Ken's Korner

GENERATOR NOISE ABATEMENT

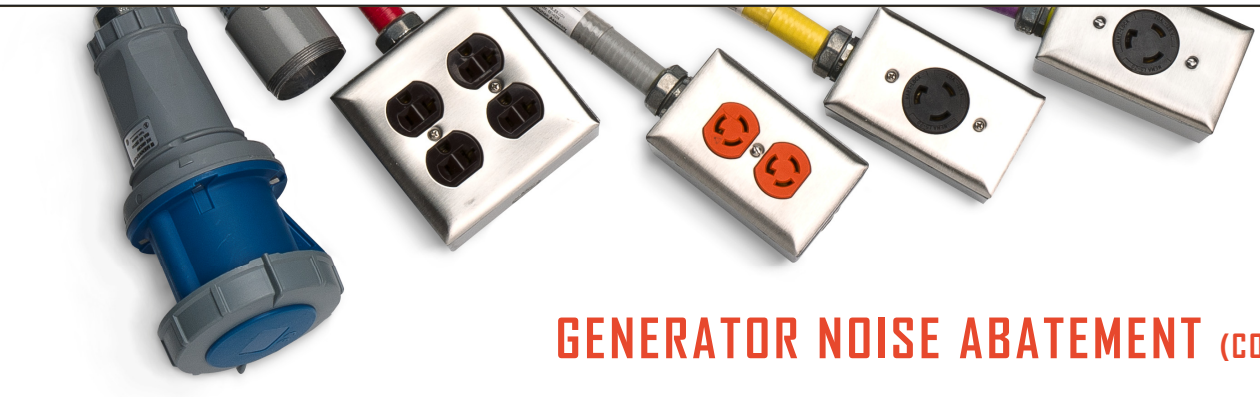
Since generator noise levels can reach 100 decibel's (dB) or more, compliance with national, state or local ordinances can dictate when and where generators are used if noise abatement measures are not implemented. Our city codes allowed a maximum decibel reading at our property line of 55 or less after 10:00 pm, causing us to implement a number of different noise abatement measures.

It is a good idea to hire a professional acoustics engineer that deals with this issue. With the amount of money you are spending on the generators, you want to have an acoustics engineer help in the planning and installation to ensure that you aren't faced with making lots of costly changes later just to bring them into compliance with noise level restrictions. They really can save you a lot of time and money.

Generators have six areas that create noise:

1. **Engine Noise:** This is caused by mechanical and combustion forces, and typically ranges from 100 dB to 121 dB.
2. **Cooling Air Noise:** Sounds of air being moved at high speed across the engine and through the radiator range from 95 dB to 105 dB.
3. **Alternator Noise:** Caused by cooling air and brush friction, and ranges from 80 dB to 90 dB.
4. **Induction Noise:** Fluctuations in current in the alternator windings that give rise to mechanical noise range from 80 dB to 90 dB.
5. **Engine Exhaust:** Without an exhaust silencer, noise can range from 120 dB to 130 dB.
6. **Mechanical Noise:** Is caused by mechanical vibrations of structural parts that radiate as sound.

Since any one noise area can exceed your noise level restrictions, addressing noise problems must be holistic and fully incorporate each component. The cost to make small reductions in noise is generally inexpensive and easy, but the cost of noise control is non-linear. The first 10 dB of a reduction may be relatively inexpensive, but the last 10 dB may be very expensive.



GENERATOR NOISE ABATEMENT (CON'T)

Passive Noise Control

Acoustic Barriers: Sound dampening acoustic barriers are rigid and have substantial mass and stiffness to reduce the transmission of sound. It is important to eliminate sound paths by sealing cracks in doors and walls or through access points for exhaust, fuel or electrical wiring. If they are in an outside generator courtyard you may have to install sound proof walls. This can help greatly in reducing noise leaving your property. You can combine your generator courtyard with our cooling towers so it will serve a dual purpose. A bonus is also this will provide security for both of these critical systems of your data center.

Acoustic Insulation: Sound absorbing acoustic foam is effective for controlling high-frequency noise and is used extensively in outdoor enclosures. Fire retardant foam is the most common material used in enclosures.

Maximizing Distance: Utilizing distance to reduce noise can be accomplished when you consider that noise level decreases by approximately 6 dB every time the distance is doubled.

Cooling Air Attenuation: Reducing sound by making it move greater distances. Baffles can help reduce the noise produced by the cooling air as it moves across the engine and through the radiator. The radiator can be remotely located or making the air travel through a 90° bend in a duct reduces high-frequency noise. Finally direct the airflow upwards, this way much of the airflow sound at ground level is reduced and redirected upwards away from people and structures.

Vibration Isolation: Vibrating generator components induce pressure waves as sound into the environment. Anything that is attached to the generator can cause vibrations to be transmitted into the building structure or foundation. If you are installing the generators within your building pour separate isolation pads for each generator. If you are installing multiple generators, make sure to pour each pad with a different depth layout. Ask your engineers about this, it will reduce the transmission of vibration into the foundation. The weight of your isolation pad should be at least equal to the weight of your generator. Also all components that physically connect to the generator must be flexible to absorb movement without being damaged.

Exhaust Silencers: Mufflers and silencers are generally grouped into either chamber type silencers or spiral type devices. Chamber type devices tend to be more effective, but the spiral type are more compact. Silencers are available in several different "grades" offering noise reduction of between 12 and 35 dB depending on the level. In general, the more effective a silencer is at reducing exhaust noise, the greater the level of restriction on the engine exhaust. Exhaust muffler grades; industrial/ commercial 15 to 25 dB reduction, residential 20 to 30 dB reduction, critical 25 to 35 dB reduction. A good acoustics' engineer can ensure you have the proper silencer (muffler) to deal with noise issues so you don't run into noise violations as well as keeping the noise level down within your own facility.

Active Noise Control & Active Vibration Control

Active noise control involves superimposing a secondary acoustic wave to interact destructively with the primary noise to lower sound pressure levels. Active vibration controls utilize secondary vibrations to interfere destructively with unwanted vibrations that are the source of noise. The basic idea is to control the vibration that generates the noise, by using loud speakers to control the vibration motion of the air around the generator.