



Nuisance Baghouses Maintenance & Troubleshooting



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Types of Ventilation Systems

- **Process**
 - Kiln
 - Clinker Cooler
 - Mills
- **Auxiliary**
 - Belt Transfers
 - Elevators
 - Silos



Baghouses Don't Make Cement

But They Can Stop Production of Cement

Agenda

- Pulse Jet Baghouses
- Filtration Media
- Installation
- Operation
- Ventilation System
- Problems and Solutions

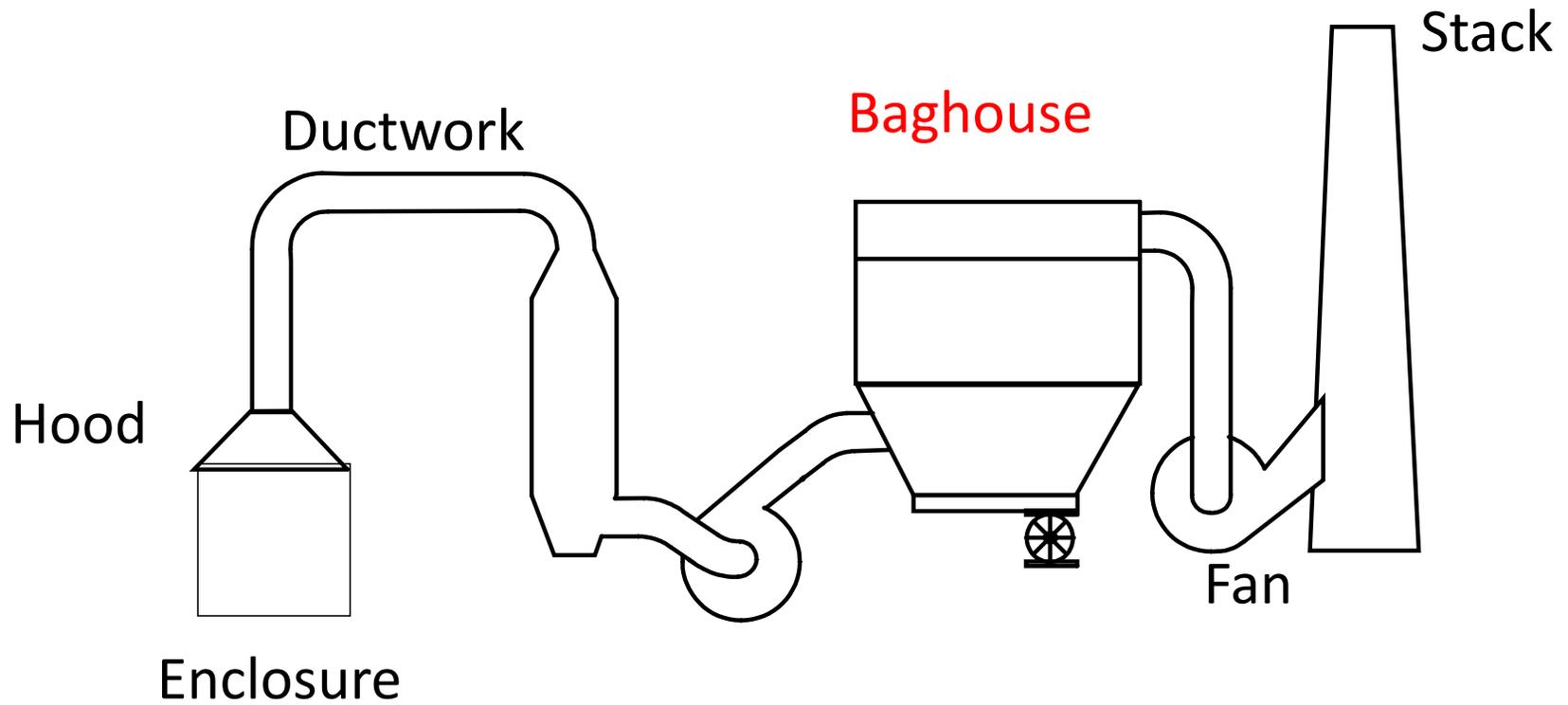


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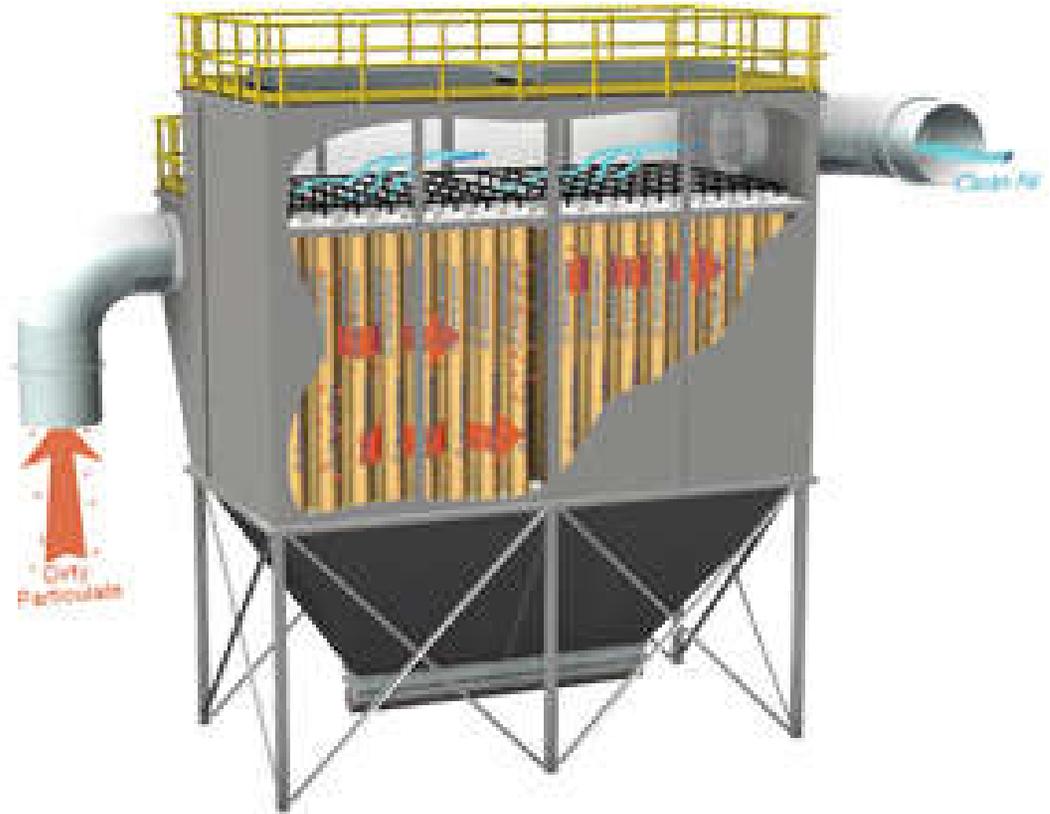


Ventilation System



Pulse Jet Baghouses

- On-Line Cleaning
- High Capacity/ Small Size
- Lower Cost
- Latest Technology
- *2 to 3 year Bag Life*



Types of Pulse Jet Baghouses

- Top Load
- Bottom Load
- Walk-in Plenum
- Bin Vents
- Point Vent Unit



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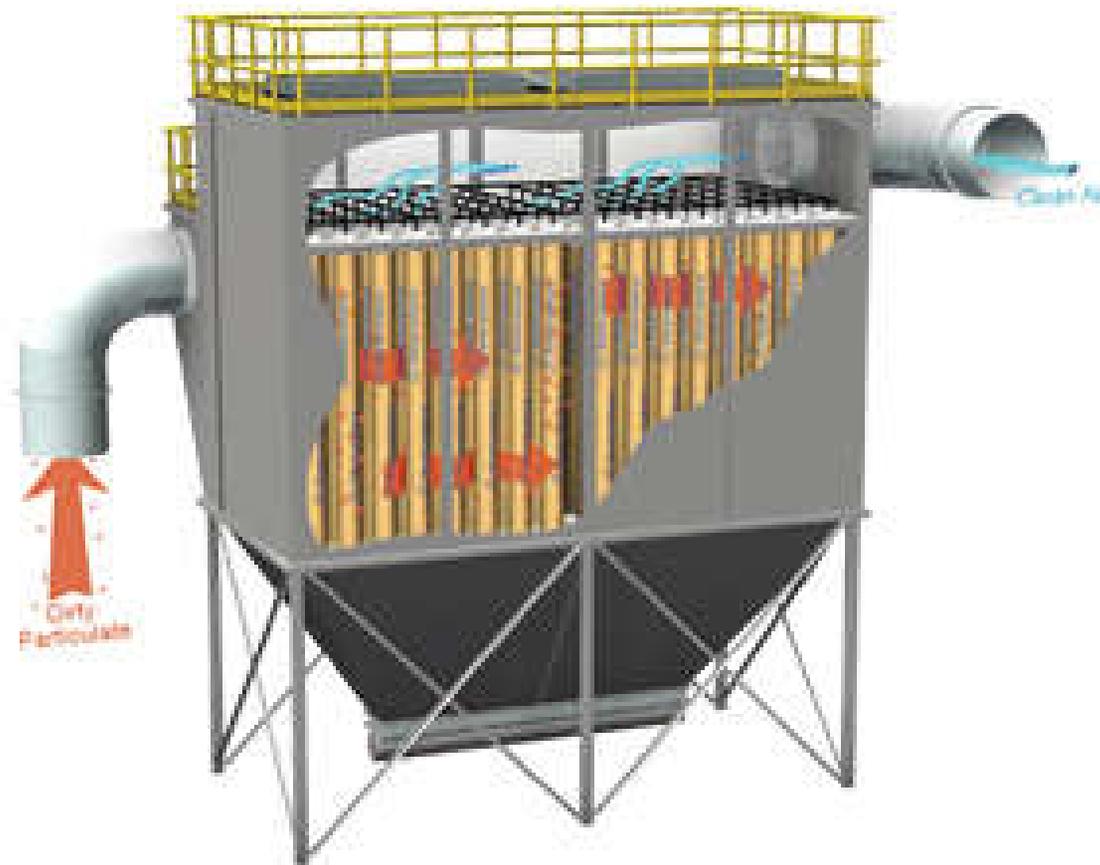


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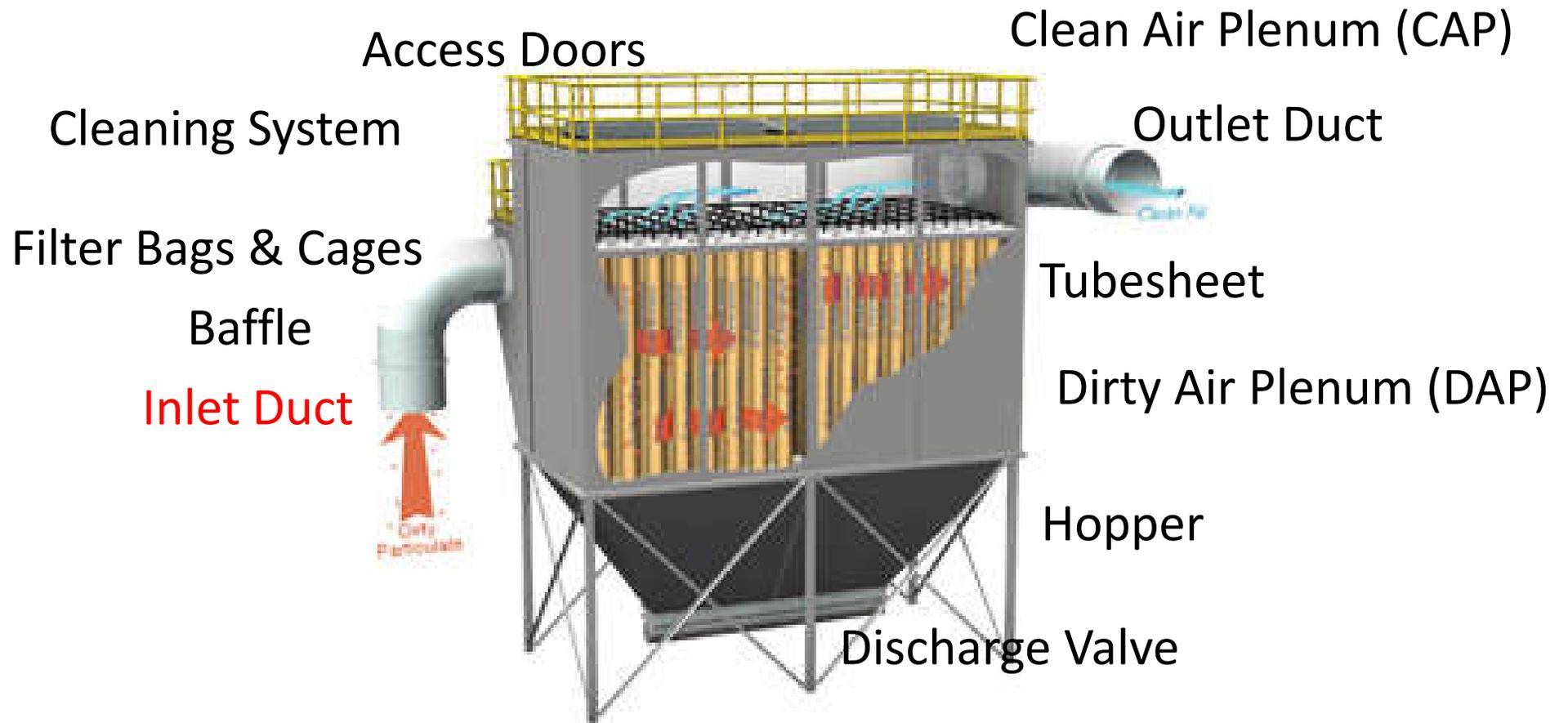
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- Bottom Load
- Walk-in Plenum
- Bin Vent
- **Point Vent Unit**



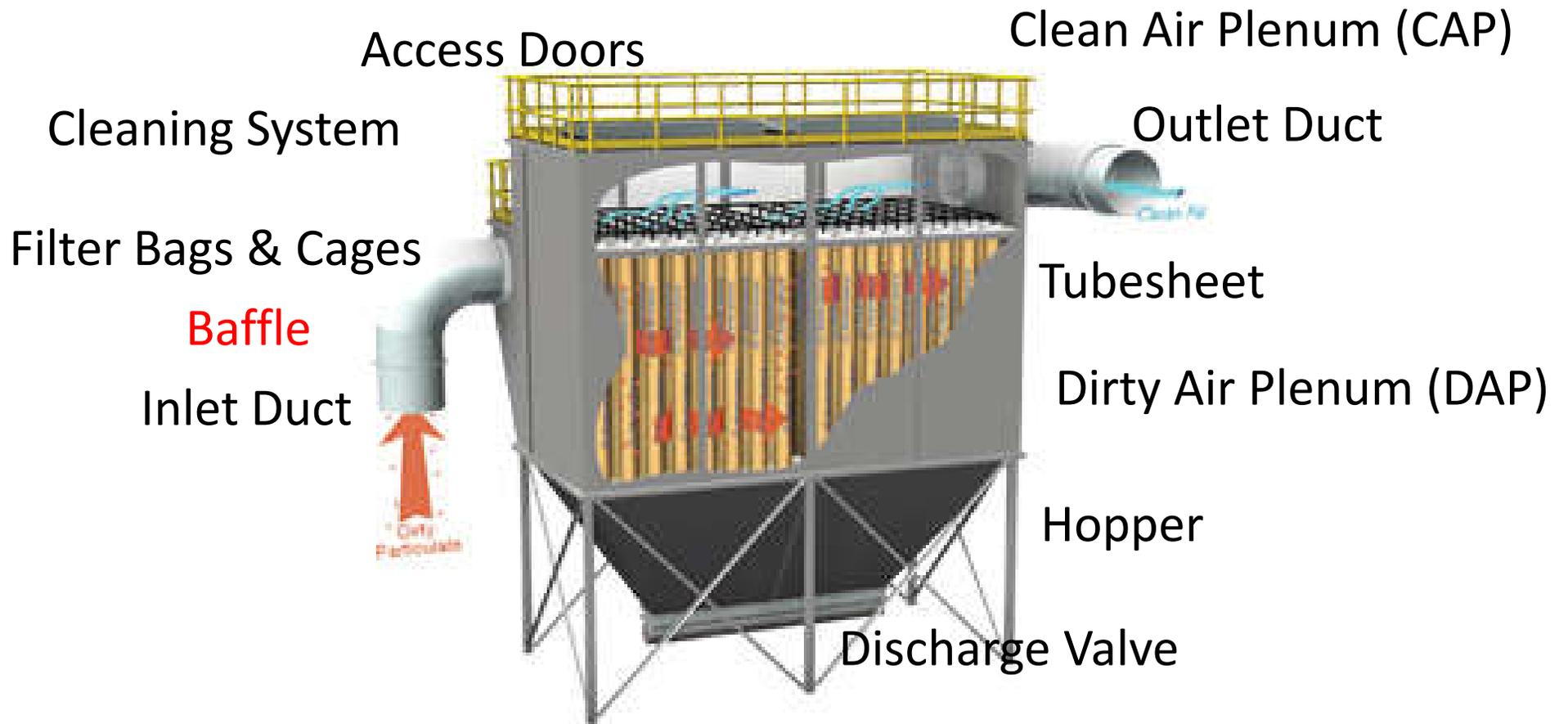
How Does a Baghouse Work?



Baghouse Anatomy

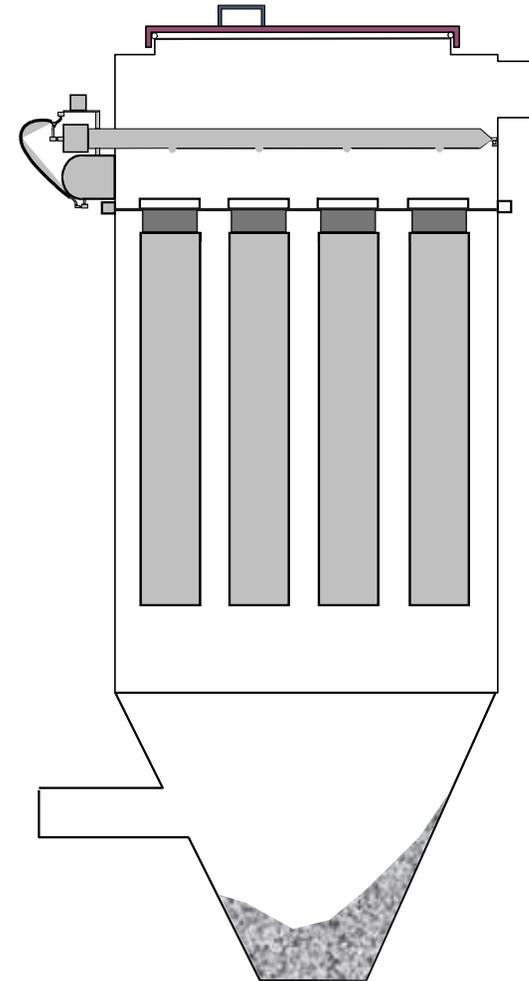


Baghouse Anatomy



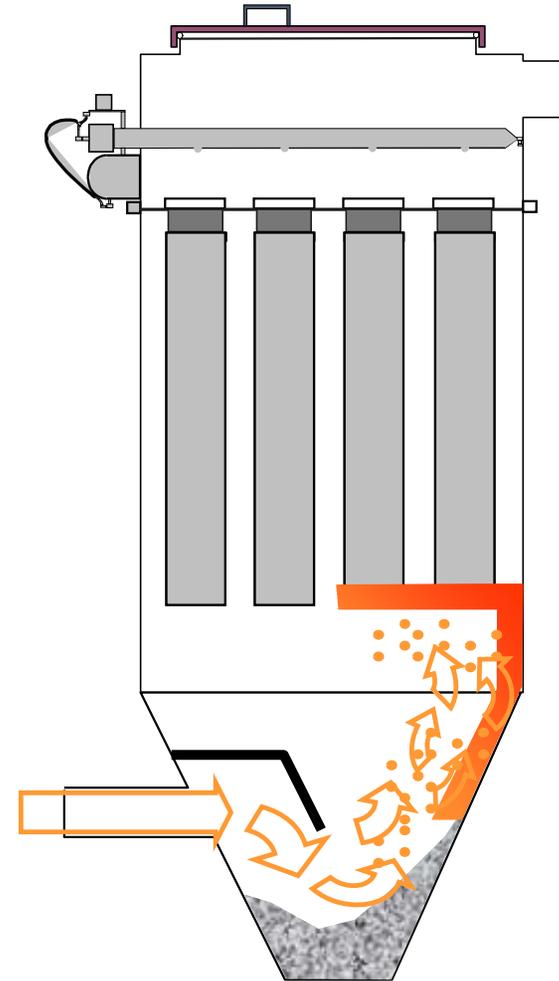
No Baffle

- Concentrated Flows
- Bag Abrasion on Opposite Side



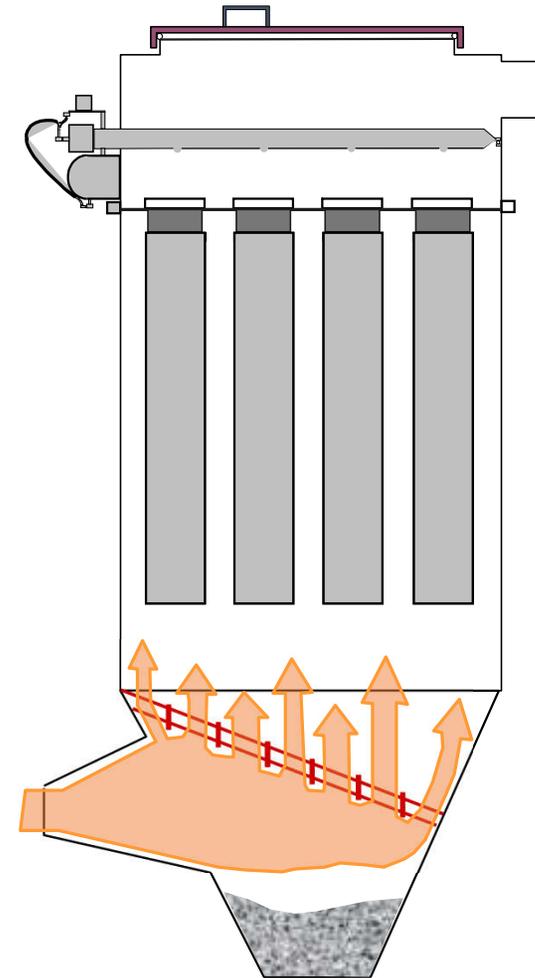
Deflector

- Concentrated Flows
- Bag Abrasion on Opposite Side
- Plus Material Reintrainment

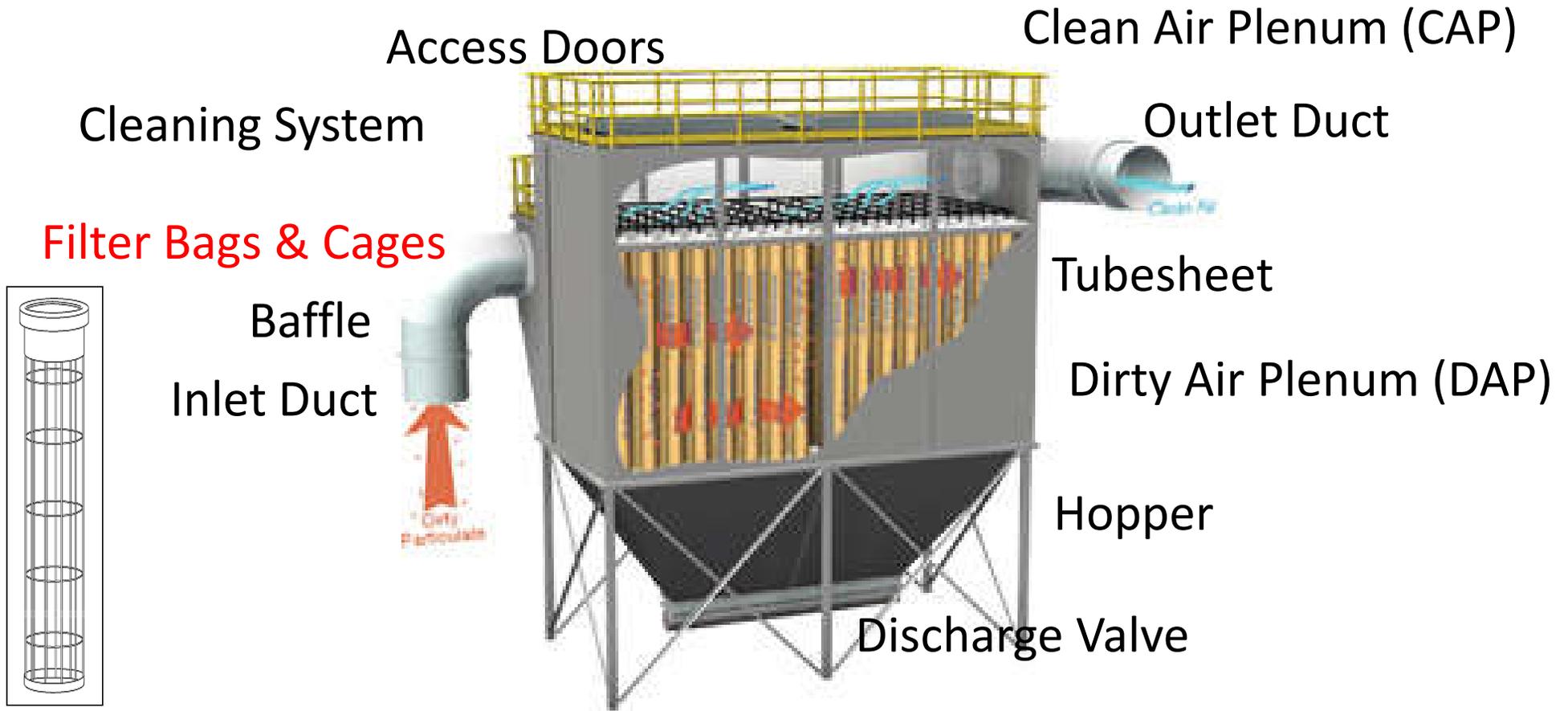


Ladder Vane Baffle

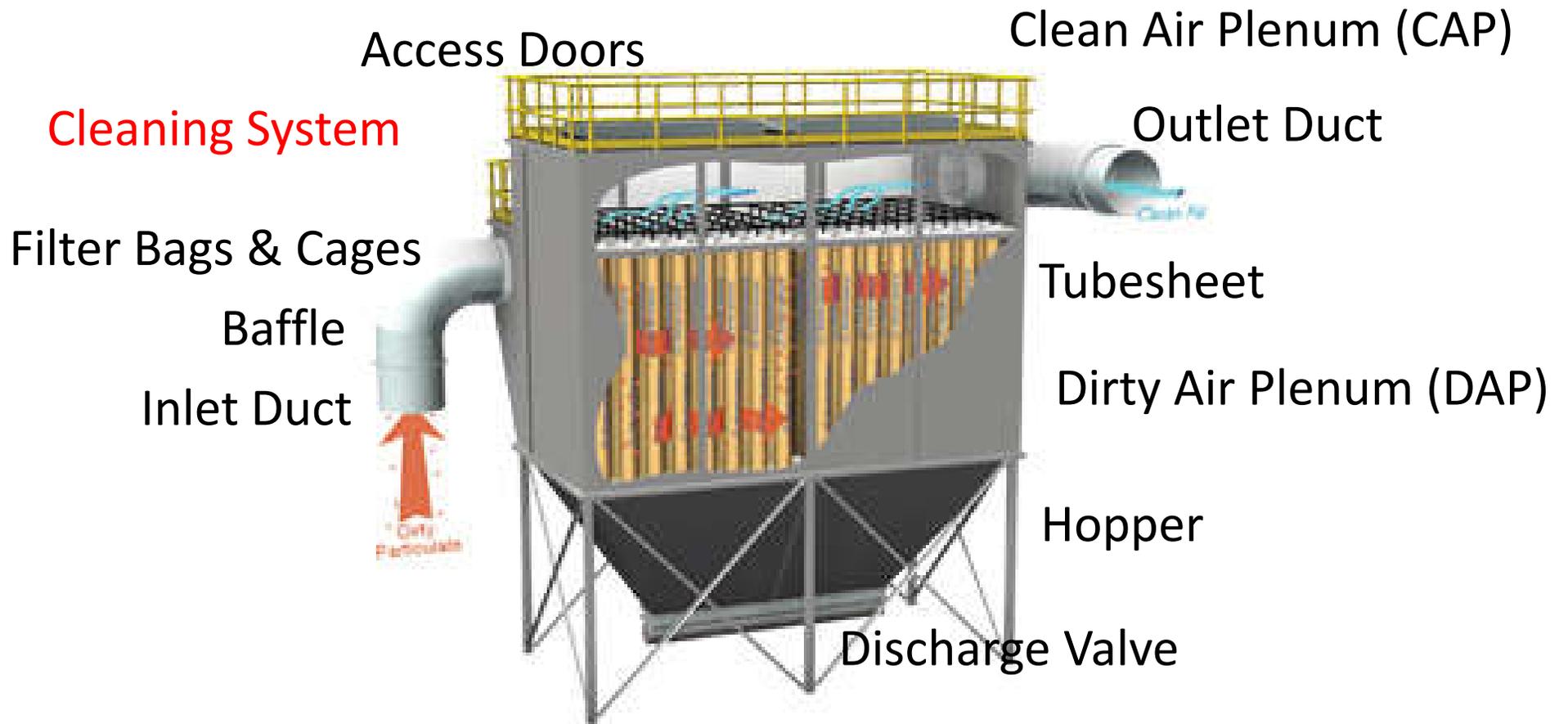
- Flow Evenly Distributed
- Full Cross-Sectional Area



Baghouse Anatomy

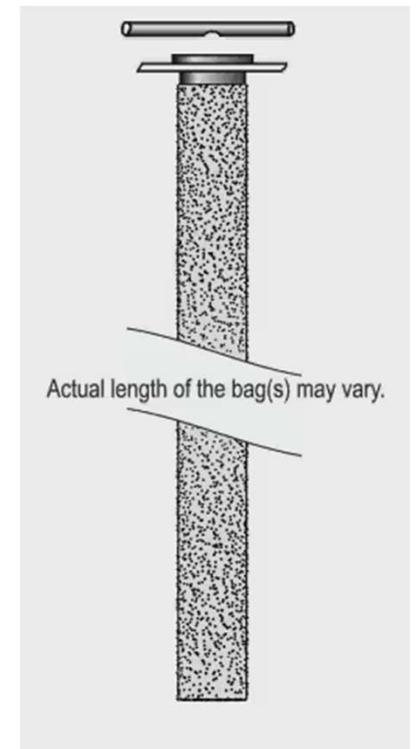
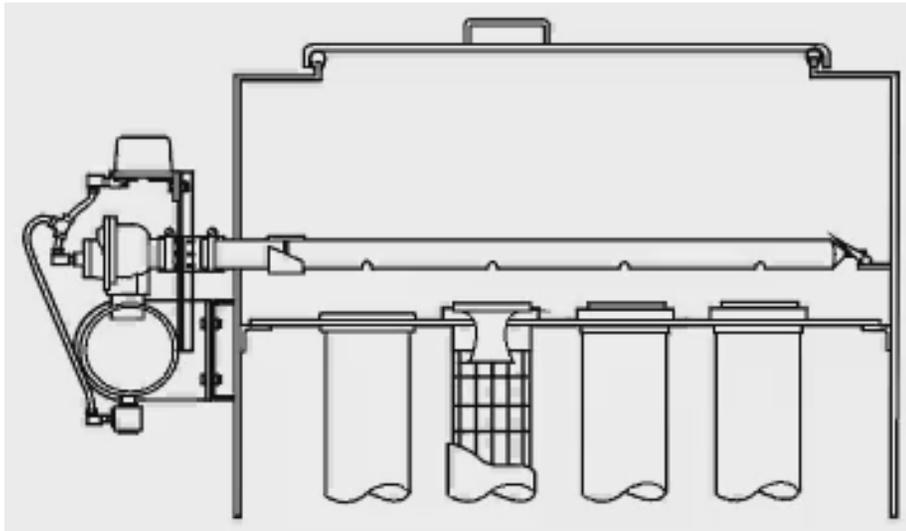


Baghouse Anatomy



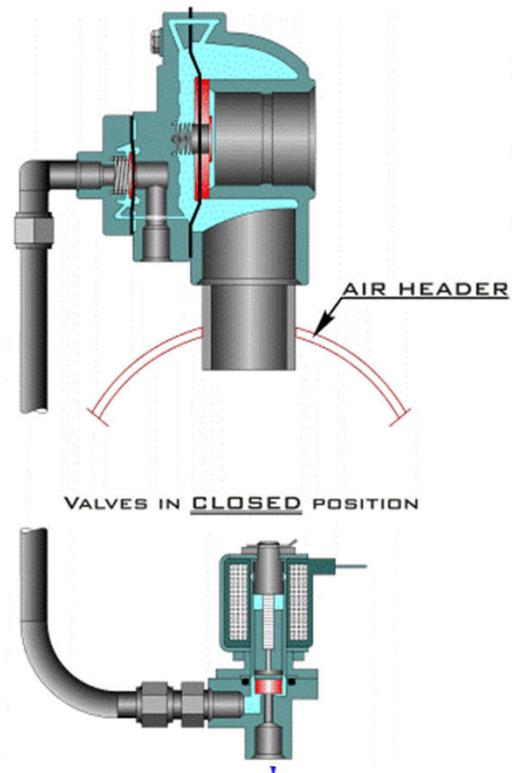
Pulse Jet Cleaning System

- Blast of Compressed Air Pulse Removes Dust



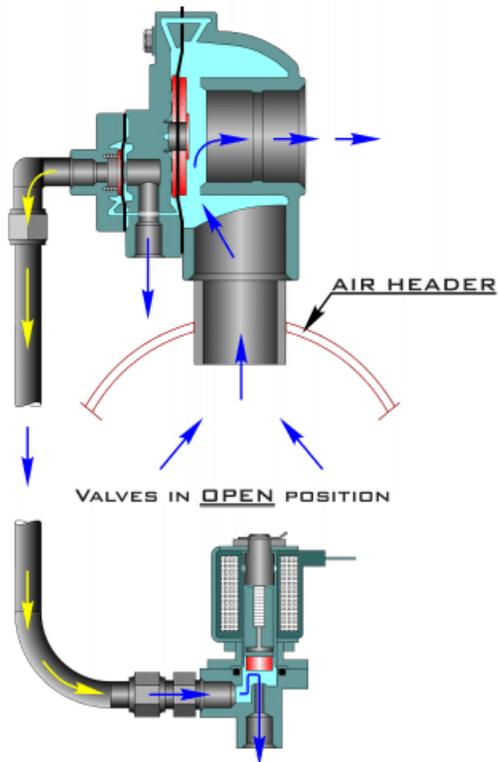
Heart of a Pulse Jet

- Diaphragm and Spring are the Only Moving Parts



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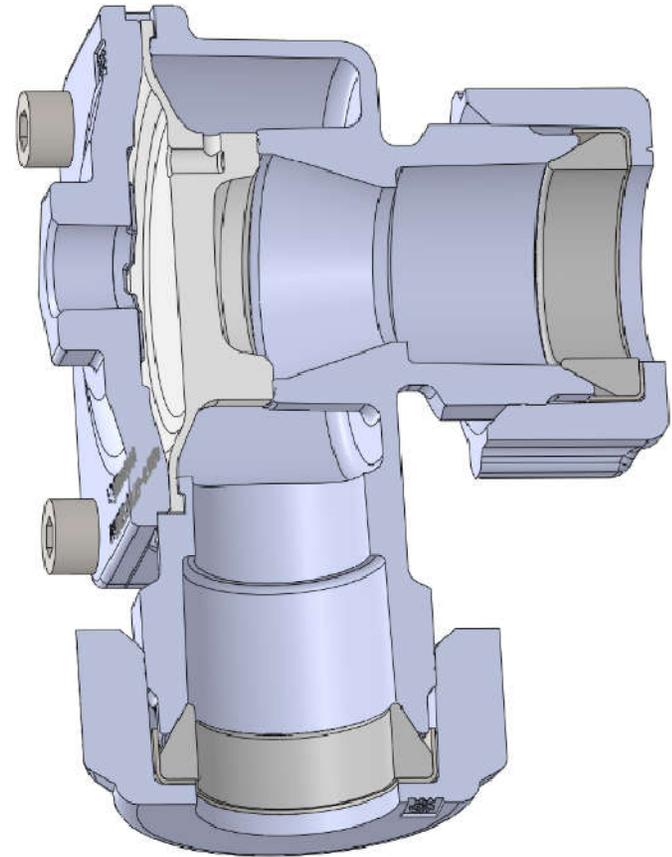
Heart of a Pulse Jet

- Piston Valve
- Elastomer Diaphragm



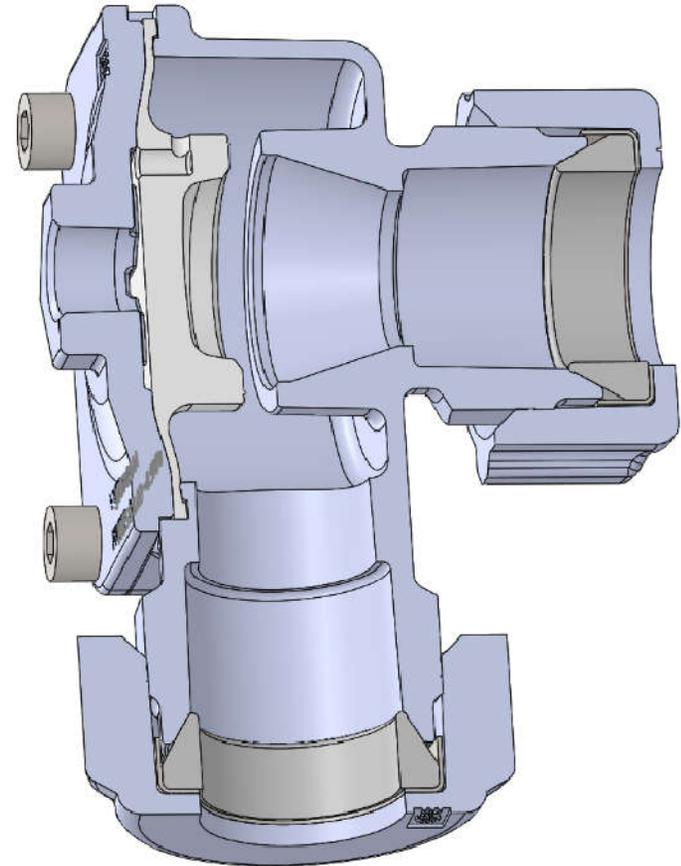
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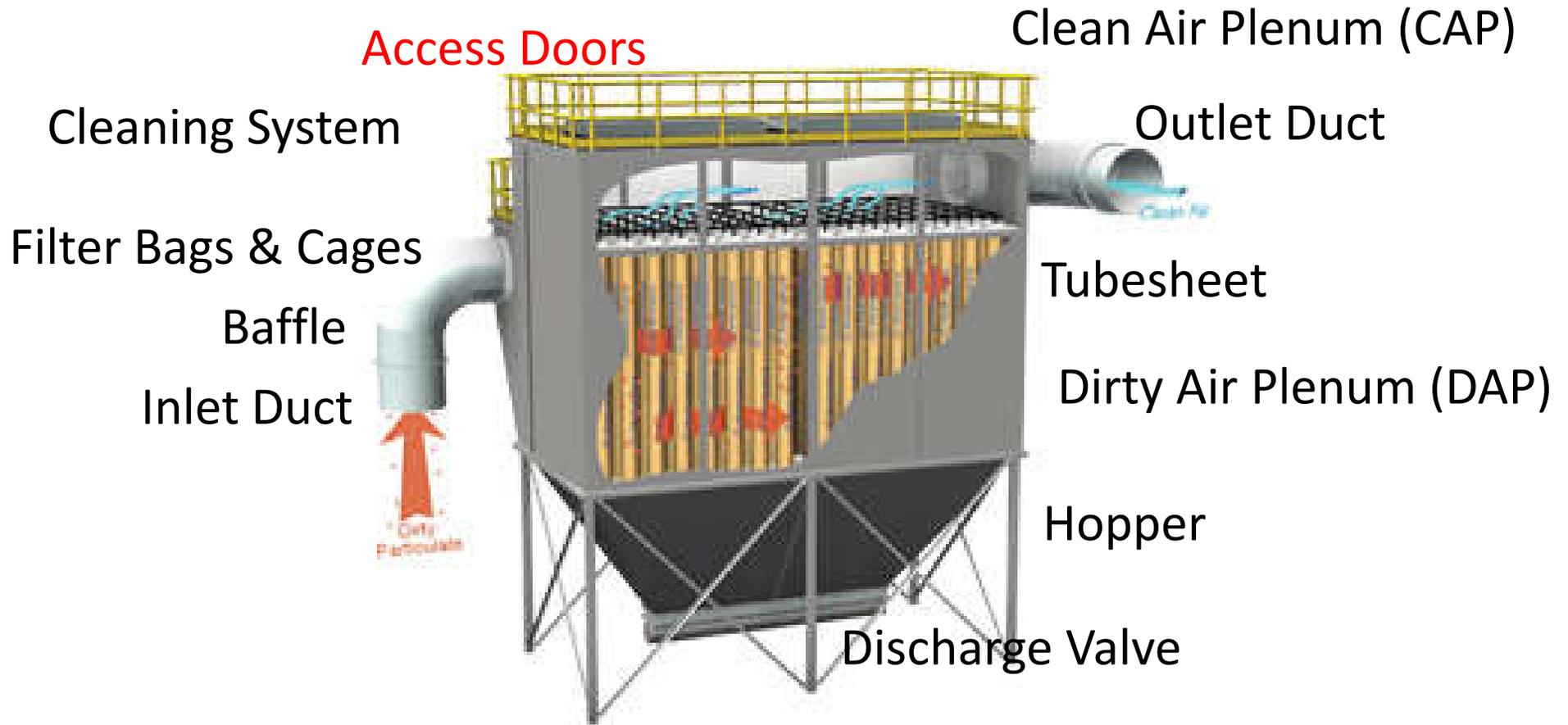


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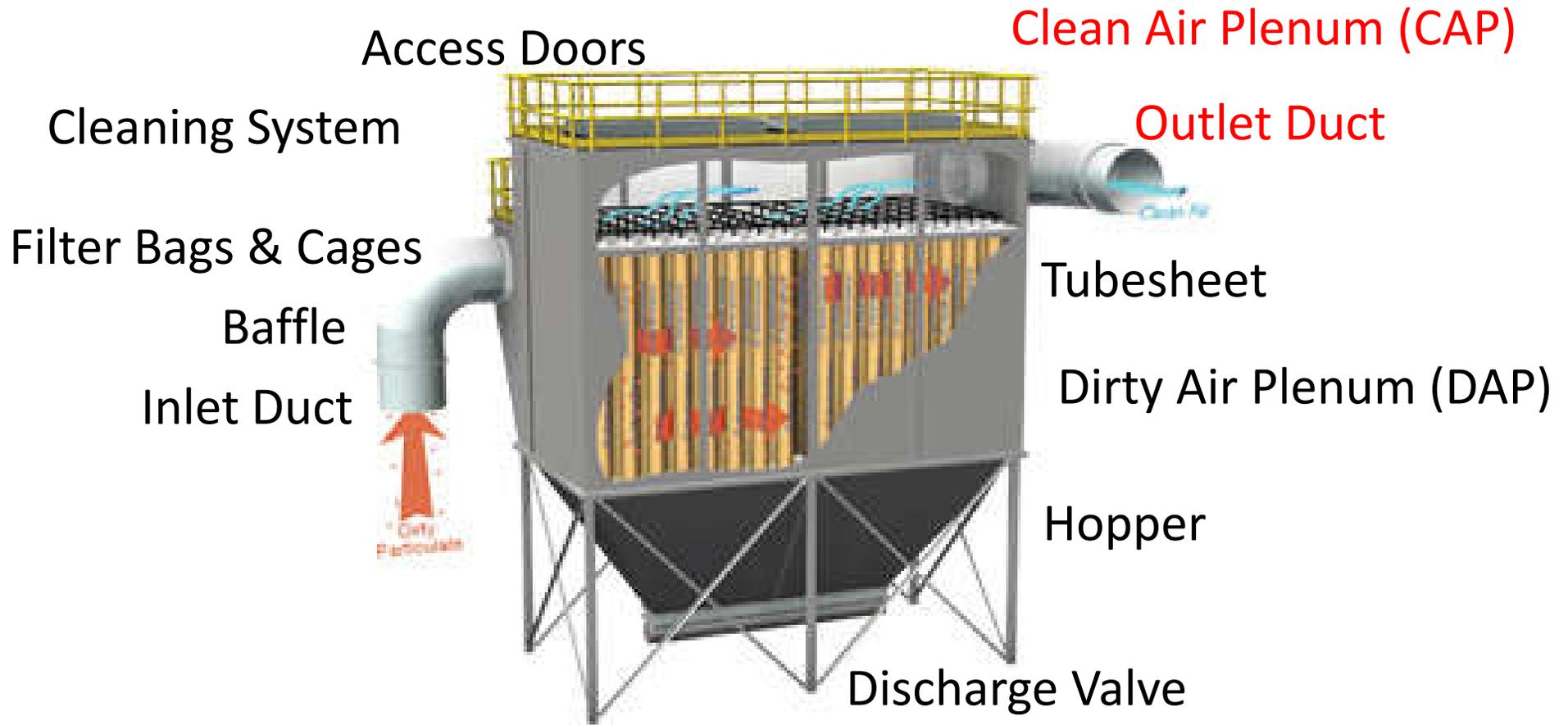
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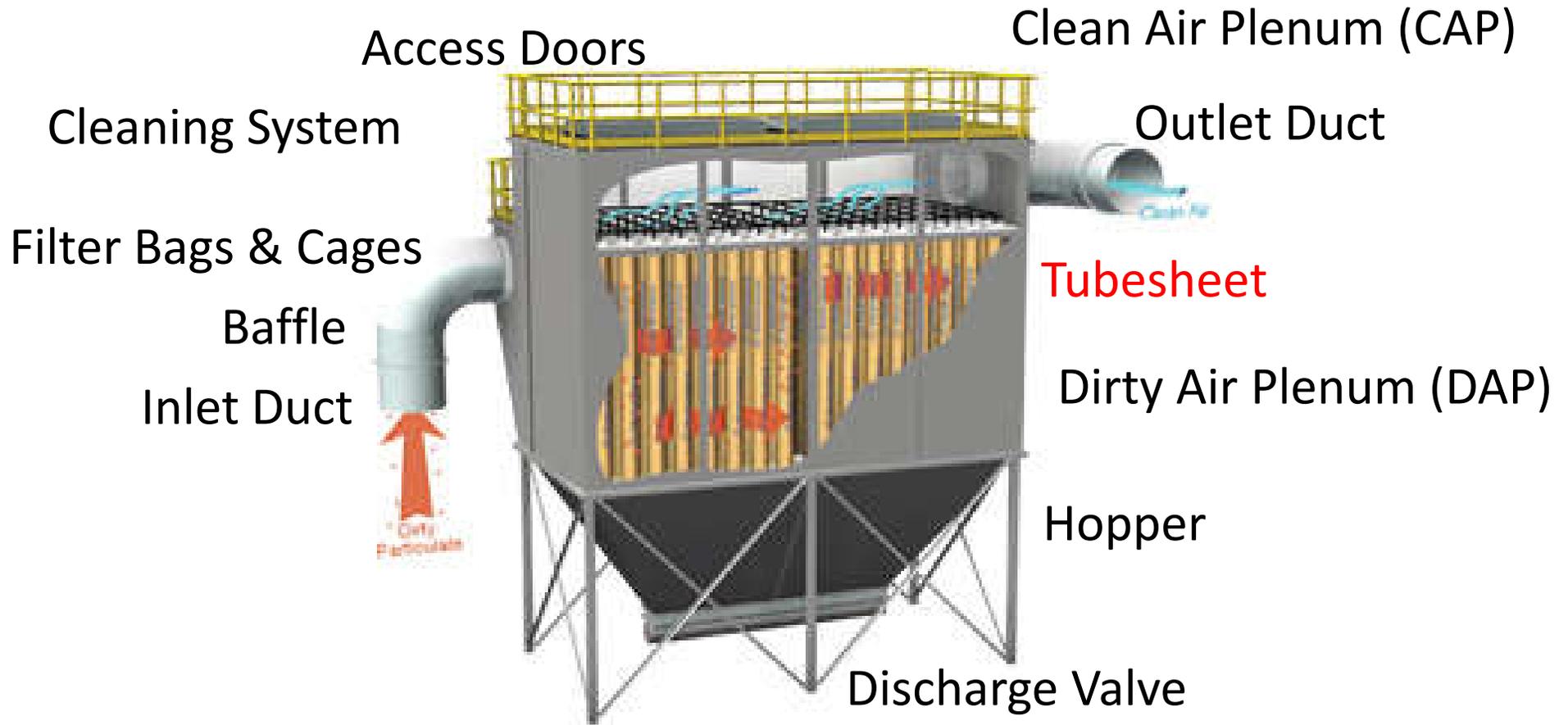
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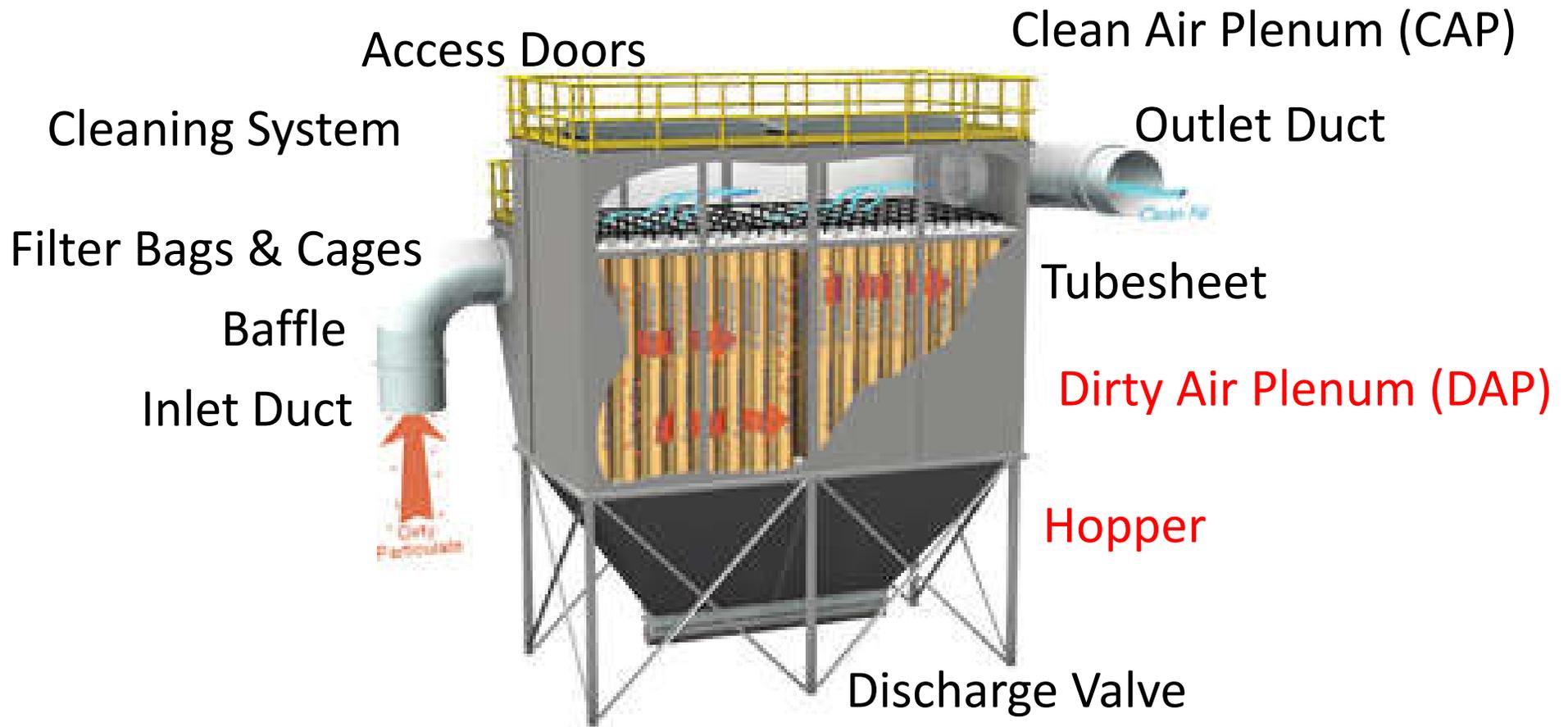
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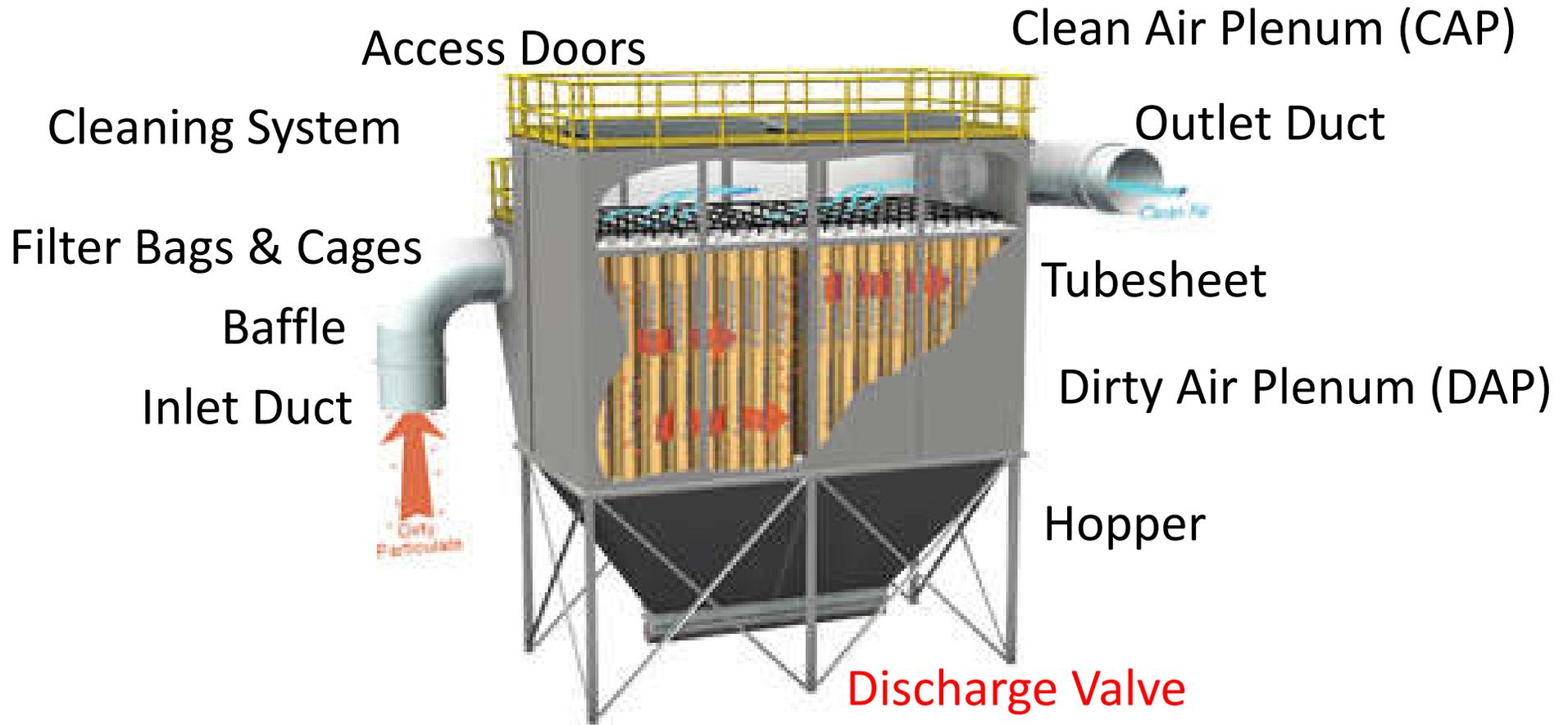
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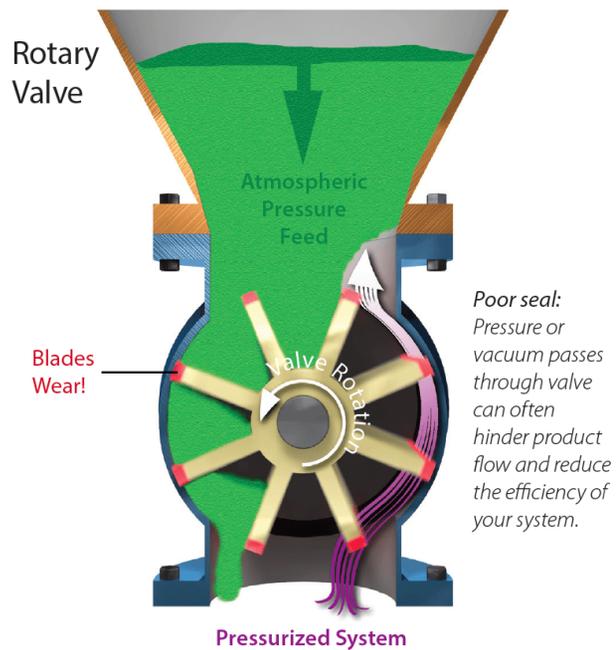


Discharge Valve Duty

- Discharge Material
- Block Suction of Air

Discharge Valves

- Rotary Valve
- Fine Material



- Double Dump Valve
- Coarse Material
- Actuated Preferred



Agenda

- Pulse Jet Baghouses
- **Filtration Media**
- Installation
- Operation
- Ventilation Systems
- Problems and Solutions



Polyester Felt

- Workhorse of Industry
- 275F Temp Limit
- Inexpensive, Durable
- Subject to Hydrolysis
- Used in Most Low Temp Applications



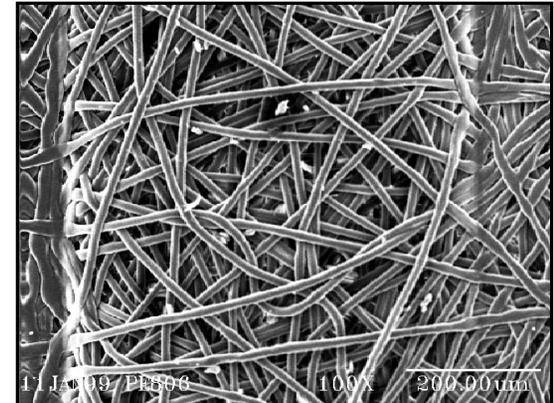
Aramid Felt (Nomex)

- 390 F Temperature Limit
- Subject to Hydrolysis at +300F With High Humidity
- More Expensive than Polyester and Acrylic
- Commonly Used in Clinker Conveying



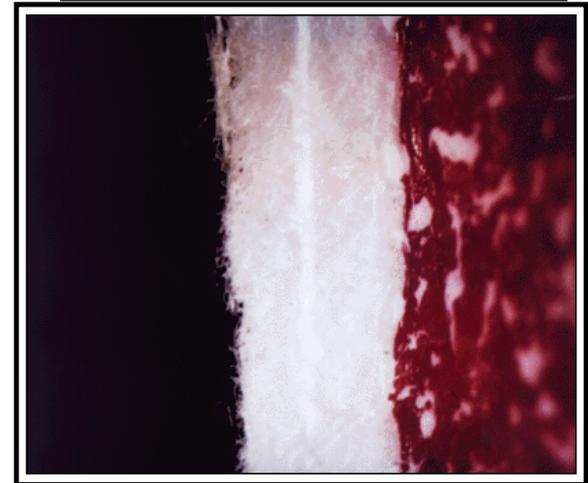
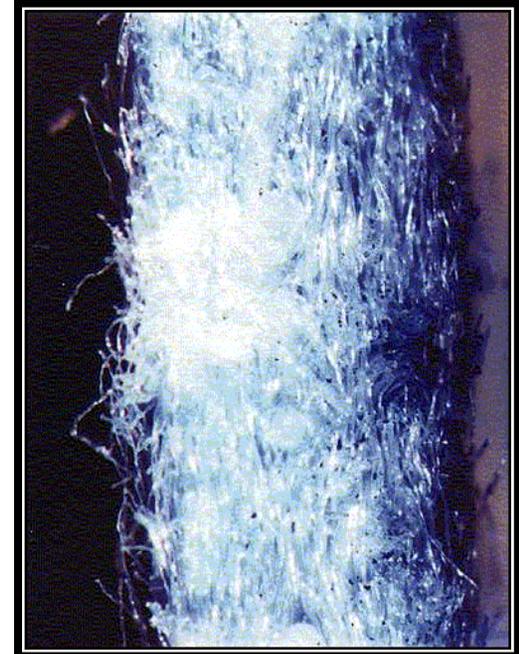
SpunBond Polyester

- 260°F Temperature Limit
- Rigid
- Tighter Pores than Felt
- Subject to Hydrolysis



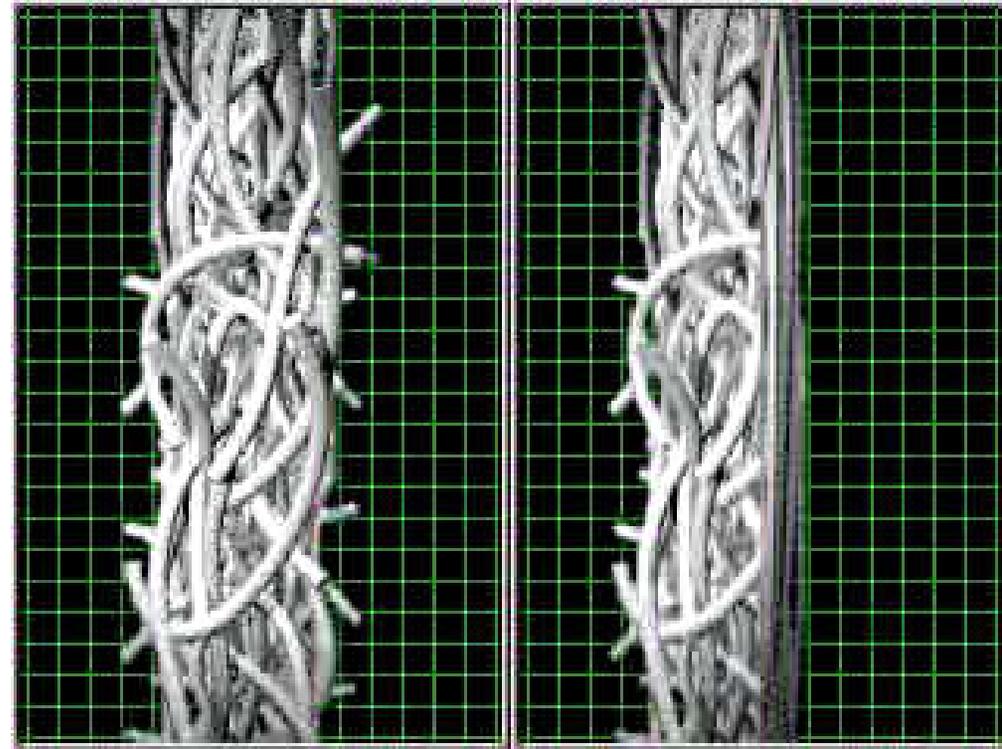
PTFE Membrane

- Surface Filtration Principle
- High Efficiency Filtration
- Excellent Dust Release
- Base Fabric Becomes Support Only



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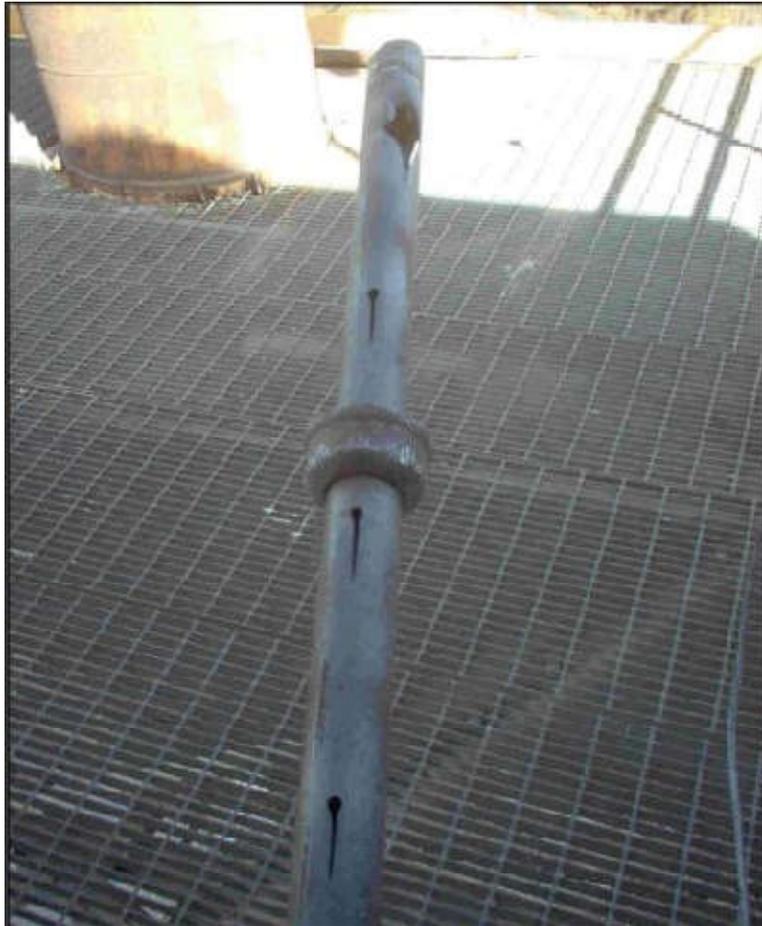


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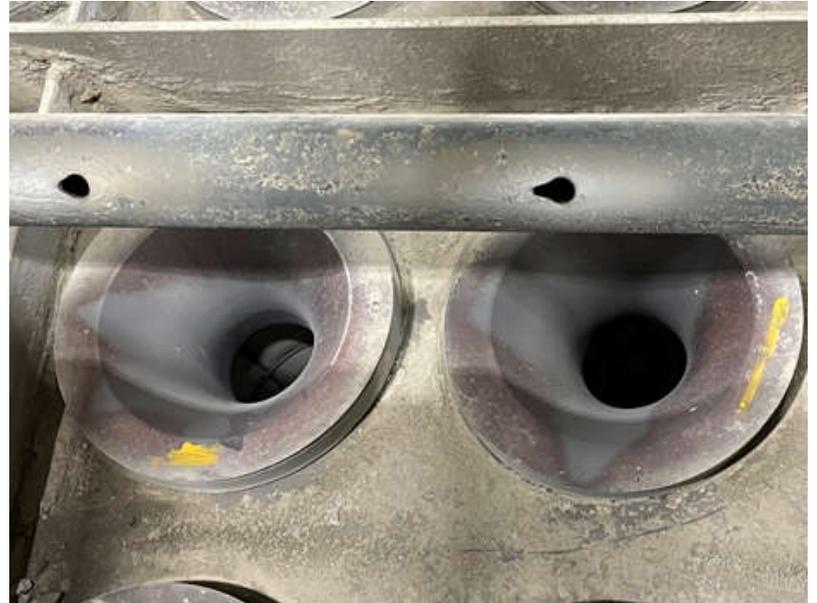
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Verify Blowpipe Hole Integrity

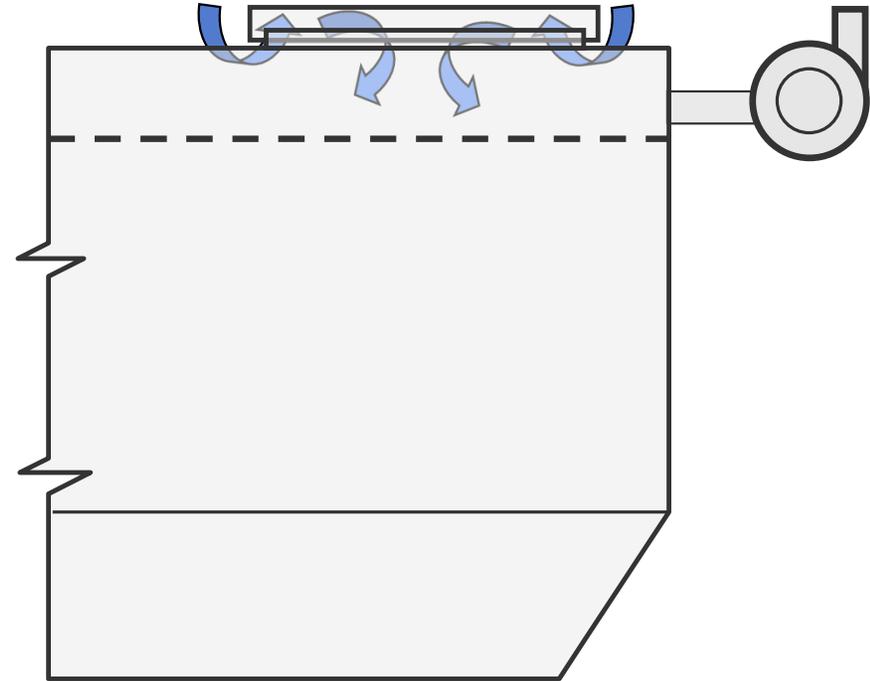


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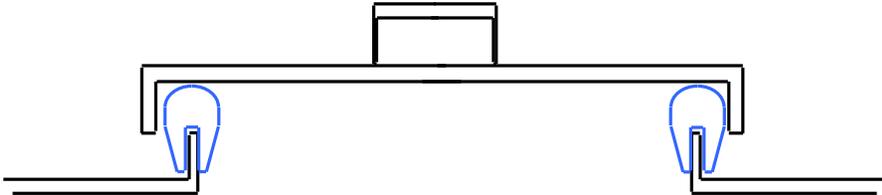
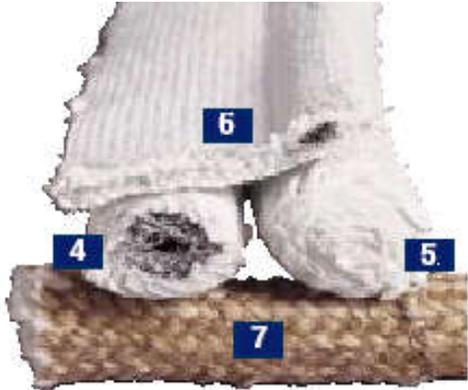
Eliminate Inleakage

- Incoming Ambient Air Reduces Capacity
- Most Common Deficiency
- Particularly Troublesome in High Temperature Systems

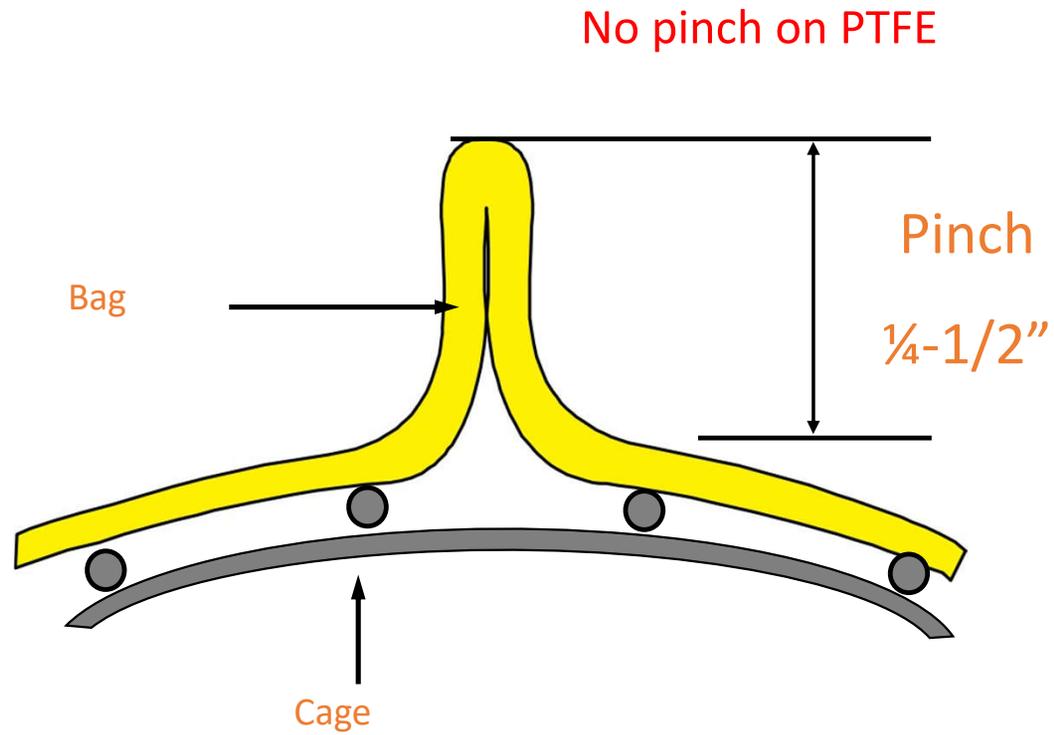


Fixing Inleakage

- No Need to Reinvent the Wheel



Bags & Cages- Verify Pinch



Excess Pinch

- Reduces Cleaning Efficiency
- Causes Excess Flex



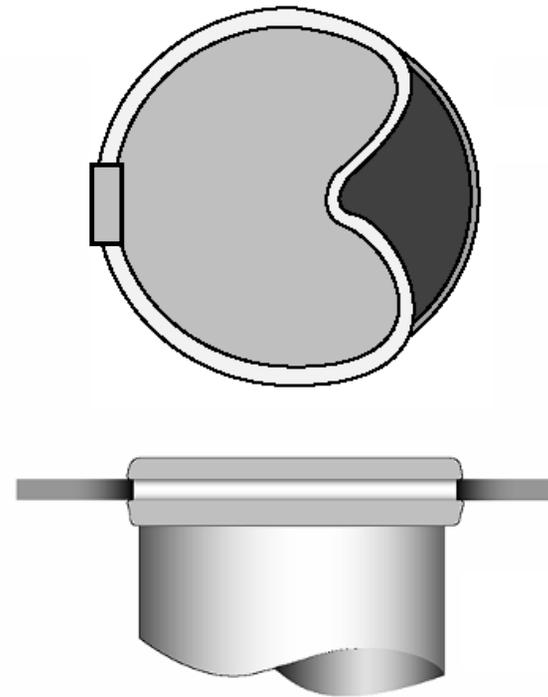
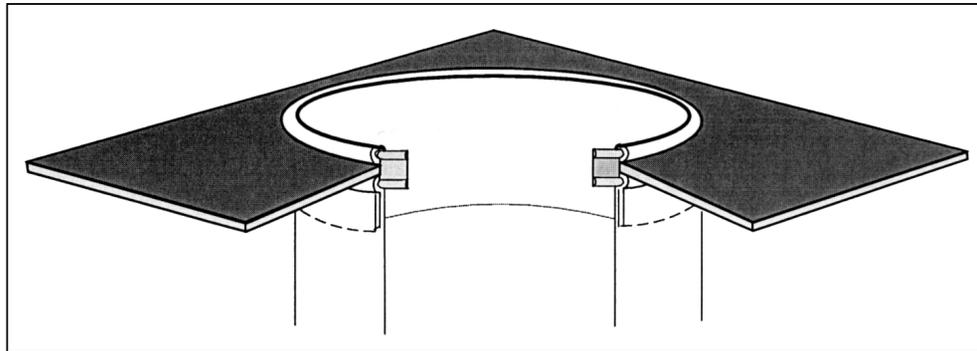
Verify Cage Length

- Slight Overlength Causes Mysterious Bag Failures
- Cage Bottom Must Touch the Bag Bottom Disc



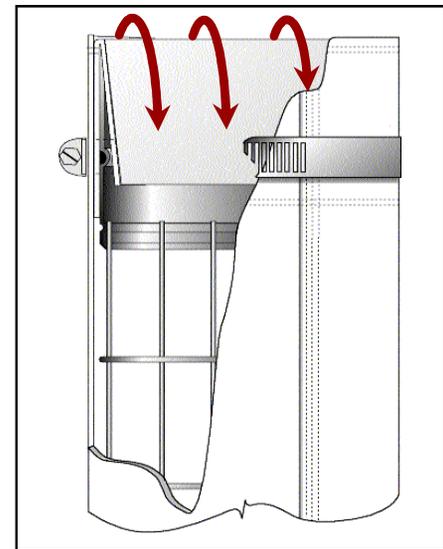
Snapband Installation

- Seam Opposite to Deformation
- Two Hands to Minimize Deformation
- Confirm a Clean and Solid Snap
- Verify Tight Fit



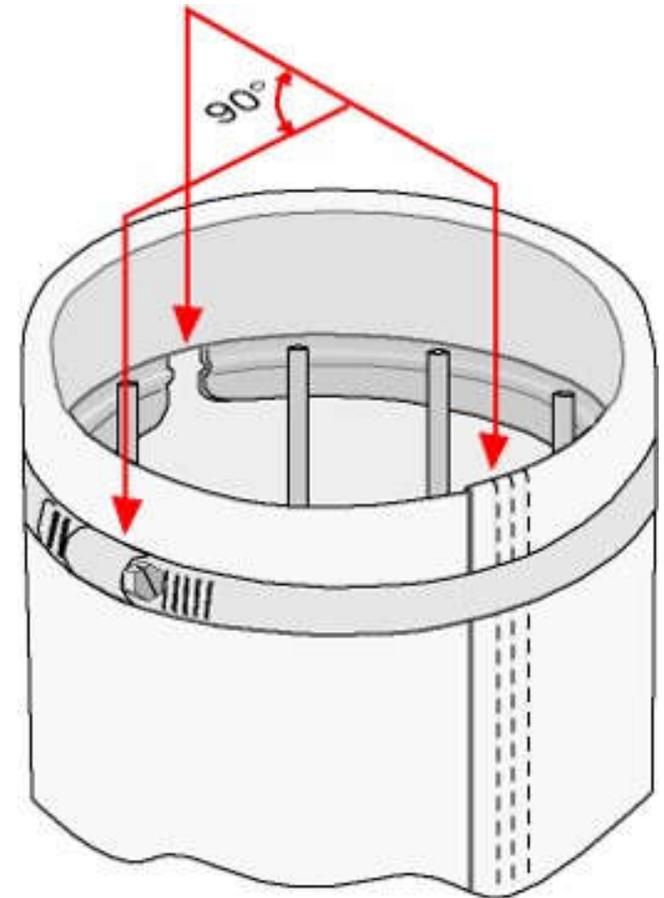
Bottom Load Installation

- Minimize Wrinkles Around Circumference
- Separate Notch, Clamp and Seam
- Verify Position in Cup Groove Before Tightening
- Consider Pleated Retrofit for Bottom Load



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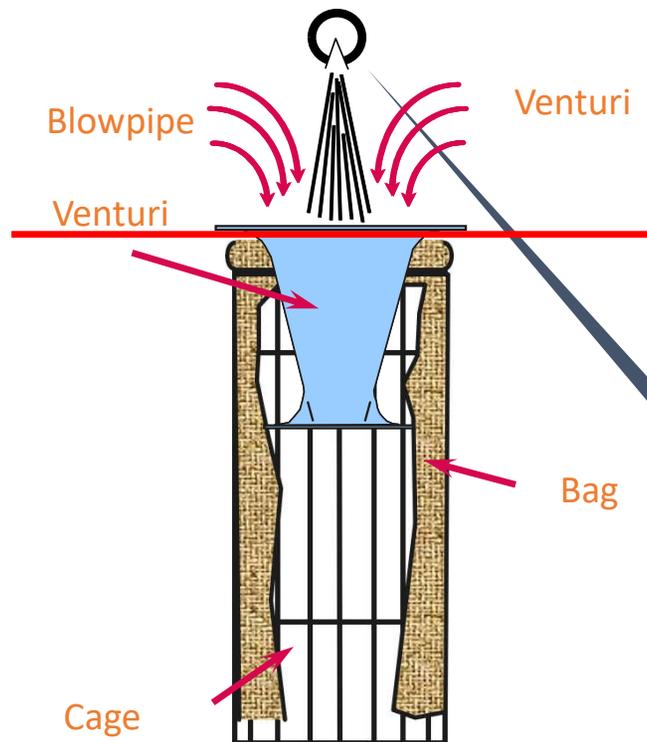
Bottom Load Leak Elimination

- Rubber Top Pleated Filters
- Shorter, Easier Handling
- Creates a Dropout Chamber
- Verify Suitability



Tubesheet Clean Before Startup

- Avoids Inside Bag Contamination



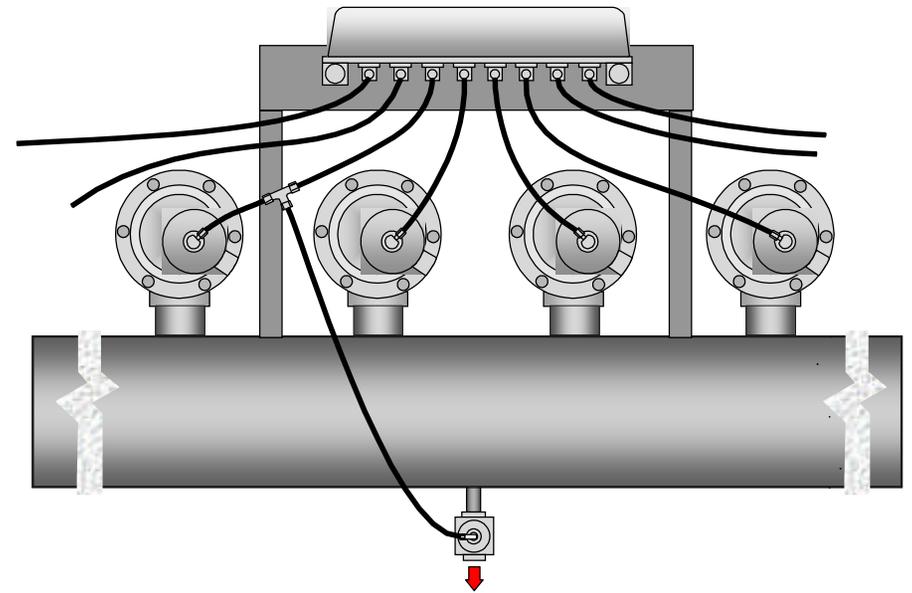
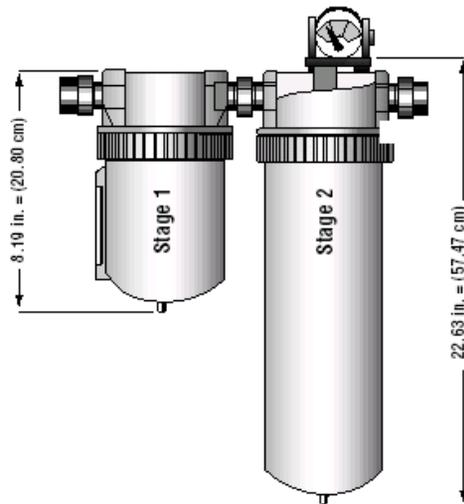
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- Filtration Media
- Installation
- **Operation**
- Ventilation Systems
- Problems and Solutions

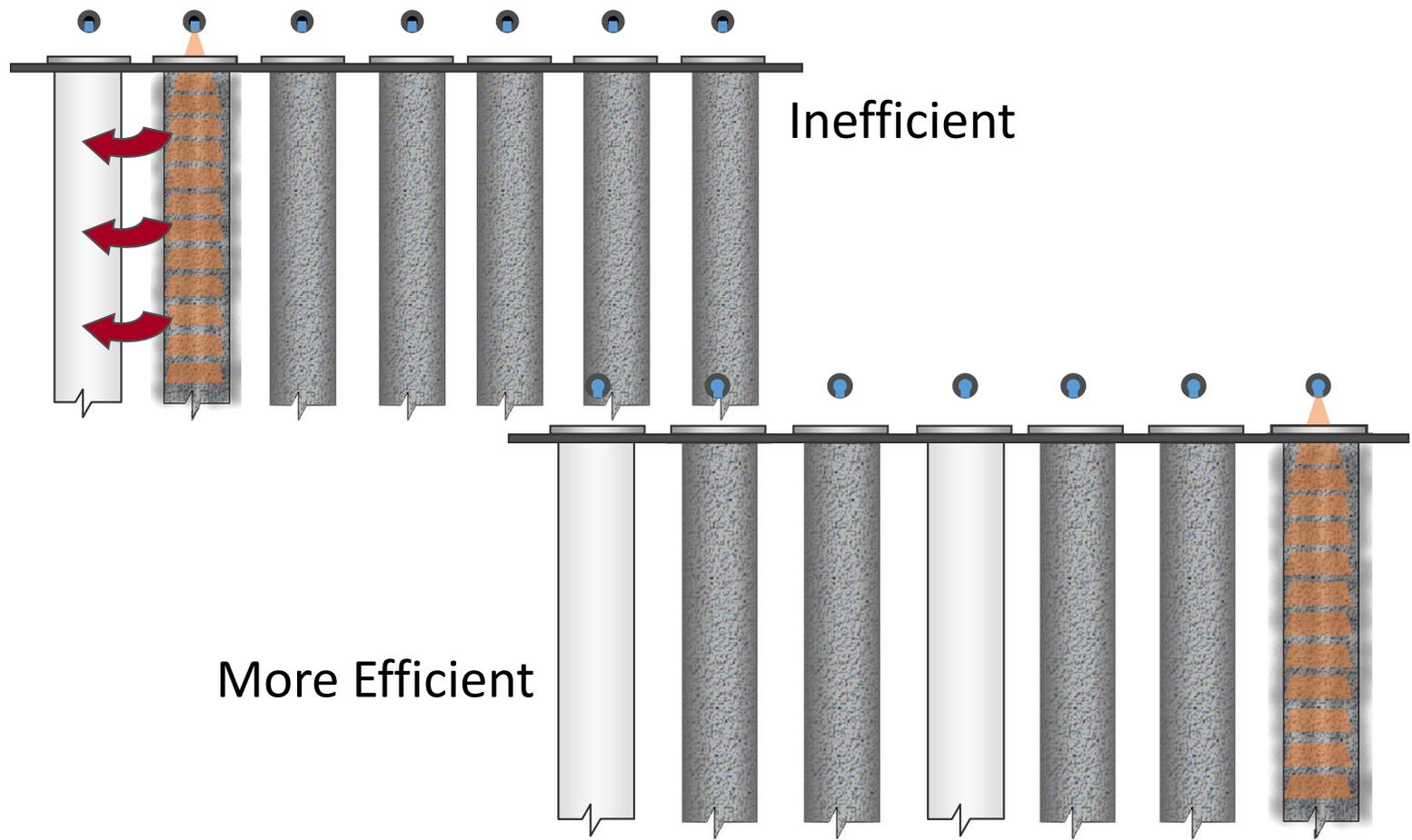


Pulse Jet System

- Apply Recommended Pressure and Pulse On-Time
- Typical 80 – 90 psi, 0.1 to 0.2 seconds
- Use Clean, Dry Compressed Air



Pulse Jet Activation Sequence



Inefficient

More Efficient

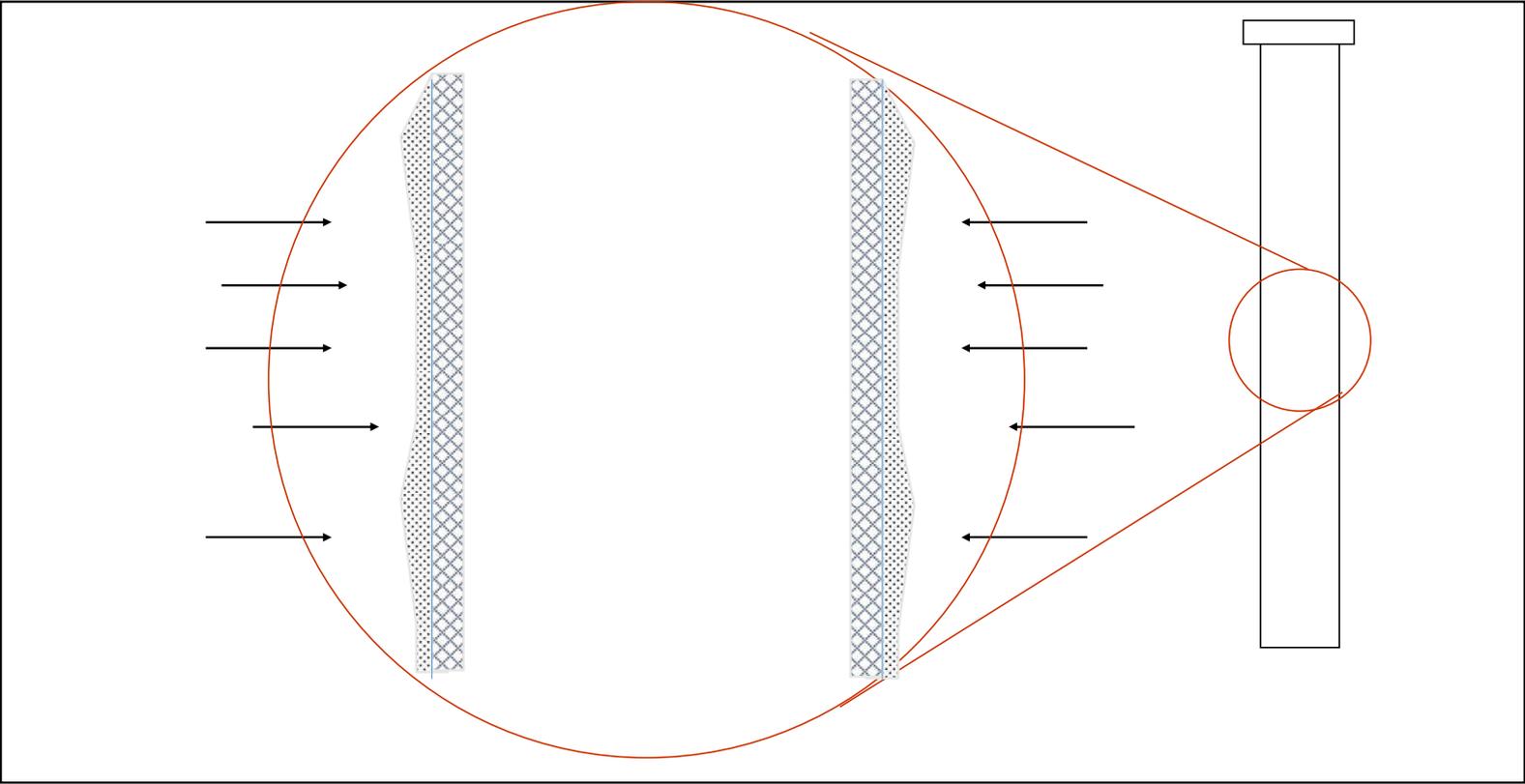
Flow Balancing

- The Fan Will Suction Through the Path of Least Resistance
- Restrict Flow on Closer Vents

Is My Baghouse Healthy?

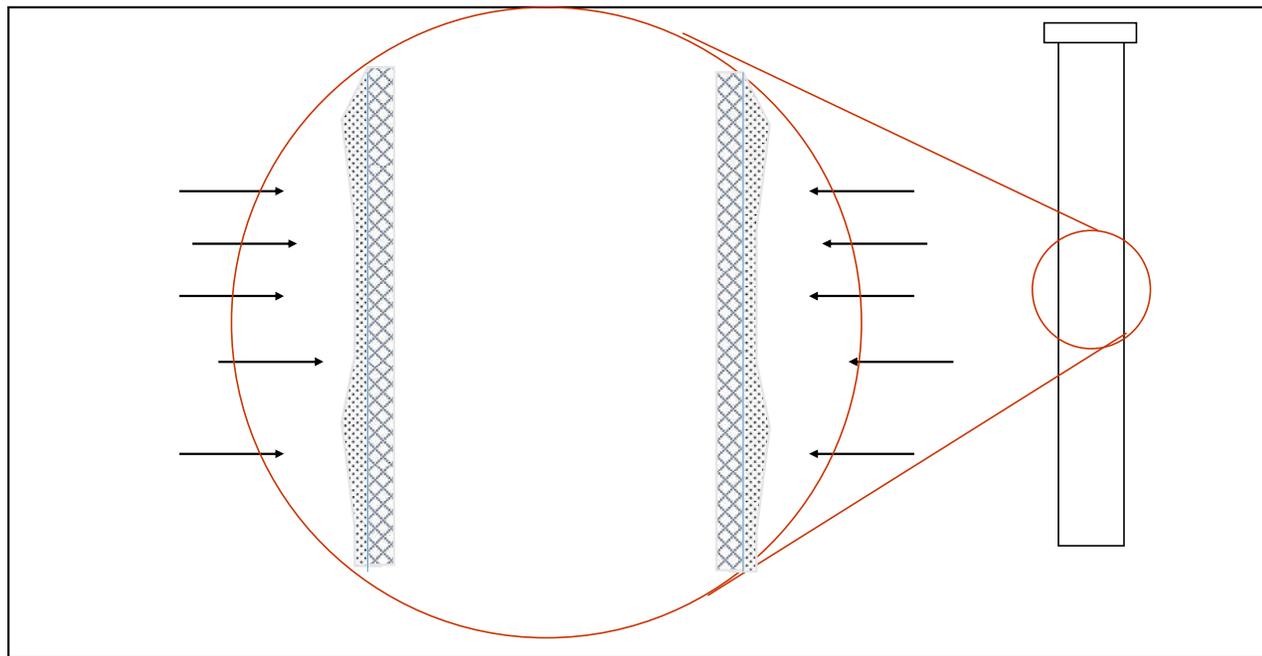


Dustcake - Filtered Material Buildup on Media



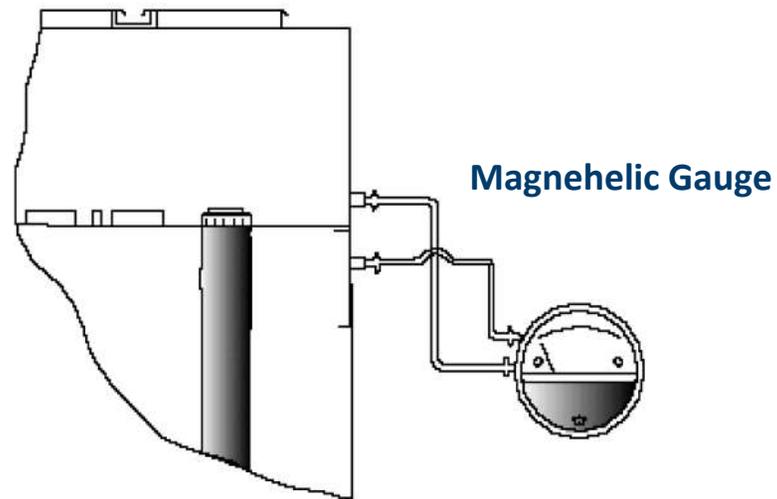
Verify a Good Dustcake

- Differential Pressure



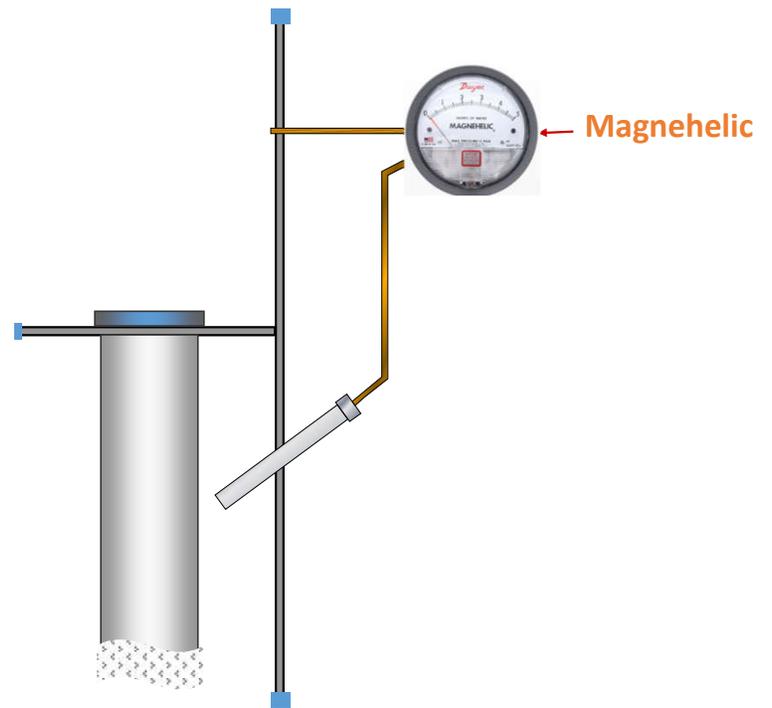
Differential Pressure

- Operator's Stethoscope
- Indicates a Problem Before it Becomes Disaster
- Good DP Range is around 4" to 5.5" w.g.



Ensure Good DP Measurement

- Dirty Side Plug
- Inclined Pipe Works



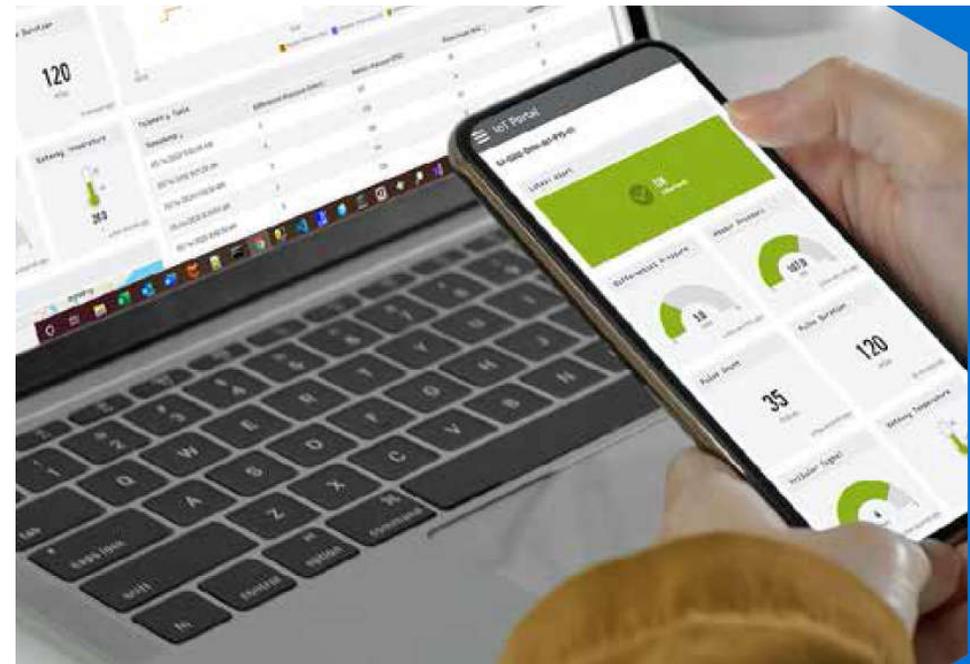
DP Measuring Devices

- Manometer
- Magnehelic
(Accessible)



Smart Plant Monitor

- Multiple Sensors
Temp, Vibration, Pressure,
Flow, Emissions, Other
- Wireless Installation
- Send Warning to SmartPhones
- Inexpensive



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- **Ventilation System**
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Purpose of a Vent System

- ~~• Suction Dust~~

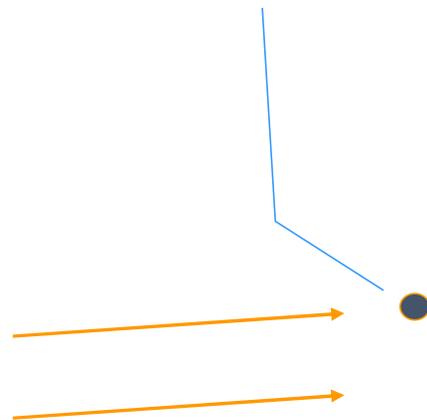


Basic Concepts of Ventilation Systems

- Capture Velocity Concept
- Closed Box Concept

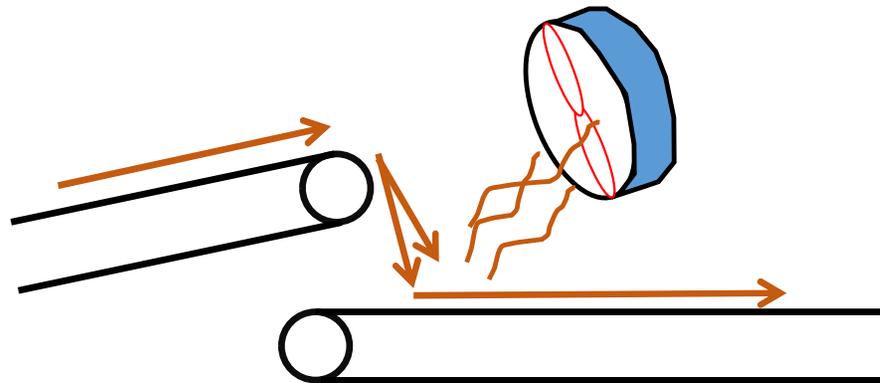
Capture Velocity

- A Draft of Air Influences Particle Behavior
- This Can Be Used to Address Dust Emissions Problems



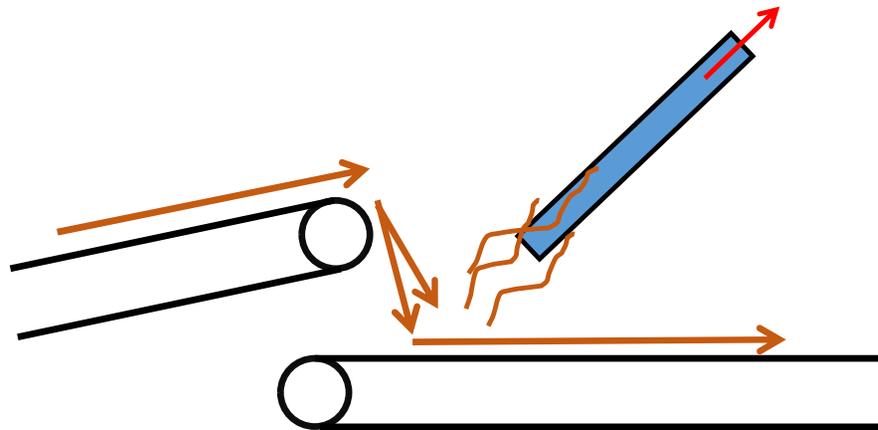
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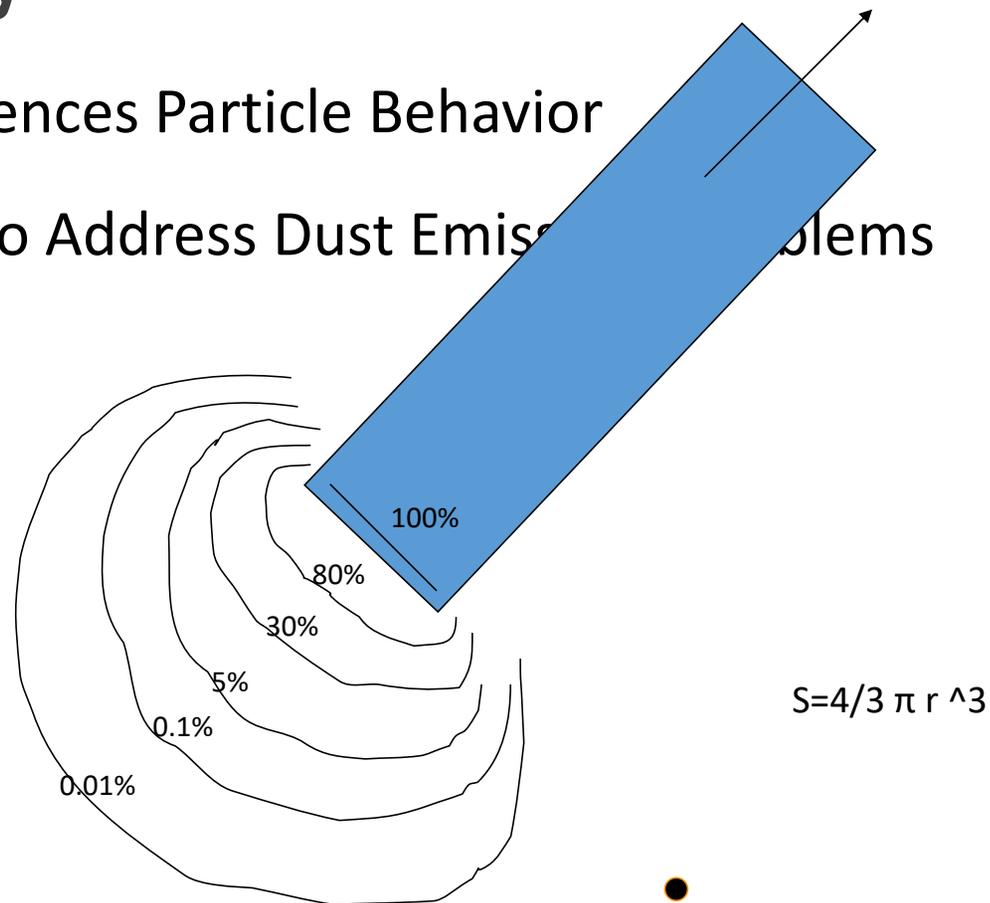
Capture Velocity

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Capture Velocity

- A Draft of Air Influences Particle Behavior
- This Can Be Used to Address Dust Emission Problems
- **By Itself, NOT A Solution**



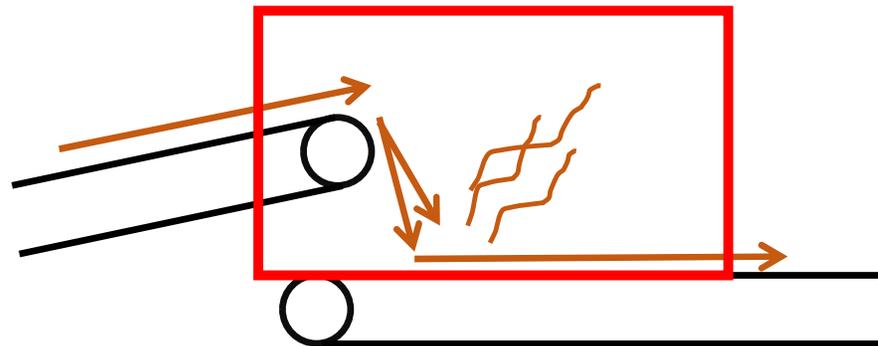
Closed Box Principle

- Dust in a Sealed Box Is NOT a Problem



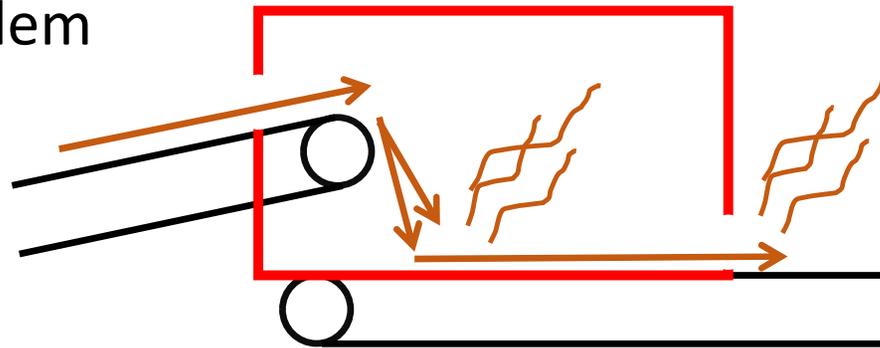
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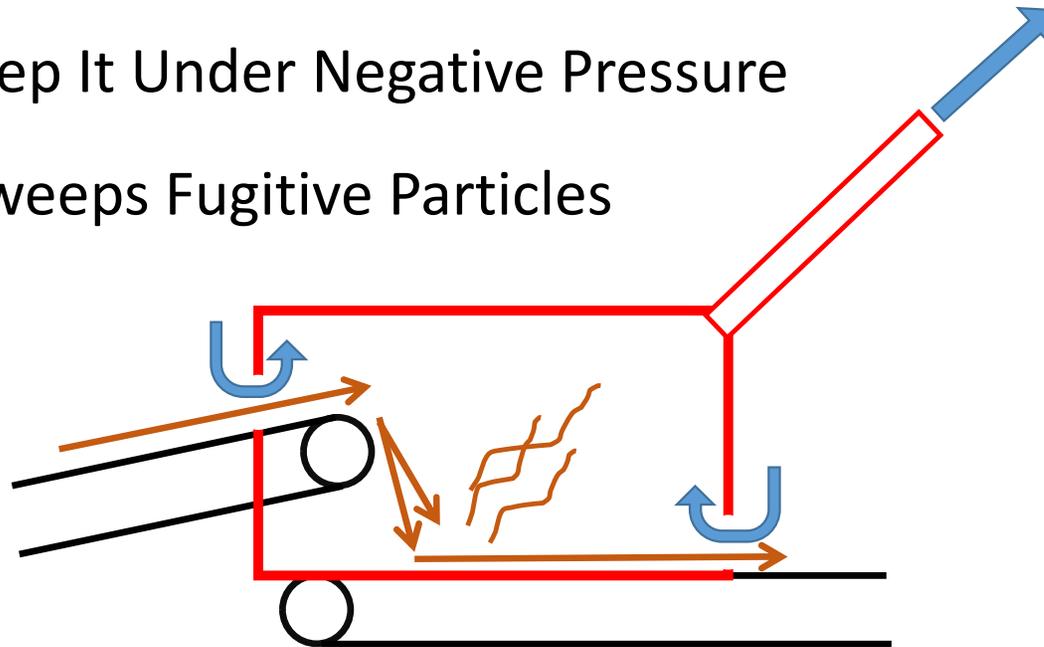
Closed Box Principle

- Dust in a ~~Sealed~~ Box Is NOT a Problem
- Helps, But Does NOT Solve The Problem



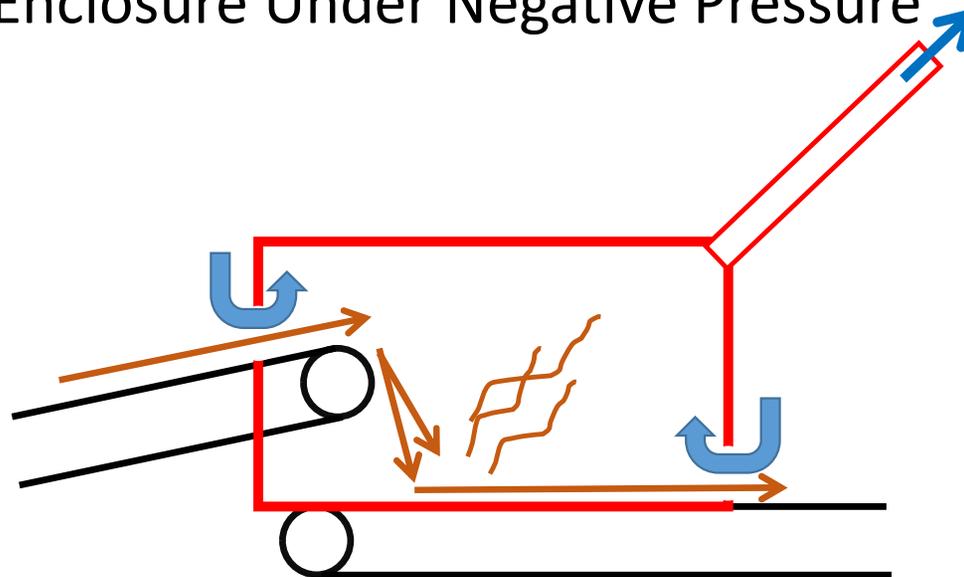
Ventilation Solution

- Combine Both Principles
- Enclose and Keep It Under Negative Pressure
- Incoming Air Sweeps Fugitive Particles

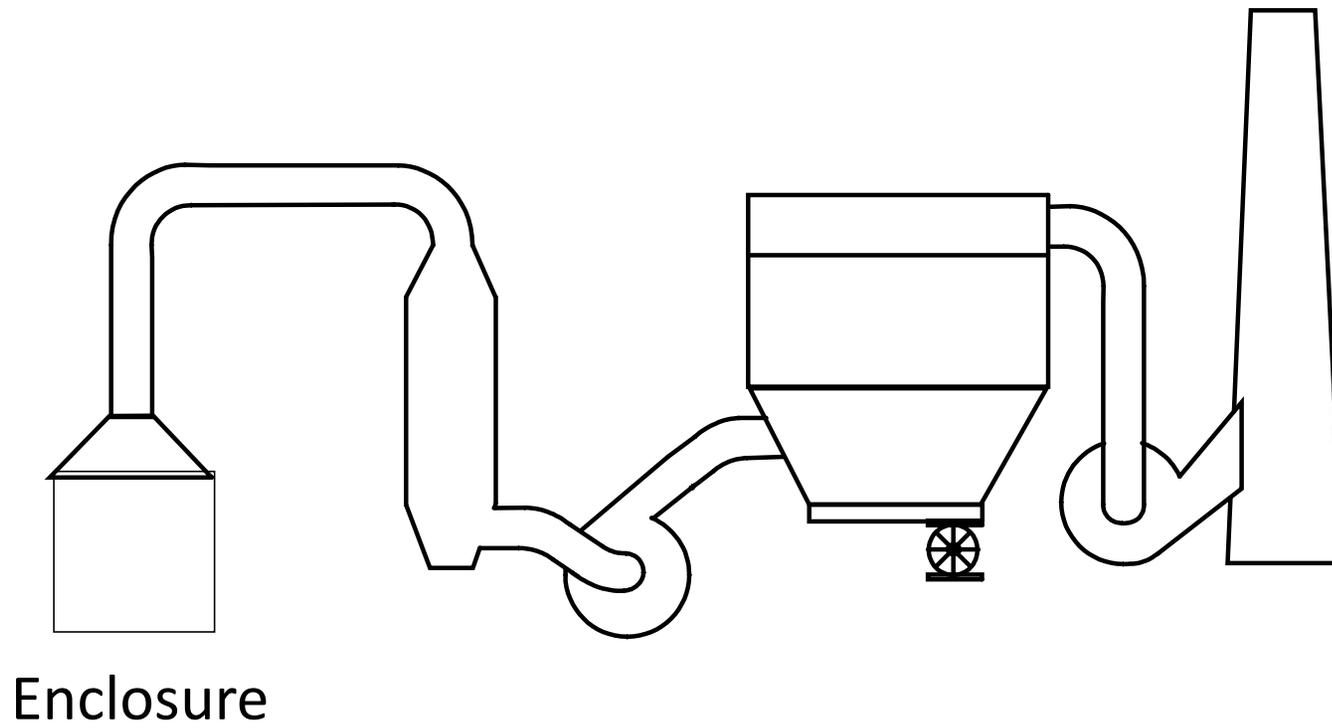


Purpose of Ventilation System

- Is NOT to Suction Dust
- It's to Keep an Enclosure Under Negative Pressure



Ventilation System



Enclosures

- Box Over the Source of Emissions
- Bad Example

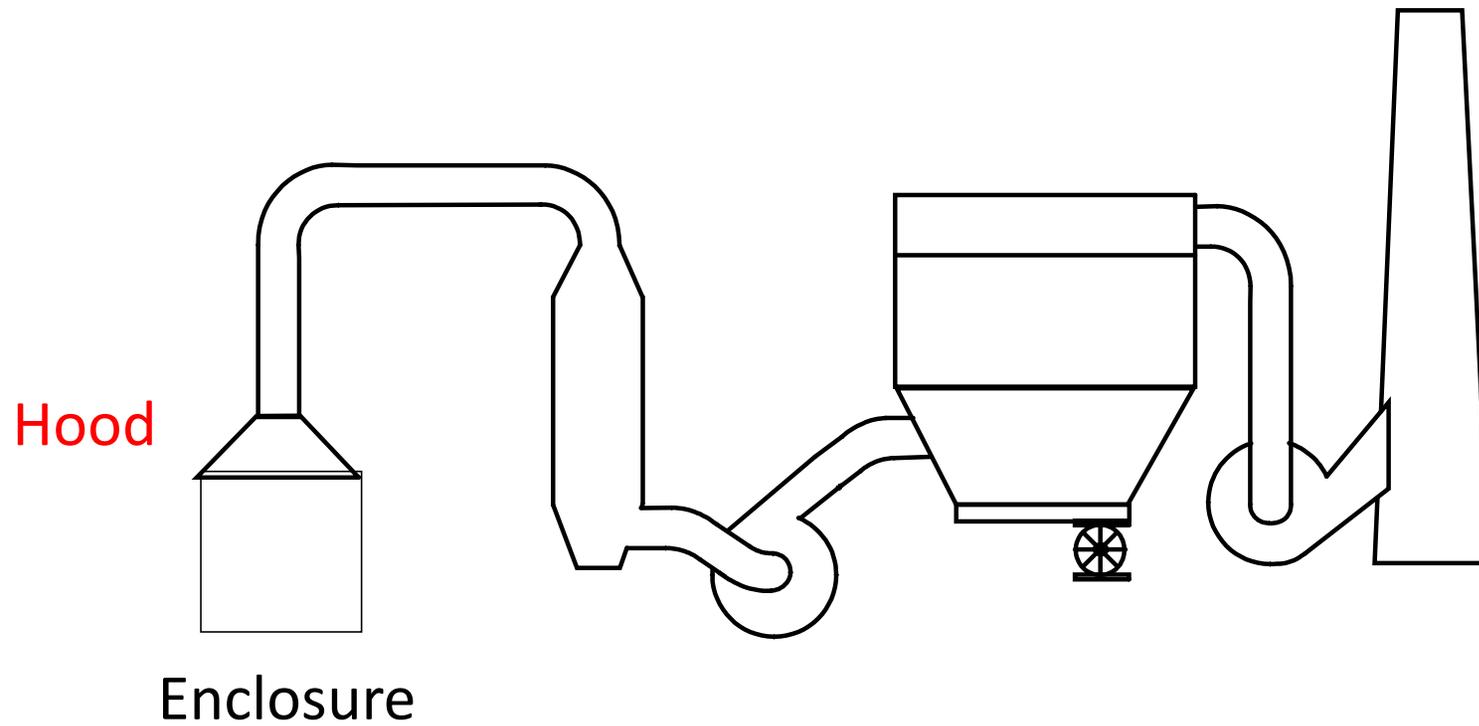


Enclosures

- Good Enclosure

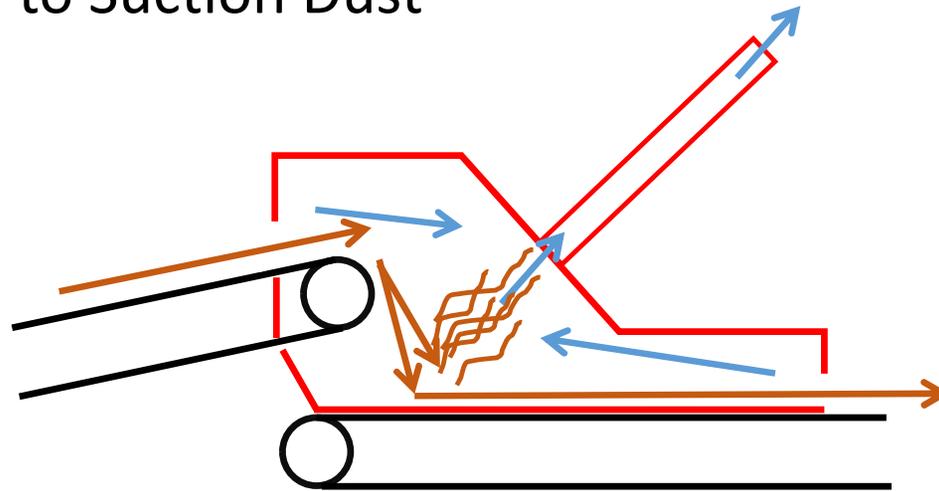


Ventilation System



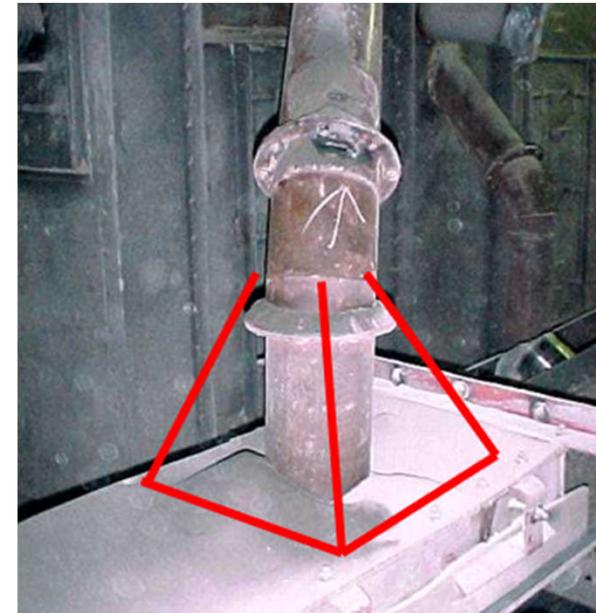
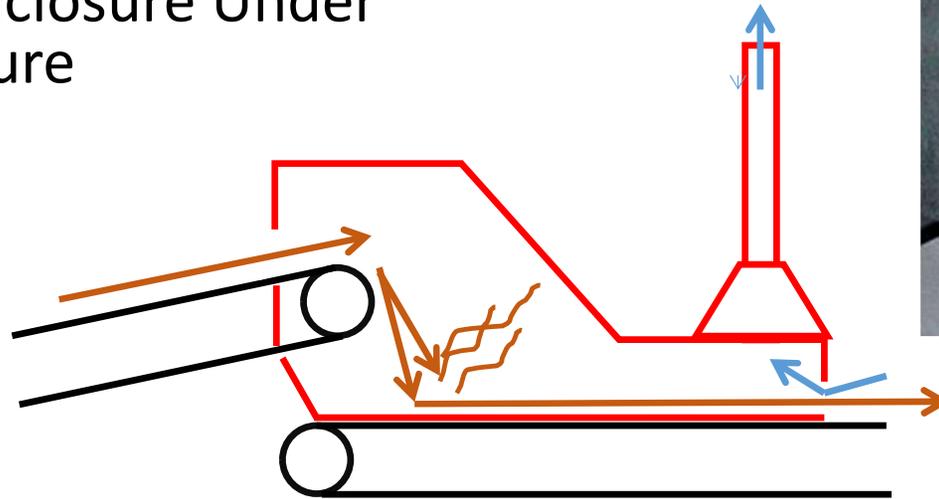
Vent Point Position

- Purpose: Keep Enclosure Under Negative Pressure
- Purpose is NOT to Suction Dust



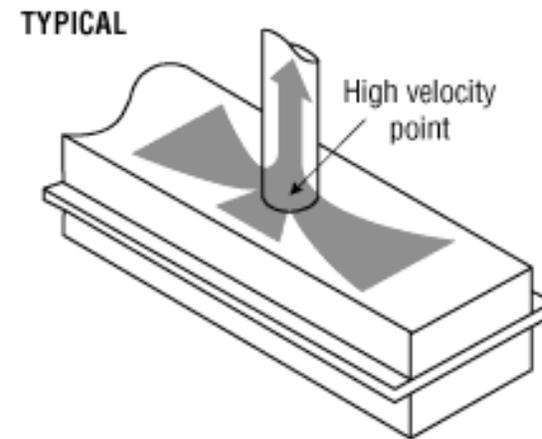
Vent Point Optimized With Hood

- Minimize Suction of Material
- Still Keeping Enclosure Under Negative Pressure



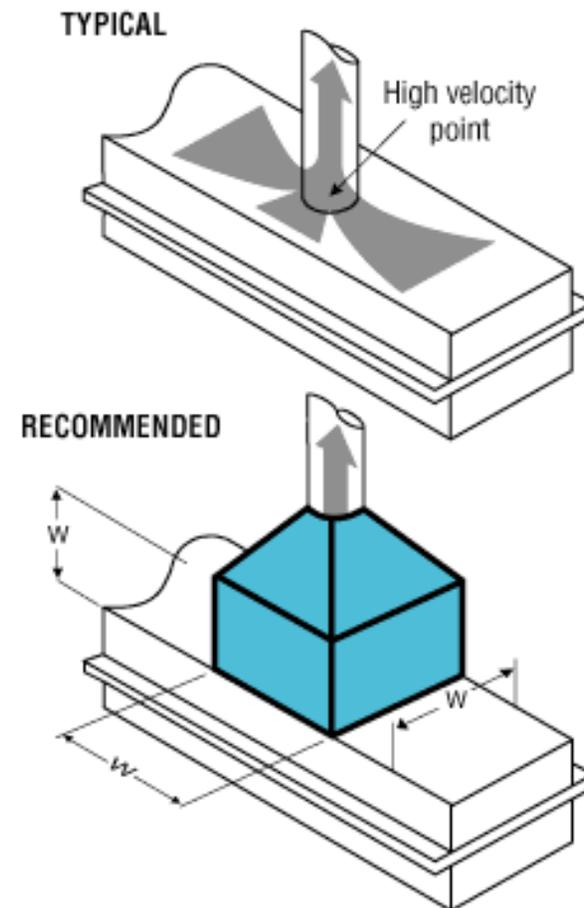
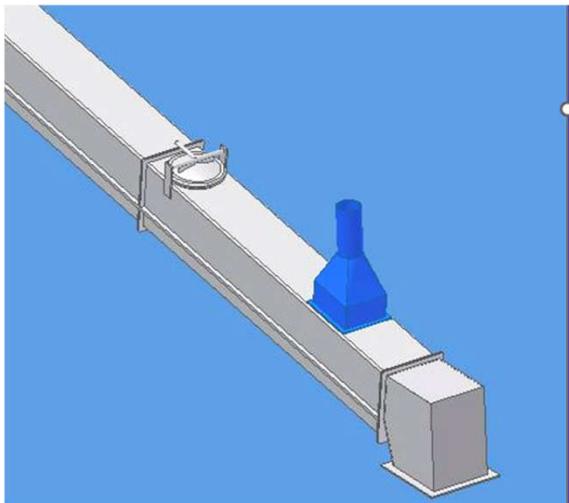
Hoods

- Minimize Flow Restriction
- Get Away From The Cloud of Dust
- Minimize Suction of Material



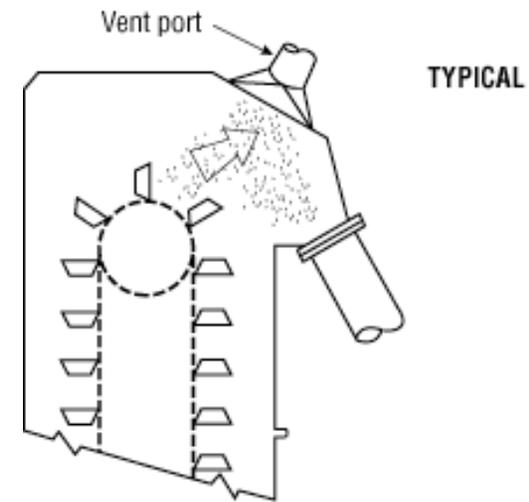
Airslide Hood

- Minimize Flow Restriction
- Get Away From The Cloud of Dust
- Minimize Suction of Material



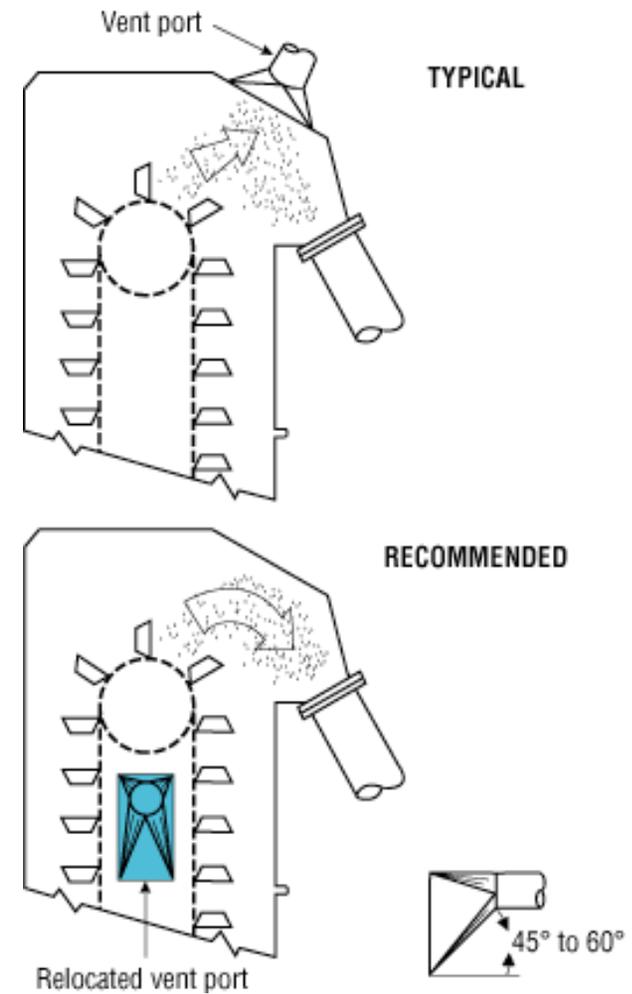
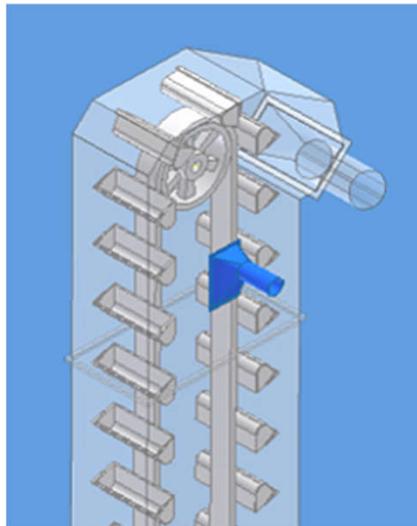
Elevator Hood

- Minimize Flow Restriction
- Get Away From Cloud of Dust
- Minimize Suction of Material

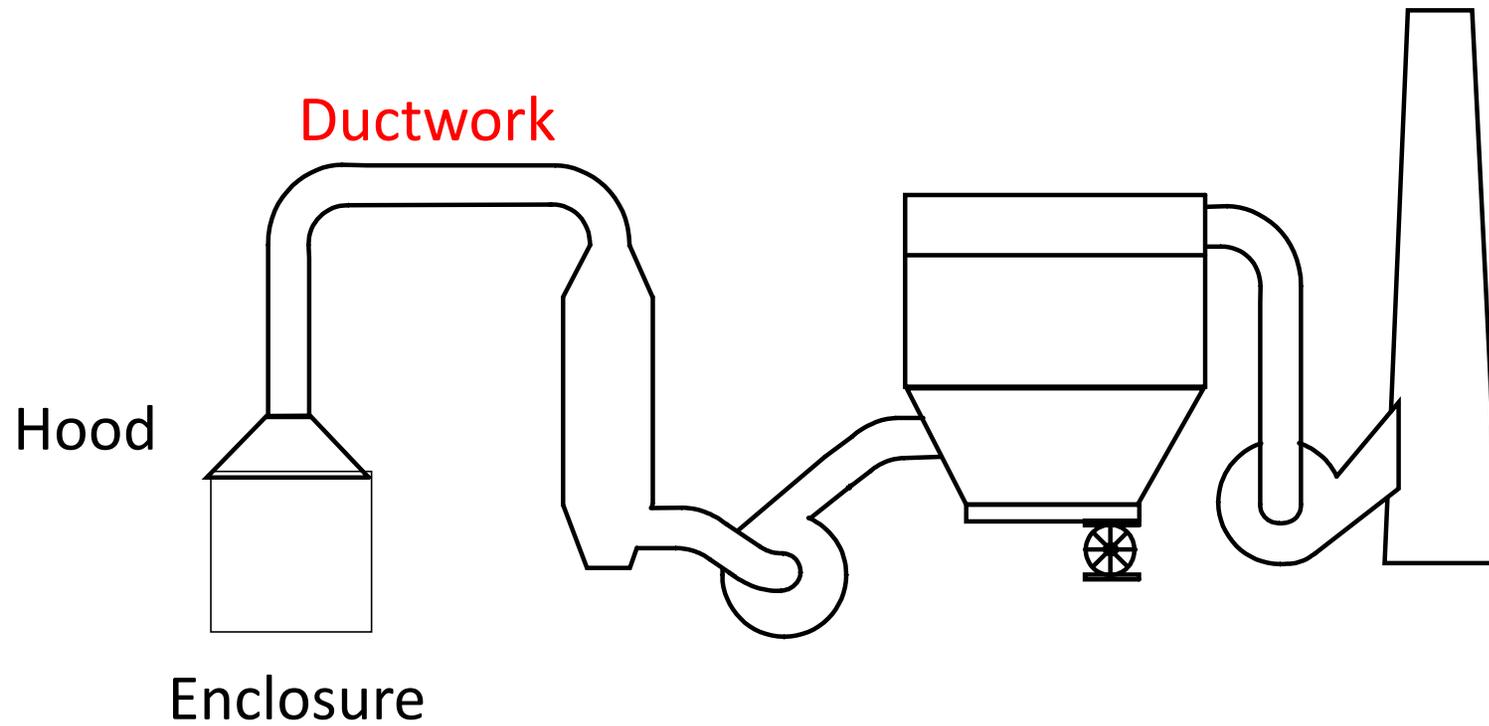


Elevator Hood

- Minimize Flow Restriction
- Get Away From Cloud of Dust
- Minimize Suction of Material

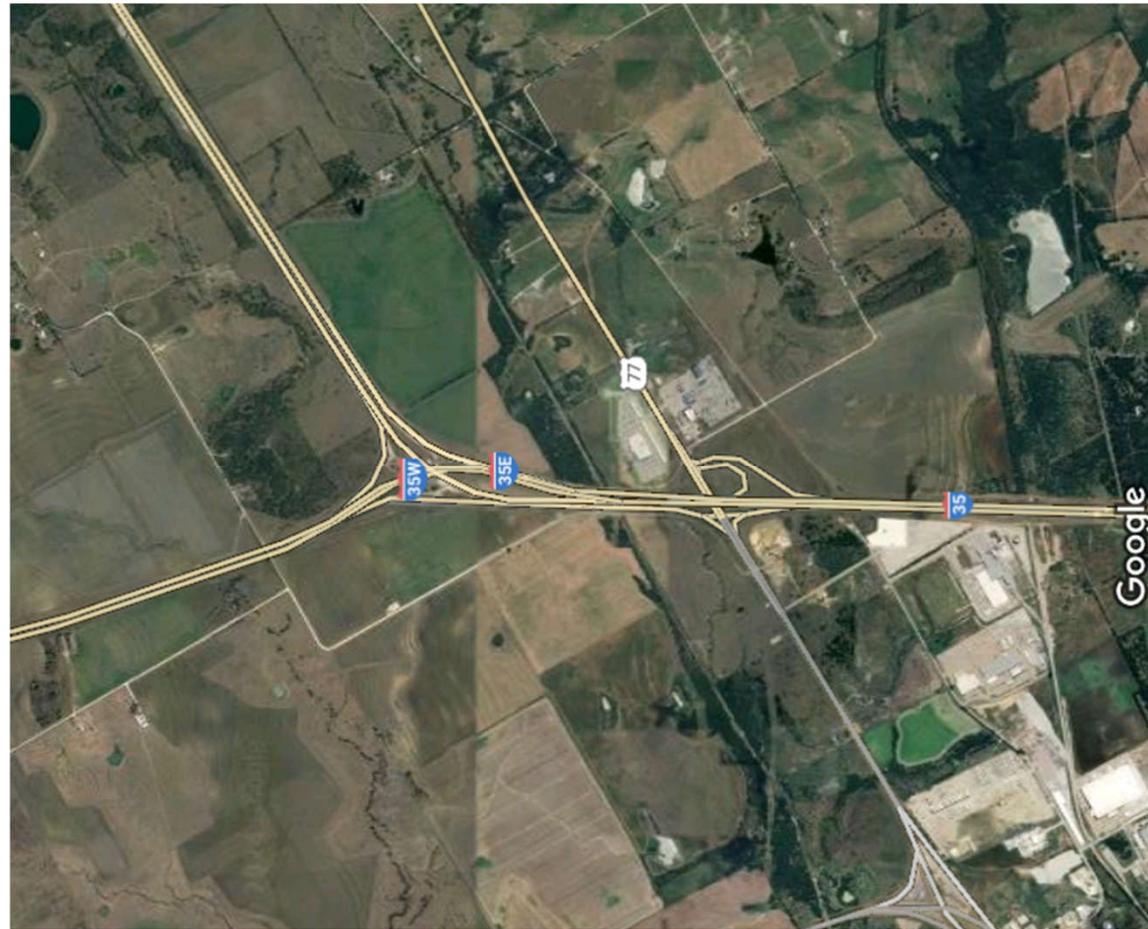


Ventilation System



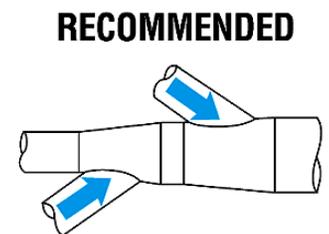
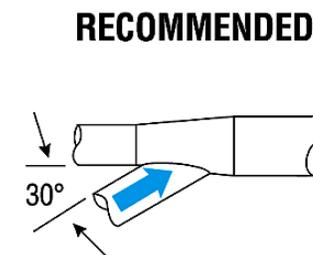
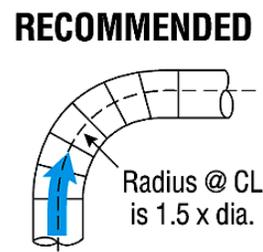
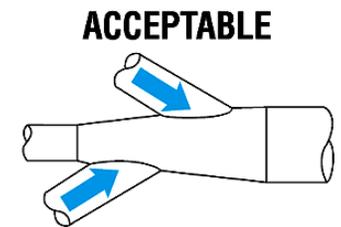
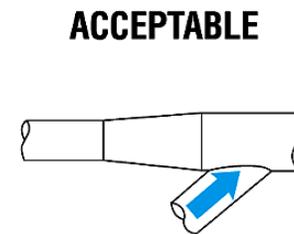
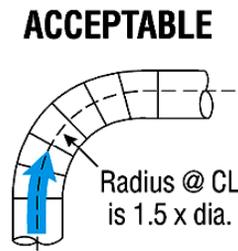
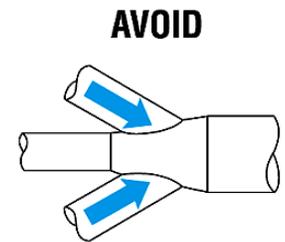
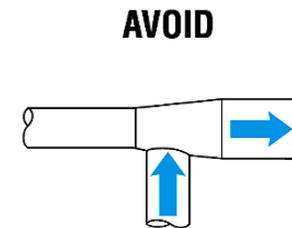
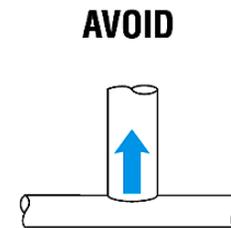
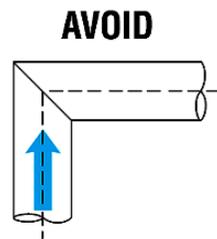
Interstate Highway

- Smooth Flow
- Traffic And Speed
- Just Like Ductwork



Ductwork

- Smooth Flow
- Think of Interstate Highway



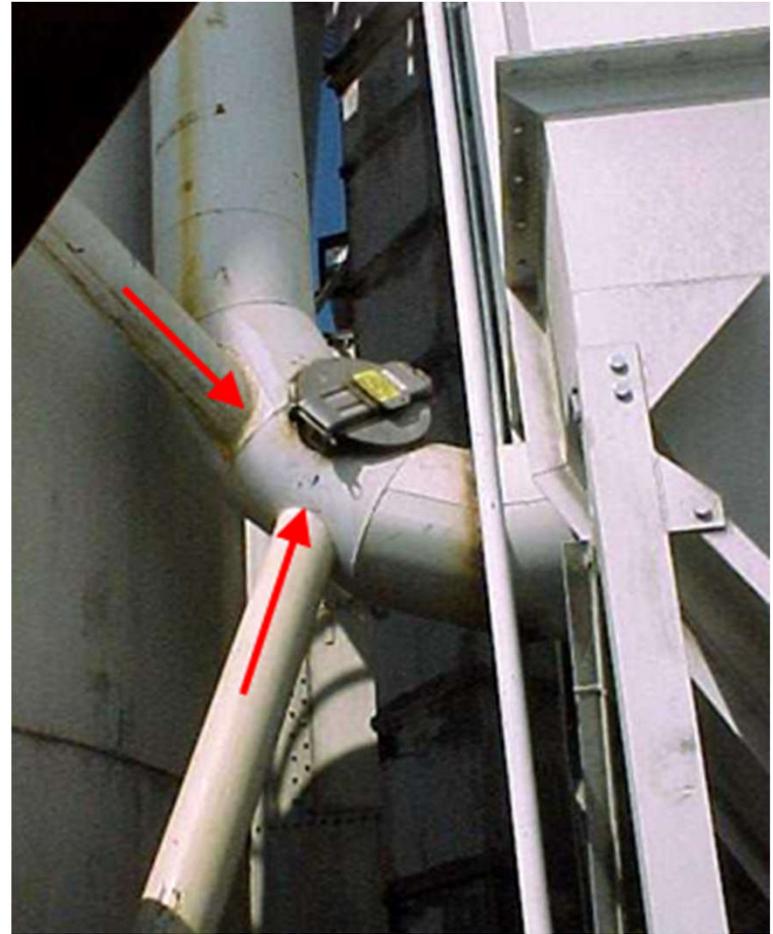
Ductwork

- What NOT To Do

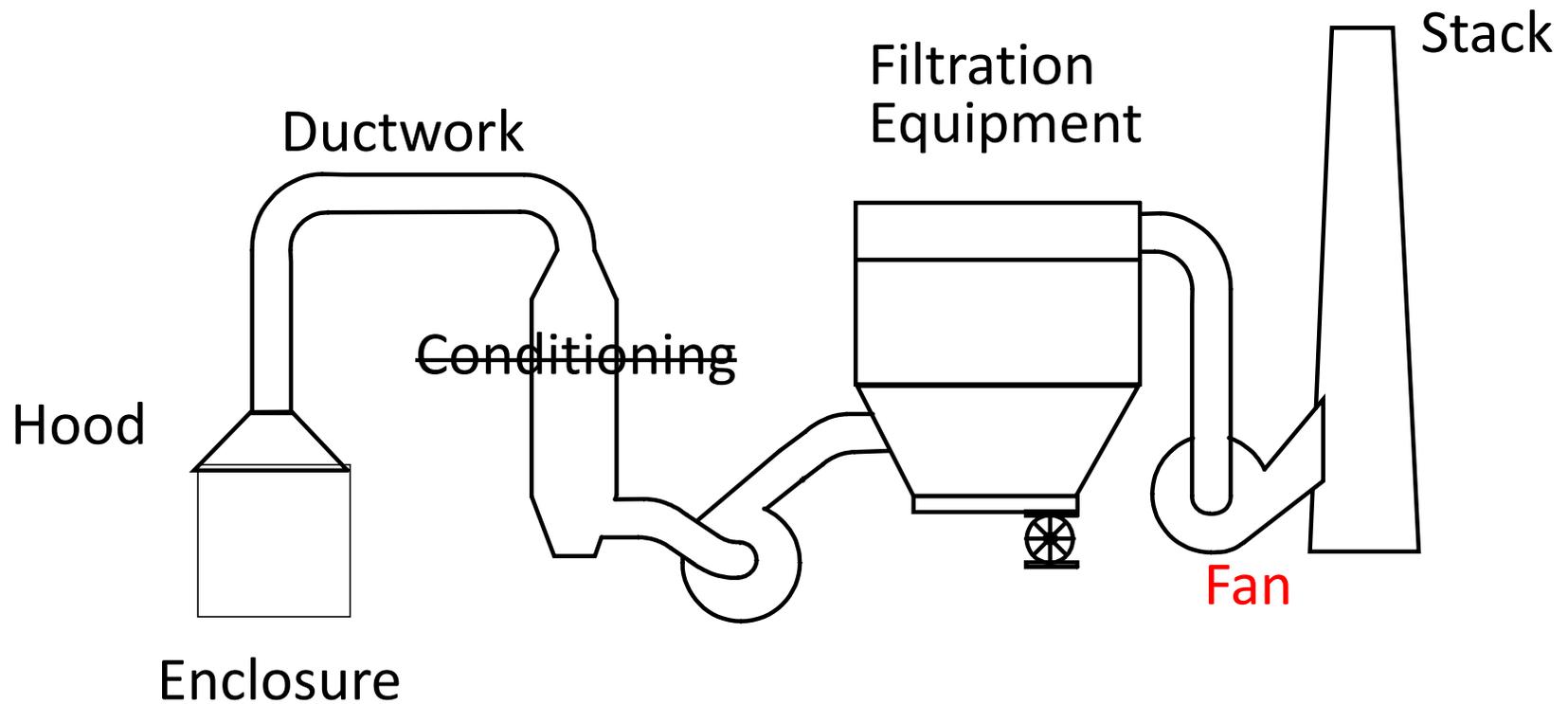


Ductwork

- What NOT To Do



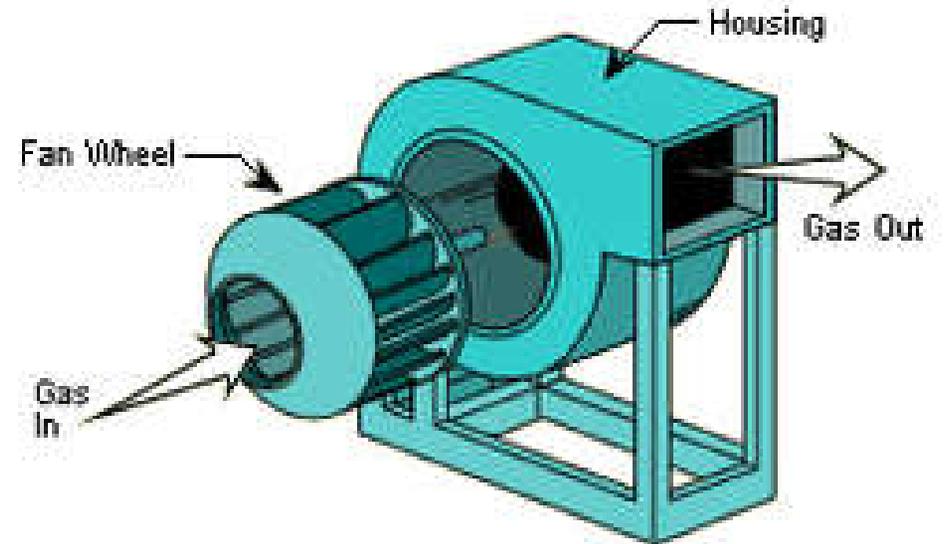
Ventilation System



Fans

Axial

- High Q
- Low P



Centrifugal

- High P
- Low Q



- Works Backwards
- Choking Will Not Overamp

Poor Fan Outlets

- Smooth, Unrestricted Flow



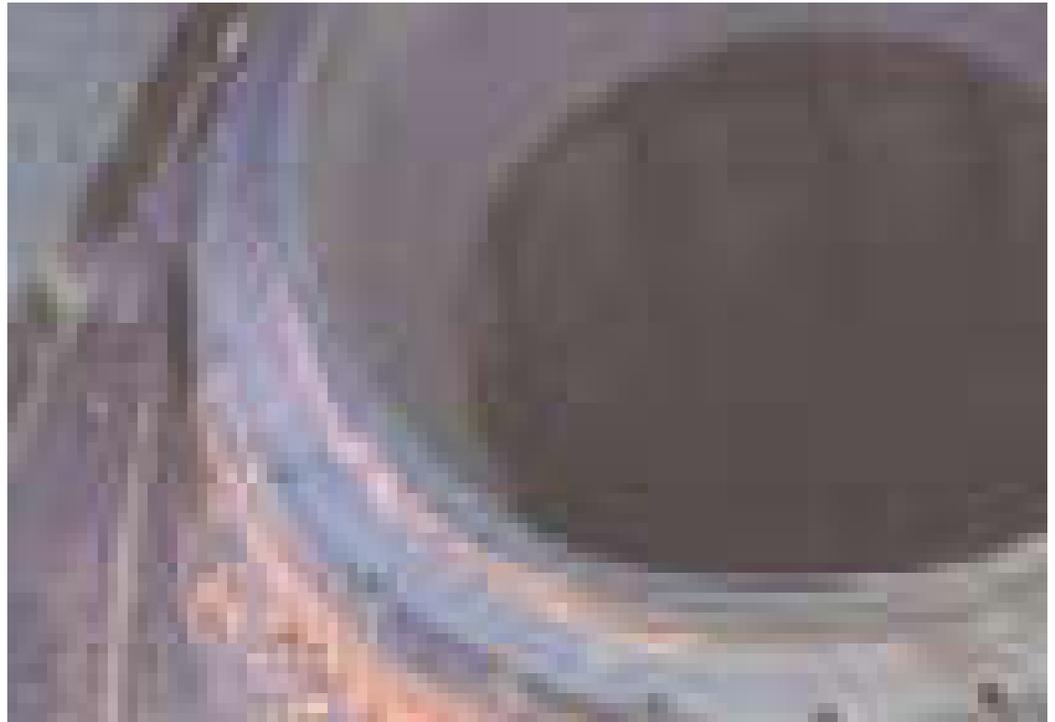
Agenda

- Pulse Jet Baghouses
- Filtration Media
- Installation
- Operation
- Ventilation System
- **Problems and Solutions**



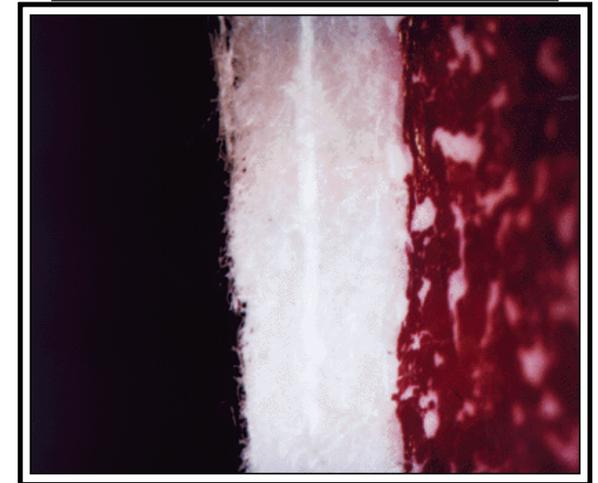
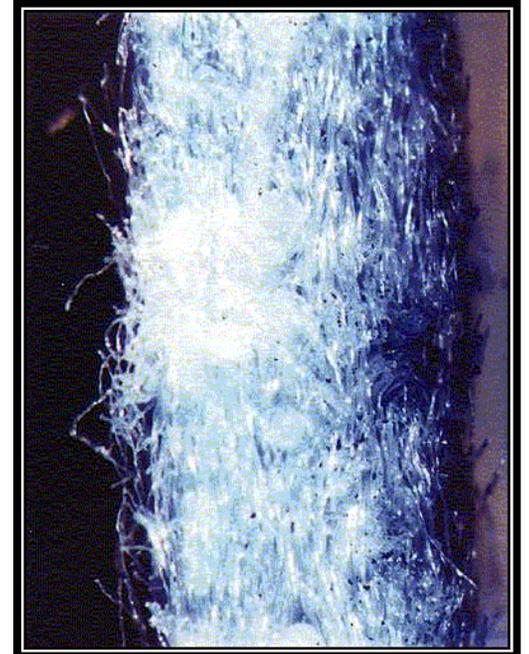
Finding Leaks

- Leak Powder



Humidity, Fine Dust, High DP

- PTFE Membrane Bags



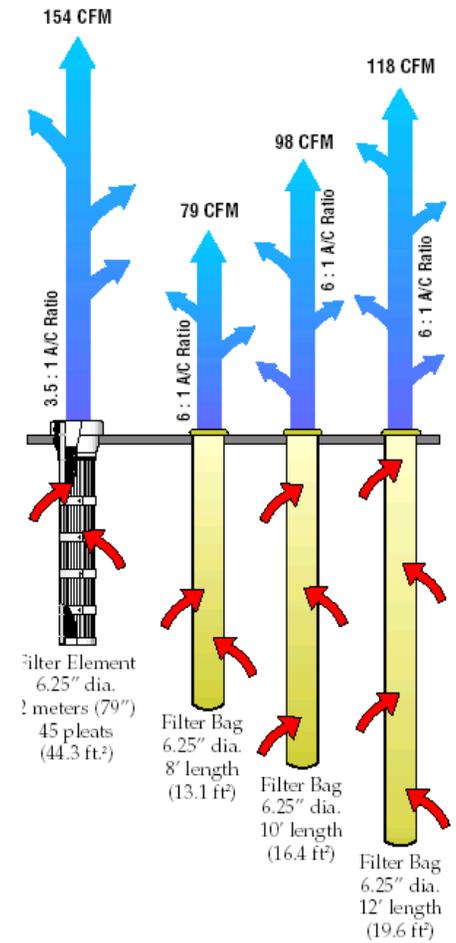
Inactive Pulse Valves

- Masking Tape on Breathers



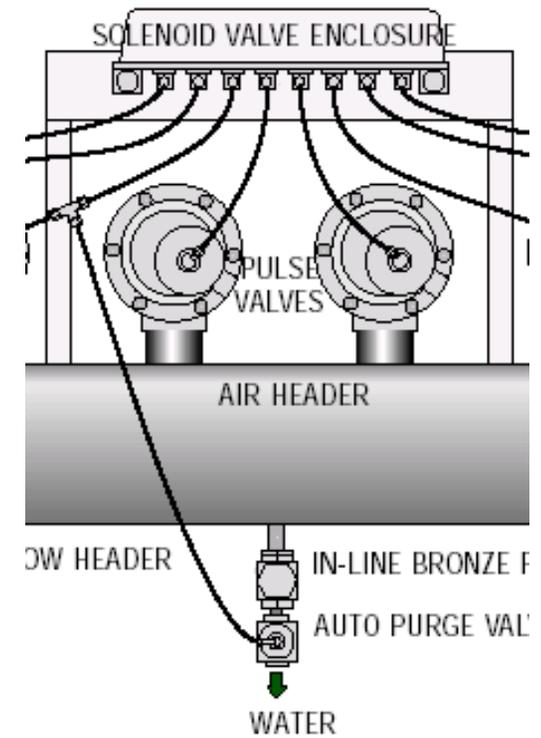
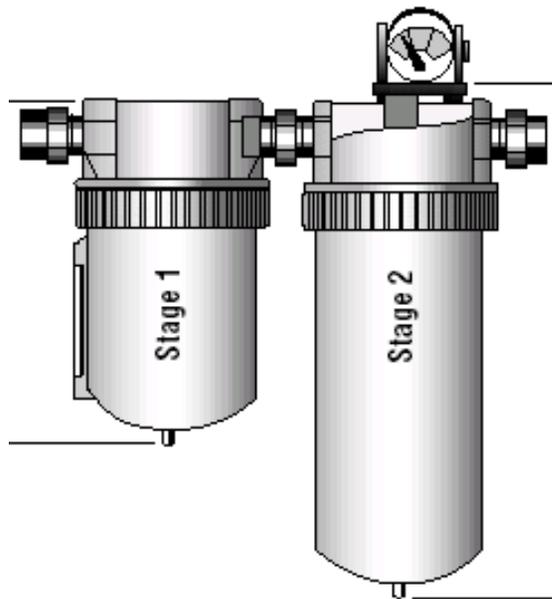
Low Capacity / BL Poor Seal

- Pleated Filters



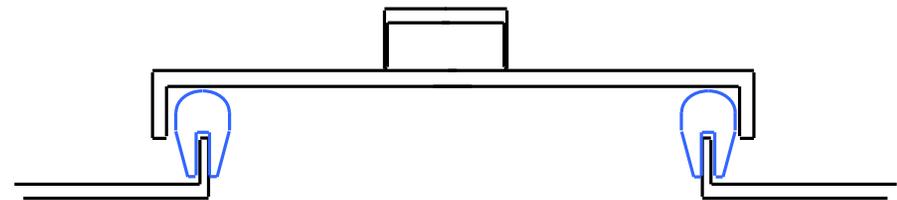
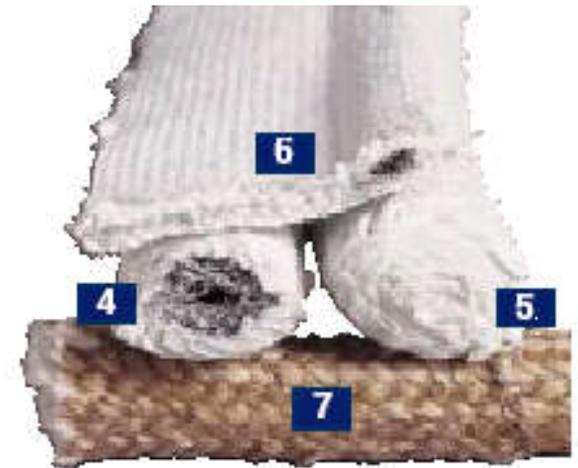
Compressed Air Moisture

- Filter Trap / Auto Purge



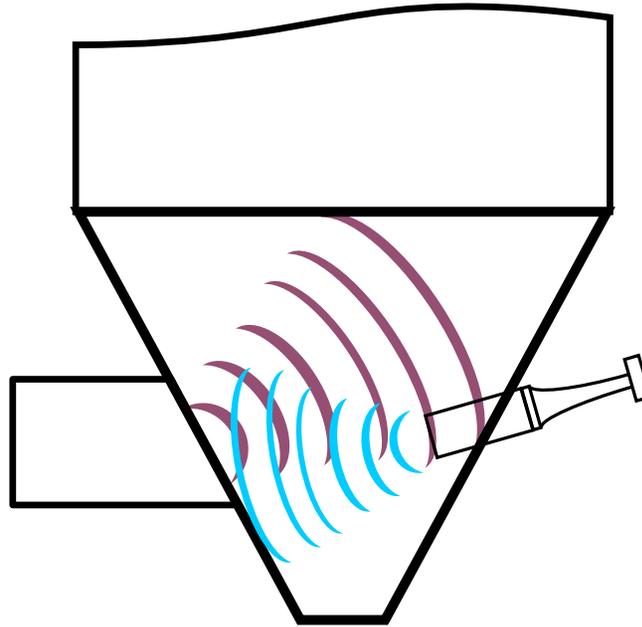
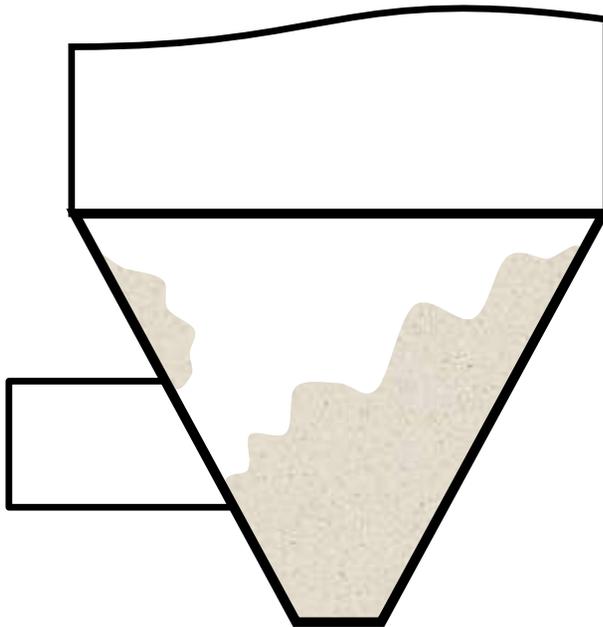
Ambient Air Inleakage

- New, Correct Seals



Hopper Buildup Issues

- Acoustic Horns



Mysterious Bag Failures/ Deterioration

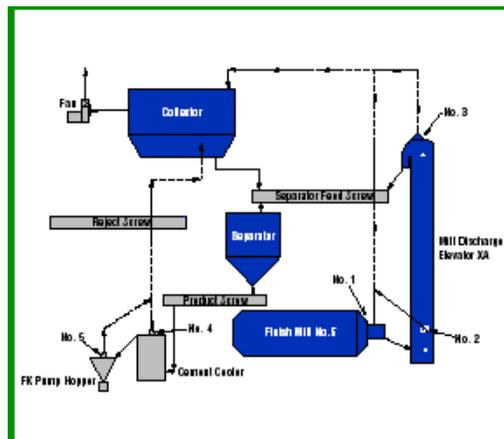
- Lab Analysis

II Lab Report Template

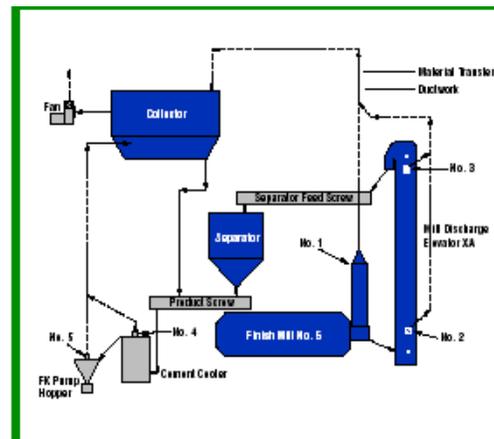
Report Sections		Explanation
A.1	Title Page	
A.2	Abstract	
A.3	Table of Contents	
A.4	Introduction <ul style="list-style-type: none"> • Background / Theory • Purpose • Governing Equations • Discovery Question (DQ) 	In this section, you describe what you are trying to find and why . Background and motivation are used to provide the reader with a reason to read the report.
A.5	Methods <ul style="list-style-type: none"> • Experiment Overview • Apparatus • Equipment Table • Procedures 	In this section, you explain how question addressed is answered. Clearly explain your work so it could be repeated.
A.6	Results <ul style="list-style-type: none"> • Narrate (like a story) • Tables and Graphs • Equations in Variable Form • Uncertainties • Units! • Indicate Final Results 	In this section, you present the results of your experiment. Tables, graphs, and equations are used to summarize the results. Link equations and visuals together with narrative, like a story. Remember your audience.
A.7	Discussion <ul style="list-style-type: none"> • Answer DQ • Theoretical Comparison • Explanation of Anomalies / Error • Conclusion / Summary • Future Work 	In this section, you explain and interpret your results. Insert your opinion, backed by results. Discuss issues you had and how this could be corrected in the future. The conclusion is a summary of your results and discussion.
A.8	References	

Find Cause & Determine Solution

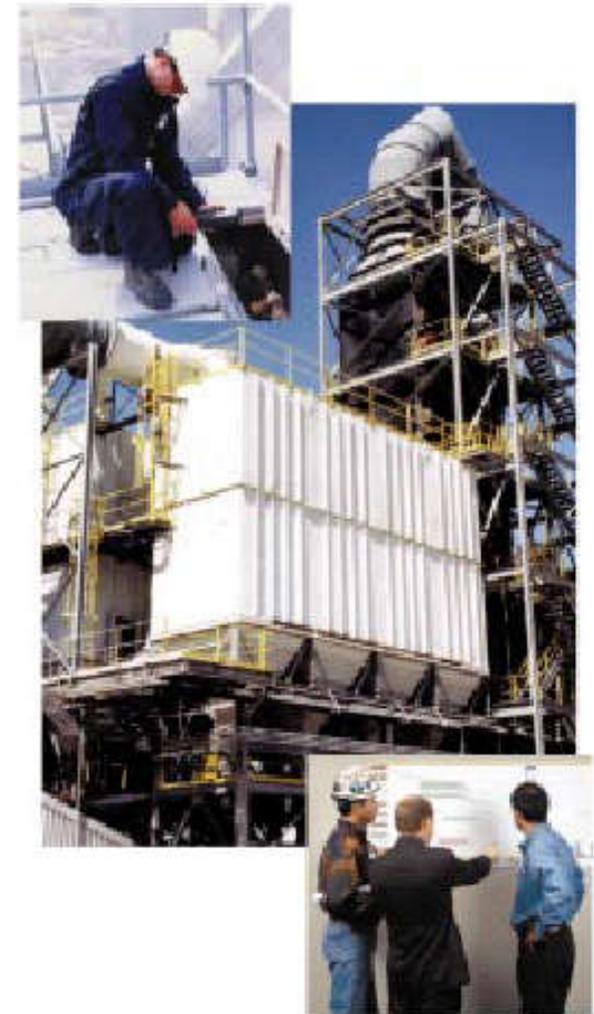
- Vent System Engineering Studies



*Existing Finish Mill Layout
(Cement Plant)*



*STEP Recommended Finish Mill Layout Resulting
In Better Dust Collection System Performance
and Increased Production*



IAC at-a-Glance

- Founded in 1987
- Industrial Equipment Parts and Components
- Baghouse OEM
- Plant Services, Emergency Service
- EPC Projects / Construction / Plant Upgrades





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lcastano@iac-intl.com