



SIXTH INTERNATIONAL CONFERENCE ON WIND TURBINE NOISE

POST CONFERENCE REPORT

A very busy and intense four days but greatly informative and sociable. How good to meet everybody that I knew again and to meet some new people.

For the third conference running we had just under 200 delegates (199 this year to be exact, just topping the previous two years). 11% were from Pan-America and 13% from Asia Pacific, the rest from Europe. The host country as usual had the greatest number of delegates at 61 followed by Germany with 32. But as usual, the highest number of delegates per population was from Denmark with 15. Close behind were Canada, France and Japan.

The big difference this year was that 45% of delegates provided papers compared with 30 to 35% in recent conferences. We returned to 20 minute presentation slots this year. Geoff and I disagree on this – Geoff believing that shorter slots are better than parallel sessions. No doubt there will always be two camps here but the one day split session worked well this year because we could clearly separate two groups of papers. It might be more difficult in the future.

We are really at the limit now as far as conference length is concerned with almost four full days – perhaps even slightly beyond the limit so parallel sessions and posters might become a permanent feature. As to the posters, they were a great success and I was really very pleased with the enthusiasm of the presenters. Some people preferred posters and some would have preferred an oral presentation. All of you also produced good quality informative presentations and mostly spent a lot of time in breaks speaking to delegates about them.

The workshops also went very well. Both Workshops had over fifty people and there was a good discussion at both. I would like to make more of workshops next time if I can but it's a matter of competing needs and balancing these with time to catch up with old friends and meet new ones.

The highlight of the academic part of the conference was, of course, the whisky tasting. It was an excellently presented mix of education and entertainment. And, on the Wednesday night at the dinner we were piped into the restaurant and up the stairs in the good traditional Scottish way.

WHERE ARE WE NOW – AND WHERE NEXT?

I will try to summarise here the position that we are in with regard to knowledge of Wind Turbine Noise following the papers at WTN 2015. This leads me to suggest in the final section what will be the most useful work to carry out in the next year or two and report at WTN 2017 or even WTN 2019.



SIXTH INTERNATIONAL CONFERENCE ON WIND TURBINE NOISE

Propagation

We pretty much understand the basic mechanisms now and we have the methodology to calculate the propagation effects. The papers in the propagation section of the conference demonstrated this. What we have not adequately answered however is how we can best describe the complex variation of noise levels at neighbours with meteorological conditions in a way simple enough to be used in national noise limits and in compliance testing. Is Leq, L90 or L50 – whatever your country uses the best metric?

Health Effects

The overall health effects of turbines on the population in general has now been established clearly in a number of studies. There is some evidence of direct effect of noise on sleep but otherwise no significant **direct** health effect. But there is a significant effect on a proportion of people who have health effects associated with stress brought on by annoyance. The papers by David Michaud and Brian Howe agreed on this and their conclusions largely confirm earlier studies. There is no evidence – either from WTN 2015 or studies reported elsewhere - that there is any link between infrasound from turbines and any health effects. Indeed the papers from Hansen, Tonin and Walker showed positively that Infrasound had no impact on the subjects and was not detectable. Swinbanks paper alone suggested a link but had no evidence that infrasound was the cause of his illness as opposed to any other factor.

Nevertheless it seems clear that there are some people who are made ill by turbine noise whether the mechanism is direct or not. A number of people called for proper case studies to investigate and understand better these illnesses.

Regulations.

There were a number of useful papers on Regulations. Almost all papers on regulations past and present have described regulations or made comparisons between different jurisdictions. Few if any have addressed the critical issue of whether they actually protect wind farm neighbours and achieve a balance between the need for wind power and the impact on people. This seems to be a significant gap.

I have detected a mood generally and it was touched on a few times at the conference that there should be an international standardisation of wind turbine noise regulations. Whilst this may be a laudable aim, my view is that it is difficult enough to get national agreement let alone international.

Designing the Windfarm for Compliance

Papers by Petitjean and Fotheringham described how to “optimise” a wind farm. That is to say how to operate a wind farm right on the noise limits in a range of different wind



SIXTH INTERNATIONAL CONFERENCE ON WIND TURBINE NOISE

speeds and directions. This was criticised by Bill Palmer and Frits van den Berg. I have observed such practice elsewhere and, whatever the rights and wrongs of it (and there is no doubt that operators are legally entitled to do it) it is the sort of thing likely to antagonise residents.

Background Noise and Compliance Testing.

There were some very interesting papers here including Jiggins on automated measurements and also the other poster presentations in this group. However, there is a long way to go in this area mainly because of the enormous temporal and spatial variation background noise in particular but, to a lesser extent, turbine noise. It is further complicated by how to separate turbine noise from background noise which was a subject covered by a number of presenters. We know almost nothing about the variation of background noise with seasons, with wind direction or with different vegetation.

There has been much discussion regarding the correct equipment and locations for measuring noise but very little about where wind should be measured. Since accurate wind speed is as important as accurate noise level in plotting the background noise graph more work is needed here.

Tones

There were less papers on tonal noise than we have had previously. Perhaps this is because the issue is now more or less solved. Even if tone occur we generally know how they can be mitigated. However, the paper by Evans raised the interesting idea that LF tones might be being missed and wrongly interpreted as merely low frequency noise or even infrasound.

Small Turbines

There were only a few papers about small turbines. These turbines are taking up an increasing proportion of the noise complaints at least in the UK and more work needs to be done. In particular, as Sarah Large demonstrated, small turbines can have annoying features often quite different from large turbines.

Amplitude Modulation

At a previous conference someone suggested that AM was a very British phenomenon. However, only five of the 15 papers this year were from British authors – though it is true that it does not seem to be an issue at all in some countries. Although dynamic stall is clearly a major factor, personally I am not convinced that it is the whole story and

more work needs to be done on the source mechanism and how, as di Napoli pointed out, risk assessments can be formulated.

In addition, a major question is how we quantify it in terms of the depth of modulation and other characteristics and also how we deal with the fact that it is generally intermittent. And when we have solved periodic AM what will we do, as Frits van den Berg asked in discussion, about AM that is not periodic.

WTN 2017 - Themes

It seems to me that there are a number of major issues we need to address between now and 2017:

How we can describe numerically the continually varying noise levels and noise features of turbine noise at neighbours in such a way that noise limits can be defined that adequately protect people on the one hand yet are simple enough to be able to define in regulations on the other?

More dose response tests on turbine noise to allow us to produce more robust regulations.

What parameter best represents people's reaction to turbine noise?

Why do some people become ill near wind turbines?

Do wind farm noise limits actually achieve a balance between the need for wind power and the impact on people?

How does background noise vary with seasons, wind directions types of foliage and other factors?

How to separate turbine noise from background noise?

Where wind should be measured?

Are LF tones being missed or wrongly interpreted as merely low frequency noise or even infrasound?

What are the particular problems of small turbines?

How can we quantify AM in terms of the depth of modulation and other characteristics and how can we deal with the fact that it is generally intermittent?

And, of course any other subjects that are useful to further the knowledge of Wind Turbine Noise.

Any feedback will be welcome – good or bad. Please contact me by email.

Dick Bowdler

dick@dickbowdler.co.uk