"Discover the Difference"

In virtually every application, ***Scientific Dust Collectors are sized to operate at air-to-cloth ratios significantly higher than those required by less sophisticated dust collectors***. In some cases, our air-to-cloth ratio is ***as much as twice or even more*** than that of generic collectors using venture-based cleaning systems. This means Scientific Dust Collectors need only half, or less, of the filtering fabric area for a given air volume. Obviously, this difference in air-to-cloth ratios is dependent on the type of dust collected and the specifics of the dust collection application.

At first glance it appears as though Scientific Dust Collectors is grossly undersizing the equipment. Nothing could be further than the truth. In fact, ***you are at greater risk of having problems with your dust collector if you choose one that has to increase the filter area to compensate for the poor performance of the cleaning system***.

Benefits of Superior Performance

- **Very reliable dust collection using a more compact collector that saves space.**
- **Wide selection of fabric types for any dust application.**
- **Fewer bags, valves and cages to maintain.**
- **Less wear and tear on the filtering media.**
- **Lower system pressure drops.**
- **Ability to handle high dust loads without the need for a cyclone precleaner.**
- **Greater ability to recover should the bags become blinded due to dust surges, moisture, loss of compressed air or other unexpected interruptions that occur in real life.**

By using our ***superior cleaning technology***, Scientific Dust Collectors offers ***price competitive*** dust collectors ***without having to resort to cost cutting*** elimination of valued constructional features, quality and the attention to detail we believe you deserve.

Benefits of Quality Construction

- **Wide variety of dust collector types to choose from; full collectors, top bag removal, bottom bag removal, bin vents, inserts and special designs.**
- **Thicker tubesheets to avoid warping which can cause leakage.**
- **Standard primer paint inside and out, enamel paint on exterior to avoid weathering.**
- **Standard flanged inlets and outlets for easy duct connections.**
- **Rain hoods over access door to prevent moisture problems.**
- **All welded construction for easier installation and a sturdier structure.**
- **Platforms and ladders designed per OSHA safety standards.**
- **Large, leak tested, compressed air headers to reduce load on air compressor.**

Company Background

Scientific Dust Collectors is an autonomous division of Venturedyne, Ltd., a large diversified industrial manufacturing corporation with divisions involved with ***dust collection, indoor air quality, environmental test chambers and sub-micron particle counting for clean rooms***. All dust collector design, manufacturing, applications and sales support are done in one location providing close control over key aspects of our business.

Scientific Dust Collectors began business in 1981 when our first patented improvement for cleaning a filtering media was issued. Subsequent patents were issued in 1986, 1987 and 1988 that relate to further improvements in dust collector cleaning technologies.

In 1995 all operations of Scientific Dust Collectors were relocated to our current facility in Alsip, IL. The reasoning behind the move was to allow Scientific Dust Collectors more space to grow and reach its full potential. A major investment was made in new manufacturing and engineering design capabilities.

Benefits of Working With a Sound Company

- **All engineering and manufacturing is done at one location ensuring consistency, careful monitoring and precise quality control.**
- **Common service parts are stocked on site for accurate inventory and immediate shipment.**
- **Computer aided design and drafting means exacting documentation and the ability to make changes quickly with little impact.**
- **Readily available application assistance and responsive customer service.**
- **Significant investment in manufacturing equipment to ensure quality & accuracy.**
- **Knowledgeable, experienced and stable personnel guarantees future business continuity.**

Summary

Scientific Dust Collectors' approach to dust collection can be summarized by the following:

- **To provide very reliable dust collection using more compact dust collectors.**
- **To maintain our competitiveness through the innovation in our superior cleaning system and proper dust collection techniques.**
- **To add the quality and value back into our dust collectors that our competition takes out in order to save costs.**
- **To allow our customers the flexibility to tailor our dust collectors to their needs.**
- **To provide responsive customer service.**

The Proof is in the Performance

The performance superiority of Scientific Dust Collectors is not just an idle claim. It is fact based on ***sound theory, solid engineering practices and extensive field experience***.

The sections which follow lay out the theories that are the basis for Scientific Dust Collectors' superior performance. Comparisons are made between Generic Dust Collectors and Scientific Dust Collectors to highlight the ***important differences and the superiority of Scientific Dust Collectors***.

Characteristics of Air Jet Pulses

- ***Maximum possible*** air jet velocity at the discharge of a plain orifice, even under ideal conditions, is fixed at the ***speed of sound***.
- Secondary air outside the air jet will be induced into the jet, expanding the jet volume and slowing the jet down. ***A higher velocity jet will induce a greater volume of air***.
- An air jet discharged into free air that allows free induction of secondary air, will expand at an angle of ≈ 15° ***regardless of its velocity***.
- Expansion of the ***air jet will be constrained if the induced air can be limited*** from entering the jet. The air jet velocity will be maintained for a longer distance when expansion is constrained.
- The velocity of the cleaning air jet going into the bag must be ***great enough to overcome the velocity of the filtered air*** coming out of the bag.

Generic Pulse Jet Cleaning

If the air jet is allowed to expand freely as it enters the throat of the filter bags, the velocity of the air jet will decrease to the point where it is ***not strong enough to overcome the filtered air upward velocity*** and only the top few feet of the bags will be cleaned unless air jet expansion is constrained.

By stopping the induction of secondary air, and therefore limiting the expansion of the air jet, the ***jet velocity stays high*** allowing the air jet to reach the bottom of the bag with a sufficient velocity.

Generic pulse jet cleaning systems use a ***so called*** "venturi" to stop the induction of secondary air. ***Their venturi does not act to induce more cleaning air***, in fact, the ***venturi limits the induction of secondary air***. That is its purpose.

In a typical generic collector the diameter of the venturi throat is ≈ 1-3/4". ***The filtered air velocity through the venturi, which must be overcome by the cleaning air jet, is high due to this small venturi area***.

The Scientific Dust Collector Difference

Scientific Dust Collectors use a ***patented high velocity converging/diverging nozzle***, instead of the plain orifice used by generics, to generate our cleaning air jet. The nozzle geometry produces ***air jet velocities much greater than is possible with a plain orifice. A much greater volume of secondary cleaning air is induced*** by this increased air jet velocity.

As with the generic system, Scientific Dust Collectors also stops the induction of secondary air to limit the expansion of the air jet. However, instead of using a ***flow restricting venturi***, we use the ***whole open area of the bag mouth*** to limit the secondary air induction. The larger area of the bag opening reduces the filtered air velocity coming up and out of the bag. Less cleaning energy is wasted overcoming a high filtered air velocity.

Comparison of Generic vs. Scientific Dust Collectors Cleaning Systems

The comparison below assumes the only difference between dust collectors is the method of pulse jet cleaning, venturi vs. nozzle, and the air-to-cloth ratio used. ***Scientific Dust Collectors is operating at twice the air-to-cloth of the generic system*** which is quite common in actual field practice.

	Generic System	**Scientific Dust Collectors**
Bag Length	8'	8'
Bag Diameter	4-1/2"	4-1/2"
Bag Fabric Area	9.46 ft²	9.46 ft²
Air-To-Cloth Ratio	5:1	10:1
Filtered Air Volume per Bag	(5)(9.46) = 47.3 CFM	(10)(9.46) = 94.6 CFM
Bag/Venturi Throat Diameter	1-3/4" at venturi	4-1/2" at bag opening
Bag/Venturi Throat Area	$\frac{\pi(1\text{-}3/4)^2}{(4)(144)} = 0.0167$ ft²	$\frac{\pi(4\text{-}1/2)^2}{(4)(144)} = 0.1104$ ft²
Filtered Air Velocity at Bag/Venturi Throat Opening	47.3 ÷ 0.0167 = 2,832 fpm	94.6 ÷ 0.1104 = 857 fpm
Cleaning Air Jet Velocity at Bag/Venturi Throat Opening	Higher Velocity Lower Volume	Lower Velocity Higher Volume

As the above calculations show, in the generic system the cleaning air jet must overcome 2,832 fpm, a ***much higher filtered air velocity***, even though the air volume per bag is only half that of the volume run through the Scientific Dust Collector bag. The energy required to overcome the high filtered air velocity in the generic system is not available to clean the built up dust cake off the fabric bag. Additionally, there are other ***problems associated with the generic system that increase bag wear and cause an uneven dust cake to build up, thus reducing the efficiency of the generic collector and increasing the pressure drop of the system***.

Generic Cleaning System

- The ***high filtered air velocity*** through the venturi must be overcome by the cleaning air jet, robbing it of energy to clean the bag.

- A ***lower volume of secondary air*** is induced by the slower cleaning air jet. There is ***less energy available to clean the bag***.

- The ***high velocity*** of the cleaning air at the discharge of the venturi creates a greater negative pressure at the top of the fabric bag. Dust fines are more apt to embed into the fabric blinding the bag in this area ***reducing the effective filter area*** of the bag.

- Higher negative pressure at the top of the bag causes ***premature bag wear and dust migration thru the bag*** during each cleaning cycle as fine dust is sucked into the bag.

- As the air jet expands inside the bag it can ***impinge upon the filtering media causing "dust cake blowout"***. Once dust cake blowout occurs, the cleaning pressure in the bag is relieved prematurely, thus ***reducing the cleaning effectiveness***.

The Scientific Dust Collector Difference

- Much ***greater amount of secondary air is induced*** by the higher velocity air jet. ***More energy is available for cleaning***.

- Lower throat velocity at the inlet of the bag ***does not add to the negative pressure on the outside of the bag*** that causes dust to then migrate and blind the top section of the bag.

- ***More even bag inflation*** pressure from top to bottom of the bag causes ***less wear and tear*** on the bags.

- ***Less chance for dust cake blowout*** to occur since the cleaning air jet is already expanded to the full diameter of the bag.

- Dust cake is more even and it is less densely packed providing ***higher filtering efficiencies at lower pressure drops***.

- ***Scientific Dust Collectors makes better use of the available filtering media***.

Downward Air Pattern and Low Can Velocities Improve Dust Collection

Dust naturally wants to fall down out of an air stream due to gravity. That is, ***unless the air stream is directed upward at a high enough velocity*** to re-entrain the dust particles.

Scientific Dust Collector housings, with high side inlets, are designed so as to promote ***downward air movement*** and to ***reduce the "can" velocity***. Below is an example of two dust collectors, a generic collector and a Scientific Dust Collector, showing the effects of a high side inlet. Though the Scientific Dust Collector uses only half the cloth area, our ***enclosures are very liberally sized***, yielding a slightly smaller footprint than that of the generic.

Generic Dust Collector @ 5:1 A/C

- 6,800 CFM @ 5:1 air-to-cloth
- 144 bags, 8' long, 4-1/2" dia.
- 1,362 ft² total fabric area
- Bag enclosure: 80" W x 80" D x 102" H
- Projected Interstitial Area:
  $$\frac{(80" \times 80")}{144} - \frac{(144)\pi(4.5)^2}{(144)(4)} = 28.5 \text{ ft}^2$$
- Can Velocity = 6,800 cfm ÷ 28.5 ft² = 239 fpm

Scientific Dust Collectors @ 10:1 A/C

- 6,800 CFM @ 10:1 air-to-cloth
- 72 bags, 8' long, 4-1/2" dia.
- 681 ft² total fabric area
- Bag enclosure: 65" W x 92" D x 102" H
- Projected Interstitial Area:
  $$\frac{(65" \times 92")}{144} - \frac{(72)\pi(4.5)^2}{(144)(4)} = 33.6 \text{ ft}^2$$
- Can Velocity = 6,800 cfm ÷ 33.6 ft² = 202 fpm

Scientific Dust Collectors' baffled high side inlet, an expensive option for others, allows dust laden air to flow ***down and across*** the filter bags so dust is directed down into the hopper. Scientific Dust Collector bags are spaced on 7-1/2" centers leaving a ***generous 3" spacing between bags***. Generic collectors often have only a little more than 2" spacing between bags. ***Wide bag spacing helps to keep material from bridging between bags or hopping from row to row*** as each successive row of bags is pulse cleaned.

The Scientific Dust Collectors Difference

Now you know the ***Scientific Dust Collector difference***. Not all dust collectors are created equal! Please do not group us with the many generic dust collectors on the market today that require more cloth area to overcome their poorer performance. ***Why settle for less when a more sophisticated alternative is available to you***.