Baghouse Basics

operation and maintenance

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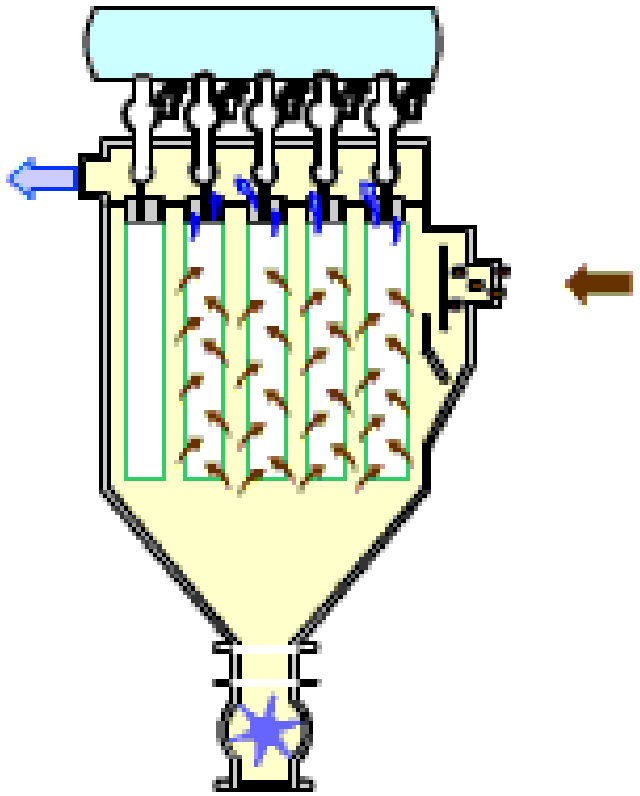
kice.com

Baghouse Applications

- Dust Control
  - *Found at end of dust control system to filter air*
- Bin/Silo Venting
  - *Mounted atop bins, silos, or plenums to vent and filter air*
- Receiving
  - *Used as a receiver at end of conveying line (positive or negative pressure)*
  - *Collects product and relieves filtered air*

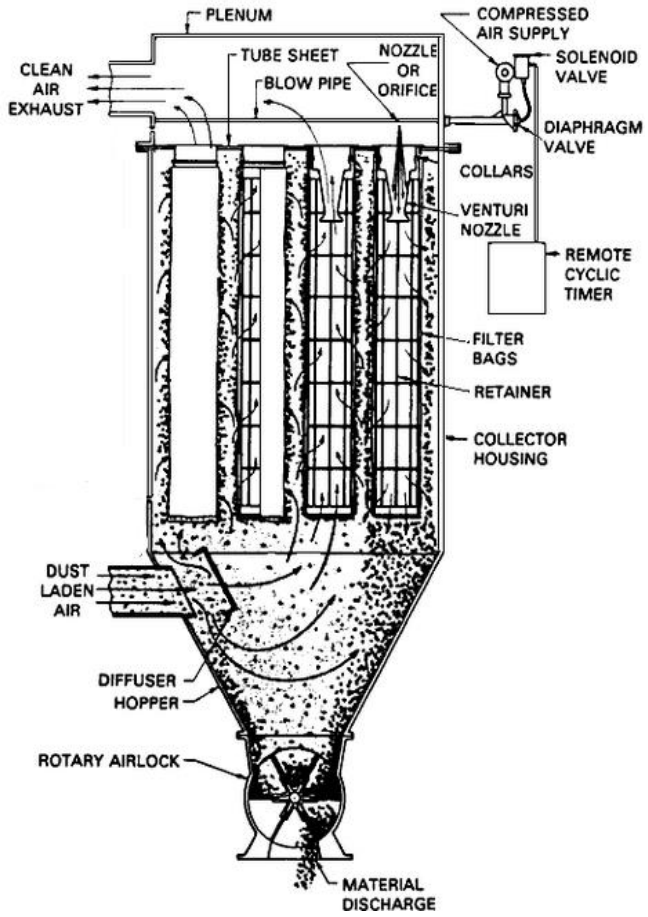
Baghouse Function

- Dust-laden air enters dirty-air chamber
- Air is drawn through filter media
  - *Dust is captured on outside of filter media*
  - *Filtered air exits through filter exhaust*
- Reverse air “blows down” filter media
  - *Knocks trapped dust off of media*
- Material collects at bottom of hopper and exits through filter discharge



Baghouse Function

- Utilizes fabric socks for filtration
- Inherently very efficient
  - *Upwards of 99% efficient on most common dusts*
  - *High efficiency on sub-micron particles utilizing specialized filter medias*
- Dust “cake” on surface of filter bags aids filtration
- Reverse air cleaning system helps to clean bags and extend effective life



Baghouse Cleaning Systems

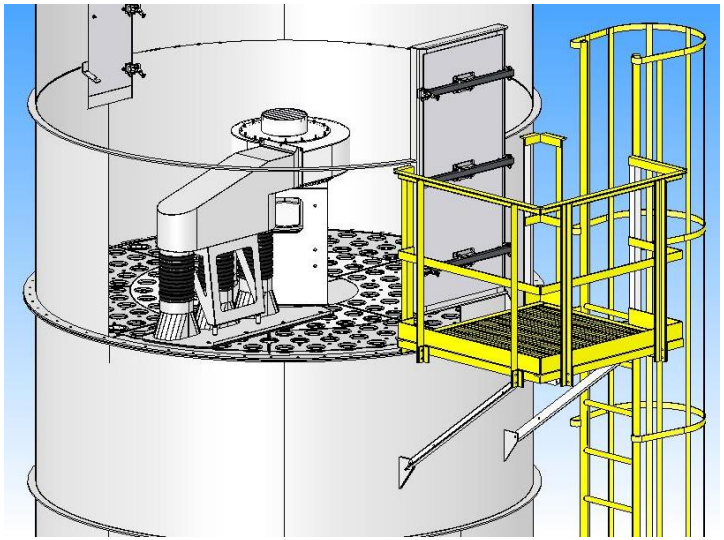
- High Pressure / Low Volume Cleaning
  - *Kice = VenturiJet Style Filter*
  - *80-100 psig air*
  - *Cleaning air supplied by "house" compressed air system*
  - *Venturi effect to "pop" bags*

Baghouse Cleaning Systems

- Medium Pressure / Medium Volume
  - *Kice = PneuJet Style Filter*
  - *10-12 psig air*
  - *Cleaning air supplied by PD Blower unit*
  - *Medium pressure “rush” of air to clean bags*

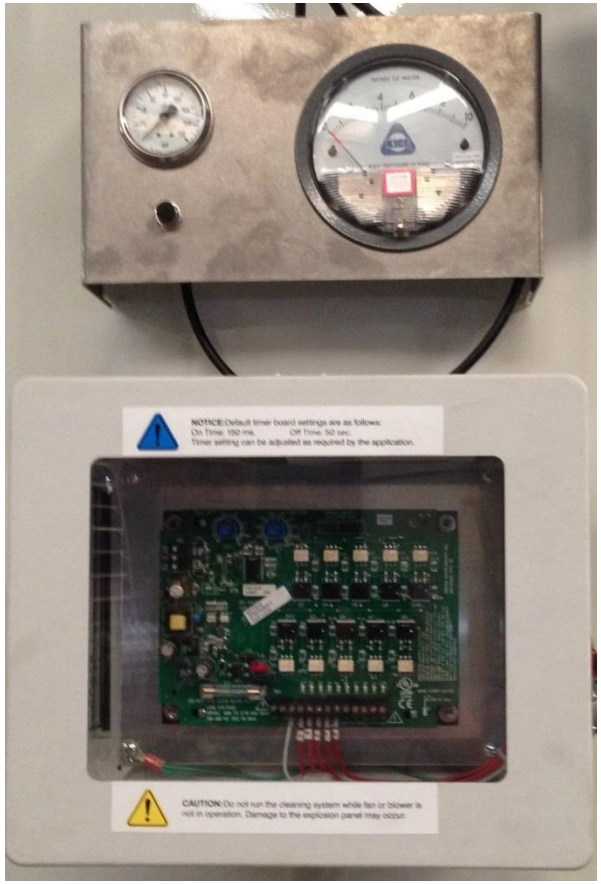
Baghouse Cleaning Systems

- Low Pressure / High Volume Cleaning
  - *Kice = CR Style Filter*
  - *20-50” wc air*
  - *Rotating fan delivers high volume of air*
  - *Forcefully pushes air through bags*



Baghouse Cleaning Systems

- Pressure gauge
  - *Reads air tank pressure*
  - *Push Palm button to read tank pressure*
- Magnehelic Gauge
  - *Measures Pressure Differential across filter bags*
  - *The difference in static pressure upstream (dirty air side) and downstream (clean air side) of the bags = pressure drop.*
  - *Magnehelic gauge mounted to filter, visible to operator.*
- Timer Board in Enclosure
  - *Sends signal to electronic solenoid valves to pulse air*
  - *Allows for adjustment for the application or fine-tuning*



Design Considerations

- Effective air filtration is relative to volume
  - *Air to Cloth ratio*
- Velocity also factors into effective filtering
  - *Can velocity*
  - *Interstitial velocity*
- Pressure drop / resistance across dirty bags challenges the air mover and affects the entire air system

Design Considerations

- Air to Cloth Ratio
  - *Establishing component of baghouse sizing*
  - *Refers to volume of air (cfm) in relation to filtration surface area (square ft)*

  - *EXAMPLE:*
    - 8,000cfm air required for dust control
    - Kice VR96-10 Filter offers 1,131ft² of filtration area

    8,000cfm / 1,131ft² filtration area = 7.07 air:cloth

Design Considerations

- Air to Cloth Ratio Rules of Thumb
  - *7-10:1 Ratio: Elevator, Cleaning House, General Suction*
  - *7:1 Ratio: Secondary Collector, High Humidity Air Systems*
  - *5:1 Ratio: Filter Receiver, Centro-vac System*

NOTE: Pleated filter bags require application at much lower air:cloth

Design Considerations

- Interstitial Velocity
  - *Upward velocity of air/particulate between filters inside baghouse*
  - *Measured in fpm (feet per minute)*
  - *Determined by dividing airflow (cfm) by cross sectional area of filter housing less bag area*
  - *Not to be confused with can velocity*

  - *EXAMPLE:*
    - 8,000cfm air required for dust control
    - Kice VR96-10 Filter offers 43.43ft² of open area between bags

    8,000cfm / 43.43ft² open area = 184.2fpm interstitial velocity

Design Considerations

- Interstitial Velocity Rules of Thumb
  - Varies with application, but generally assumed a can velocity of 300fpm or below is acceptable

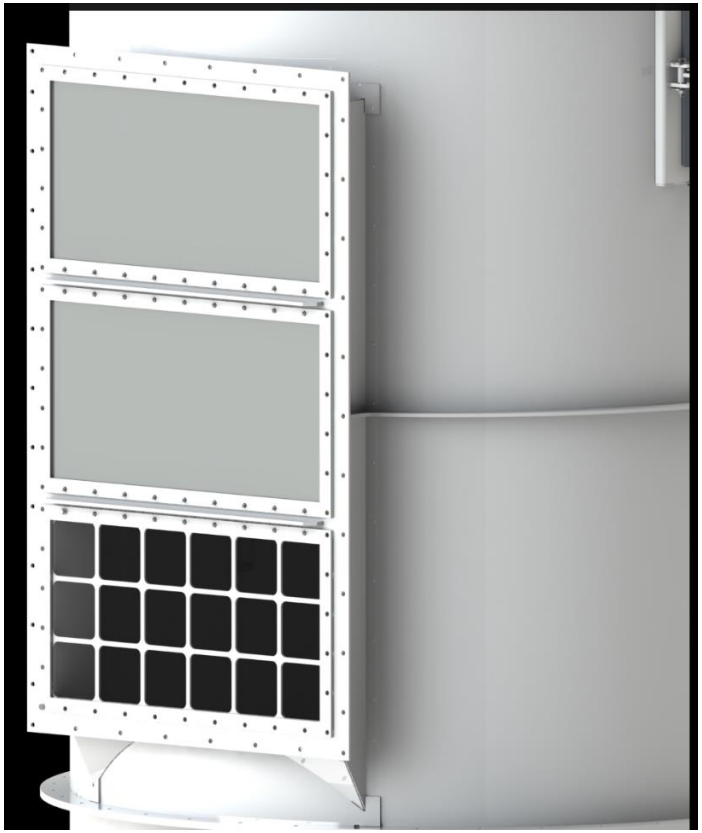
  - *30-50 lb ft³ = 360fpm*
  - *< 30 lb ft³ = 300fpm*
  - *< 20 lb ft³ = 240fpm*
  - *< 10 lb ft³ = 180fpm*
  - *< 5 lb ft³ = 120fpm*
  - *< 1 lb ft³ = 60fpm*

Design Considerations

- Pressure Drop
  - *Can be thought of as resistance*
  - *Pressure drop across a baghouse increases as bags become dirty*
  - *Typical allowance for baghouse pressure drop = 6”wc*
  - *Imperative for blower design*

Explosion Venting

- Explosion Venting/Protection
  - *Required vent area determined using Kst and Pmax values*
  - *Vent ducts increase required vent area*
  - *Rupture vent intended to be weak spot to allow pressure to escape*
  - *Many options*
    - Flameless vents
    - Duct mounted backdraft preventer
    - Chemical Suppression/Isolation



Troubleshooting

Troubleshooting Issues

- Typical Symptoms:
  - *Stack emissions from clean-air fan discharge*
  - *High or unstable pressure drop (high magnehelic reading)*
  - *Bag blinding / Premature bag failure*
  - *Condensation / moisture within baghouse*
  - *Product bridging above hopper discharge*

Troubleshooting Issues

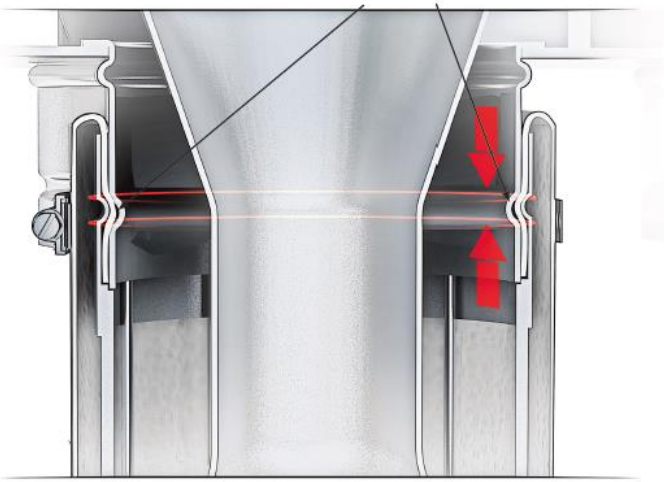
- Stack Emissions:
  - *Improper Bag Installation*
  - *Broken bag(s)*
    - Abrasive material
      - *Material handling inlet*
    - Too frequent pulse cleaning
      - *Adjust timer board*

Filter Bag Installation and General Information

- When changing filter bags; change all bags at same time
- Special bags may be needed if moisture, temperature, abrasion, and/or chemicals are an issue.
- Periodic cleaning of bags “off-line” when system is down
  - *Improves bag life and filter performance over time*
    - Keep airlock running to discharge dust
  - *If bags were blinded over (due to any number of reasons), they can be cleaned to functionality again, or at least recover sufficient performance until they can be changed*

Filter Bag Installation – the right way

Bags are 2” longer than cages and tuck the extra 2” INSIDE for sealing inside and outside



NOTICE: Kice Industries, Inc., will always supply internal safety grating in the bottom of the filter housing if it is to be mounted onto a storage bin, to prevent personnel, bags and cages from dropping into the storage bin.

FIGURE 5.1

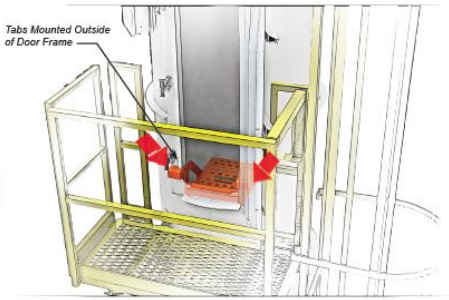


FIGURE 6.1

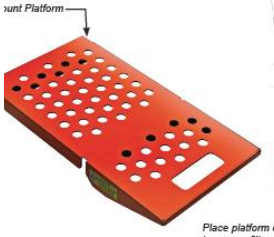


FIGURE 5.2

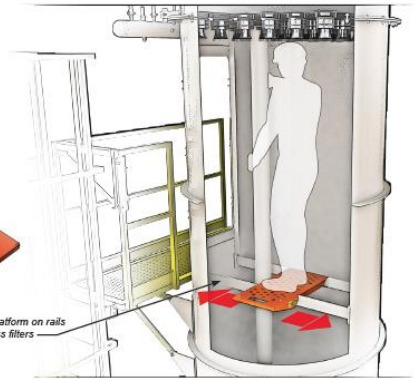
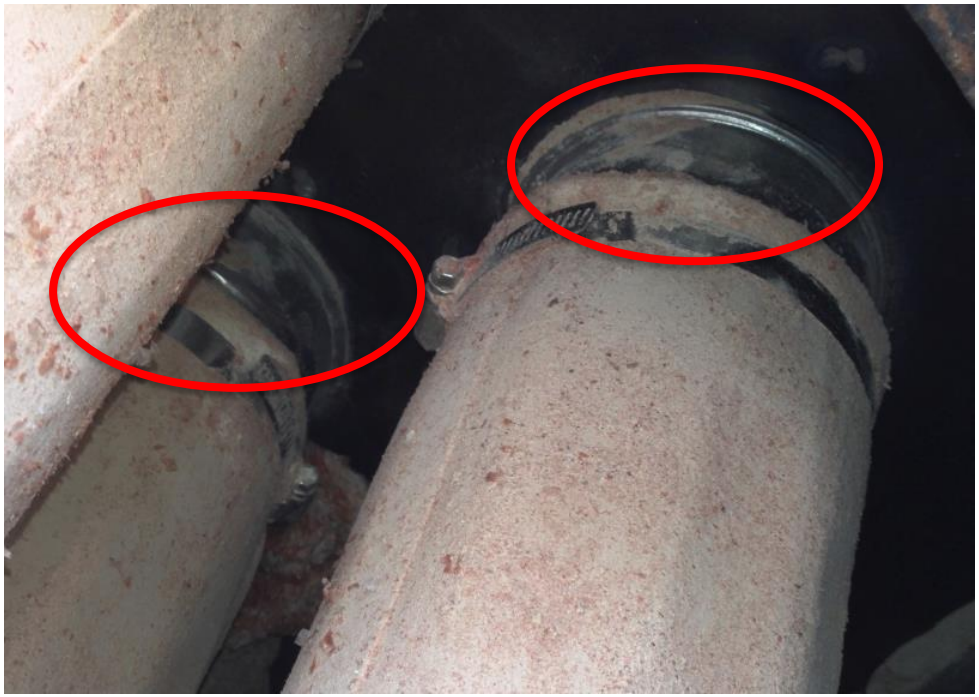


FIGURE 6.2

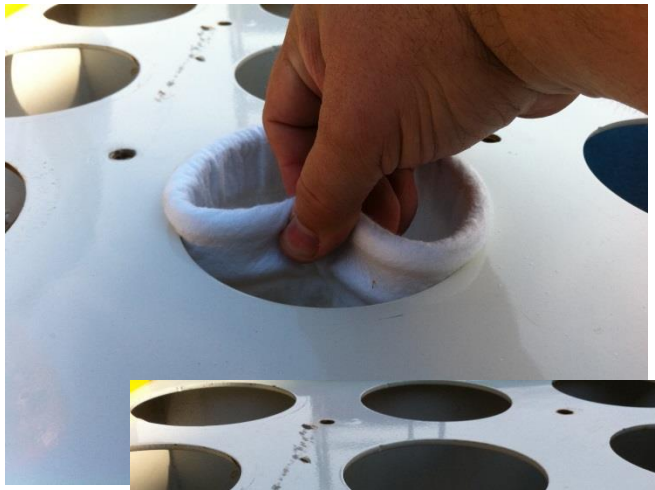
NOTICE: Two platforms may be used in conjunction when using rail mount system.

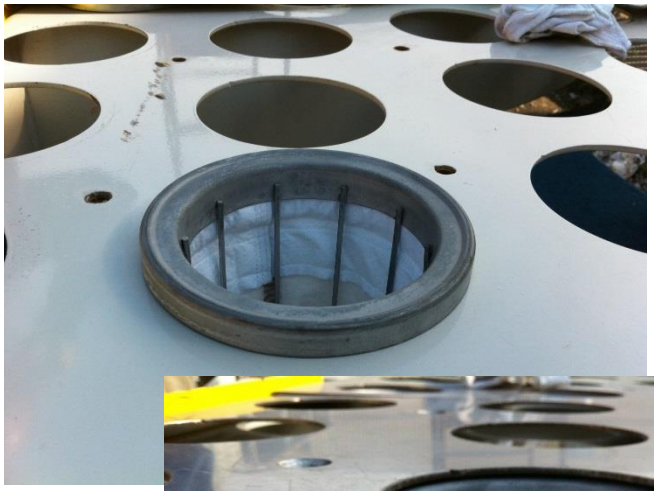
Filter Bag Installation – incorrect

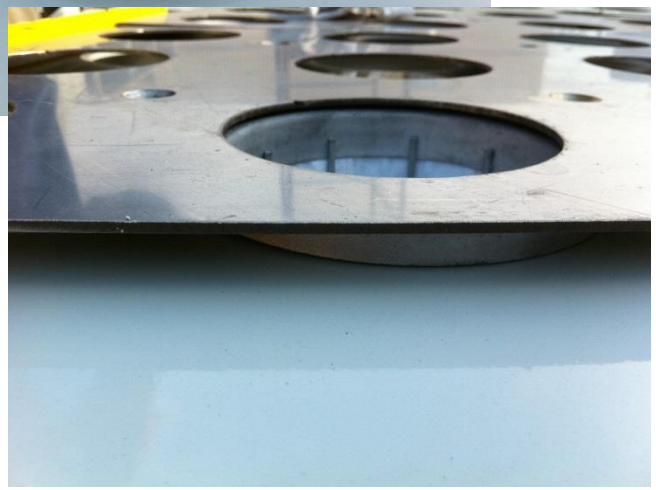
- Not tucked in so there is no seal on inside
- Not over the bead; will slip off



Top Bag Filter Bag Installation







Troubleshooting Issues

- High or Unstable Pressure Drop / Bag Blinding:
  - *Premature increase in pressure drop*
  - *Magnehelic gauge climbs quickly*

    - Filter undersized? (high air:cloth)
    - Air added to filter after initial design?
      - *Increase filtration area / re-allocate air*
    - Unable to build adequate pressure in cleaning air?
      - *Adjust cleaning air timer*
      - *Maintain blast valves*

Baghouse Cleaning Systems Problems & Symptoms

Confirm settings of controls for bag cleaning

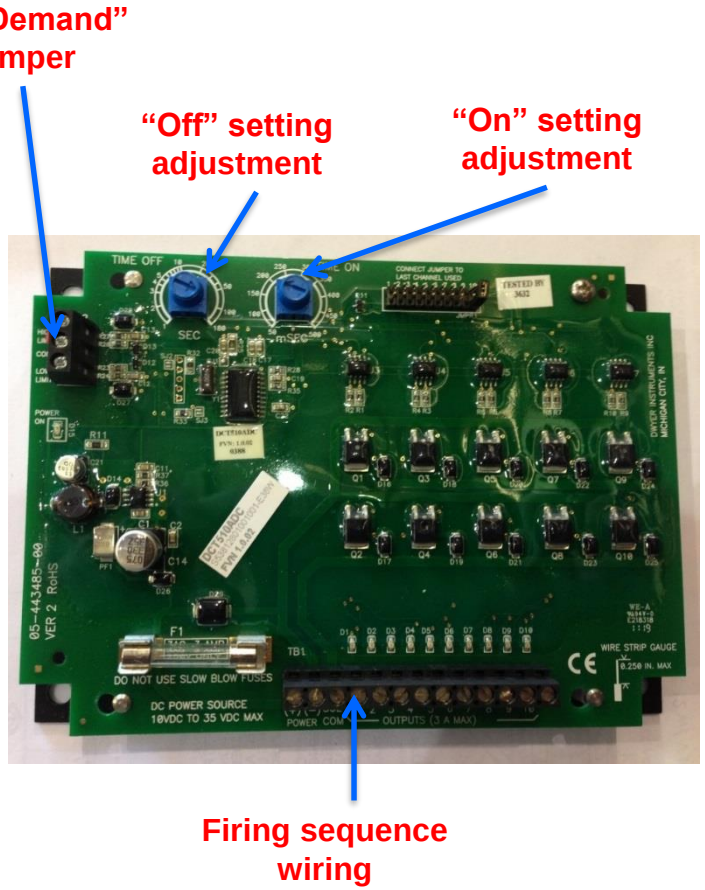
The air pressure and timer board regulate frequency, duration, and amplitude of reverse air cleaning of bags.

If pressure, frequency, amplitude settings are too low:

- "Dust cake" layer can build up too thick and bags don't get cleaned, resulting in:
  - Higher pressure drop
  - Shortened bag life
  - Lower than anticipated air volumes in system

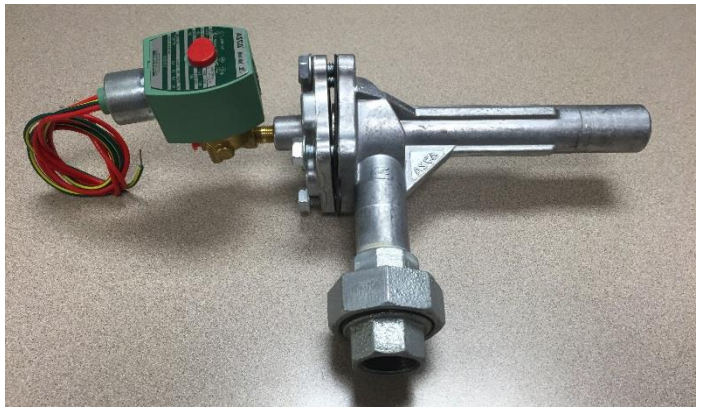
If pressure, frequency, amplitude settings are too high:

- May result in over cleaning of bags:
  - Premature bag failure in the form of rips or holes
  - May prevent "dust cake" build up on bags utilizing "depth" filtration, resulting in:
    - Particles allowed to "bleed-through" bags, producing emissions to atmosphere.
    - Bags blinded over by small particulate imbedding in bags without "dust cake" – resulting in increased pressure drop, reduced air volume, and shortened bag life.
- Waste of Energy!



Baghouse Cleaning System – High Pressure/Low Volume

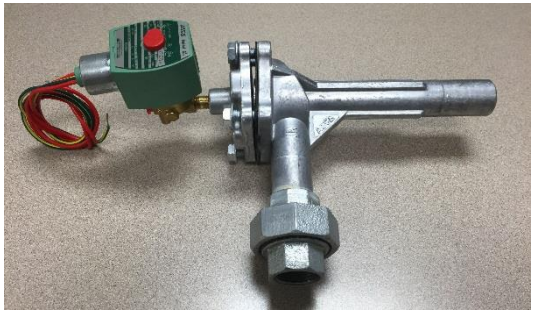
Kice Venturi-Jet Valve



Baghouse Cleaning System Problems

Kice Venturi-Jet Valve or any Compressed air system

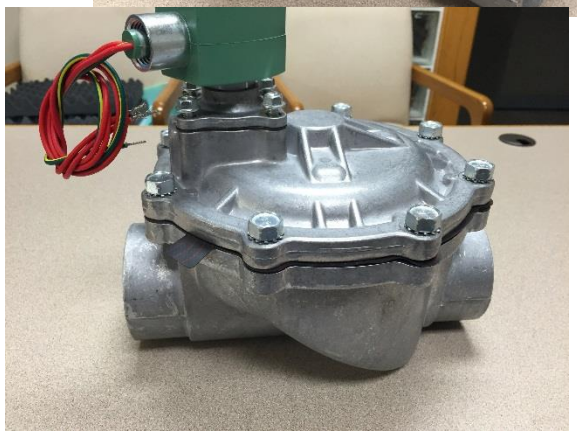
- Bent or broken nipple between solenoid and blast valve
- Cracked diaphragm
- Missing spring
- Solenoid epoxy coil loose or open
  - *(Red Hat missing)*
- Hose connection to lateral leaking/dried out
- No regulator or filter installed ahead of air tank



When valve operating correctly, will feel slight "puff/blast" of air here when operated

Baghouse Cleaning System – Low Pressure/High Volume

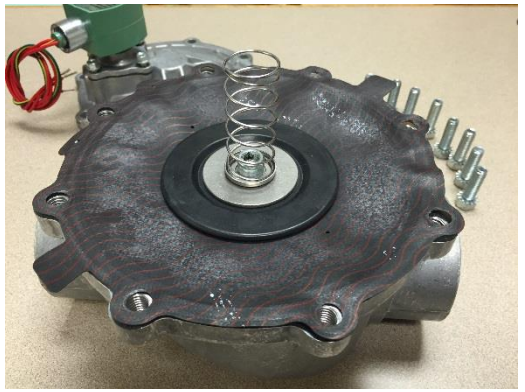
Kice Pneu-Jet Valve

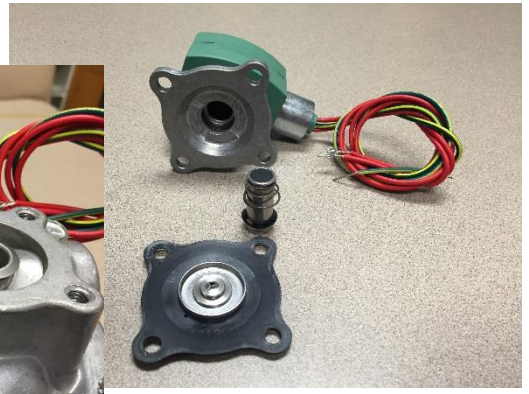


Baghouse Cleaning System Valve & Solenoid Problems

Kice Pneu-Jet Valve or any "PD Blower air system

- Cracked large or small diaphragm
- Worn seat
- Broken spring
- Solenoid epoxy coil loose or open
  - *(Red Hat missing)*
- 3" gasket to lateral leaking/dried out
- PD blower issues





When valve operating correctly, will feel slight "puff/blast" of air here when operated

Troubleshooting Issues

- Condensation / moisture within baghouse:
  - Proper air dryer system on plant air?
    - *Common mistake*
  - Duct insulation necessary?
    - *Warm process air / cold external temps*

Troubleshooting Issues

- Product bridging above hopper discharge :
  - Don’t forget about the airlock!
    - *Worn airlock clearances allow air to “leak” into filter*
    - *Can-velocity problem by definition*
  - Shutdown procedure?
    - *Cycle cleaning mechanism and airlock after fan has been shut off*

Airlock Problems / Shutdown Procedure

Clogged hopper; Not running airlock after system is shut down

In Closing…….

- Understand the equipment and processes that you have in operation
  - *Understand system behavior in both optimal and upset conditions*
- If in doubt or confused, rely on the manufacturer or system designer for advice
- Learn to identify and resolve issues before failures occur
- Regular and effective maintenance pays off
- BE SMART / BE SAFE

Always work smartly and practice safety!!

Troubleshooting Issues

Additional Issues or Ideas ???

Questions or Comments ???


Thank you for the opportunity to speak with you today
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