BHA® Powerwave® Acoustic Cleaning Systems

Powerful cleaning to help increase performance

ENGINEERING YOUR SUCCESS.

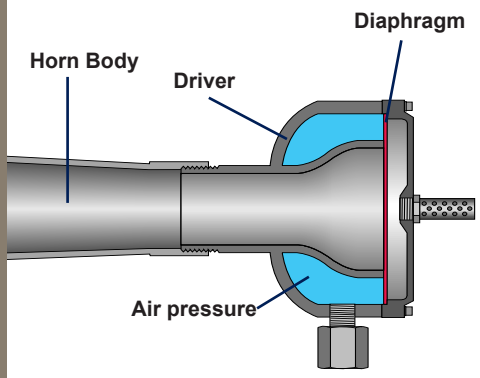
BHA Powerwave acoustic cleaning systems can significantly improve the cleaning process for air pollution control equipment for a wide range of sizes and fundamental frequencies in a variety of applications. BHA Powerwave can:

- Improve performance of precipitators that have poor rapping strength
- Cut excessive material buildup, which can otherwise lead to unscheduled maintenance expense and downtime
- Decrease material flow problems
- Lower operating costs, when compared with other cleaning methods

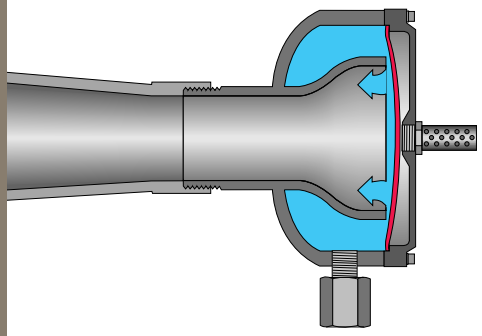
The unique combination of science and technology and our more than two decades of proven experience results in reduced emissions and maximized performance of air-pollution control equipment.

Benefits:

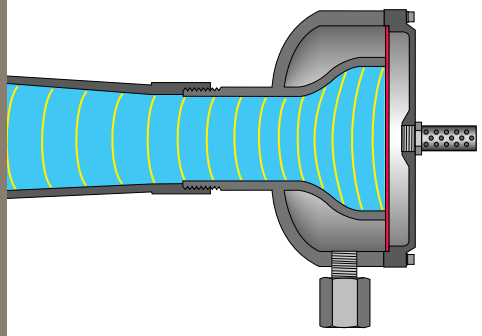
- Low fundamental frequencies and high decibel output means more energy for superior cleaning
- Cleans more surface area for increased power
- Superior quality cast iron bells and steel drivers are available in stainless steel for high-temperature, corrosive applications
- Fits existing openings and access doors for easy installation
- Maintenance is simple and inexpensive with only one moving part
- No exotic air supply or special plumbing required



Compressed air is introduced to the driver assembly of an acoustic horn. The pressure builds up rapidly, causing the diaphragm plate to flex.



Air escapes past the flexed titanium diaphragm plate into the horn, reducing the air pressure in the driver. The pressure reduction allows the diaphragm to snap back quickly, creating a strong pulse in the horn body.



The pulses travel through the horn, where they are amplified by the bell shape, and become powerful bursts of acoustic energy capable of blasting particles away from surfaces.

The length of the horn's "bell" is one factor that determines the main, or fundamental, frequency of the horn. The longer the bell, the lower the frequency. The horn pictured has a long, curved bell, and is often used to dislodge slag from boiler tubes.

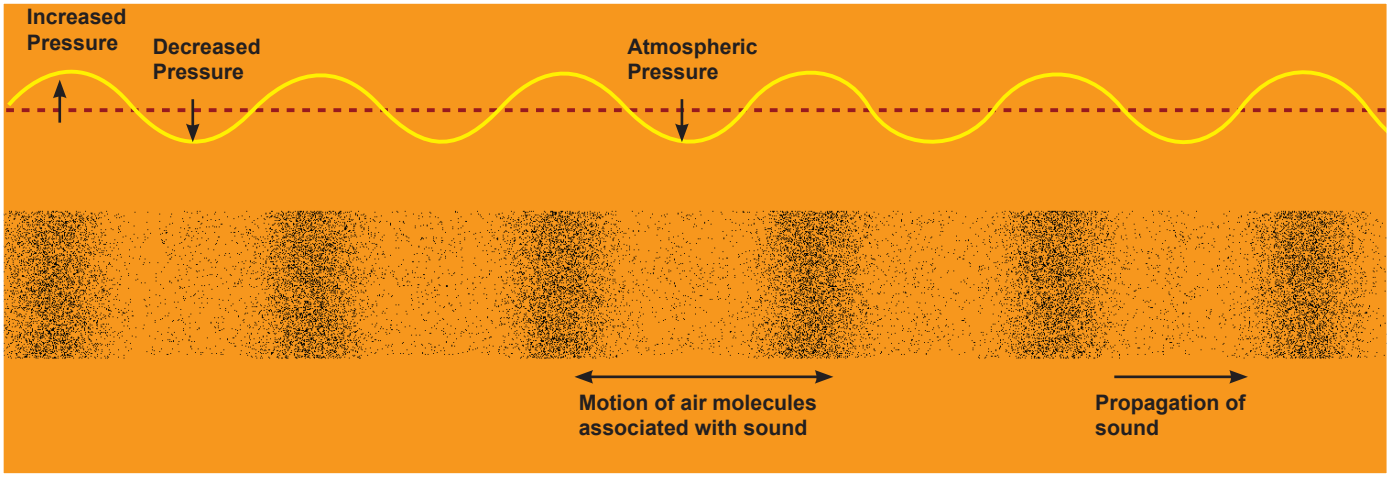
Powerful Cleaning Technology

The Role of Frequency and Intensity

Acoustic cleaning is a simple concept performed by displacing particles—a change in pressure that breaks the bond of the particles from themselves and the structure. Lower frequencies produce higher levels of displacement that cleans a larger cross-sectional area.

Acoustic cleaners typically dislodge dust and particulate more effectively at low frequencies. Extremely low frequency sound waves must be located close enough to the structure or vessel, but can potentially cause structural damage or loosen welded or bolted connections.

Since low frequency, high-decibel sound is most effective at removing particulate; Powerwave acoustic cleaning systems operate at 75 Hz or higher—above the structure's natural frequency—to ensure that structural components are not damaged.



Sound Technology for Cleaning Air Pollution Equipment

BHA's Powerwave acoustic cleaners produce powerful pulses of sound energy that resonates to dislodge dust from fabric filters, boiler tubes and heat exchangers, precipitator collecting plates, hoppers, ducts, and SCR catalysts.

Acoustic cleaning technology is based on the simple principle that sound is a vibration through air that can be heard. Whatever its source—sound waves or mechanical impact—if it has enough intensity, a vibration directed at a surface will dislodge dust and other particulate.

For effective acoustic cleaning, vibration frequency should be low and sound intensity high enough to remove collected particulate. Powerwave acoustic cleaning technology has proven to be so effective for improving the efficiency of air pollution control equipment, that some plant operators use acoustic horns as their only cleaning device.

Proven Applications for BHA Powerwave

Boiler Tubes/Heat Exchangers

By keeping boiler tubes clean, BHA Powerwave acoustic cleaners can supplement or eliminate steam sootblowers in industrial or utility boilers—often reducing or eliminating opacity spikes associated with sootblowing. Acoustic cleaners can operate more frequently than sootblowers, and the result is cleaner tubes without parasitic steam use. With just one moving part — a tough titanium diaphragm plate — BHA Powerwave acoustic cleaning systems cost less to maintain than retractable sootblowers and are also extremely effective for removing particulate from rotary or tubular heat exchanger surfaces.

BHA Powerwave acoustic cleaning systems are designed to be compact, and the curved shape allows them to be positioned in existing sootblower openings for easy retrofitting in existing boiler access doors.

Benefits in the boiler:

- Maximum heat rate efficiency by keeping heat transfer surfaces clean
- Reduced or eliminated use of sootblowers that consume large amounts of steam
- Dramatically reduced maintenance requirements
- Increased air heater efficiency
- Extended boiler duty cycles

Baghouse Fabric Filters

Acoustic cleaning is proven to effectively resonate and dislodge dust accumulations from filters and unlike traditional fabric filter cleaning methods such as shaking and reverse air systems that shorten filter life—acoustic cleaning is gentle to the fabric and does not cause abrasion or flexing of fibers.

BHA Powerwave acoustic cleaning systems can be chain hung inside baghouses—decreasing the frequency of traditional cleaning cycles, and in some cases, eliminating the need for other cleaning methods.

For operation in high temperatures, BHA Powerwave acoustic cleaning systems eliminate common material buildup problems in bins, hoppers, silos, and duct work.

Benefits in the baghouse:

- Enhances dust removal from filter bags
- Reduces differential pressure
- Reduces filter wear (especially in shaker or reverse air baghouses)
- Helps eliminate blinding
- Increases filter life expectancy

BHA Powerwave acoustic cleaning systems provide intense acoustic energy to break up and remove blockages and stubborn deposits—without the mechanical fatigue caused by vibrators, shakers, or sledgehammers.

Acoustic Cleaning Systems

Electrostatic Precipitator Components

Traditional cleaning systems (e.g., externally mounted rappers and internally mounted rotating hammers) literally "hammer" dust free to fall into the hoppers, often resulting in re-entrainment of dust. The mechanical impact of these methods are cracks, distortion, and fatigue of collecting surfaces—along with failure of discharged electrodes.

BHA Powerwave acoustic cleaning systems clean surfaces without causing mechanical stress and fatigue, in some cases eliminating the need for a conventional rapping system.

In addition to the reduction of re-entrainment and mechanical fatigue, this powerful cleaning technology helps increase electrical field strength and collection efficiency.

Selective Catalytic Reduction (SCR) Equipment

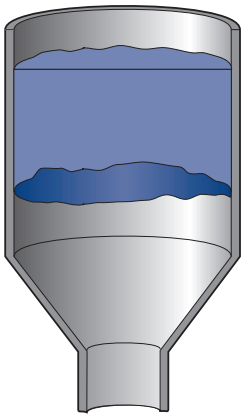
Sootblowers for SCR cleaning results in parasitic steam and can cost thousands of dollars each year for operation and maintenance, as well as eroding and reducing tube life span. Because they are operated infrequently, excessive ash dislodged by sootblowers can result in re-entrainment and "puffing" at the stack—reducing catalytic reaction between sootblowing cycles.

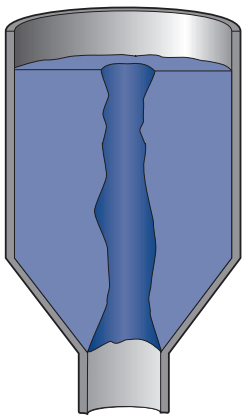
BHA Powerwave acoustic cleaning systems can provide a viable and effective method for cleaning SCR catalyst that is comparatively less expensive to operate, in comparison to steam sootblowers. Because of their small size, they can be positioned across catalyst beds to remove fly ash without sootblowers. In addition to reduced valuable steam consumption, the BHA Powerwave system can decrease catalyst erosion.

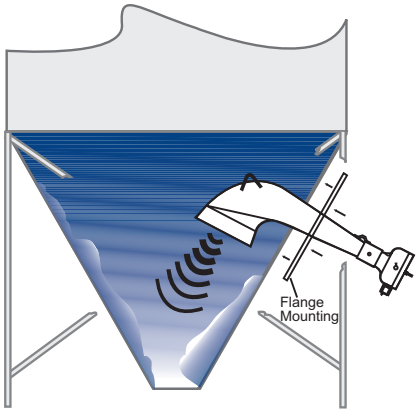
Material Handling (Hoppers, Fans, Silos, Ductwork)

BHA Powerwave acoustic cleaning systems are available in various configurations for hoppers, I.D. fans, bins, and ductwork. The more compact models can fluidize dust in pneumatic conveyor lines and hopper emptying valves—while specialized models keep fan blades clean, balanced, and vibration-free.

Acoustic cleaners can eliminate the need for sledgehammering, hazardous rodding, or the dangerous work of unclogging ash vessels. They also eliminate fatigue and cracking caused by vibrators. Powerwave acoustic cleaning system can eliminate hopper bridging, ratholing, and sidewall buildup.







BHA Powerwave acoustic cleaners eliminate common material buildup problems in bins, hoppers, silos, and pneumatic conveying lines. Easily installed through poke holes or access doors, these powerful cleaners provide intense acoustic energy to break up and remove blockages and stubborn deposits, without the mechanical fatigue caused by vibrators, shakers, or sledgehammers.

Reduce Buildup and Maximize Efficiency

Acoustic Cleaner Specifications

ESP-75

Fundamental frequency	75 Hz
Output power level	147 dB
Bell Material	Cast iron
Weight	135 lbs (61.2 kg)
Length	92.3” (234.4 cm)
Air Consumption	80 SCFM @ 90 PSI (38 l/s @ 5.52 bar)

D-75

Fundamental frequency	75 Hz
Output power level	147 dB
Bell Material	Cast iron (stainless steel fabricated cone)
Weight	100 lbs (45.4 kg)
Length	91.9” (233.43 cm)
Air consumption	80 SCFM @ 90 PSI (38 l/s @ 5.52 bar)

DC-75

Fundamental frequency	75 Hz
Output power level	147 dB
Bell Material	Cast iron/carbon steel (stainless steel fabricated cone)
Weight	110 lbs (49.9 kg)
Length	58.8” (149.35 cm)
Height	52.7” (133.86 cm)
Air Consumption	80 SCFM @ 90 PSI (38 l/s @ 5.52 bar)

D-230

Fundamental frequency	230 Hz
Output power level	150 dB
Bell Material	Cast iron or cast stainless steel
Weight (one piece bell)	64 lbs (29.03 kg)
Weight (two piece bell)	62 lbs (28.12 kg)
Length	27.30” (69.3 cm)
Air consumption	80 SCFM @ 90 PSI (38 l/s @ 5.52 bar)

D-360

Fundamental frequency	360 Hz
Output power level	150 dB
Bell Material	Cast stainless steel
Weight	35 lbs (15.9 kg)
Length	17” (43.1 cm)
Air consumption	80 SCFM @ 80 PSI (38 l/s @ 5.52 bar)

D-Fluidizer

Fundamental frequency	220 Hz
Output power level	150 dB
Bell Material	Cast stainless steel
Weight	27 lbs (12.2 kg)
Length	15.2” (38.61 cm)
Air consumption	80 SCFM @ 90 PSI (38 l/s @ 5.52 bar)

AH-10

Fundamental frequency	125 Hz
Output power level	145 dB
Material	Carbon steel (stainless steel available; Food Grade available on request)
Maximum operating temperature	650° F (343°C)
Weight	40 lbs (18.1 kg)
Air consumption	50-60 SCFM @ 55 PSI (23-28 l/s @ 3.8 bar)

AH-15

Fundamental frequency	125 Hz
Output power level	145 dB
Material	Carbon steel (stainless steel available)
Maximum operating temperature	650°F (343°C)
Weight	70 lbs (31.8 kg)
Air consumption	65 SCFM @ 65 PSI (31 l/s @ 5.5 bar)

AH-25

Fundamental frequency	125 Hz
Output power level	145 dB
Material	Carbon steel (stainless steel available)
Maximum operating temperature	650°F (343° C)
Weight	110 lbs (49.9 kg)
Air consumption	75 SCFM @ 75 PSI (35 l/s @ 6.2 bar)

with BHA Powerwave Acoustic Cleaning Systems

BHA Powerwave+® Impulse Cleaning System

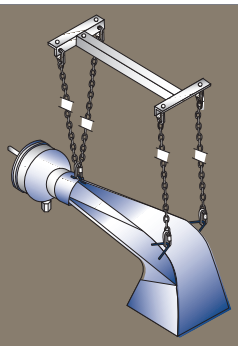
This product from Parker Hannifin attacks tenacious deposits and can potentially improve flow rate, increase heat rate, and reduce emissions. Managed entirely by a fully automated, easy-to-use control system, each impulse consists of precise delivery of fuel and air into the combustion chamber followed by the ignition of this mixture and acceleration from subsonic to supersonic mach-5 speeds.

This supersonic combustion creates a strong impulse wave that exits the BHA Powerwave+ into the problem area. The strength and frequency of this process is adjustable depending on the application and can be repeated multiple times per second. The impulse wave resulting from this process has the ability to penetrate in and around obstructions to provide more complete surface contact. The benefit of this online cleaning technology over traditional cleaning methods is deeper penetration from stronger pressure waves which can result in a more complete removal of deposits.

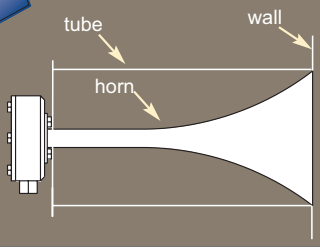
Installation Options

Designed to fit inside existing openings such as access doors, inspection ports, or poke holes, BHA Powerwave acoustic cleaning systems are easy to install. Since instrument quality air is not required, standard plant air can be used to drive the cleaners.

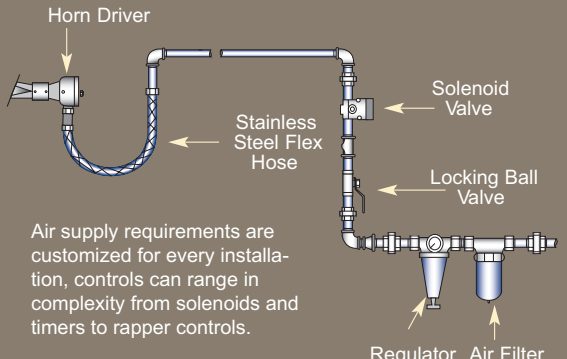
Parker Hannifin can supply all flanges and penetrations to install acoustic cleaners through the sides of hoppers, bins, or any vessel requiring cleaning.



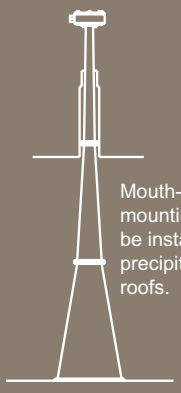
Chain-hung inside a baghouse or vessel



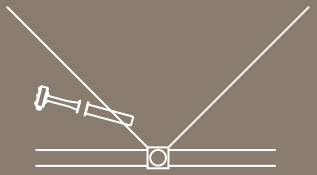
D-Series cleaners have tube mountings for simple installation on vessel walls and other enclosures.



Air supply requirements are customized for every installation, controls can range in complexity from solenoids and timers to rapper controls.



Mouth-flange mountings can be installed on precipitator roofs.



The D-Fluidizer can be installed on a tube for hopper mounting at the precise angle to ensure that sound energy is aimed at the problem area.

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