Equation for sound pressure level

Noise levels on our Norwin Brand of Wind Turbines are documented at the Nacelle in terms of sound power.

Sound sources radiate sound power, while the human ear responds to changes in sound pressure. The sound pressure level (Lp) is related to the sound power level (Lw) by the following equation for hemispherical radiation from a source:[1]

$$Lp = Lw - 10 \times \log_{10}(2 * 3.14 * d^2) + 10$$

Where d is the distance in feet from the source to the position of interest. In the equation, take the common logarithm of the value inside the parentheses.

As an example, if a wind turbine manufacturer specifies a sound power level of 100 dBA, what is the sound pressure level at the closest residence, which is 500 feet from the base of the turbine?

$$\begin{aligned} Lp &= 100 - 10 \times \log_{10}(2 * 3.14 * 500^2) + 10, \text{ in dBA} \\ &= 100 - 10 \times \log_{10}(1{,}570{,}000) + 10, \text{ in dBA} \\ &= 48 \text{ dBA} \end{aligned}$$

Using this equation, sound levels drop off at a rate of 6 decibels for every doubling of distance. So, at a distance of 1,000 feet from the wind turbine, the expected sound pressure level would be 42 dBA.

Our thanks to Chris Bajdek, Senior Noise Specialist for ESS Group of Wellesley, MA (**p: 781-489-1147**) *for the above information about sound pressure and power relationships.*

[1] Hoover & Keith, "Noise Control for Buildings and Manufacturing Plants," Thirteenth Edition, 2000.