

ABSTRACT: Background

The cleaning cycle is the most important part of the dust collector because it controls efficiency and media life. In order to clean a row of bags in a reverse pulse jet baghouse first the flow of filtered air must be momentarily stopped and then back flushed or “induce” air to knock the dust cake off the outside of the filter media. A venturi at the top of the bag/cage is used to accomplish such a task. The typical venturi is six inches long with a 1-3/4 “ diameter hole. While the reverse jet with venturi does provide some advantages when compared to other methods such as reverse air or mechanical shaker cleaning systems, the venturi creates undesired effects during the cleaning cycle. Not only is a vacuum created due to the close proximity of the blowpipe to the venturi, but also an area of significant flow is created directly after the venturi. This contrast in positive and negative flow is detrimental to the media and as a result, there is a large section at the top of the bag that is unusable for repetitive cleaning of the dust.

Results

During the cleaning cycle, the venturi creates four distinct zones. The first zone from 3 inches to 7 inches is under negative flow, or a vacuum, pulling in the necessary air to compensate for the small area available to induce air before the flow enters the venturi. The second zone from 8 inches to 12 inches, just below the end of the venturi, is under very high positive flow. A significant amount of air is being forced out of the bag creating a “puffing” effect. The air is propelled at such a force that it imbeds into the surrounding media. The third zone from 13 inches to 17 inches is also under a negative flow and more air is being pulled in to compensate for the amount of air forced out in the second zone. In the fourth zone from 18 inches to 25 inches, the system finally reaches a stabilized pressure flow. In summary, the first eighteen (18) inches of the bag cannot be used for repetitive cleaning in a generic venturi-based cleaning system. In comparison, the new SDC nozzle allows for consistent positive flow cleaning throughout the entire bag. This phenomenon can be seen in Figure 1 below. The red zone is when the venturi cleaning flow is negative and the blue zone is when the venturi cleaning flow is positive. As a comparison, the green zone is the SDC nozzle cleaning action, which is uniform throughout.

It is interesting to note that the excessive airflow in Zone 2 is not a good thing. In Figure 1, the yellow dotted line (at 2060 CFM) is the maximum amount of airflow that surrounding media can absorb (based on a permeability of 40 CFM/ft² and 3” spacing between bags). The high airflow in Zone 2 is actually overwhelming the neighboring bags that cause a “blinding” effect, impeding cleaning and damaging filter media. This phenomenon is the subject of “Ineffective Cleaning in Generic Baghouses”, a separate technical paper also available from SDC.

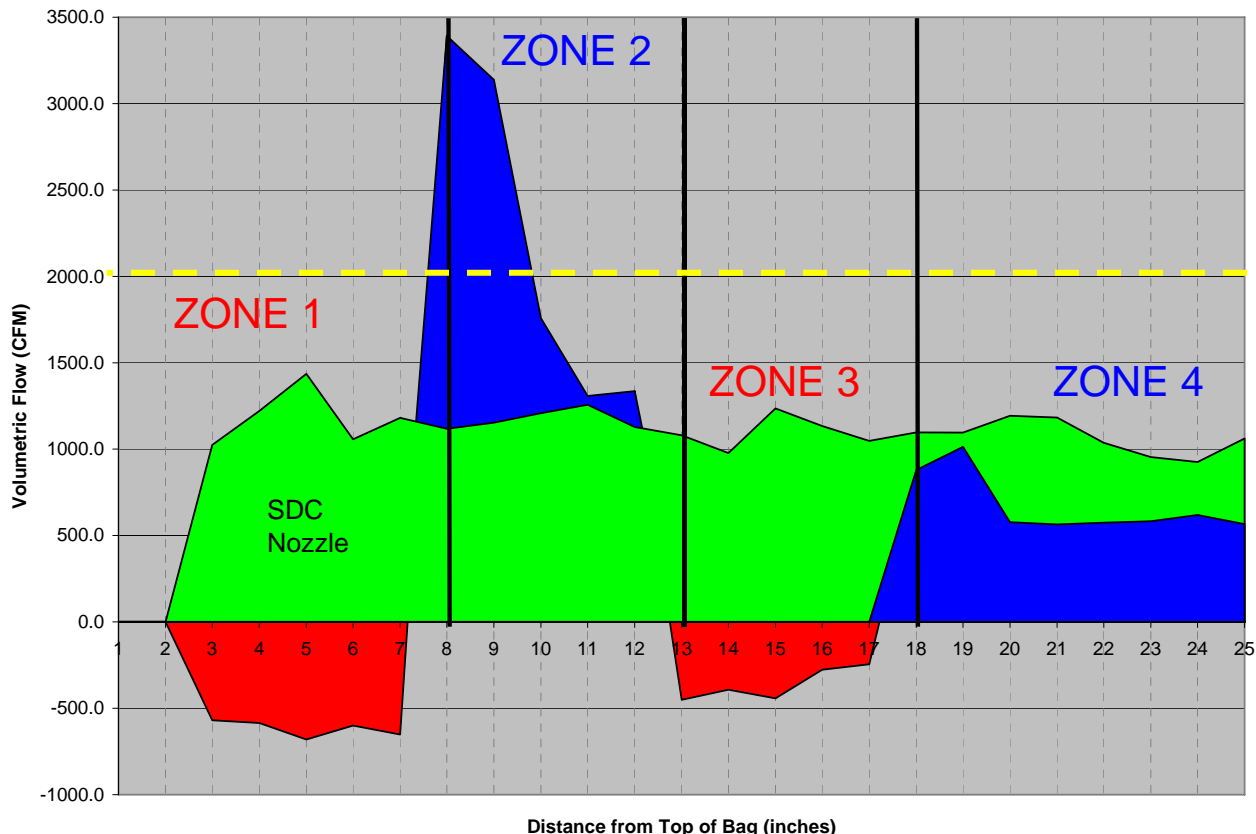


Figure 1. Volumetric Flow Comparison of SDC Nozzle and Venturi

Benefits

The disadvantages of the venturi-based cleaning system far outweigh its advantages. Over time, as the dust affects the pores of the media and clogs them, the amount of air able to aspirate will decrease causing the cleaning systems performance to decrease. As can be seen in Figure 2, with this system, using a venturi, the top 18 inches of the bag cannot be used for repetitive cleaning. Over an eight-foot long bag, for example, that amounts to almost 20% of the media. This is the reason why the air to cloth ratios for this type of cleaning system has to be reduced.

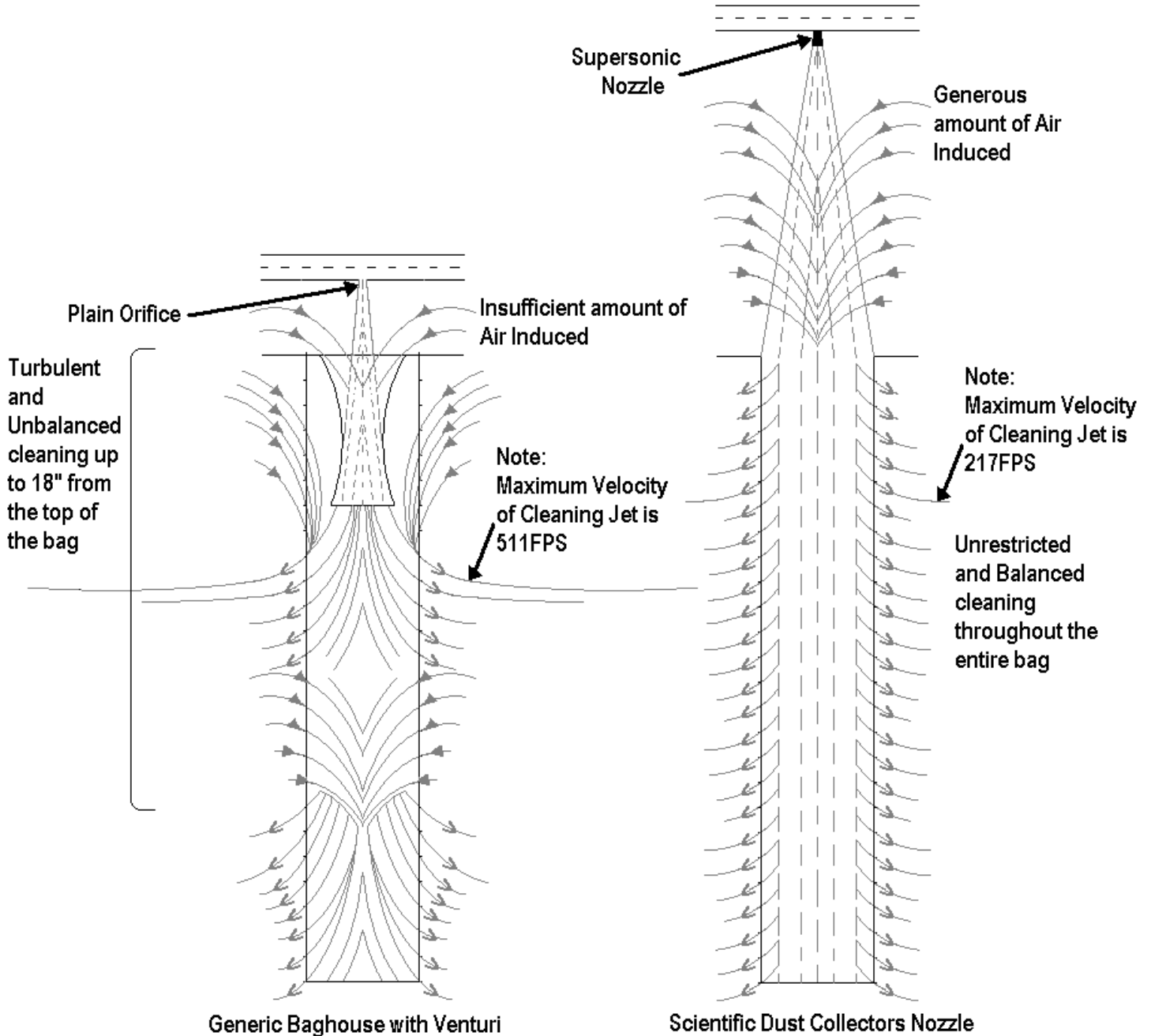


Figure 2. Cleaning system comparison of Generic Baghouse with Venturi to SDC Nozzle.

The advantages of a reverse-pulse jet cleaning system without a venturi offers the best solution in dust collection. Scientific Dust Collectors' patented converging-diverging nozzle based cleaning system, which eliminates the venturi, is able to induce enough air to effectively and consistently clean the entire bag. This allows SDC to operate with fewer filters; less valves and uses less compressed air to clean the entire collector. SDC guarantees filter life and performance.