



Paving the Way to Quieter Communities

Wouldn't it be great if you could make your community quieter just by waving a magic wand? Well, it turns out if that wand is filled with specially treated asphalt, and you wave it over the busiest streets, you may be able to make magic! Wieland Acoustics has been involved in a very interesting project with a local public works department. They have decided to carry out long-term testing to establish whether rubberized asphalt can reduce traffic noise.

One of the most significant components of traffic noise occurs when the rubber meets the road: tire noise. Vibration occurs in the tire structure and sound is created by the movement of air between the tire tread cavities and the road surface. Additional noise is generated by the forces of friction that develop as the tire flattens and deflects, and by vibration as the blocks of the tire tread leave the contact area. Each of these factors is affected by the type of road surface.

Researchers in the UK conducted an in-depth road surface study, and were able to construct a highly complex sound propagation model. By inputting a range of parameters, they were able to determine that the porosity and thickness of the asphalt layer on the road were the most important factors for noise reduction. The porosity affects tire noise reduction, and the thickness affects the specific frequencies at which the reduction occurs. (See, *Reducing Noise from Motorways: The Acoustic Performance of Porous Asphalt on the M4 at Cardiff*, Acoustics Bulletin September/October 1995.)

Similarly, our study will be based on a computer noise model constructed from data collected along the project street. To figure out whether the new surface is effective as a noise mitigation method, we obviously need to obtain "before paving" and "after paving" noise measurements. But since our real-world data is affected by a whole host of other variables such as traffic volumes, speed and truck mix, temperature, wind speed, humidity and barometric pressure. Even the microphone itself is affected by atmospheric conditions. To isolate the effects of the paving alone, all the other variables must be extracted.

To extract the other variables, we must first measure them. So simultaneously with our noise measurements, we obtain traffic counts, speed and truck mix data. At a specially installed computerized weather station, we gather atmospheric information. Once we have all of this measured data, we can begin to peel away all that we don't need. To accomplish this, first the microphone's response is adjusted per the manufacturer's specifications. Next the atmospheric conditions are taken into account and the data is adjusted. We are then left with an "ideal conditions" noise level.

Next, the noise and traffic data (volume, speed, and mix) that we measured simultaneously is entered into the FHWA traffic noise model, and the result there should be the same as our "ideal conditions" level. In practice, it often isn't, due to some variables such as barriers and ground effects that you aren't able to account for. The model allows for the introduction of calibration factors so that the measured level and the computed level are equalized.

When, as in our case, a series of measurements is to be obtained on many different occasions, it is vital to establish standard traffic parameters that are appropriate and realistic for the conditions observed. Once this standardized traffic data: volumes, speed and truck mix have been determined, it is entered into the calibrated noise model, and the result will be a “normalized” sound level that can be used for purposes of comparison. Subsequent noise measurements and traffic data collected over a period of months or years can then be processed and analyzed in a meaningful manner and realistic comparisons can be made.

Over time, with this type of study, many questions can be answered. Does the new surface provide any measurable noise reduction compared to the original surface? How much noise reduction is achieved? How long does the new surface provide the initial level of noise reduction? If the noise reduction performance begins to degrade, by how much does it degrade and how long does it take? How does it compare with traditional paving in terms of cost and maintenance requirements?

Wieland Acoustics is proud to be a part of this new research, as we assist in literally paving the way to quieter communities.

© 2008

Wieland Acoustics, Inc.

All rights reserved.

This article may not be republished without written permission from Wieland Acoustics, Inc.