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The Environmental Acoustics Magazine

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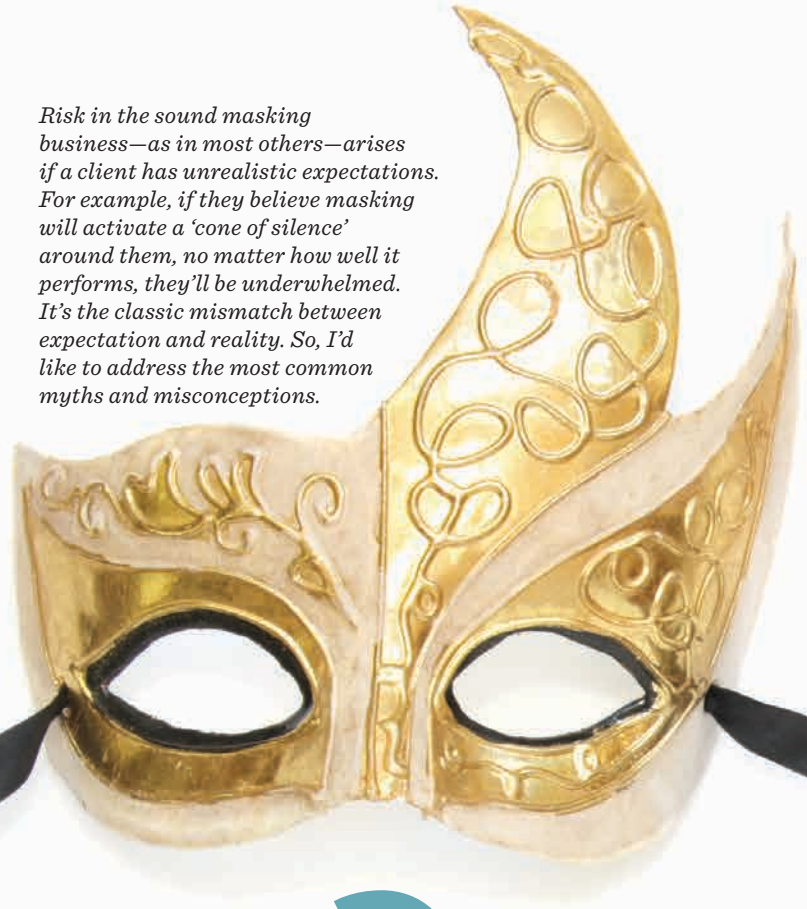
Premiere Issue

Sound Masking Unmasked

Myths & Misconceptions About the Technology

Risk in the sound masking business—as in most others—arises if a client has unrealistic expectations. For example, if they believe masking will activate a 'cone of silence' around them, no matter how well it performs, they'll be underwhelmed. It's the classic mismatch between expectation and reality. So, I'd like to address the most common myths and misconceptions.



1 MYTH

Sound masking is white noise.

The original masking systems developed in the 1960s and 70s used white noise generators. While this type of sound was an effective masker, its hissing quality irritated occupants (if you're old enough to remember, think of an untuned television). That's why these systems were often turned down (or off) soon after installation. However, the term 'white noise' became widely adopted. 'Pink noise' is another term occasionally—and also incorrectly—substituted for 'sound masking.' Its relatively louder low frequencies give it a rumbling quality, like a waterfall. Given these descriptions, it's understandable why modern systems don't use white or pink noise (or any of the other colors). Instead, their output is tuned to meet a spectrum that's designed to provide both effective acoustic control and comfort. It usually spans 100 to 5,000 Hz, but can go as high as 10,000 Hz. Most compare this type of sound to softly blowing air.

2 MYTH

Sound masking cancels noise.

'Noise cancellation' is another well-known term thanks to the popularity of headphones with this feature. Cancellation technology uses microphones to detect a noise, which signals a device connected to a loudspeaker to produce an equal and opposite sound wave. This wave is projected in the same direction as the noise, largely eliminating it. This approach is most effective for continuous, low-frequency sounds such as from airplane engines and traffic. Its applications are limited in buildings because the noise source and the listener have to remain in the same position for the effect to occur. Cancellation doesn't work in an office or similar settings because it can't address the variable, high-frequency nature of speech or moving occupants. For an explanation of how sound masking works, see Understanding Sound Making (pg. 28).

3 MYTH

Direct field speakers provide more even sound distribution.

'Direct field' simply means the loudspeakers are cut through the ceiling and face downward. Only one manufacturer routinely installs one of their product lines this way. While they tend to refer to other masking systems as 'in plenum,' in reality loudspeaker can be installed in a variety of ways (i.e. above the ceiling, cut through the ceiling, in an open ceiling, under the floor, and mounted to the wall) as installation conditions demand—and have been for decades. The downward orientation of 'direct field' loudspeakers produces a spotlight effect, like the beam from a flashlight when directed towards the floor. To prevent noticeable gaps in the sound, vendors must install a greater number of speakers (every 8 to 10 ft; 4.5 m)—double that of other systems. Upward-facing loudspeakers are typically placed on 15-foot (4.5 m) centers because indirect introduction of the masking sound results in broader coverage.

4 MYTH

HVAC provides masking.

Heating, Ventilation and Air-Conditioning (HVAC) can't be relied upon to deliver a consistent sound level over time and space or to generate a spectrum conducive to acoustic control. Even if well-designed, HVAC output is only governed by not-to-exceed maximums, such as those defined in the *2013 ASHRAE Handbook—Fundamentals.* Accordingly, the discussion of HVAC noise in ASTM E1374-18, *Standard Guide for Office Acoustics and Applicable ASTM Standards* pertains only to limiting maximum noise levels rather than using this equipment for masking. The standard also identifies a sound masking system as the only source of a reliable minimum background sound level. Unlike HVAC noise, masking is continuous and precisely controllable, and professionally tuned to meet a spectrum specifically engineered for acoustic control and comfort.

Similarly, some contemplate using music to cover noise and provide speech privacy. However, studies show that we use 30 percent of our cognitive energy when listening to music, even if it doesn't have lyrical content. Music also varies and can't consistently mask conversation and noise.

5 MYTH

For more masking, I need more speakers.

When clients want to address facilities with higher levels of noise or greater speech privacy needs, they often assume that a higher number of loudspeakers will provide a greater amount of masking. Of course, the loudspeakers must be installed in a way that allows for uniform masking coverage throughout the space; however, once that requirement is met, the need for greater masking levels is actually met by increasing the system's volume.

6

MYTH

Small zones are only needed in certain situations.

Control zones are groups of loudspeakers for which a technician can set individual volume and frequency settings. Keeping them small (one to three loudspeakers each, covering 225 to 675 ft^2) ensures the same settings aren't used for dissimilar spaces. Whereas it's readily apparent that closed rooms have different acoustic needs, what's less known is that ambient conditions vary across open plans. One can't ensure consistent masking levels by simply 'blanketing' the space with a sound using a single system-wide setting. Not only do the facility's ambient levels already vary, but the sound is also affected by its interaction with the workplace design, the furnishings, the materials used in the space, and so on. In order to achieve the required masking spectrum and level, the technician has to be able to address local variations in the sound where they arise. As zones get larger, they're decreasingly able to control the masking only where needed. Instead, any adjustments they make affect large areas. Small zones offering fine control over volume and frequency allow technicians to address local variations and achieve a consistent—and, therefore, consistently comfortable and effective—masking sound.

7

MYTH

I can treat small areas of my workplace.

Technically speaking, you can limit masking installation to particular areas within your facility. But should you? I understand asking about spot treatment. Clients may feel the most urgent issues exist in one area. Sometimes they're limited by budget. But, it's important to clearly understand what you are—and aren't—getting from your sound masking system if it's restricted to particular areas. Because masking works at the ear of the listener, you can't treat individual private offices or selected areas in an open plan...or just suspend a loudspeaker over the one person with a particularly loud voice. Treatment of only particular areas within a facility also runs contrary to a key design goal: occupants are supposed to forget that the masking's there. This goal can't be achieved if there are noticeable voids in coverage as they walk through the space. Treated and untreated areas can vary by as much as 10 to 12 dBA.

8

MYTH

Sound masking is just an open-plan solution.

For most closed rooms, it's better to combine a reliable background sound level with a reasonable amount of isolation, allowing organizations to save on wall construction by reducing Sound Transmission Class (STC) ratings and using floor-to-ceiling rather than deck-to-deck solutions. A networked architecture with computer tuning easily provides effective and comfortable masking sound in the fragmented and individual environments presented by private offices and meeting rooms, offering a suite of acoustic benefits that couldn't otherwise be achieved in these areas. Including closed rooms in the masking plan also prevents the noticeable changes in the background sound level that are created when masking is only applied to open areas.

9

MYTH

Masking should automatically adapt to noise levels.

When first introduced to masking, some ask whether its volume will rise and fall according to what's happening in their space. At first glance, that seems logical and it's a feature that's been available with paging systems for years. But unlike paging, masking is a *continuous* signal. When changes are made to it, occupants notice... especially if they're made too quickly or too often, they're too dramatic or applied to the wrong area. We've all been in a restaurant at that time in the evening when they suddenly dim the lights—and everyone stops talking for a moment. Imagine that happening all day long, but with sound. Our senses are designed to detect such changes and even small ones command our attention.

Adaptive masking systems may make volume changes of about 7 dBA in as little as 15 to 20 minutes, which is far too fast. And the masking volume will still be out of sync with the current noise level because the system's adjusting the volume based on noises that were created in the past. In other words, this feature isn't predictive, it's reactive. It doesn't ensure that the proper masking volume is achieved at the right moment. A consistent masking sound, on the other hand, reliably covers up many of the conversations and variable noises in a facility, thereby reducing disruptions to occupants. Consistency also makes the masking 'disappear' from occupants' awareness.

10

MYTH

I can just use a desktop device or an app.

Desktop devices and mobile applications simply aren't commercial-grade solutions. Placement is limited to areas with desktops, leaving the rest of the facility without coverage. And while a user can increase their personal level of *noise control* to some degree, any feeling of increased *speech privacy* is only an illusion. Because they can't easily hear others due to the increased background sound level in their area, they believe those people can't hear them either. However, if a listener isn't using such a device or doesn't have it set to an appropriate level or frequency spectrum, they'll be able to hear the conversation. In any case, the quality of sound these devices produce is questionable because it's affected by the size and quality of their loudspeaker. No matter what mobile you own, it can't generate the curve required to produce a truly comfortable and effective masking sound.

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