



Professional Qualifications

Michael Hankard

Education:

B.S., Electrical Engineering
University of Maine, 1990

Professional Affiliations:

Institute of Noise Control Engineering
Acoustical Society of America

Agency Experience:

Public Service Commissions (various)
World Bank
Federal Highway Administration
Colorado Department of Transportation
U.S. EPA
Numerous Cities and Counties

Background:

Mr. Hankard has been practicing in the fields of acoustics and noise control engineering for the past 25 years. In 1996 he started and remains president of Hankard Environmental Inc. The firm consults in environmental noise and has successfully completed over 400 projects relating to wind turbines, other power generation facilities, oil and gas extraction facilities, highways, mines, entertainment venues, and land development projects.

Mr. Hankard has experience in almost all aspects of environmental noise, including field measurements, predictions, impact assessments, and mitigation design. He has conducted and managed ambient noise surveys lasting from days to years, used a variety of models to predict noise from wind turbines, roadways, and industrial facilities, and designed a wide variety of mitigation measures such as walls, enclosures, baffles, and silencers.

Vibration experience includes the measurement and prediction of ground-borne and structure-borne levels from sources such as rail lines, blasting, and roadways; and the assessment of impact according to internationally accepted methods and standards.

Wind Turbine Acoustics Experience:

Noise Level Compliance Measurements

Mr. Hankard has conducted some of the most extensive utility-scale wind turbine noise compliance measurements in the U.S. Wind turbine measurements present unique challenges due to the need to measure for long periods of time, in windy environments, down lower in frequency than is otherwise typical, and to separate turbine from non-turbine noise. Built on 25 years of measurement experience, he has developed simple, effective, noise monitoring systems that maintain their accuracy over weeks, months, and even years of continuous outdoor measurements, including protecting the microphones from both wind and precipitation. Low frequency noise is measured accurately by understanding windscreen characteristics and microphone sensitivities. Mr. Hankard has developed his own unique methods of separating turbine and non-turbine noise using time, frequency, turbine on/off analyses, and comparing noise levels and operating conditions. This is critically important in assessing compliance.

Ambient Noise Measurements

Mr. Hankard has conducted over 100 ambient sound surveys for the power generation, land development, mining, and other industries. His experience includes the design, execution, and reporting of these studies. Ambient surveys for wind turbine projects are particularly challenging due to the need to measure in a wide variety of windy conditions. A successful study begins with the careful consideration of the project environs, the relative location of turbines and residences, applicable regulations, turbine type, and potential seasonal fluctuations. The selection of the measurement locations is paramount, as is the need to possibly measure for weeks to months at a time, wind screen selection, and microphone mounting and placement. Finally, the analysis of the data is complex, needing to separate ambient sounds from those made by the wind, those resulting from microphone-wind interaction, and transient events.

Low Frequency Noise

LFN, extending from about 20 to 200 Hertz and infrasound (0 to 20 Hz) is often an issue raised on some wind turbine projects and must be addressed. Mr. Hankard continuously reviews the U.S. and International published research on these topics, including measurement techniques and results, compliance assessments, health impacts, and court cases. He has represented clients at public service commission hearings as an expert on noise, including LFN and infrasound. He has measured interior and exterior LFN on multiple utility-scale wind turbine projects.

Modeling

Mr. Hankard has an in-depth understanding of the proper way to model wind turbine noise. The size of this source, as well as its distributed nature and other attributes, make it a non-traditional source to model. He understands the differences between modeling methods (ISO 9613-2, Nord2000, CONCAWE, etc.), the different settings to be used within these methods (ground type, propagation rate, directivity, low frequency considerations), variation in sound power levels determined using IEC 61400-11, and the different results all of these factors can produce.

Representative Projects

Mr. Hankard was the lead consultant for the acoustical aspects of the following projects:
California Ridge Wind Energy Center, Illinois: IPCB Compliance Measurements (2013)
Willow Creek Energy Center, Oregon: Long-term compliance monitoring (present)
Highland Wind, Wisconsin: Ambient survey, Public Service Commission testimony (present)
Shirley Wind, Wisconsin: Ambient noise measurements and compliance testing (2010 to 2012)
Forward Energy, Wisconsin: Post construction compliance testing (2008)
Pleasant Ridge Wind, Illinois: Noise level predictions (2014)
Apple Blossom Wind, Michigan: Ambient measurements and modeling (2014)
Spring Canyon Wind: Noise level predictions (2013)
Ledge Wind, Wisconsin: Ambient noise measurements (2009)
High Sheldon, New York: Compliance noise measurements (2009)