Laboratory assessment of noise annoyance from large wind turbines

Pedersen, Steffen; Møller, Henrik

Published in:
Proceedings of Acoustics '08

Publication date:
2008

11:40

4aNSe5. Criteria for wind farm noise: Lmax and Lden. Frits Van Den Berg (University of Groningen - Science & Society Group, Nijenborgh 4, 9747AG Groningen, Netherlands, fvdberg@ggd.amsterdam.nl)

Wind turbine noise limits are based on either the highest sound immission level (Lmax) or several sound immission levels for a series of wind speed classes (Lmax,v). As yet no procedure has been proposed to determine the day-evening-night sound level (Lden) that is now commonly used in the European Union for all noise sources. Wind speed dependent rating wind turbine noise levels Lr,v can be predicted based on climatological data. This has been verified by measurements over a nine month period for a wind farm at a coastal location in the Netherlands. From these measurements also the long term average sound level Lden can be determined. Lden can also be determined from previously published wind speed measurements at an inland location over one year. The procedure shows that for a wind turbine or wind farm the Lden can be derived from Lmax by taking into account the regional climatology.

12:00

4aNSe6. Response to wind turbine noise in the Netherlands. Eja Pedersen (Occupational and Environmental Medicine, Göteborg University, PO Box 100, SE-405 30 Göteborg, Sweden, eja.pedersen@set.hh.se), Jelte Bouma (Northern Centre for Healthcare Research, University Medical Centre Groningen, PO Box 30001, 9700 RB Groningen, Netherlands, j.bouma@med.umcg.nl), Roel Bakker (Northern Centre for Healthcare Research, University Medical Centre Groningen, PO Box 30001, 9700 RB Groningen, Netherlands, R.H.Bakker@med.umcg.nl), Frits Van Den Berg (University of Groningen - Science & Society Group, Nijenborgh 4, 9747AG Groningen, Netherlands, fvdberg@ggd.amsterdam.nl)

A cross-sectional study with the objective to explore the impact of wind turbine noise on people living in the vicinity of wind farms was carried out in the Netherlands in 2006. A postal questionnaire assessing response to environmental exposures in the living area, including wind turbine noise, was answered by 725 respondents (response rate: 37%). Immission levels of wind turbine noise outside the dwelling of each respondent were calculated in accordance with ISO-9613. The risk for being annoyed by wind turbine noise outdoors increased with increasing sound levels ($rs = 0.501$, $n = 708$, $p<0.001$). The risk for annoyance was decreased for respondents who could not see wind turbines from their dwelling and for respondents who benefited economically from the turbines. No statistically significant correlations between immission levels of wind turbine noise and health or well-being were found. However, noise annoyance due to wind turbine noise was associated with stress symptoms, psychological distress and lowered sleep quality.

12:20

4aNSe7. Laboratory assessment of noise annoyance from large wind turbines. Steffen Pedersen (Acoustics, Aalborg University, Fredrik Bajers Vej 7 B5, 9220 Aalborg Ø, Denmark, stp@acoustics.aau.dk), Henrik Møller (Acoustics, Aalborg University, Fredrik Bajers Vej 7 B5, 9220 Aalborg Ø, Denmark, hm@acoustics.aau.dk)

An investigation of the annoyance from the wind turbine noise, to which neighbors may be exposed, is carried out. The aim is to obtain dose-response relationships and to uncover if specific noise components (e.g. low-frequencies) are primary contributors to the annoyance. In the experiments, sounds recorded close to large wind turbines are filtered (and levels adjusted accordingly) to represent indoor and outdoor positions at the neighbors' dwellings and played back in the laboratory. Challenges relating to the recording and transformation of sounds are discussed. The exposure technique is a combination of an advanced low-frequency chamber that can reproduce the frequency range 2-250 Hz (with uniform distribution in the room) and additional loudspeakers for the higher frequencies. The listening test is a randomized design. The stimuli, of 10 minute duration, are presented at three levels and in combinations of filtered versions (low- and mid-frequency) such that the influence of low-frequency tonal components and level fluctuations is investigated. 25 subjects are exposed to the stimuli while reading a novel and afterwards they rate annoyance on a visual analog scale.