CLAIMS

1. An integrated cyclone stabilizer assembly for a cyclone having a body and a conduit extending therefrom, the assembly comprising:

an upper annular ring to be disposed at an upper portion of the cyclone, the upper annular ring having a plurality of hinge members extending radially therein to support the upper portion of the cyclone therefrom;

a lower annular ring to be disposed at a lower portion of the cyclone, the lower annular ring having a plurality of hinge members extending radially therein to support the lower portion of the cyclone therefrom; and

a plurality of struts extending between the upper annular ring and the lower annular ring.

2. The assembly of claim 1, wherein the upper ring is disposed proximate an upper end of the conduit, and the lower ring is disposed proximate a lower end of the conduit.

3. The assembly of claim 1, wherein the upper ring has a cross dimension at least about 30% greater than a cross dimension of the lower ring.

4. The assembly of claim 1, wherein the plurality of hinge members comprise one or more flat plate hinges.

5. The assembly of claim 1, wherein three hinge members extend radially inward from the upper ring.

6. The assembly of claim 1, wherein three hinge members extend radially inward from the lower ring.

7. The assembly of claim 1, wherein the hinge members of the upper ring are aligned with corresponding hinge members of the lower ring.

8. The assembly of claim 7, wherein each strut extends from and is joined to one of the plurality of hinge members of the upper ring and to one of the plurality of hinge members of the lower ring.

9. The assembly of claim 8, wherein the upper ring includes three hinge members and the lower ring includes three hinge members, and further wherein three struts extend between the upper ring and the lower ring.

10. The assembly of claim 1, further comprising at least one connecting member to couple at least one of the upper and lower rings to a corresponding annular ring of a similarly-configured stabilizer assembly for another cyclone.

11. The assembly of claim 10, wherein the upper ring includes two connecting members extending tangentially to an upper ring of the similarly-configured stabilizer assembly, and the lower ring includes two connecting members extending tangentially to a lower ring of the similarly-configured stabilizer assembly.

12. A cyclone assembly comprising:

a primary cyclone;

a primary stabilizer assembly comprising:

an upper annular ring disposed at an upper portion of the primary cyclone, the upper annular ring having a plurality of hinge members extending radially therein to support the upper portion of the primary cyclone therefrom;

a lower annular ring disposed at a lower portion of the primary cyclone, the lower annular ring having a plurality of hinge members extending radially therein to support the lower portion of the primary cyclone therefrom; and

a plurality of struts extending between the upper annular ring and the lower annular ring;

a secondary cyclone;

a secondary stabilizer assembly comprising:

an upper annular ring disposed at an upper portion of the secondary cyclone, the upper annular ring having a plurality of hinge members extending radially therein to support the upper portion of the secondary cyclone therefrom;

a lower annular ring disposed at a lower portion of the secondary cyclone, the lower annular ring having a plurality of hinge members extending radially therein to support the lower portion of the secondary cyclone therefrom; and

a plurality of struts extending between the upper annular ring and the lower annular ring; and

at least one connecting member coupling at least one of the upper and lower rings of the primary stabilizer assembly to a corresponding annular ring of the secondary stabilizer assembly.

13. The cyclone assembly of claim 12, wherein the secondary cyclone has an outlet tube extending therefrom, the outlet tube having a cross dimension and length, the outlet tube configured to be secured to a pressure vessel closure head to support the secondary cyclone therefrom; and

wherein the primary cyclone is operatively coupled with the secondary cyclone, the primary cyclone having a tubular support member extending therefrom, the tubular support member aligned substantially parallel with and having a length similar to the outlet tube of the secondary cyclone and configured to be joined to the pressure vessel closure head to support the primary cyclone therefrom.

CLAIMS:

1. An integrated cyclone stabilizer assembly for a cyclone having a body and a conduit extending therefrom, the assembly comprising:

an upper annular ring to be disposed at an upper portion of the cyclone, the upper annular ring having a plurality of hinge members extending radially therein to support the upper portion of the cyclone therefrom;

a lower annular ring to be disposed at a lower portion of the cyclone, the lower annular ring having a plurality of hinge members extending radially therein to support the lower portion of the cyclone therefrom; and

a plurality of struts extending between the upper annular ring and the lower annular ring;

wherein the integrated cyclone stabilizer assembly and the portion of the cyclone about which the integrated cyclone stabilizer assembly is disposed are disposed within a pressure vessel; wherein the integrated cyclone stabilizer assembly is free from attachments to the pressure vessel.

2. The assembly of claim 1, wherein the upper ring is disposed proximate an upper end of the conduit, and the lower ring is disposed proximate a lower end of the conduit.

3. The assembly of claim 1, wherein the upper ring has a cross dimension at least about 30% greater than a cross dimension of the lower ring.

4. The assembly of claim 1, wherein the plurality of hinge members on the upper annular ring or lower annular ring comprise one or more flat plate hinges.

5. The assembly of claim 1, wherein three hinge members extend radially inward from the upper ring.

6. The assembly of claim 1, wherein three hinge members extend radially inward from the lower ring.

7. The assembly of claim 1, wherein the hinge members of the upper ring are aligned with corresponding hinge members of the lower ring.

8. The assembly of claim 7, wherein each strut extends from and is joined to one of the plurality of hinge members of the upper ring and to one of the plurality of hinge members of the lower ring.

9. The assembly of claim 8, wherein the upper ring includes three hinge members and the lower ring includes three hinge members, and further wherein three struts extend between the upper ring and the lower ring.

10. The assembly of claim 1, further comprising at least one connecting member to couple at least one of the upper and lower rings to a corresponding annular ring of a similarly-configured stabilizer assembly for another cyclone within the same pressure vessel.

11. The assembly of claim 10, wherein the upper ring includes two connecting members extending tangentially to an upper ring of the similarly-configured stabilizer assembly, and the lower ring includes two connecting members extending tangentially to a lower ring of the similarly-configured stabilizer assembly.

12. An integrated cyclone stabilizer assembly for a single cyclone pair, consisting of a primary cyclone and a secondary cyclone, each having a body and a conduit extending therefrom, the assembly comprising:

a first upper annular ring disposed at an upper portion of the primary cyclone, the first upper annular ring having a plurality of hinge members extending radially therein to support the upper portion of the primary cyclone therefrom;

a first lower annular ring disposed at a lower portion of the primary cyclone, the first lower annular ring having a plurality of hinge members extending radially therein to support the lower portion of the primary cyclone therefrom; and

a plurality of struts extending between the first upper annular ring and the first lower annular ring;

a second upper annular ring disposed at an upper portion of the secondary cyclone, the second upper annular ring having a plurality of hinge members extending radially therein to support the upper portion of the secondary cyclone therefrom;

a second lower annular ring disposed at a lower portion of the secondary cyclone, the second lower annular ring having a plurality of hinge members extending radially therein to support the lower portion of the secondary cyclone therefrom; and

a plurality of struts extending between the second upper annular ring and the second lower annular ring; and

at least one connector coupling either the first upper annular ring to the second upper annular ring or coupling the first lower annular ring to the second lower annular ring;

wherein the integrated cyclone stabilizer assembly and the portion of the single cyclone pair about which the integrated cyclone stabilizer assembly is disposed are disposed within a pressure vessel; wherein the integrated cyclone stabilizer assembly is free from attachments to the pressure vessel or an adjacent cyclone(s) or cyclone pair(s).