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**Session: April 2018**

# PowerHour FAQs

## Sound Attenuation and Test Strategies for Generator Set Installations

This course will provide an overview of acoustics including methods of specification and onsite testing. The instructor will review common sound attenuation strategies for generator set installations and will recommend methods to employ to meet stringent noise requirements. The course will also review how to interpret data provided by manufacturers and how it can be best applied.

To learn more about sound attenuation and test strategies, please join the Cummins PowerHour webinar:

Following this PowerHour participants should be able to:

- Describe the fundamentals of acoustics relative to generator set installations
- Identify appropriate strategies for specifying sound requirements and test methods
- Recognize data provided by manufacturers that is most relevant to site noise limits.

**Is a combination of various sound attenuation strategies the most effective solution? How many sound attenuation methods are usually required to reduce sound to an acceptable level?**

There are two aspects to consider: sound attenuation components on the generator, and sound attenuation methods onsite.

Generator set manufacturers apply the appropriate sound reduction devices to meet the targeted sound level for your project. For example, we're not going use an intentionally oversized muffler when there's little to be gained by oversizing. We're going to try to strike a balance of muffler sizing, fan speed and diameter, enclosure louvers and sound muffling material.

At the building site, there are a number of ways to moderate the sound. Often we see a local requirement for no more than 55 decibels at one meter. Sometimes an acoustical barrier structure housing the generator set is required to meet

that level, as well as to block the view. But an acoustical barrier can have a detrimental affect on ventilation and cooling. So you need to keep that in mind.

A lot depends on the measurement method used by the local authority. If they are taking the sound level at the property line, it can be very effective to use turning vanes to push the sound up instead of out. The perceived sound level will be significantly reduced.

In short, you need to be strategic and determine what combination of methods will be most effective for meeting the sound attenuation requirements for your project, keeping in mind the local authority's measuring method.

### **How does temperature affect sound pressure? Is temperature a factor when calculating how to meet code requirements?**

As I mentioned in my presentation, the great thing about having our own sound test facility at the factory in Fridley is that tests are always performed under the same conditions, so the results are consistent. Sound is impacted by air density, which is affected by temperature. So you want to avoid testing on a cold day or hot day, if possible. The generator set manufacturer should be able to provide you with information about the conditions under which their testing was performed. Just be aware that your actual results in the field may deviate somewhat, depending on the temperature that day.

### **You referred to “infinite exhaust”. What does infinite mean? Please explain.**

When you install a generator set with an enclosure provided by the manufacturer, it's usually installed outdoors, not indoors where you're ducting the exhaust somewhere else.

A outdoor generator that comes with a housing or enclosure provided by the manufacturer includes a muffler, whether it's inside of or on top of the enclosure. So when we test a product in that configuration, we test it just like that; we don't duct the exhaust away. We're measuring all of the noise produced by the enclosed generator set. Because that's most likely the way it is going to operated at the site.

On the other hand, unenclosed units that are intended to be installed in indoor applications, where the exhaust is typically routed somewhere else—you don't just let the exhaust discharge in the equipment room—we test in the configuration that we refer to as infinite exhaust. In that case, the exhaust in our test cell is ducted out, and so our resulting measurement does not account for the exhaust; it's only the radiator fan, the engine, and the alternator. That's why we also provide the exhaust sound power data, which can then be used to understand the impact to other parts of the site where that exhaust may be discharged to.

### **What is the most cost-effective way to reduce sound level in intake and exit ducts?**

If you're looking at an indoor installation with a large generator set, our factory generator room in Fridley is a good example. We have four generators that are used to provide our backup power as well as some other run-time opportunities. The factory is in a mostly residential neighborhood, so we have to meet extremely stringent sound requirements. So the facility was designed to house the generators in the most cost-effective way while meeting the sound requirements. In our case we ended up using very large sound attenuating louvers, eight to ten feet deep.

But louvers are not always the best solution — it depends on the facility configuration. I had the opportunity to work on a hospital project where the inlet was actually ducted down from above, if you can imagine that. So, the air was coming in from the roof and being ducted down to the generator sets. That can be effective because you don't need any sort of special louver. You do need a facility designed for that configuration. But, the nice thing is when you send sound up, instead of out, it substantially reduces the amount of sound when it's measured at the property line.

The easiest and most cost-effective way to accomplish sound attenuation is to push the sound away from your sensitive receptors. It really helps to dissipate the sound upward.

### **When providing a walk-in enclosure, do you specify the sound level of the enclosure muffler?**

I would look at the requirements for this particular site, whether you're using a walk-in enclosure or not. What matters is the sound level from the entire system, regardless of the type of enclosure. The required measurement is usually taken at the property line, so I would call out the required distance from the generator set, inclusive of the muffler. For example, the product that's being provided should not exceed 75 decibels at the property line when installed at the specified distance. I would look at the overall enclosure sound level; I would not recommend specifying a muffler grade or reduction.

### **How does Cummins partner with enclosure manufacturers? Does Cummins test their generator sets in enclosures?**

I'll answer the second question first. Yes, we test the generator in its enclosure. We have a state-of-the-art sound testing facility here in Fridley that is big enough to allow us to move our largest generator set, including the enclosure, into the facility for testing. We are able to test at the actual distances provided on our sound data sheets. For example, when our data sheet says 75 decibels at 7 meters, that is the actual measured value, not a calculated value. Using actual measured values gives us more consistent and more reliable data.

Back to the first question about our partnerships with enclosure manufacturers — for our larger generator sets, above 1 megawatt, typically the customer requests a walk-on enclosure with a very specific list of features. The requirements are customer-driven and they differ for each customer. In that case, we partner with a handful of enclosure vendors and work very closely with them to develop a solution that meets all of the owner's requirements as well as complying with sound limit requirements. We follow stringent sound test methodology to ensure that the generator set is meeting all of the performance expectations.

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