



## **Attention: Specifying, Procurement & Purchasing Departments**

**Dust Solutions Incorporated** (D.S.I.) manufactures Dust Suppression Systems for the Power Generation, Mining, Mineral Processing, Aggregate, Pulp & Paper, Wood Products, Hazardous Waste, Marine and Bulk Handling industries.

We offer the following types of dust suppression-dust control systems:

### **1. Dry Fog Agglomerative Dust Suppression Systems**

Our technology uses a very special type air-atomizing nozzle that produces a very dry fog (water droplets 10 microns or smaller) to agglomerate and remove airborne dust particles (PM-10) from various material handling and processing operations. It is our primary product and our specialty. Engineering Specifications often refer to this type of technology using the following terms: agglomerative dust suppression, ads (in caps), dry fog system, sonic dry fog system, ultra-sonic fog, air atomizing water spray system.

D.S.I. dry fog systems have proven to significantly reduce fugitive dust from a variety of material handling points. These include truck dumps, rail dumps; reclaim tunnels, crushers, screens, stack outs, ship loaders, and truck loading silos and conveyor transfer points. These systems utilize compressed air and plain water to produce a very dry fog (1-10 micron droplet size). These ultra-fine water droplets attach (agglomerate) to like size dust particles, particulate matter 10 microns or smaller (PM-10). The slightly wetted dust particles are then heavy enough to be removed from the air by their added weight and fall back into the process. It is important to note, we only wet the dust, not the material, resulting in low water consumption and no significant wetting of the product (typically less than 0.05 % by weight). This is the driest form of dust suppression available.

There are many advantages to our system, including, ease of installation, simplified maintenance, and flexible system configuration. The overall capital investment, operating cost and system performance is superior to ventilation, conventional water spray, and chemical injection type systems. These advantages are due in part to the fact that we use easy to install, pre-assembled components, housed in protective enclosures. Individual nozzle mounts are used in most applications for optimum nozzle placement. We supply all components for complete systems including air compressors, air receiver stations, pumps, filters, pressure regulating modules, nozzles, and supply lines.

### **2. Wind Fence and Wind Screen Systems.**

Wind Fence Systems are often used in conjunction with fogging as a way to help control and contain dust around open dump points. They are also used as a stand-alone system to

reduce wind velocities around stockpiles and stack out operations. Wind reductions of 75% or more can be realized by the use of this unique knitted polyester material and its use can offer a significant savings over construction of storage buildings. We supply the windscreen fabric, standoff brackets, attachment hardware and basic fence design.

### **3. Hydraulic Water Spray Dust Suppression Systems**

Sometimes it is desirable to wet the process material by direct application of water onto the process material. These type of systems are used at locations such as conveyor stack outs to storage piles, and in processes where wetting the process material is not a problem. Some systems are equipped with modulating water regulators that are programmed to maintain the proper ratio of material process flow to water. We supply all of the necessary components including filters, pressure pumps, distribution modules, pressure regulation modules; electrical control modules supply lines, nozzle manifolds and nozzles.

### **Sales Area**

We offer our products and services worldwide. D.S.I. maintains two offices in the United States: Bluffton, South Carolina and Vancouver, Washington, U.S.A. (Sales & Service)

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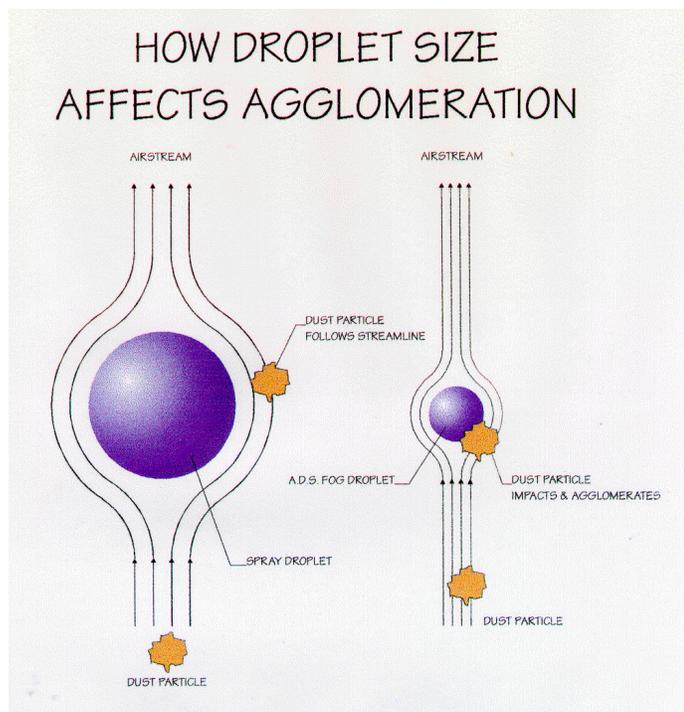
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## INTRODUCTION TO DRY FOG AGGLOMERATIVE DUST SUPPRESSION

### PRINCIPLE OF OPERATION

The DSI dry fogging system, agglomerates (attaches) the airborne dust particles to micron sized water droplets so that the particles become heavy enough to be returned to the product stream by the force of gravity. Unlike water spray systems, dry fogging uses very little water and does not wet the process material, only the airborne dust. No expensive surfactant or binding type chemicals is required. Dust control efficiencies can be as good as a dust collection system, but with lower capital, installation, and operating cost.

The reason the DSI dry fog system works so efficiently is due to our ability to atomize water into micron-sized droplets of similar size to the dust particles that are of concern. The effectiveness of like size droplets is easily understood from the illustration below.



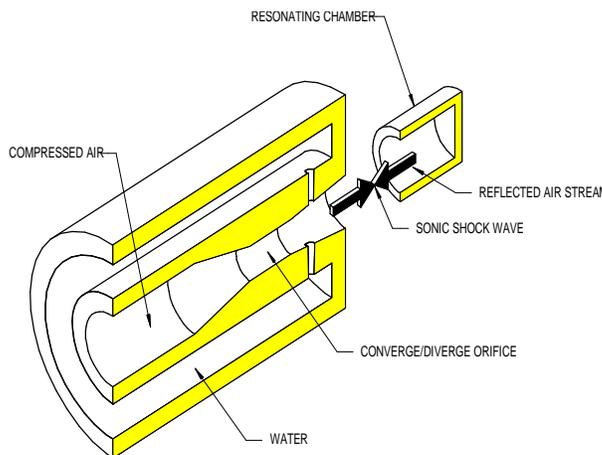
*“Consider a water droplet about to impinge on a dust particle, or what is aerodynamically equivalent, a dust particle about to impinge on a water droplet, as shown in the drawing. If the droplet diameter is much greater than the dust particle, the dust particle simply follows the air streamlines around the droplet, and little or no contact occurs. In fact, it is difficult to impact micron-size particles on anything, which is why inertial separators do not work well at these sizes. If, on the other hand, the water droplet is of a size that is comparable to that of the dust particle, contact occurs as the dust particle tries to follow the streamlines. Thus the probability of impaction increases as the size of the water spray droplets decreases.”* COAL AGE Magazine, April 1976

To achieve agglomeration at the dust source point, two conditions need to exist; 1.) Enough water droplets of the same size as the dust particles have to be generated and 2.) Both dust particles and water droplets have to be contained in the same area so that agglomeration can occur. The following two sections will explain how the DSI system achieves these two conditions.

### FOG NOZZLES

The design of the DSI system is based on a unique nozzle that can produce a very dense fog of 1-10 micron size water droplets that literally blanket the dust source and keep the dust particles from becoming airborne. It is important to note that the DSI dry fogging system wets the dust, not the material!

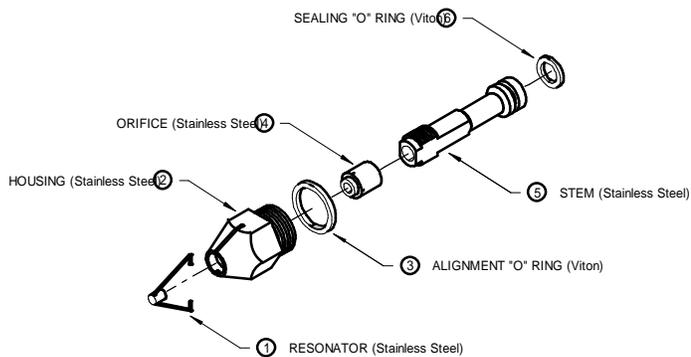
The DSI nozzle is an air driven device for fogging liquids by passing them through a field of high frequency sound waves. This is accomplished by compressing air upstream of a specially designed converge section of the nozzle. The result is an air stream that will accelerate past the speed of sound in the diverge section. When it passes the speed of sound, a primary shock wave is generated at the mouth of the nozzle. To enhance the fogging capability, a resonating chamber in the path of the air stream reflects the air stream back at itself to amplify the primary shock wave. Once the shock wave is generated, water is delivered through annular orifices where it is sheared into relatively small droplets. **OVER >>>**



These small droplets are then carried by the primary air stream into the shock wave and exploded into thousands of micron size fog droplets. The air then escapes around the resonating chamber and carries the droplets downstream in a soft, low velocity fog pattern. The nozzle has no moving parts and is constructed of 100% stainless steel to provide years of trouble free service. Dissolved minerals pass through the nozzle without clogging and any undissolved solids are easily filtered out by our system. The following diagram and table give the operating parameters of our DSN series of nozzles.

## FOG CONTAINMENT

As explained in the “*PRINCIPLE OF OPERATION*” section, both the dust particles and the fog droplets have to be contained in the



## NOZZLE SPECIFICATIONS

NOTE: ALL NOZZLES ARE THE SAME PHYSICAL SIZE & FIT INTO THE SAME ADAPTOR.

NOZZLE ASSEMBLY - DSN 3	
NOMINAL FLOW RATE:	3.5 GAL./HR. (13.25 LITERS/HR.)
AIR CONSUMPTION:	3 SCFM @ 70 PSI (5.1 CUBIC METERS/HR.)
AIR ORIFICE DIA:	.052 INCHES (1.3 MM)
APPLICATIONS:	TRANSFER POINTS WITH LOW FINES CONTENT CONFINED AREAS MISCELLANEOUS LOW FLOW APPLICATIONS
NOZZLE ASSEMBLY - DSN 6	
NOMINAL FLOW RATE:	8 GAL./HR. (30.25 LITERS/HR.)
AIR CONSUMPTION:	7.5 SCFM @ 70 PSI (12.7 CUBIC METERS/HR.)
AIR ORIFICE DIA:	.078 INCHES (1.98 MM)
APPLICATIONS:	TRANSFER POINTS WITH HIGH FINES CONTENT PROTECTED DUMPING AREAS MISCELLANEOUS MED. FLOW APPLICATIONS
NOZZLE ASSEMBLY - DSN 10	
NOMINAL FLOW RATE:	11 GAL./HR. (41.6 LITERS/HR.)
AIR CONSUMPTION:	9.5 SCFM @ 70 PSI (16.1 CUBIC METERS/HR.)
AIR ORIFICE DIA:	.086 INCHES (2.18 MM)
APPLICATIONS:	LARGE, UNCONFINED DUMPING AREAS SHIP & CARGO LOADING & UNLOADING MISCELLANEOUS HIGH FLOW APPLICATIONS

same area so that agglomeration can occur. The reason for this is because conditions such as material flow, ambient wind and low relative humidity can mitigate the affects of the fog blanket, reducing reaction time and therefore affect the efficiency of the system.

The enclosures necessary to contain the fog and dust are typically not part of the DSI scope of supply, however, DSI does offer design assistance and in some instances supplies special containment materials such as DustTamer™ Wind Screen materials for areas like dump pockets and hoppers. With conveyor transfer points, there must be sufficient room for the fog to fully develop, particularly in the receiving belt area. In addition, it is necessary to maintain the tightness of skirt boards and insure that conveyor covers are in place and inspection doors are closed so as not to affect the efficiency of the system.

## CONTROL

DSI supplies easy to install modular controls housed in enclosures suitable for all types of industrial applications. DSI components include Electrical Control Modules; Multi-Function Modules containing air and water filters and control solenoids, Flow Control Modules for regulating the water and airflow rates to the foggers, self-sealing adjustable Nozzle Mounts and interconnecting air/water Supply Lines. Because every application presents a unique set of operating parameters, each DSI system is engineered to meet the specific needs of each of our customers. These needs include specific system control configuration, electrical control interface including plant computer logic systems, explosion hazard and corrosion resistance requirements.

**D.S.I. Specializes in Dry Fog Dust Suppression for PRB Coal Mines and Power Plants, with over 25 Years of Dry Fog experience!**

Go to [www.NoDust.com](http://www.NoDust.com) for more information



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## TYPICAL APPLICATIONS for DRY FOG™ SYSTEMS

**Conveyor Transfer Points** are a big area of concern for PRB Coal Users. However, there is a Dry Fog Solution. Dry Fog eliminates dust explosion risk associated with dust collection systems. There is no expensive reoccurring chemical cost either. Dry Fog works by injecting sub-micron water droplets into the air at the point of dust creation. The fog droplets attach to like size airborne dust particles. The slightly wetted particles agglomerate to other particles, adding sufficient mass to settle the dust back into the conveyed product within the covered transfer point. Use at crushers, screens, coal yard & plant conveyors, including reclaim and tripper conveyors.



**Ash Handling** can be challenging. Adding enough moisture to the ash to prevent dust is difficult, often resulting in some percentage of ash being over-wetted and the balance not wetted at all. Overwetted ash spilled onto the ground dries out, creates a secondary source of dust and must be cleaned up. If used for structural landfill, overwetting can take ash out of specification. Dry Fog Systems use very little water and can bring your operation into Environmental Compliance while meeting ash compaction specs. It will reduce the mess, and increase truck haul capacities. One plant has reduced haul trips by 19%. Big Savings!



**Rail Car & Truck Dumps** can be a very significant source of dust. Collecting dust from large open dump pockets is very difficult. Cost for collection systems can exceed \$1,000,000 and still the user is faced with what to do with the collected dust. Chemical systems require use of expensive chemicals and are not effective in removing dust from the air. Water and chemical sprays create a costly BTU Penalty due to the significant addition of moisture. Furthermore, sprays create large water droplets that will freeze, making wintertime operations in many regions impossible. Dry Fog Systems can effectively capture airborne dust, returning it to the dump pocket, without wetting the material. Dry Fog will not freeze and can operate in temperatures as low as -35° F.

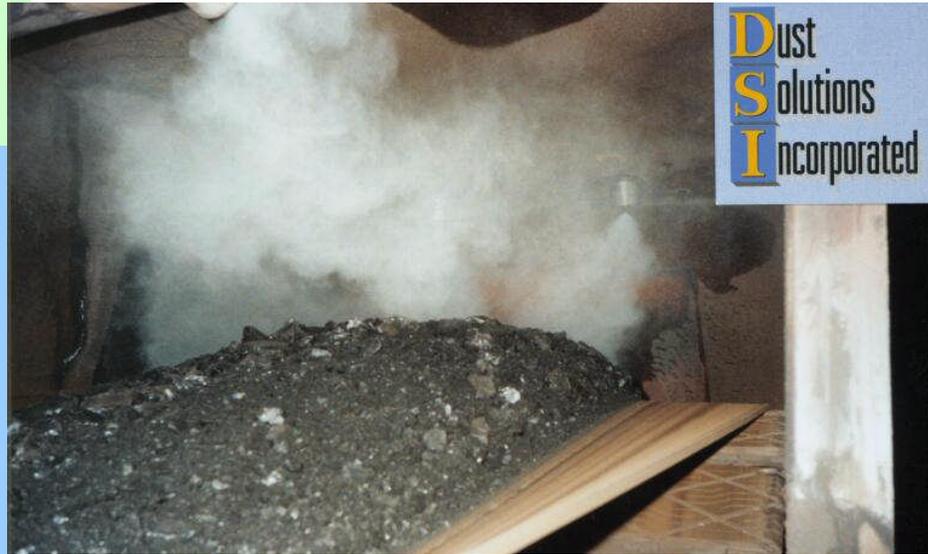


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## Dry Fog Dust Suppression

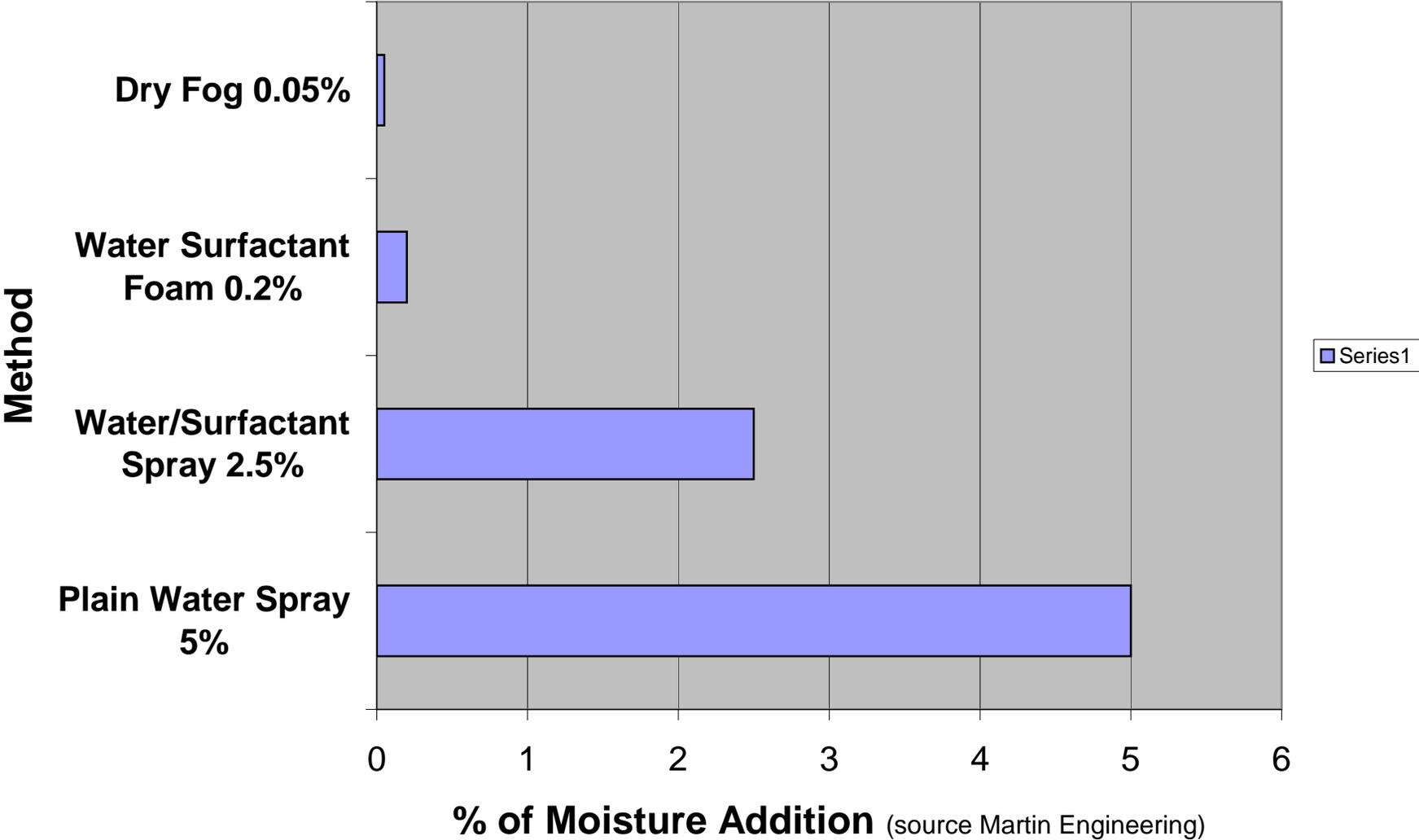
- **The Driest Dust Suppression System Available**
- **Rated Best Demonstrated Technology by the E.P.A.**
- **Considered B.A.C.T. in the Powder River Basin**
  - **“No Visible Emissions” Status for Conveyors**
  - **96% + Dust Reduction at Rail Dumps**
  - **No Explosive Waste Stream**
  - **No Chemical Expense**

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# Moisture Addition By Weight





## DustTamer™ Wind Screen Systems

D.S.I. Wind Screen Systems are used in a variety of applications as a measure to lower ambient air velocities thus reducing the amount of airborne particulate from many types of sources. These sources typically include material stockpiles, stackout conveyors, truck, rail or loader dump pockets, vibrating screens, grizzlies, conveyor transfer points and load out silos.

Many times Wind Screen Systems are used in conjunction with D.S.I. fogging systems to help the agglomeration and settling of dust by controlling and containing the dust/fog mixture at a fog application point.

Wind Screen Systems work better than a solid structure in the above applications, because of the fabrics specially designed porosity. Approximately 30% of the ambient air will go through the fabric helping to equalize the pressure differential from one side of the fabric to the other.

Solid structures generally have openings for equipment access, dumping or stacking activities. These open areas can be great sources of dust creation by allowing air to move from a high to low pressure area, increasing velocities and the amount of airborne particulate.

## System Components

The following components make up a Wind Screen System.

**DustTamer™ Fabric:** This fabric is specifically designed for use as a wind reduction material. It is knitted from an industrial grade woven polyester, resistant to UV rays, in-climate weather and temperature extremes. Its unique ability to be stretched and tensioned to over 500lbs. of pull prevents "flagging" of the material and consequential damage due to abrasion.

The standard fabric width is 90cm (35.5 inch) wide and is available in forest green or desert tan colors. The fabric is generally installed horizontally, spanning support columns as wide as 20 feet apart.

**Stand Off Brackets:** We provide specially designed metal brackets to "stand off" the fabric from the support columns. This prevents the fabric from coming in contact with sharp edges or rough surfaces that I-beams and wood poles may have.

Stand Off Brackets also make installation easier by providing a material that is thin enough (1/8 inch) to allow self drilling/tapping attachment screws to penetrate the metal without pre-drilling, when attaching the fabric to the support columns.

**Lockbars:** Aluminum Lockbars are available in 90 cm (35.5 inch) length. They are used to "pinch" the wind screen fabric against the stand off brackets. The lockbars are pre-drilled to accommodate (15) #10 self drilling/tapping screws per bar.

**Attachment Screws:** (15) #10-3/4" long, self drilling/tapping hex head screws are provided per each lockbar.

**Tie Wraps:** UV resistant nylon wire ties are the most common ties that we supply for tying runs of fabric together. These ties are similar to what one uses to tie wire bundles together and are self locking.

## Installation Tools

The following are the basic installation tools that are required. Additional equipment and quantities of equipment and tools such as man lifts, electrical generators, and extension cords may be required depending on the size of the fence or screen, and site conditions.

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1. A spring scale 0-500 lb. range to measure fabric tension.
2. A come-a-long, to tension the fabric.
3. A power driver with hex nut driver.
4. A tensioning tool to attach the come-a-long and scale to the end of the fabric.

All of the above items are available from D.S.I..

## Support Structure

Wind Screen Fabric can be attached to a variety of surfaces. Sometimes it is used in place of solid siding on a building and the existing column supports can be used with little or no modification. Other times a simple tubular steel frame is used to cover a transfer point similar to a cage or awning.

A free standing Wind Fence will require its own structure. Column materials can vary based on local conditions, available materials and engineering requirements. Typical materials include, wood poles, steel I-beams, channel iron, and steel pipe.

## Design and Engineering

Several factors must be considered when designing a Wind Fence System. These factors fall into three main categories:

1. Ambient air/dust control effectiveness.
2. Existing site conditions including equipment traffic patterns, other structures (including underground) and grade of terrain.
3. Engineering factors that include wind load, seismic conditions, soil type and selection of column supports.

D.S.I. engineers can assist in the evaluation of these factors and provide whatever calculations that may be required, including certified drawings. We typically charge a nominal fee for this service and may be required in order to provide the customer with a firm scope of supply and or turn-key pricing. Budget pricing is typically provided at no charge.

## Conclusion

Dust Tamer Wind Fence/Screen Systems, can be a highly effective measure to help control fugitive dust. It is a cost effective alternative to buildings and other solid structures.

Additional information is available upon request, including a U.S. EPA sponsored study titled, Windbreak Effectiveness for Storage Pile Fugitive Dust Control: A Wind Tunnel Study.

For more information, contact us directly at:

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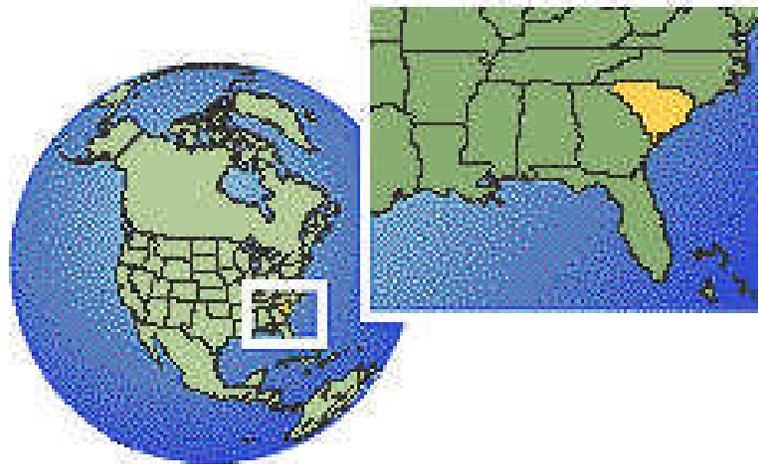
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