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The sound of high winds

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X EPILOGUE

This is the end of my tour of discovery, of over two years of reading about and trying to understand atmospheric physics and wind turbines, of measurements and theory, of applying knowledge and expertise in physics and acoustics to a new topic. Of course there is much more to discover: indeed, it looks like wind turbines have become more fascinating now their sound has proved to be more complex than a simple constant noise from the sky, driven only by wind with a constant profile. This may motivate researchers and consultants to put more effort in better predictions of wind turbine noise, and considering again noise exposure to local residents.

This period began with publishing the results of the measurements at the Rhede wind farm and it ended, seemingly symbolically, with the first International Conference on Wind Turbine Noise in Berlin in October 2005. At that conference there was a general acknowledgment that wind turbine sound is not the simple issue we once thought it was. At the conference many delegates agreed that, looking back, the internationally used ‘standard wind profile’ might have been misleading people by suggesting it was, everywhere and always, the best wind profile. Although the widely used IEC-61400 standard certainly does not state that, a less careful reader might think it did, finding no alternative profile in the standard. Thus, it becomes a question of careful communication and taking into account that acoustic consultants do (did?) not have the knowledge to apply the standard in ‘non standard’ conditions. Paul Botha [2005] proposed to do away with 10-m wind velocities entirely and relate background sound directly to hub height wind velocity. This is a sensible idea as it relates the two factors that are most relevant, wind turbine sound and ambient sound, without an intermediate variable (10-m wind velocity). It will lead to better insight in the masking capability of background sound: the ability to mask (= make inaudible) unwanted sound is not only dependent on wind velocity, but also on atmospheric stability and wind direction.

The Berlin conference helped me solve a riddle. Malcolm Hayes had written me before that according to his observations blade swish is caused by the blade that is going down, not by the blade being in the downward position (passing the mast). This seems contradictory to my conclusion that blade beating is due to blades passing the mast. Oerlemans [2005] showed that close to the tower Malcolm was right, but this could not explain blade swish far away from a turbine. So what we heard depended on the distance to the turbine, which is also true for other sound phenomena: further away from the turbine the sound has a lower pitch, the pulses can be amplified by synchronicity of turbines and it can be louder under an inversion layer. This point again illustrates that one must be careful when generalizing observations.

I don't expect the problem of the distinct, beating character of wind turbine sound to be solved easily. Though I am convinced the sound character is a major factor in wind turbine noise annoyance, a 5 dB penalty for an impulsive character of the sound may indeed impede wind farm projects as a wind farm will need more 'empty space'. Also, the sound is not as impulsive as gun shots or hammering are, giving way to a discussion on whether it is 'really' impulsive (5 dB penalty) or not (no penalty). Is it possible to have a truly independent opinion in a legally created dichotomy with such significant consequences?

Several technical possibilities to minimize the noise have been outlined in this book, but we need not just depend on technical solutions. A change in public relations can also make a difference: proponents must accept that wind turbine noise is not (always) 'benign', that the noise may affect people, and that people who are complaining are not always just a nuisance. And no, we still do not understand wind turbine noise immission entirely, so proponents should watch their WARYDU attitude.

“..... about 80 per cent of the population supports wind power in the surveys investigated in this paper. On the local level the support of wind power in areas with operating wind power plants is equally high. (...) This, however, does not mean that protests will not appear. It takes only one devoted opponent to start for instance a legal procedure against a planning permit. This is one of the reasons why public conflicts over wind power plants have become the rule rather than the exception. Lack of communication between the people who shall live with the turbines, and the developers, the local bureaucracy, and the politicians seems to be the perfect catalyst for converting local scepticism, and negative attitudes into actual actions against specific projects. Conversely, information and dialogue is the road to acceptance.”

Steffen Damborg (Danish Wind Industry Association) in “Public Attitudes Towards Wind Power”, a “survey of surveys” from several countries, 2002; posted on <http://www.windpower.org/en/news/articles> (consulted December 3, 2005)

