REINHOLD ENVIRONMENTAL Ltd.

2017 APC & Wastewater Round Table & Expo Presentation

July 17 & 18, 2017 in Charlotte, NC / Hosted by Duke Energy

Reinhold Environmental LTD.
2017 APC & Wastewater/ PCUG Conference

July 17, 2017 - Monday - APC & Wastewater Round Table
Training Class 5 (Mecklenburg 3) 9:15 AM – 10:15 AM

Maintaining Sonic Horns for Proper Cleaning of Your Equipment

By: Jake Shelton with Acoustic Cleaning Systems, Inc.

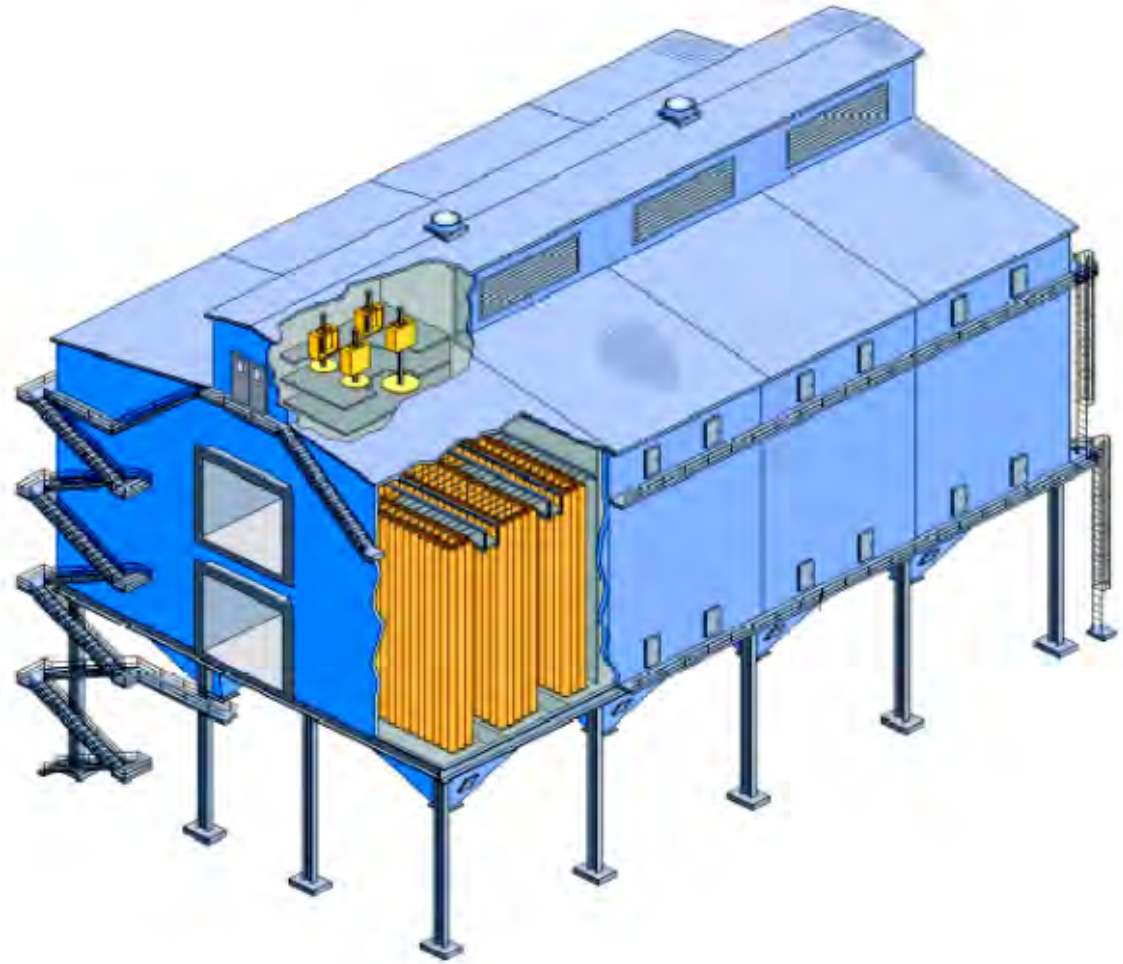
ACS
Acoustic Cleaning Systems

Coal-Fired Utility Boiler Applications

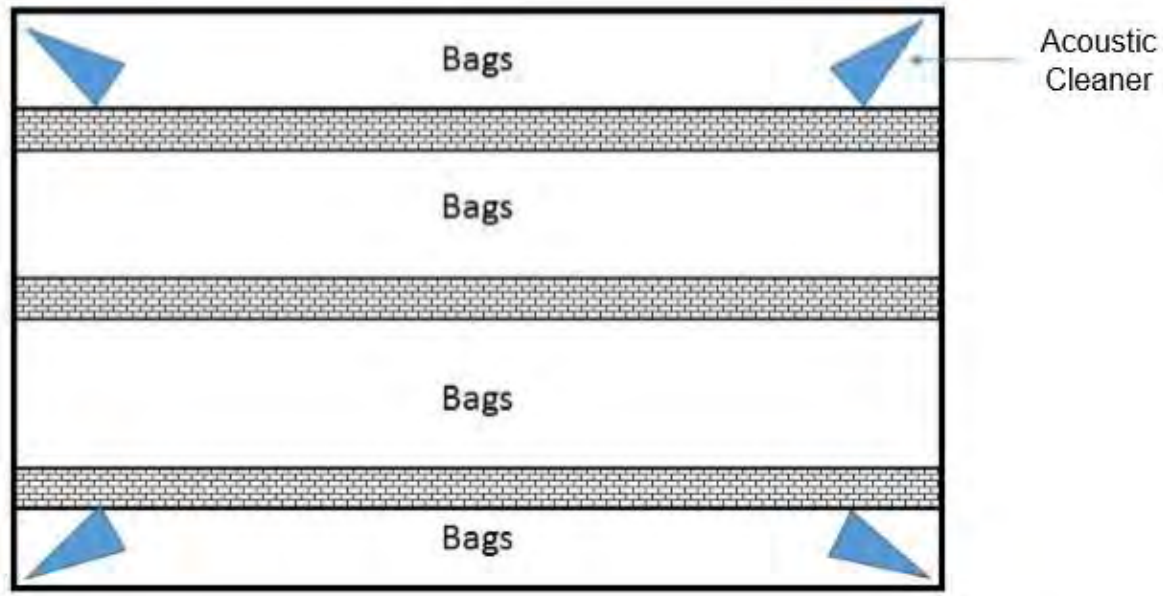
Air Preheaters
Baghouses
Economizers
Fans
Precipitators
SCRs

Installation Justifications For Baghouses

- **Improved Bag Life**
- **Elimination of Hopper Pluggage**
- **Decreased Pressure Drop**
- **Decreased Bag Weight**
- **Reduction in Cleaning Cycles**



Reverse Air Baghouse
Four (4) Acoustic Cleaners per Compartment

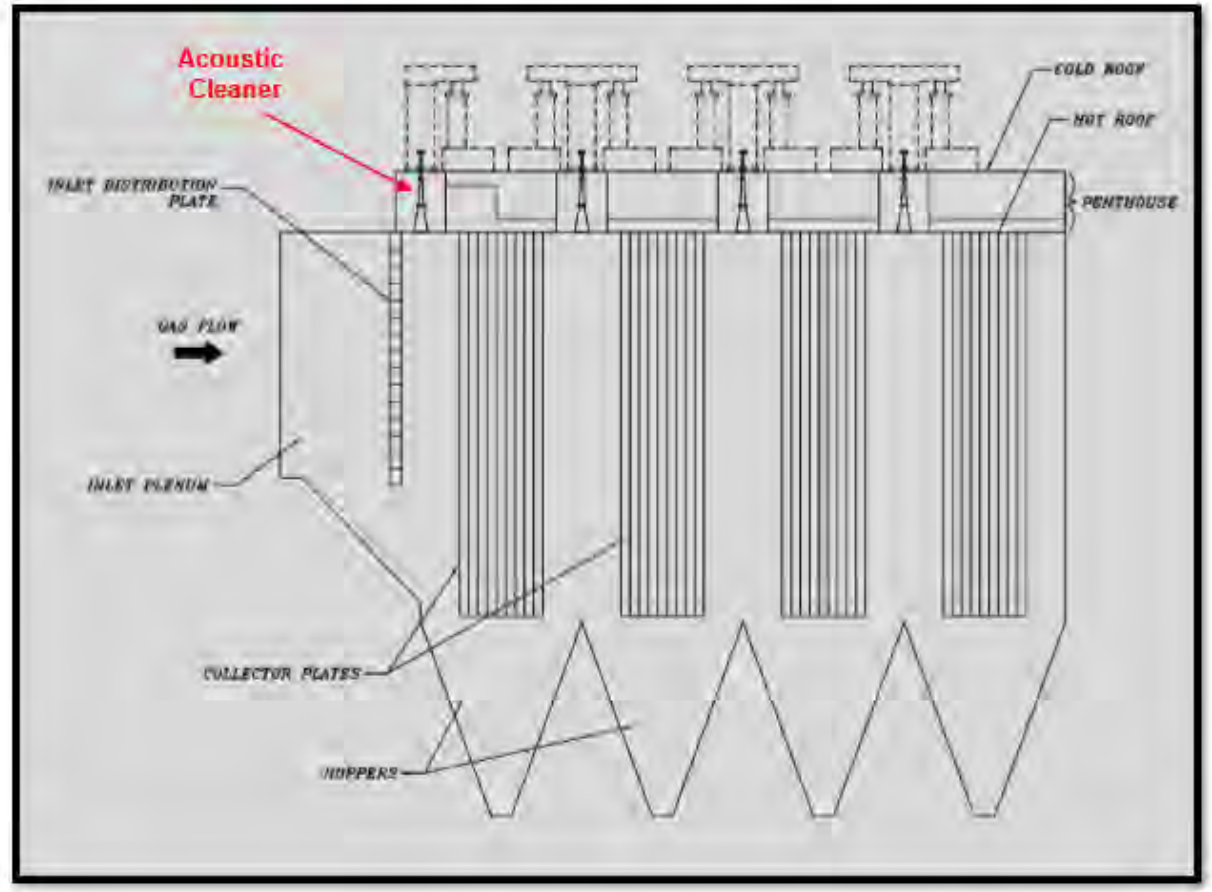


Reverse Air Baghouses

Pulse Jet Baghouse

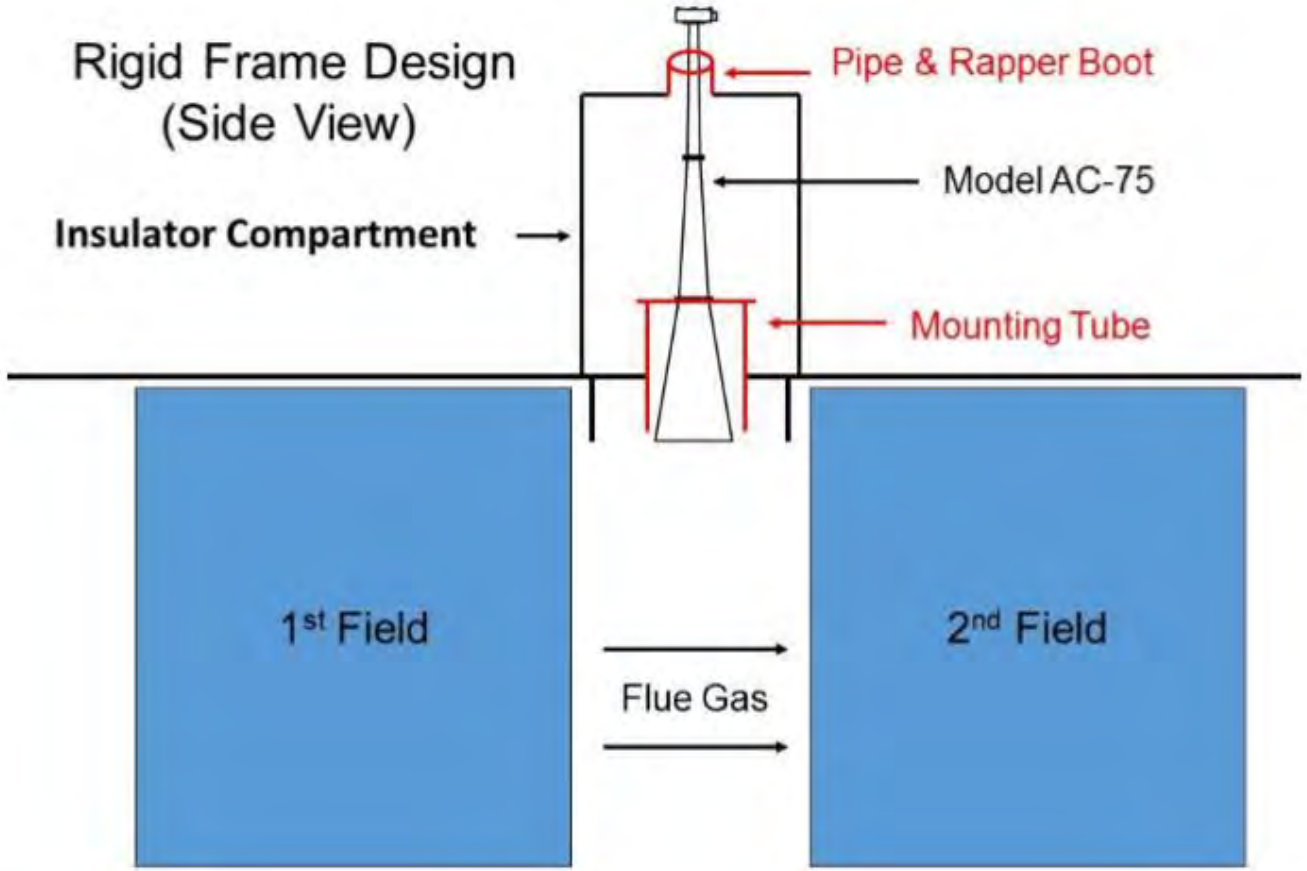
Installation Justifications For Precipitators

- Improved Rapping Efficiency
- Increased Collection Efficiency
- Increased ESP Up-Time
- Reduced Maintenance Costs
- Elimination of Hopper Pluggage

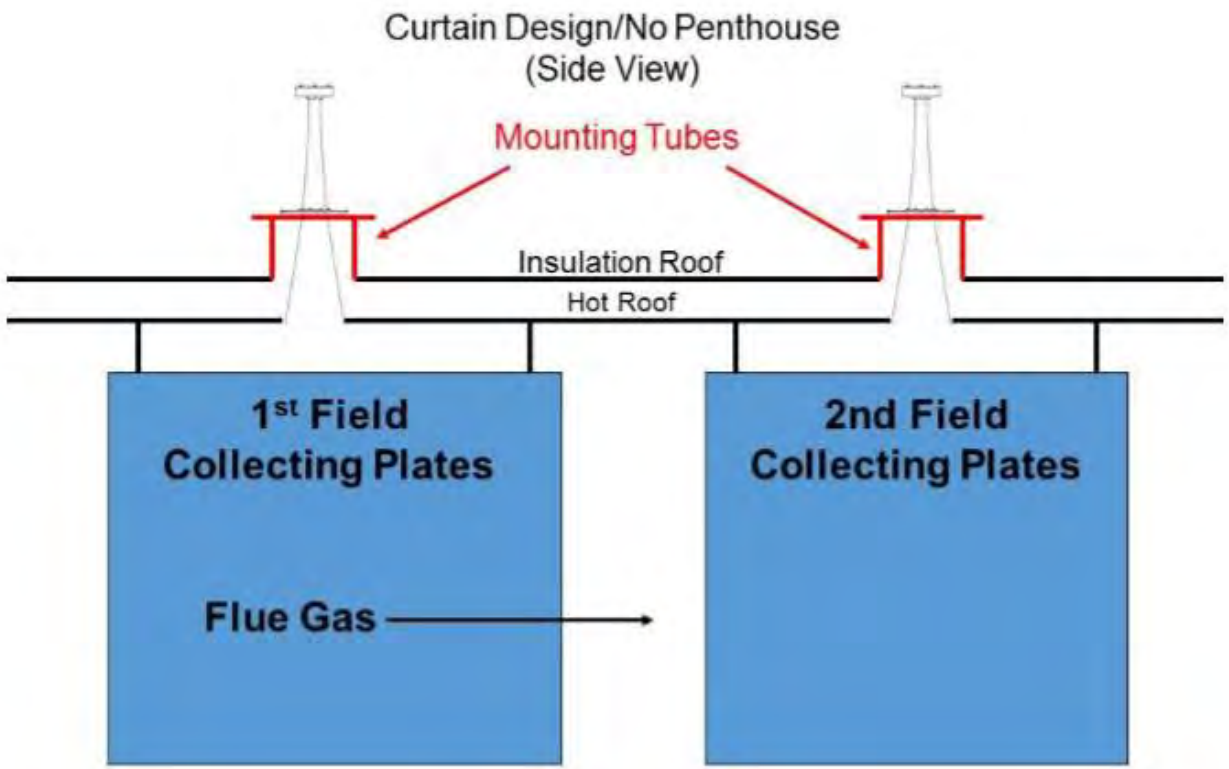


ESPs using side mounted tumbling hammer rapping systems are the most commonly retrofitted with the acoustic cleaners.

Precipitator Installations

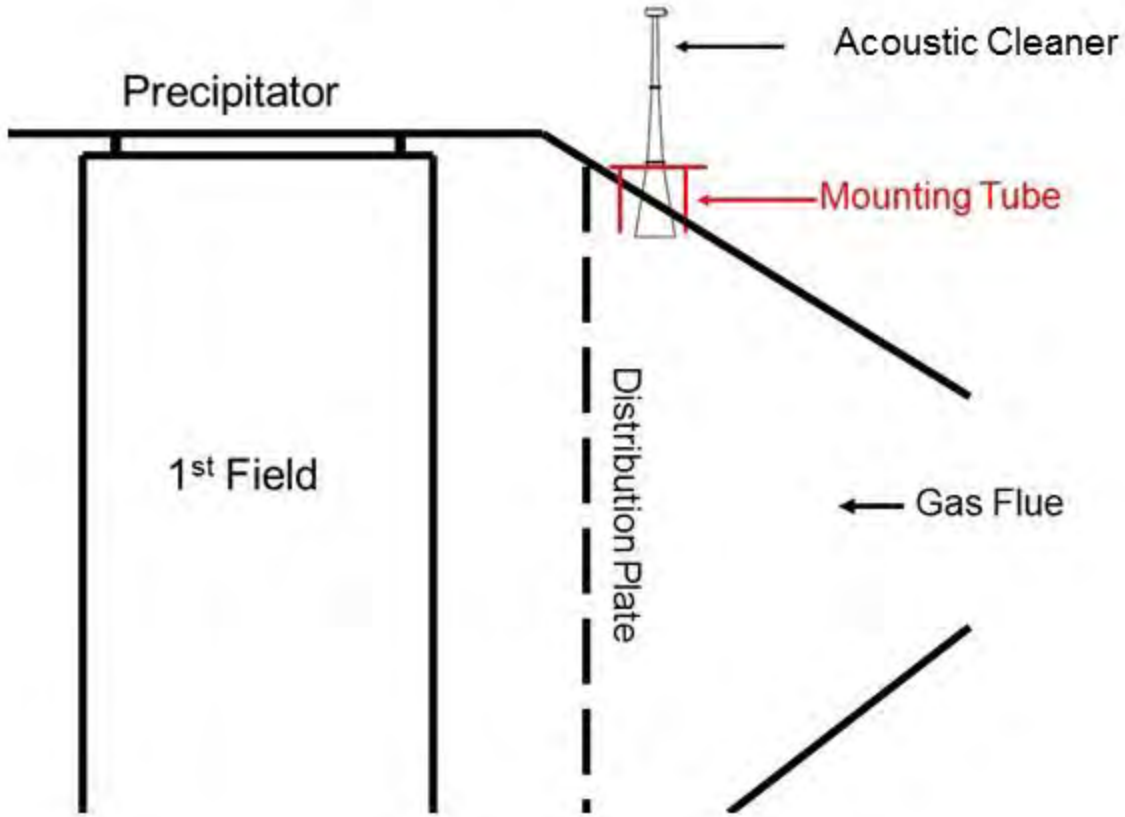


Precipitator Installations



Precipitator Installations

Cleaning Inlet Distribution Plate

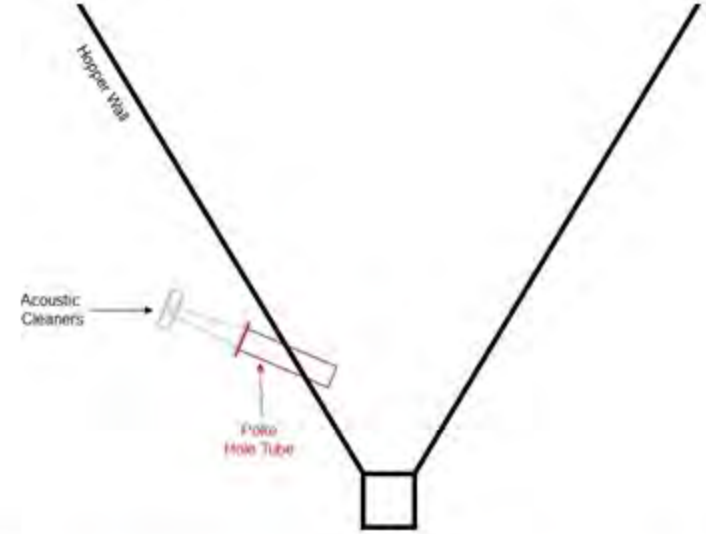


Hopper Applications

Goal of the Installation

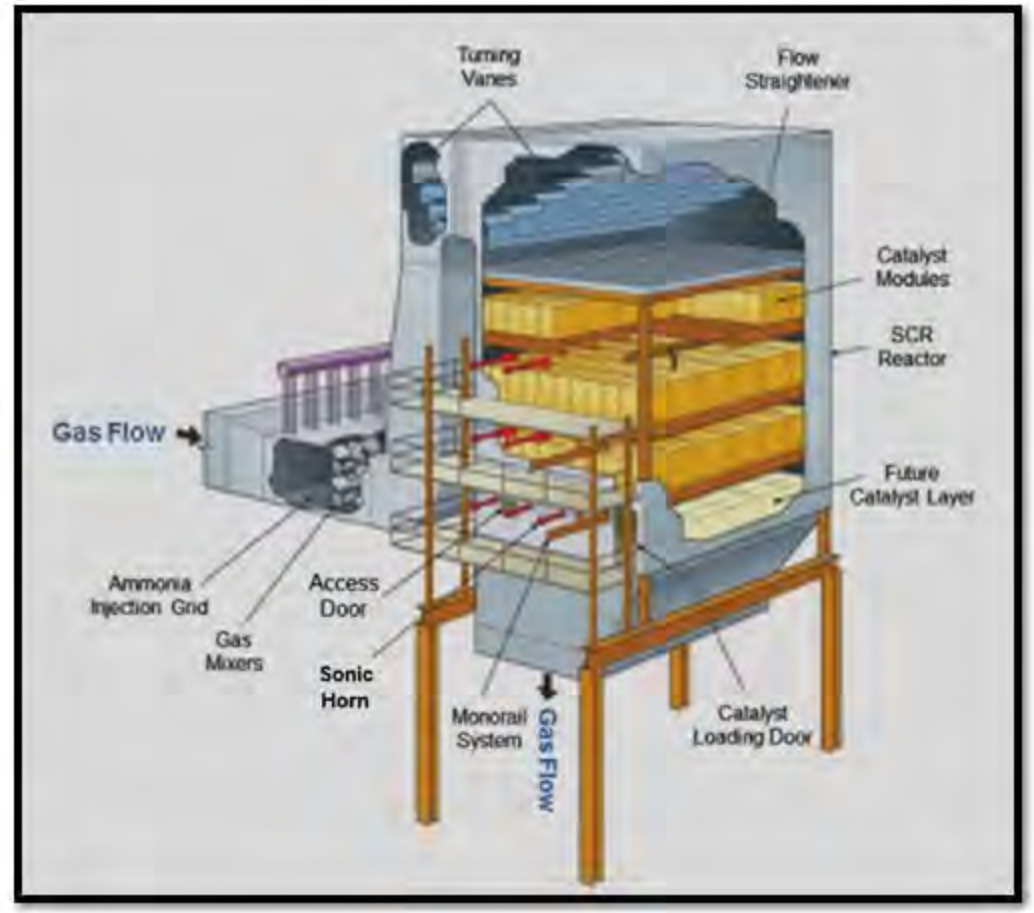
Typically, the acoustic cleaners are installed on hoppers to eliminate hopper pluggage. This is accomplished by sounding the acoustic cleaner when ash is being evacuated. The acoustic energy emitted by the acoustic cleaner fluidizes the ash so the hopper can be completely emptied.

The acoustic cleaner is sounded only while ash is being drawn from the hopper.



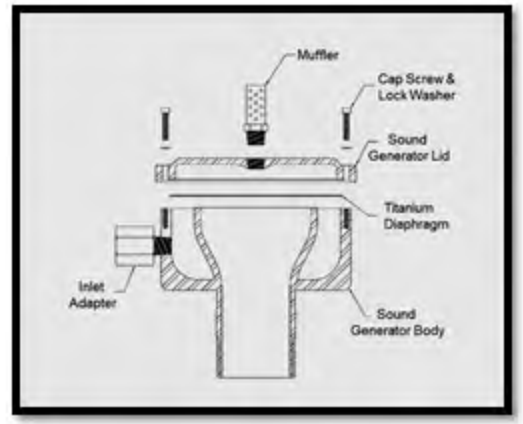
Installation Justifications For SCRs

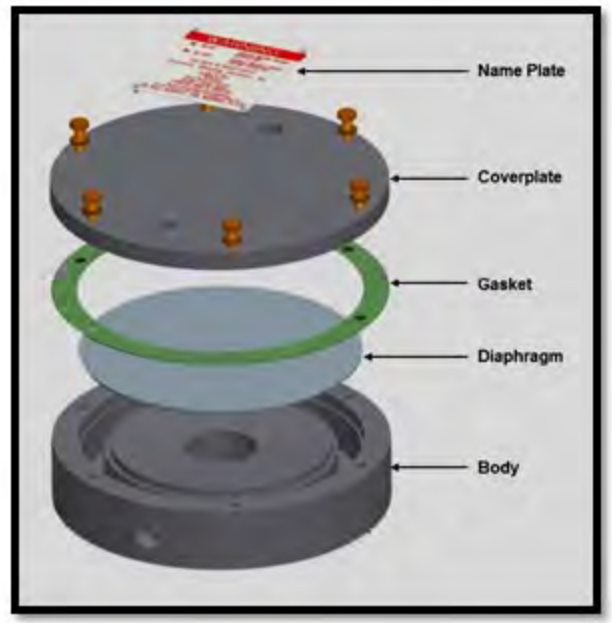
- **Improved Catalyst Life**
- **Increased DeNOx Potential**
- **Increased Mercury Oxidation**
- **Limiting Ammonia Slip**
- **Decreased Off Line Manual Cleaning**



SCR Installation

Acoustic Cleaners





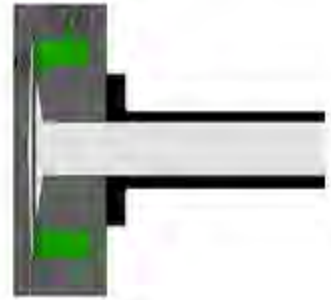
((ACS))

Principle of Operation

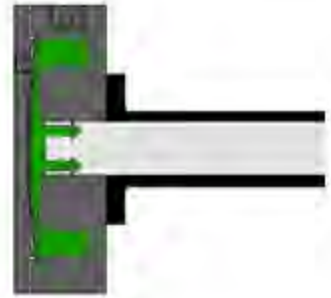
Sound Generator

Air enters the sound generator at the inlet. This causes the diaphragm to flex which creates a pressure pulse.

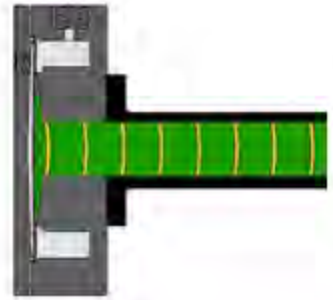
The pressure pulse is then amplified by the bell of the acoustic cleaner. The frequency is determined by the shape and length of the bell.



Step 1: Compressed air enters into the sound generator. As the air fills the plenum, the pressure builds rapidly.

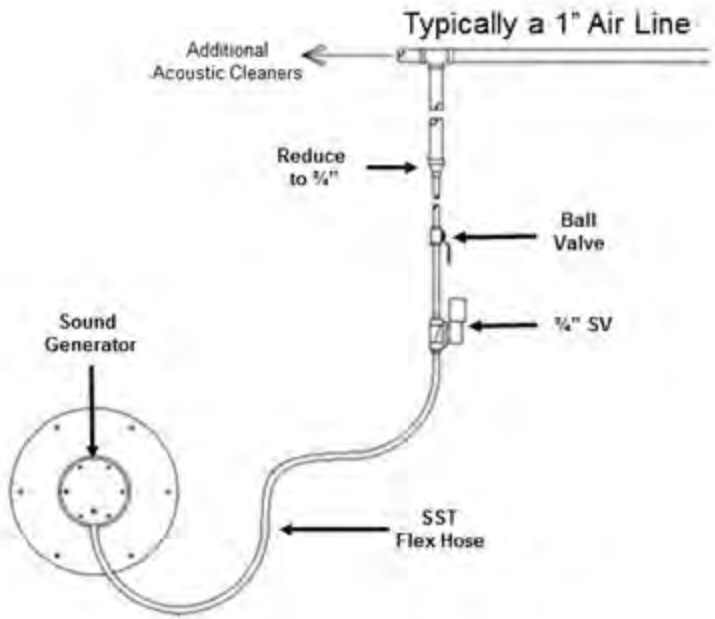


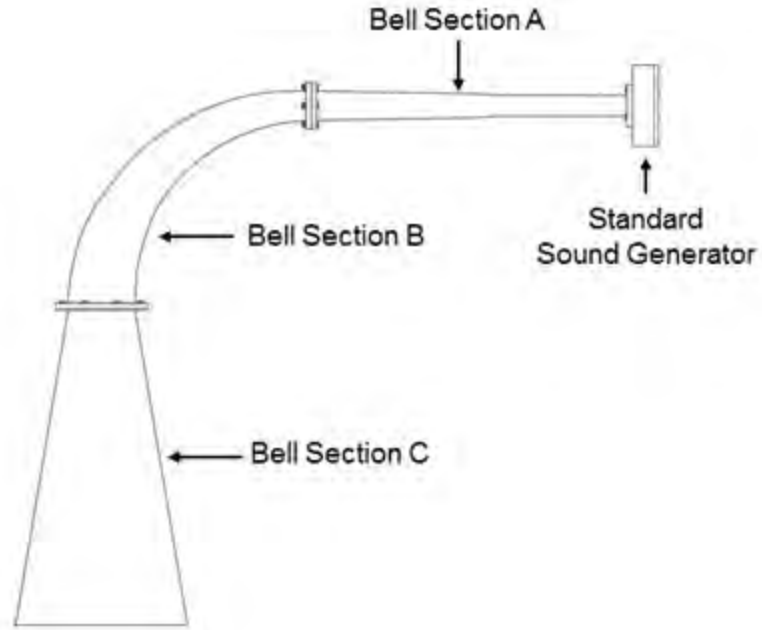
Step 2: The air pressure causes the diaphragm to flex which allows air to pass into the bell section. The pressure reduction allows the diaphragm to flex back resulting in a pressure pulse.



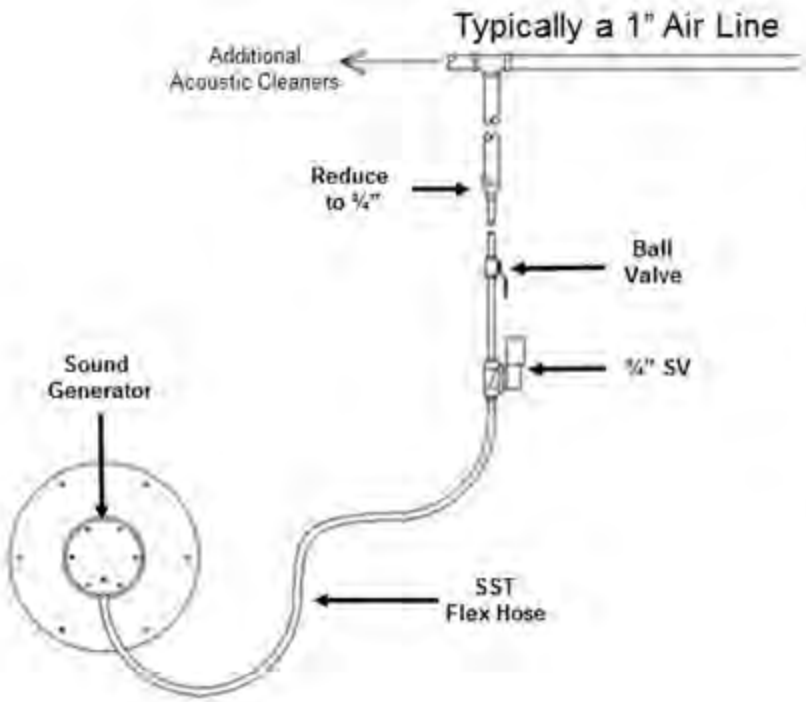
Step 3: The pressure pulses are amplified by the shape of the bell. The energy of the pressure pulses causes particles to be resonated/vibrated. The particles are then swept away by gravity and/or flue gas.

There are three (3) main system/components to maintain to ensure proper operation of the Acoustic Cleaners.
Air Supply System, Sound Generator and Bell Sections





Air Supply System



The air supply system is designed to provide the acoustic cleaner with the correct amount air pressure and volume to flex the diaphragm. Ideally, the compressed air being supplied to the sound generator is dry and free of debris. It is recommended to install an air filtering system on the main air header. The air filtering system is not shown on the illustration on the left.

On new installations, the air line should also be blown down to remove all metal shavings before connecting to the sound generators.

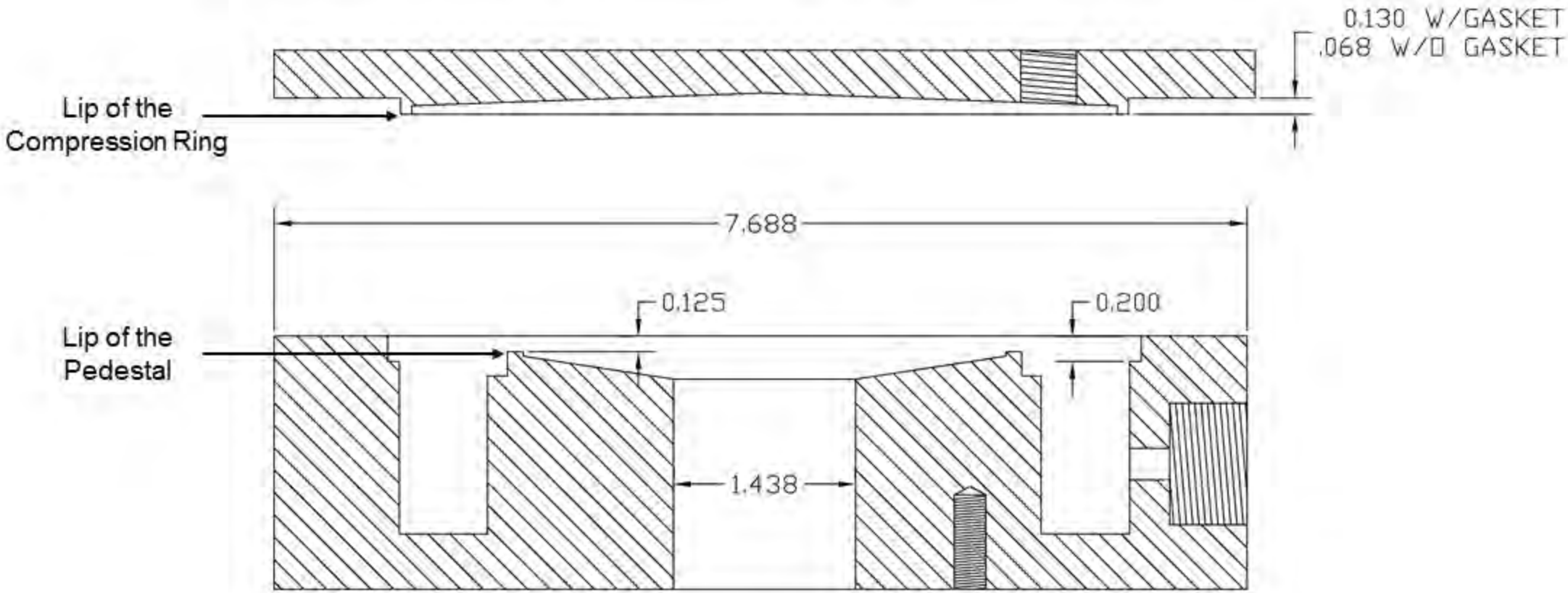
Air Requirements:

Air Consumption: 40 to 80 SCFM

Air Pressure: 60 to 90 PSI

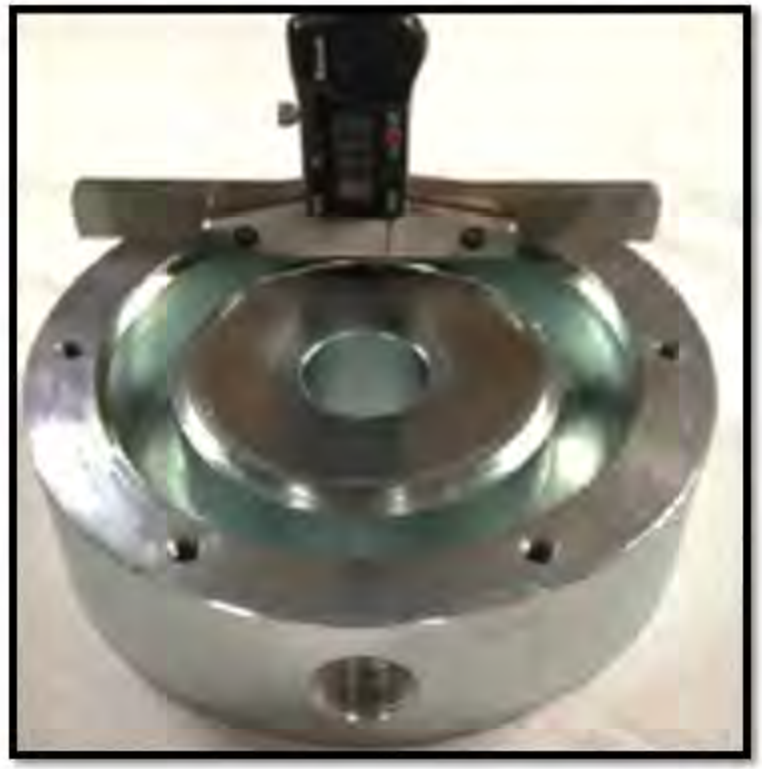
Sound Generator

The sound generator houses the only moving part, a diaphragm.



Sound Generator Illustration

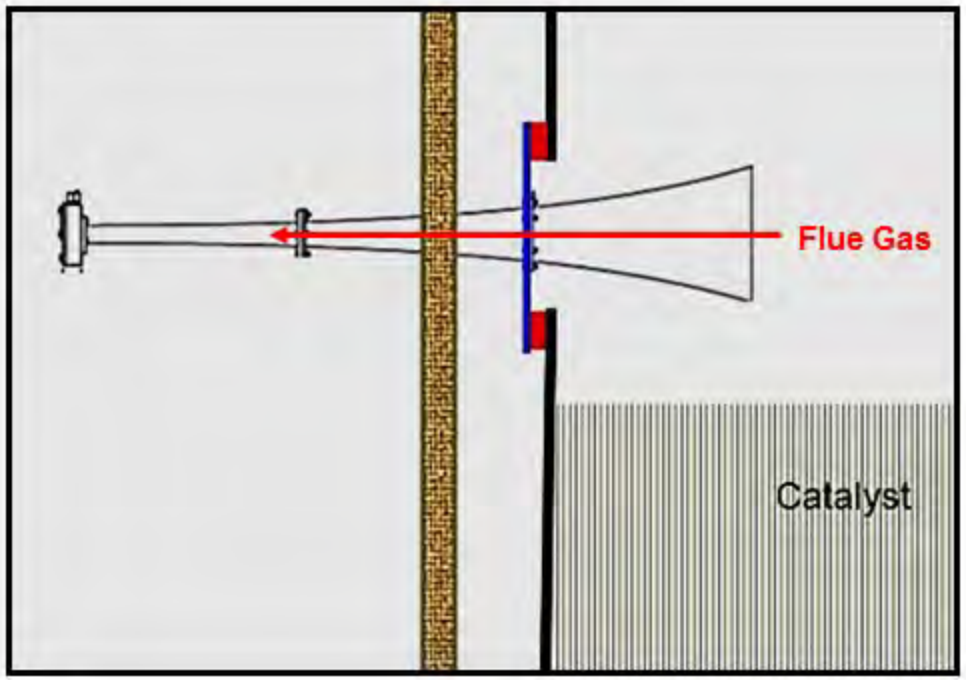
A depth micrometer can be used to check the tolerances of the sound generator.
If the wear surfaces are found to be out of tolerance, the sound generator should be replaced.



The surfaces of the pedestal and compression ring should be a smooth finish.
If there are imperfections on the surfaces, the component should be replaced.
If there is debris on these surfaces, wipe the surfaces clean.

Bell Section

The flue gas that backs into the bell sections is dropping below the acid dew point causing a slow steady growth of deposits. When using an acoustic cleaner with a curved bell design, seeing and dislodging the deposits can be very difficult.

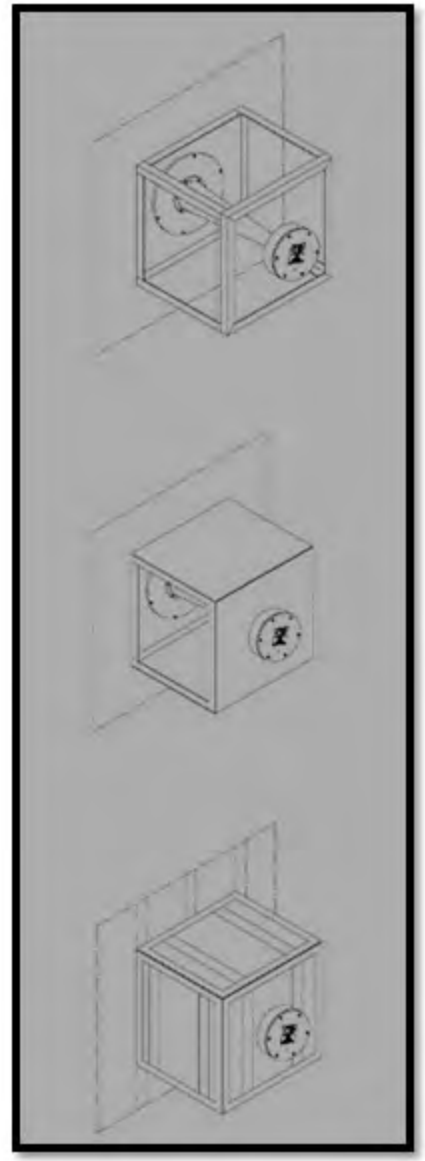


Close up view of the ID of the acoustic cleaner's bell sections.

Corrosion Issue

The bell is in good condition.

There is a high level of surface rust on the sound generators. However, the wear surfaces are within tolerance.



Before

After

Insulation Box

In this type of installation arrangement, Bell Section B is being kept warm by using the hot air trapped between the reactor wall & lagging. This keeps the flue gas that backs into the bell sections above the acid dew point.

The joint between the flange on the end of Bell Section and the Sound Generator should protrude through the insulation box for maintenance accessibility.

Questions?