Title: **A Sound Method of Cleaning SCR Catalyst**

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Since the early 1980's acoustic horns have been used to remove ash deposits in a variety of powerhouse applications. These applications include: 1) cleaning the heat transfer surfaces in boilers, 2) the cleaning of filters in baghouses, and 3) the collecting surfaces in electrostatic precipitators. The main advantage of using acoustic horns instead of conventional cleaning systems is the simplicity and reliability of the horns.

Acoustic horns are air-operated devices that emit low frequency, high-energy sound waves. The sound waves are produced by air entering the driver causing the diaphragm to flex. The flexing of the diaphragm generates sound waves that are then amplified by the horn's bell. These sound waves resonate and dislodge the ash deposits from the surfaces to which they have bonded. Once the ash has been dislodged, gravity and/or gas flow remove it.

The benefits of using acoustic horns instead of steam sootblowers for cleaning the catalyst surfaces on SCR Systems are numerous. Some of those advantages are:

Low Initial Investment

The cost of an acoustic horn is approximately 25% of the cost of a retractable steam sootblower.

Low Installation Cost

Acoustic horns can be installed through a 16" (406.4 mm) diameter opening between catalyst layers. The bell and driver protrude off the wall less than 75" (1,905 mm). Steam sootblowers protrude off the wall a greater distance requiring additional floor grating costs.

The installation is complete with the plumbing of the acoustic horns with a 1" (25.4 mm) air line and making electrical connections between the solenoid valves and timing system. This is in contrast to the steam sootblower's plumbing which involves running high-pressure steam lines that have to be insulated.

Low Operational Cost

Acoustic horns operate on standard plant air. The air requirements are 70 to 90 PSI with an air consumption rate of 60 SCFM when sounding. The typical operating sequence for acoustic horns on a SCR System is 10 seconds every 10 minutes. This equates to an average air consumption of 1 SCFM per acoustic horn per minute. The cost of plant air is generally much lower than high pressure steam and the volume of air needed is less than the steam consumption of the steam sootblower. This results in considerable operating savings. A utility plant using 30 steam sootblowers on one (1) boiler have documented operating costs in excess of $120,000.00 per year. This is, on average, more than 20 times what it costs to operate acoustic horns.

Low Maintenance Cost

A diaphragm is the only moving part in an acoustic horn. The diaphragm is housed in the driver and has a life expectancy of over three (3) years. When required, the diaphragm is easily replaced by removing the cover plate of the driver. This can be done while the boiler is online. It is not unusual for a plant operating approximately 30 steam sootblowers to spend over $50,000.00 a year on maintenance expenses.

Improved Catalyst Contact

Since acoustic horns are inexpensive to operate and maintain, the horns can be operated very aggressively, 10 seconds every 10 minutes. This frequent cleaning of the catalyst never allows the ash to buildup on the catalyst and there is always proper flue gas to catalyst contact. This is also beneficial to the performance of the pollution control equipment since the acoustic horns are entraining a nominal amount of ash at a time. Conversely, steam sootblowers are operated very infrequently, about once every 4 to 8 hours. Opacity spikes can result from this operating program particularly if the SCR System is following a hot side electrostatic precipitator.

Actual Installation Experience

A power producing plant located in the southeast section of the United States, is operating a SCR system on the back end of a coal-fired boiler. The SCR was equipped with a plate to plate designed catalyst system supplied by Siemens. The SCR was originally cleaned by steam sootblowers manufactured by Copes-Vulcan. The steam sootblowers proved to be difficult to maintain. The lance would get off track and would be stuck

inside the ductwork between layers of catalyst. The boiler would have to be taken off-line to get the sootblower back into service. Due to the unreliable service of the steam sootblowers, the plant personnel considered an alternative cleaning system.

Plant personnel decided to try acoustic horns with a fundamental frequency of 75 Hz on a trial basis. In order to keep the installation cost very low, acoustic horns were installed through existing access doors located near the non-operational steam sootblowers. The acoustic horns were wired to a separate timing system and were programmed to operate for 15 seconds every 10 minutes.

After the installation of the acoustic horns, the boiler was put back into service. The boiler was operated for approximately one (1) year and was taken off line for inspection. The acoustic horns proved to clean the catalyst at least as well as the steam sootblowers that were operational the whole run time of the boiler. Plant personnel concluded that the acoustic horns were an effective cleaning system and decided to replace all of the steam sootblowers with acoustic horns.