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SOUND MANAGEMENT

Optimum Masking Sound: White or Pink?

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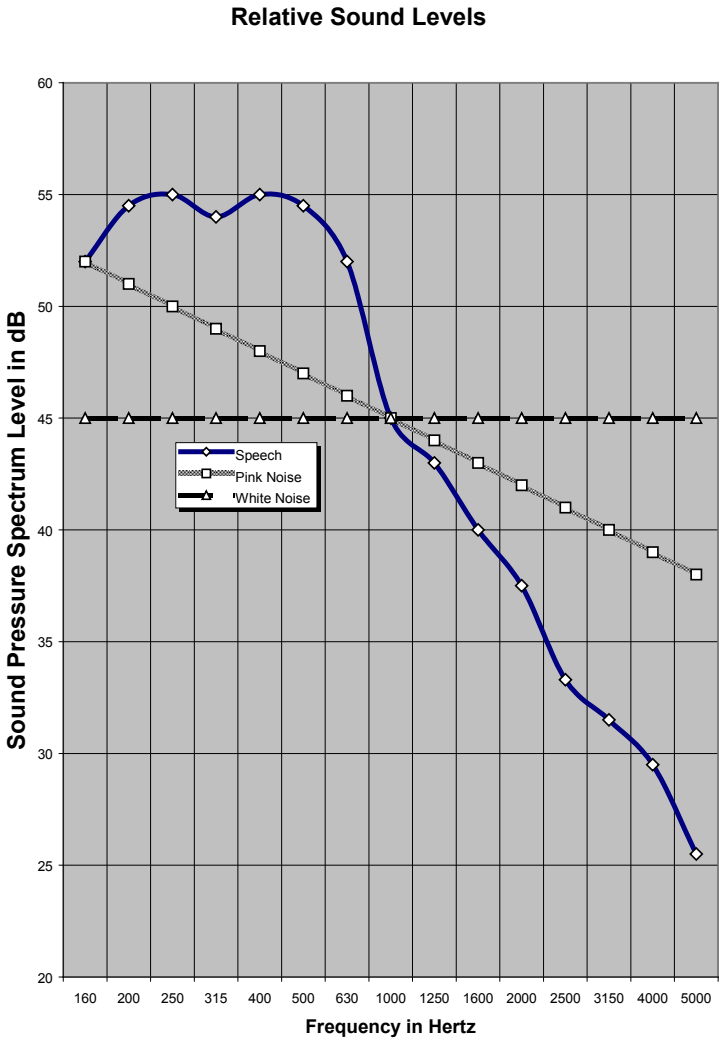
As acousticians we often encounter the statement "I like pink noise better than white noise"- or some variant - when lay people discuss speech privacy or electronic background sound systems. Such statements reflect a fundamental misunderstanding of the physics and role of background sound in reducing acoustical distraction in the workplace. This brief bulletin attempts to clarify what makes for an optimal background sound quality or frequency balance.

Anyone who is exposed to a true white noise or pink noise sound would immediately understand that neither is suitable for use as background sound in the office. An optimum background sound is one that is unobtrusive and easily ignored, as well as one that provides effective blocking of speech sound. Both white noise and pink noise are anything but unobtrusive, and neither is very effective at blocking speech. Should a vendor attempt to convince you that his system is better than another because it uses "pink" noise rather than "white" noise, run the other way, don't walk. Such a vendor is at best naïve, and more likely a borderline charlatan.



What is white noise or pink noise anyway, and what makes for a pleasant background sound in the context of the office? This chart shows the spectrum, or balance of sound strength at different frequencies, for pink and white noise, and for male speech.

1. Female speech is very close to male speech but has slightly less strength at lower frequencies – not enough difference to concern us in deciding upon an optimal background sound. There is actually a recognized technical standard for white and pink noise in the Telecommunications Industry

2. Acousticians also use the terms by acoustical analogy with light for a frequency balance that is independent of frequency (white), or one that has progressively less energy (specifically –3 dB/octave) at higher frequencies (pink). Both have a subjectively hissy, unpleasant quality if presented at a volume that can provide significant acoustical privacy. Pink noise is very slightly better in this regard, but it is sound that has about the same frequency balance as speech that provides the best masking.

We are all accustomed to the sound of speech, and other sounds which have about the same frequency balance are generally judged to be pleasant (except perhaps when originating from an argumentative spouse!) Such sound is sometimes referred to as having a "haystack" spectrum because of its overall shape, as may be appreciated by inspection of the graph. Because it is a very efficient masker of speech it may be presented to listeners at a low, unobtrusive volume while providing effective speech privacy. Accordingly, all background sound systems actually employ some form of haystack acoustical spectrum, although all systems also generate this acoustical spectrum by suitably modifying (equalizing) an initial electrical spectrum, which is normally white. (White sound or noise is also known as Johnson noise after the Swedish-American physicist who first studied it.) White noise is naturally generated by any number of analog and digital circuits.

The art of speech privacy (often referred to as sound masking) has largely to do with small modifications of this haystack spectrum to account for the acoustical characteristics of office furniture and room surfaces, allowing it to be even less obtrusive than the basic speech spectrum. These modifications should be based on a clear understanding of their important effect on both speech intelligibility and the quality of the background sound. Judging by the wide variation in the spectra of background sound systems on the market, this understanding is unfortunately all too rare.

References:

1. American National Standards Institute Standard No. S3.5.

2. American National Standard for Telecommunications Standard T1.523.

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