CENTRAL VACUUM SYSTEMS BASICS - 2013

Presented by:
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www.kice.com
Quality Components and Systems to fit every need.

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- Pneumatic Conveying
- Dilute Phase
- Vacuum & Pressure
- Railcar Unloading
- Truck Loadout Systems
- Centro-Vac Systems
- Dust Collection Systems
- Hammermill Lift Systems
- Grain Cleaning
- Automation
- Layout and Design
- Spouting and Ducting
TODAY WE’LL COVER . . .

• What is a “Central Vacuum System”?

• Why do you need a Central Vac System?

• What Equipment is Required?

• How and Where do you install a Central Vac System?

• Questions & Comments
What is “Dust”?  

A dust particle is a fine particle that is released and/or transported into the air either through entrainment with a product, displacement of air because of a product, in conveying air and/or in other processing equipment.

Why is “Dust” a Problem?

- Safety issue for PEOPLE, ASSETS, and FACILITIES
- Product degradation or loss
- Health issue for workers
- Sanitation and infestation control
- Maintenance
- Equipment life expectancy
- Retention of valuable product

Where is “Dust” a Problem?

Anywhere in a facility – product transfer, pit dumping, loadout, tunnels, head house, aeration, even in the offices.
Solutions for “Dust Control”

“An efficient dust-control program in a grain elevator has three parts: mechanical housekeeping, manual housekeeping, and methods for minimizing the generation of dust.”

-Pneumatic Dust Control in Grain Elevators, 1982, Publication NMAB 367-3
National Materials Advisory Board

- General suction system (Cyclone and/or Baghouse Filter)
- Central Vacuum System
- Grain cleaning (before it brought into the facility)

Expectations of a “Dust Control System”?

- Reduce fugitive dust inside facility and on equipment
- Protect the assets (people, equipment and facilities)
- Reduce the “tracking of dust” everywhere
- Increase storage capacity
- Reduce potential for explosions
- Better product flow ability
WHAT IS A ..... “Central Vacuum System?”

A Central Vacuum System is a custom-designed network of tubing, fittings, and elbows which go to a centrally located baghouse filter and vacuum device (typically a very high static fan, turbine or vacuum Air Power Unit).

The Central Vacuum System provides a high vacuum to the end of a hose with nozzle for cleaning floors, walls, ducts and around processing and other equipment. The system can also move bulk materials in the event of spillage, equipment cleanout, etc...
WHAT EQUIPMENT DO YOU NEED?

• Vacuum Air Power Unit
• Deep Vacuum Filter/Receiver
• Rotary Airlock (or sealed container)
• Set of Vacuum Tools
• Tubing, fittings, elbows, couplings, and Snap Caps
• Control Panel; Remote Start/Stops
Reason #1: Safety

• Safer way to clean
  – Around dangerous areas
  – Around equipment

• “Blowing Down” only moves dust.
  – An air hose does NOT remove dust.

• “Blowing Down” suspends dust in the air
  – Becomes a fuel for potential explosions and fires.

• Combustible dust
  – Potential for dust explosions

• OSHA dust level standards are lowering
  – 1/8” to 1/16” to 1/32”
Reason #2: Housekeeping

- Dirt and dust are facts of life.
- Dust is moved by air currents.
- General operation creates dust.
- Unusual operating conditions
  - Spills
  - Power outages
  - Choke-ups
Reason #3: Convenience

- Makes working much more pleasant.
- Locate pick-up points where they are needed.
- Easy to operate.
- Very flexible.
- Simplicity encourages use
  - Makes for a cleaner working environment.
Reason #4: Employee Relations

- People appreciate a clean working environment.
- Healthier atmosphere in the workplace, break area, etc…
- Sense of “We are striving to make your job easier”.

WHY?
Reason #5: Efficiency

• Do a much better job than a broom and dust pan.
  – i.e. getting into cracks, crevices, beams, etc…

• “Blowing Down” does not remove dust.

• Manual sweeping takes more time.

• Manual sweeping requires moving of material once collected.

• Central Vac Systems collect material to a central, convenient location.
  – May have value as feed stock
Reason #6: Insect/Pest Control

- Insects “live” in the dust in the cracks and corners.
- Fumigation is an important part of the process – and expensive.
- Central Vac Systems get into crevices, beams, and tight corners to collect material, including:
  - Insects
  - Trash
  - Moist grain
  - Other potential non-grain items
IDENTIFY THE NEED

- Talk to your operators.
- Try to calculate how much time and money is spent on cleaning using current methods.
- Compare those costs to the cost of owning and operating a Central Vac System.

If the need is to provide an easy-to-use and convenient system for quickly cleaning up dust and material spills BEFORE it can be tracked or blown around by air currents, then a Centro-Vac is the answer.
DEFINE THE OBJECTIVE

- Housekeeping
- Incidental spill pickup
- Equipment cleanout
- Pneumatic Conveying
- Prevent Quality issues with cross contamination
- Employee Safety
- Other?
Each sweeper requires approx. 175-200 CFM @ 8” HG vacuum
  – Flour/Plastics/General: 175-180 CFM / Grain Elevator or Feed Mill: 180-200 CFM

Maximum of 2 operators/sweepers on a 3” OD line.
  – With 1 operator, suction is hot (good)
  – With 2 operators, suction is good
  – With more than 2 operators, you lose suction to all operators

Run multiple 3” OD lines as needed through facility

Distance is not critical
  – If you are not using the system for pneumatic conveying.
  – It can move piles of grain, but not as quickly as an actual conveying system, and the filter discharge location may need additional attention.

Sizing for more operators than you really need can be a waste of energy (HP) and capital resources. Really consider how many operators you really need at one time.
WHERE DO YOU INSTALL A CENTRAL VAC SYSTEM?

Indoors, Outdoors, Ground Level, Upper Floor level are all okay locations. Just plan accordingly to meet your needs
TYPICAL SINGLE FLOOR CENTRO-VAC SYSTEM
TYPICAL MULTI-FLOOR CENTRO-VAC SYSTEM

With Filter/Receiver at top of facility
TYPICAL MULTI-FLOOR CENTRO-VAC SYSTEM

With Filter/Receiver at ground level
“QUICK” CLEANING

• 6-10 Operators at a time
• 2 separate Vacuum APU’s
• Control system for detection of number of operator

Benefits:
• Allows for many operators and fast cleanup.
• Limits HP requirements to for the number of users

Disadvantages:
• Higher capital costs
• Still inefficient with low number of operators
• Most simple method is to run multiple 3” lines from the filter receiver.

• “Out of the way” means running the tubing along the ceilings and along periphery.

• End each run with a Spring Cap on a 45-degree elbow so the hose does not start with a kink from the vertical or horizontal position.

• Install branches either upward or horizontal so branch leg does not fill with material over time.
## TYPICAL POWER REQUIREMENTS

<table>
<thead>
<tr>
<th>Operators</th>
<th>Power Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Operator</td>
<td>7.5-10 HP</td>
</tr>
<tr>
<td>1-2 Operators</td>
<td>15 HP</td>
</tr>
<tr>
<td>3 Operators</td>
<td>25 HP</td>
</tr>
<tr>
<td>3-4 Operators</td>
<td>30 HP</td>
</tr>
<tr>
<td>5 Operators</td>
<td>40 HP</td>
</tr>
<tr>
<td>(at same time)</td>
<td></td>
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*Much more economical than the “Multi-Stage” suction fan design.*
Standard systems will use a Vacuum Air Power Unit.
- Inlet filter for protection of the pump
- Inlet filter is “secondary” in case of filter bag break. Not designed to be the only filter.
- Inlet and Outlet Silencers

Relief set at 12” HG.
- To protect pump, not the system

Can be located anywhere
- Typically in existing pump room.

MD Competitor or Sutorbilt L Series works well
- More open clearances
- Run cooler and MAY BE quieter
DEEP VACUUM FILTER/RECEIVER

- Sized for total CFM
- Built to handle deep vacuum requirements.
- Cyclonic inlet
- Typically located above a screenings bin or in close vicinity to final location of material.
PRODUCT DISCHARGE UNDER FILTER

- Airlock on filter receiver outlet allows for continuous operation.
- Air tight catch can is cheaper but requires manual dumping on regular basis.
COMMON TOOLS

Standard set of tools includes:

- 2” x 45” Wand
- 18” Extension
- 20” wide Floor tool
- 25-50 ft length of 2” ID Anti-Static vinyl hose
- 15” Crevice Tool
- Special transition from Hose end to 3” ducting line
- Optional: Tool Caddy
Need to discuss with the “AHJ” (Authority Having Jurisdiction) the need for:

• Proper Electrical controls classification
• Explosion Venting
• Explosion Suppression (if inside building and cannot vent to outside)
• Explosion Isolation
  • (mechanical or chemical)

For more information, contact Kice Industries Sales or Engineering or refer to NFPA 61, 68, 69, 654, etc… which can be viewed for free at www.nfpa.org
QUESTIONS AND MISCELLANEOUS COMMENTS

• Each sweeper location uses a snap cap for sealing when not in use.
• A start/stop timer switch is recommended to insure that the Air Power Unit is shut off when not in use.
• Aluminum tubing with 16 gauge, short radius, carbon steel elbows recommended.
• Estimate cost for equipment: $15,000-$30,000
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Thank you for your time today.

Should you have any questions
Please visit our website at www.kice.com
or contact us at sales@kice.com