conduit, through the body, and to the outlet conduit,~~

~~wherein the hydrodynamic cavitation device excludes a catalyst.~~

~~19.~~ 9. ~~The~~ A hydrodynamic cavitation unit ~~of claim 18,~~ for a hydrodynamic cavitation device provided in fluid communication with an inlet conduit and an outlet conduit, the hydrodynamic cavitation unit comprising:

a body; and

at least one lumen through the body, the at least one lumen configured for fluid communication from the inlet conduit, through the body, and to the outlet conduit,

wherein a ratio of a total cross-sectional area of the at least one lumen to a cross-sectional area of the inlet conduit is about 1:1,

wherein a ratio of a cross-sectional area of the hydrodynamic cavitation unit to the cross-sectional area of the inlet conduit is about 4:1, ~~and~~

~~wherein the hydrodynamic cavitation unit configured with the 1:1 ratio and the 4:1 ratio generates hydrodynamic cavitation in response to the fluid communication at a rate of greater than about 10 gallons per minute and less than about 110 gallons per minute.~~

wherein the at least one lumen has a Venturi shape,

wherein the Venturi shape has an inlet opening, an inlet region, an outlet region, a throat region between the inlet region and the outlet region, and an outlet opening,

wherein the inlet region is disposed at a first pitch angle greater than about 8° and less than about 12°, and

wherein the outlet region is disposed at a second pitch angle greater than about 2° and less than about 5°.

~~20.~~ 10. A hydrodynamic cavitation unit for a hydrodynamic cavitation device provided in fluid communication with an inlet conduit and an outlet conduit, the hydrodynamic cavitation unit comprising:

a body; and

at least one lumen through the body, the at least one lumen configured for fluid communication from the inlet conduit, through the body, and to the outlet conduit,

wherein the at least one lumen has:

a frustoconical shape,

wherein the at least one lumen having the frustoconical shape is disposed at a pitch angle greater than about 2° and less than about 5°, or

a Venturi shape,

wherein the Venturi shape has an inlet opening, an inlet region, an outlet region, a throat region between the inlet region and the outlet region, and an outlet opening,

wherein the inlet region is disposed at a first pitch angle greater than about 8° and less than about 12°, and

wherein the outlet region is disposed at a second pitch angle greater than about 2° and less than about 5°.

~~21.~~ 11. A hydrodynamic cavitation unit for a hydrodynamic cavitation device provided in fluid communication with an inlet conduit and an outlet conduit, the hydrodynamic cavitation device including an expansion chamber located downstream of the inlet conduit and upstream of the at least one lumen, the hydrodynamic cavitation unit comprising:

a body; and

at least one lumen through the body, the at least one lumen configured for fluid communication from the inlet conduit, through the body, and to the outlet conduit~~; and ~~,

~~one or more of:~~

~~a vortex unit in a fluid passageway between the inlet conduit and the outlet conduit;~~

~~a cap in a fluid passageway between the inlet conduit and the outlet conduit; and~~

~~a second hydrodynamic cavitation unit in a fluid passageway between the inlet conduit and the outlet conduit.~~

wherein a first ratio of a first total cross-sectional area of the at least one lumen at a first intermediate point within the body to a cross-sectional area of the inlet conduit is about 1:1,

wherein a second ratio of a second total cross-sectional area of the at least one lumen at a second intermediate point within the body to the cross-sectional area of the inlet conduit is less than about 1:1,

wherein a third ratio of a third total cross-sectional area of the at least one lumen at a third intermediate point within the body to the cross-sectional area of the inlet conduit is greater than about 1:1, and

wherein a fourth ratio of a fourth total cross-sectional area of the at least one lumen at a fourth intermediate point within the body to the cross-sectional area of the inlet conduit is greater than about 1:1.

~~22. The hydrodynamic cavitation device of any one of claims 1-21, further comprising a vortex unit in a fluid passageway between the inlet conduit and the outlet conduit.~~

~~23. The hydrodynamic cavitation device of any one of claims 1-21, further comprising a cap in a fluid passageway between the inlet conduit and the outlet conduit.~~

~~24. The hydrodynamic cavitation device of any one of claims 1-21, further comprising a second hydrodynamic cavitation unit in a fluid passageway between the inlet conduit and the outlet conduit.~~

~~25. The hydrodynamic cavitation device of any one of claims 1-21, without a catalyst.~~

~~26. The hydrodynamic cavitation device of any one of claims 1-21, further comprising a vortex unit, a cap, and a second hydrodynamic cavitation unit in a fluid passageway between the inlet conduit and the outlet conduit, and without a catalyst.~~

~~27. The hydrodynamic cavitation device of any one of claims 1-21, wherein the hydrodynamic cavitation unit is formed by one or more of injection molding, extrusion, blow molding, rotational molding, thermoforming, expanded bead foam molding, extruded foam molding, 3D printing, and additive manufacturing.~~

12. The hydrodynamic cavitation unit of claim 11,

wherein the first intermediate point is located upstream of the second intermediate point.

13. The hydrodynamic cavitation unit of claim 11,

wherein the first intermediate point is located upstream of the second intermediate point, and

wherein the third intermediate point is located upstream of the first intermediate point.

14. The hydrodynamic cavitation unit of claim 11,

wherein the first intermediate point is located upstream of the second intermediate point,

wherein the third intermediate point is located upstream of the first intermediate point, and

wherein the fourth intermediate point is located downstream of the third intermediate point.

15. A hydrodynamic cavitation device provided in fluid communication with an inlet conduit and an outlet conduit, the hydrodynamic cavitation device comprising:

a hydrodynamic cavitation unit comprising:

a body;

a cap; and

at least one lumen through the body, the at least one lumen configured for fluid communication from the inlet conduit, through the body, and to the outlet conduit,

wherein the cap is located downstream of the inlet conduit and upstream of the at least one lumen.

16. The hydrodynamic cavitation device of claim 15, wherein the cap has a predominant plane substantially perpendicular to a predominant flow direction of fluid through the hydrodynamic cavitation device.

17. The hydrodynamic cavitation device of claim 15, comprising:

a vortex unit on an inlet side of the hydrodynamic cavitation device and/or on an outlet side of the hydrodynamic cavitation device,

wherein the vortex unit includes the cap.

18. A hydrodynamic cavitation device provided in fluid communication with an inlet conduit and an outlet conduit, the hydrodynamic cavitation device including an expansion chamber located downstream of the inlet conduit and upstream of the at least one lumen, the hydrodynamic cavitation device comprising:

a hydrodynamic cavitation unit comprising:

a cap;

a body; and

at least one lumen through the body, the at least one lumen configured for fluid communication from the inlet conduit, through the body, and to the outlet conduit,

wherein the at least one lumen includes a constriction configured to restrict fluid communication relative to a fluid communication in the inlet conduit, and

wherein the cap is located downstream of the inlet conduit and upstream of the at least one lumen.

19. The hydrodynamic cavitation device of claim 18, wherein the cap has a predominant plane substantially perpendicular to a predominant flow direction of fluid through the hydrodynamic cavitation device.

20. The hydrodynamic cavitation device of claim 18, comprising:

a vortex unit on an inlet side of the hydrodynamic cavitation device and/or on an outlet side of the hydrodynamic cavitation device,

wherein the vortex unit includes the cap.