CG INLET SCROLL

Buell Cyclones are designed to harness the natural flows which occur within a cyclone so that these flows enhance cyclone performance. Dust-laden gases enter at the inlet and are introduced to the cyclone proper through a gradual 180º volute turn.

Gases making a turn in a rectangular elbow or the rectangular inlet scroll of a conventional cyclone, develop currents which are perpendicular to the direction of the gas. These currents result from the fact that in different areas of the elbow, gases must travel different distances in order to complete the turn. Gases on the inside wall of the elbow have a considerably shorter distance to travel than gases on the outside wall of the elbow. The perpendicular currents are developed to balance the gas flows and the kinetic energy in the gas flow.

Uncontrolled Perpendicular Currents in Cyclones

When not controlled, the perpendicular currents retard the flow of particles to the cyclone wall and carry some of the finer particles up to the top of the cyclone. A ring of particles builds up around the top of the cyclone to a point where it can no longer be sustained by the gas flow. It then falls through the cyclone in a mass. As this mass falls through the cyclone, some of the particles enter the ascending vortex flow and escape from the cyclone. One observing the cyclone outlet will see a puff. The ring of particles at the top of the cyclones can also cause erosion in this area, shortening cyclone life.

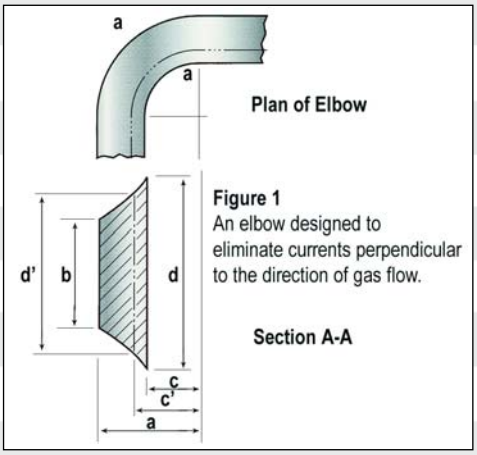

Figure 1
An elbow designed to eliminate currents perpendicular to the direction of gas flow.

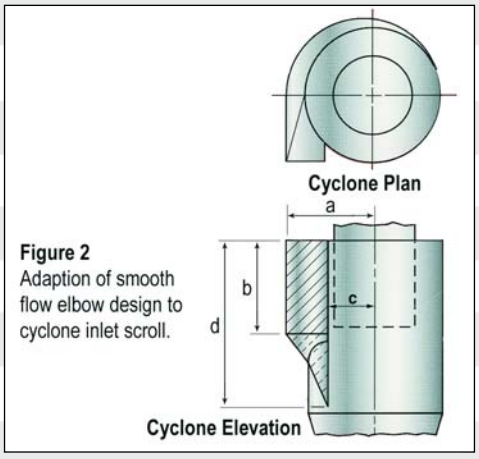

Figure 2
Adaption of smooth flow elbow design to cyclone inlet scroll.

Elimination of Perpendicular Currents in an Elbow

Considerable research was done in order to find a means of eliminating the perpendicular currents in an elbow. It was found that, if the elbow was designed so that the velocity of the gas in any area times the distance traveled equaled the product of velocity times distance in any other area, perpendicular currents were eliminated. The radius to any area in the elbow is directly proportional to the distance traveled in that area. The velocity in any area is directly proportional to the height of the elbow in that area. Therefore, an elbow designed so that the product remains constant for any radius “d” to a point in the elbow times the height of the elbow at that point “c” will not have perpendicular currents. Figure 1 shows an elbow designed to eliminate perpendicular currents. For this elbow, the product (a) (b) = (c) (d) = (c’) (d’).

Elimination of Perpendicular Currents in a Cyclone Inlet Scroll*

The principle design of an elbow without perpendicular currents has been applied to the Buell Cyclone Inlet Scroll. In order to eliminate the need for two curved surfaces (top and bottom) on the inlet scroll, the correction has been made to the bottom shelf of the scroll. This application is shown in the plan and elevation views of the cyclone in Figure 2. Because it is extremely difficult to form a double curve in a steel plate, a conical piece is used for the floor of the scroll rather than a concave conical piece. As shown in Figure 2, there is a very small deviation from the basic principle. Laboratory and field tests on cyclones with this type of inlet have shown efficiencies equal to or greater than the efficiencies of cyclones with “shave-offs” and appreciable higher efficiencies than conventional cyclones without “shave-offs.”

*patented

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