How Infra Sound and Low Frequencies are considered in France?

FED : National Group of Victims

Patrick Dugast, Engineer
acoustic and vibrations.

Glasgow 2017 WT Noise Seminar
Plan

- Which is Infrasound and LF noise from wind turbine?
- Academia of Medicine
- New French Norm: Low Frequency measurement
- ANSES National Agency of Health Risk - new report
- Works of Paul Schomer
  - US Navy
- Works of Alec Salt
  - Outer Hair cells specific sensitivity
- Conclusion – Perspectives
Audible threshold 107 dB à 5 Hz

<table>
<thead>
<tr>
<th>Fréquences en Hz</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>8</th>
<th>12</th>
<th>16</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seuils d’audibilité en dB</td>
<td>120</td>
<td>115</td>
<td>107</td>
<td>98</td>
<td>90</td>
<td>82</td>
<td>75</td>
</tr>
</tbody>
</table>


Advise 1500 m for wind turbine > 2,5 MW

Report March 2006: Infrasound too low to affect the health. Demand of an epidemiologic study correlated to distance.

New report 9 May 2017: necessity to make an epidemiological study

“Resentment and opposition can affect the health”

Necessity to control more often the wind farms.

Take care!
Expression of Suffering

In January 2016, the French FED (association for victims) has made a large inquiry concerning 1000 persons.

Expression of claims and distress:
Wind turbine annoyance is classified in categories:

- Noise
- Infrasound and Low frequencies.
- Others (visual, …)

This inquiry was Presented at the ANSES in March 2016, but not really taken in consideration.
New report January 2017:
- Threshold Salt and Hullar in question.

ANSES Recommandation:
- more continuous measurement as for airports
- Epidemiological study
Théory of physiologic effects of infrasounds from wind farm

Paul SCHOMER

A Cooperative Measurement Survey and Analysis of low frequency and infrasound at the Shirley Wind Farm in Brown County, Wisconsin.

- 275 peoples living near Shirley Wind farm – 50 peoples have distress
- Vibration sensitivity
- US NAVY sea sickness

Spectrum inside and outside at 335 m from the turbine

Vibration sensitivity versus exposure time
From ISO2631.

Sea – nauseagenic criteria - US NAVY
Exposure time and nausea %

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Norms and Regulation

New French AFNOR NF-S 31 135

- Frequency domain: 1-25 Hz
- With usual sound meter, first 1/3 octave at 1 Hz (Rion, Norsonic ?, others ?)
- Impulse sounds and periodic sounds analysed separately
- Both Inside home and outside
- Synchronized Vibration measuring is advised
Wind turbine more powerful

Bigger !

 Quieter …?

Slower !

Lower frequencies !

More infrasound…

More “nauséagénic” !

(Paul Schomer)

The Theory of Evolution
Wind turbine more powerfull.
More silent ?
NOT AT ALL !

Alec SALT: Infrasound: Your ears “hear” it but they don't tell your brain. Why?

- Alec N. Salt, Département ORL
  Washington University School of Medicine, St Louis, USA

- 16,000 cells inside Cochlea:

- Sensitivity to specific frequency range
  - Inner Hair Cells (IHC) sensitive to speed,
  - Outer Hair Cells (OHC), more sensitive to displacement.
Action on Outer Hair Cells

- Alec N. Salt, Département ORL
- Guniéa Pig
- électrod placed inside endolymph liquid, in the 3rd cochlear turn
- Infrasound 5 Hz generated at 120 dB
- Recording of electric response of Cells
Conclusion du docteur Salt

1. Infra sound 5 Hz at level 109 dB cannot be “heard”, but inner ear resent an impulse higher than from audible sound.

2. Additional audible sound at 500 Hz acts as an attenuator on infrasound ear response.
Sensibilité de l’oreille aux infrasons

- Sensibilité de l’oreille
  - 100 dB à 10 Hz
  - 109 dB à 5 Hz
  - 120 dB à 3 Hz
- Seuil Inner Hair Cells (IHC)
  - 120 dB à 5 Hz
- Seuil Outer Hair cells (OHC)
  - 72 dB à 5 Hz
- Bruit d’une éolienne (Van den Berg 2006)
  - 75 dB à 5 Hz

Dépassement du seuil des cellules externes dès 3 Hz

Diagramme de spectre de bruit de turbine à vent

- Van den Berg 2006
- Jung and Cheung 2008
- Human Hearing
- Inner Hair Cells
- Outer Hair Cells

~ 3 Hz
Conclusions

- Alec Salt Threshold is seen as a possible alternative to Audible threshold.
- ANSES stays “sceptic”, speaks “nocebo”, and did not do any serious study.
  - The new regulation NF S 31 135 for an accurate measurement
- Academy of Medicine does not recognise a dangerous risk on health;
  - but recognize physiopathology, and recommends an epidemiological study
- SALT and Hullar threshold is not rejected.
  - Some progress, but Slow