Reinhold Environmental Ltd.

2007 APC Round Table & Expo Presentation

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Hosted by TVA

Design Considerations for Fabric Filters/ Baghouses

NEUNDORFER

PARTICULATE KNOWLEDGE

Presented By

Jim Parsons

www.neundorfer.com

PRESENTATION OBJECTIVES

- Basic sizing parameters
- Cleaning systems
- Instrumentation
- Gas flow
- Maintenance considerations
- Insulation and access doors
- Performance warranty

Fabric Filter/ Baghouse Basics *(RA/FF & PJ/FF)*

- Emissions levels not typically an issue
- Differential pressure(ΔP) and bag life are directly related, key parameters
- Bags don’t filter* need dust cake
- Overcleaning worse than undercleaning
- Bags wear out cleaning (normal conditions)

*PTFE

- Reduced cleaning frequency will extend filter bag life

- Reduced cleaning energy (flexing) will extend filter bag life

- The majority of emissions occur as a result of cleaning

SIZING FABRIC FILTERS IS BASED ON AIR TO CLOTH RATIO (A:C)

GAS VOLUME (CFM) vs.

SQUARE FOOT OF FABRIC (ft.2)

Filtering velocity/ face velocity = ft/min.

REVERSE AIR/“*RA/FF”* = *2.0:1-2.50:1*

PULSE JET/“*PJ/FF”* = *3.25:1-4.00:1*

Higher A:C’s = increases ΔP & shortens bag life

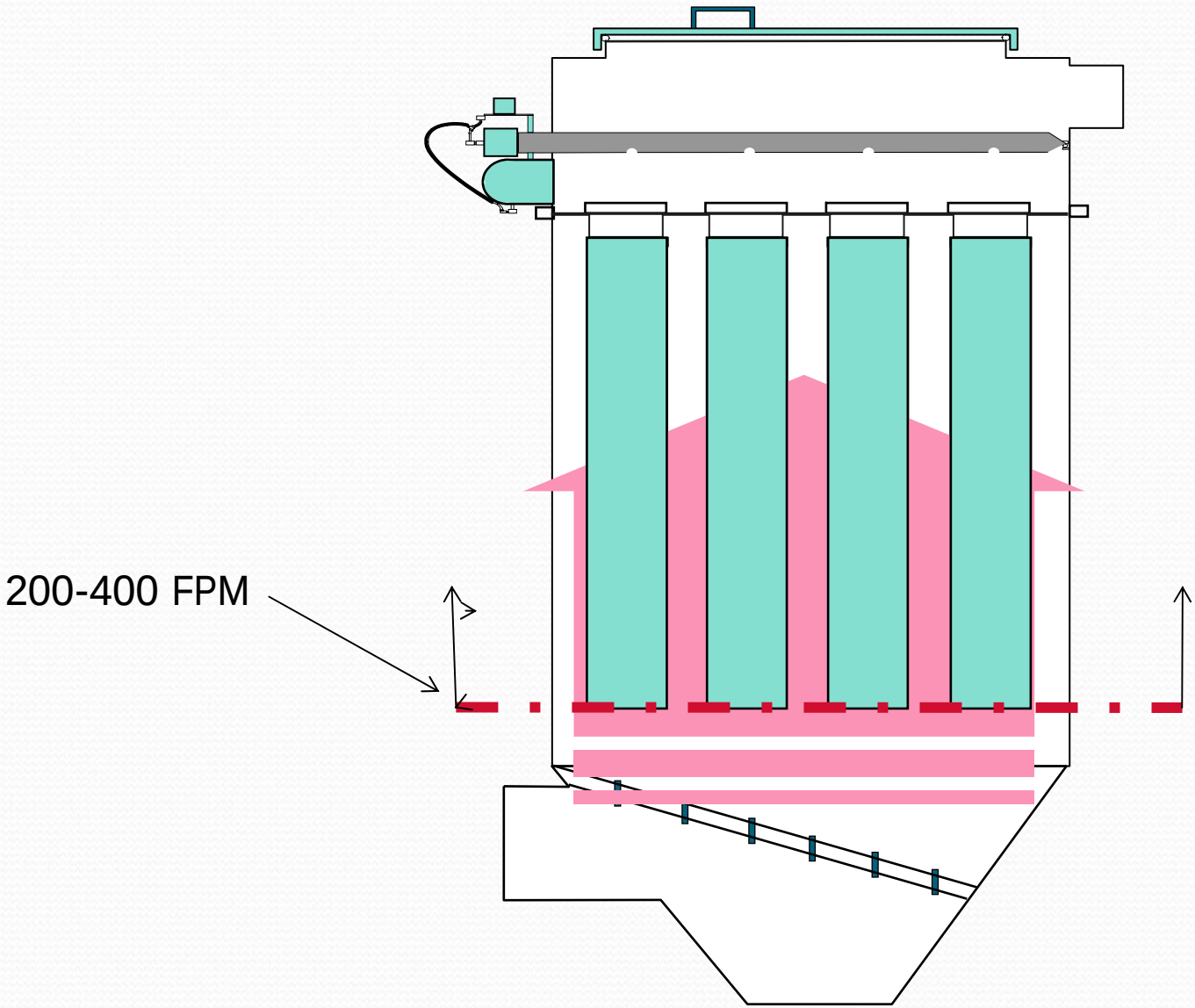
CAN VELOCITY – "PJ/FF"

- Air Volume (CFM):
- Compartment area: (Compartment length x width, measured at the plane of the bottom of the filter bags (Ft^2):
- Bag Bottom Area: (number of bags x bottom area of bag (Ft^2):
- Open Area =(Collector Area – Bag Bottom Area)

⌘ Can Velocity = (Air Volume ÷ Open Area)

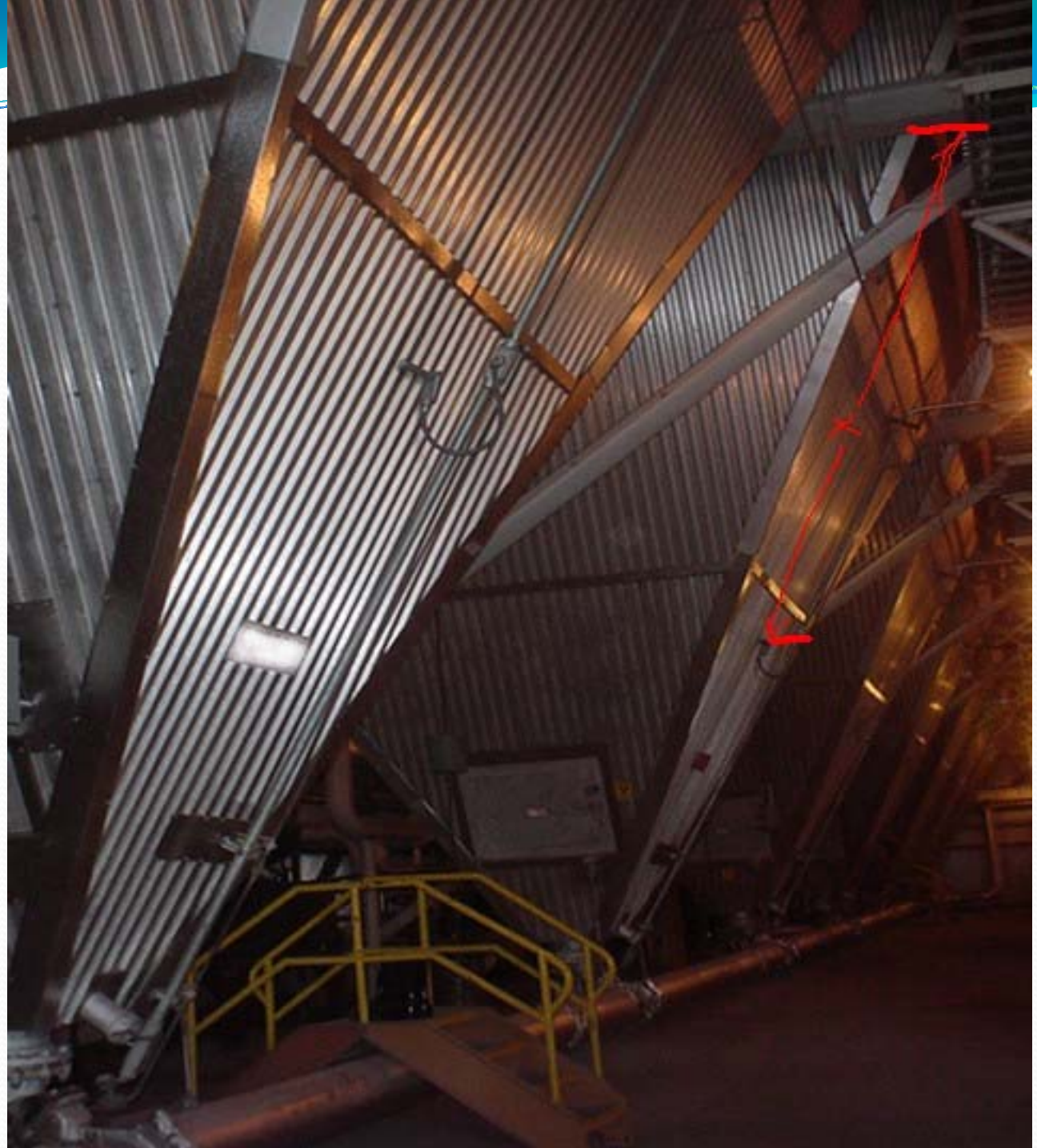
TYPICAL =200-400 FPM

Can velocity in a “PJ/FF”



CLEANING SYSTEM RECOMMENDATIONS

- REDUNDANT REVERSE AIR FANS “RA/FF”
- REVERSE AIR RECIRCULATION SYSTEM “RA/FF”
- REDUNDANT COMPRESSED AIR SYSTEMS “PJ/FF”
- QUALITY COMPRESSED AIR DRYERS “PJ/FF”
- QUALITY ISOLATION DAMPERS AND ACTUATORS (Poppet type)
- INSTALL PIPING FOR ACOUSTIC HORNS EVEN IF HORNS ARE NOT SPECIFIED INITIALLY ”RA/FF”
- HIGH & HI-HI HOPPER LEVEL INDICATORS



Smart Cleaning Controller

No longer just a damper cycling device

- A management system used to control; total Baghouse ΔP, bag life, energy consumption, hopper pulls, sorbent injection rates, horn soundings, emission data, etc
- Can be programmed onsite so you can change Baghouse cleaning parameters as your APC strategy changes
- Has the capability to receive other important inputs to alter cleaning cycles automatically (during low loads)
- Maintenance reminders and emission logs

Instrumentation

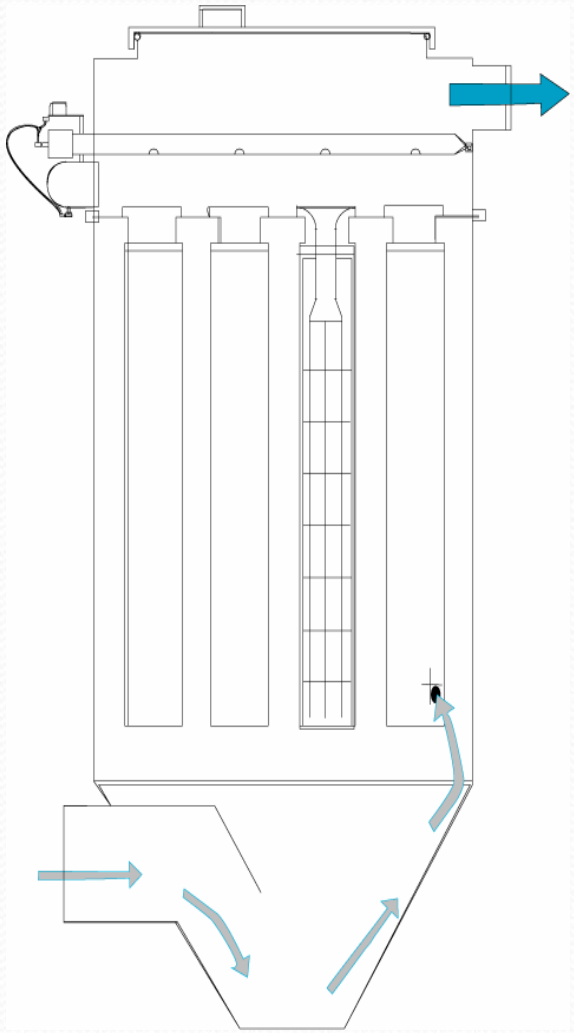
- Differential pressure, total and individual compartments (reliable instruments needed)
- Inlet and outlet temperatures (dew points)
- Individual compartment emission monitors (broken bag detectors)
- Reverse gas temp. and pressure “RA/FF”
- Compressed air PSI, temp. and flow rate “PJ/FF”
- Damper positions
- Acoustic horn sounding time and PSI
- High and Hi-Hi hopper levels indicators

GAS FLOW DISTRIBUTION

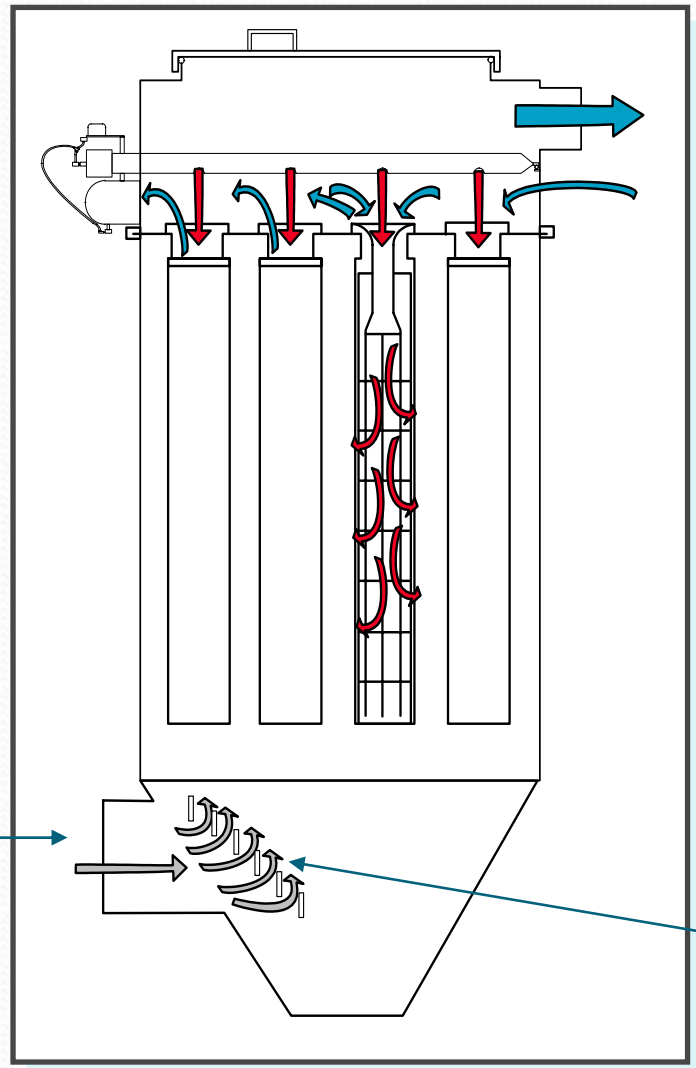
- GAS DISTRIBUTION IN A FABRIC FILTER IS A COMPROMISE BETWEEN HIGH AND LOW FLOWS
- DESIGN AROUND VELOCITIES TO AVOID ABRASION AND TURBULENT WEAR TO THE DUCT WORK AND BAGS (ICAC STD. F-7)
- “ESP” TO “PJ/FF” CONVERSION, FLOW DISTRIBUTION VERY IMPORTANT ISSUE TO AVOID BAG WEAR
- ***FLOW MODEL STUDY HIGHLY RECOMMENDED IN “ESP” TO “PJ/FF” CONVERSION***

(PHYSICAL MODEL AND CFD)

BAG FAILURES FROM BAD INLET DESIGN



“PJ/FF” HOPPER FLOW DISTRIBUTION DEVICE



Dirty Air Inlet

Inlet flow distribution device

MAINTENANCE CONSIDERATIONS

- ACCESS IS AVAILABLE AROUND AND ON THE FABRIC FILTER AT ALL LEVELS
- ENSURE SUFFICIENT SPACE IS AVAILABLE ON THE UNIT TO STAGE REPLACEMENT BAGS AND CAGES (PJ/FF)
- SAFETY VENTILATION OF MAINTENANCE AREAS

  (Online bag changes)
- DAMPER LOCK OUT CAPABILITY FOR ONLINE ACCESS
- OVERHEAD TROLLIES AND JIB CRANES TO HANDLE BAGS AND CAGES
- PORTS ON EACH COMPARTMENT INLET DUCT FOR PRECOAT AND TRACER LEAK POWDER INJECTION

INSULATION AND ACCESS DOORS

- Ensure that insulation is of sufficient thickness and “R” value to prevent dew point excursions in end compartments during low load periods

  Especially if preceded by a scrubber

- Quality center pivot doors with rugged hold down latches
- Trolley cranes for lift off top access doors “PJ/FF”
- Easily replaceable Hi-temp door gasketing
- Vacuum break open ports
- Safety chains on doors


Benefit of safety Chains

Performance warranty

- Unlike Electrostatic Precipitator, Fabric filter/ Baghouse collection efficiency in a given, (99%+)

- Filter bag life and maintaining long term differential pressure (ΔP) control are the important issues.
- Specify minimum bag life at maximum differential pressure (I.e. 5 years at 7”H2o)

- **“Write your on specification”**