Quantifying, Considering and Assessing Sound Levels Within an Acoustic Environment. Is Alberta Behind?

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OVERVIEW

This presentation is prepared to provide information on the following:

- What is Acoustics?
- Noise regulations and policy in Alberta
- What should Alberta do differently?

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Who am I?

Dan Clayton

Worked in Acoustics Consultancy for over 12 years Moved from UK recently

Sectors worked in:

- Power (O&G, Nuclear, Renewable)
- Mining
- Industry and Manufacturing
- Transport (Road, Rail and Air)
- Property (Commercial and Private)
- Government Policy Development
- Waste and Recycling



What is Acoustics?

Question? Q: Who has been affected by acoustics in their life?



Why is this??

Noise is a pollutant!

What are the different areas of Acoustics?

- Environmental Acoustics/Noise
- Environmental Vibration
- Occupational Noise
- Occupational Vibration
- Building Acoustics
- Audio and Public Address



Why should we care about acoustics?

- It affects quality of life and health
- High sound levels cause permanent hearing damage
- High vibration levels cause muscle issues and disorders
- It affects communication and safety
- It affects wildlife behaviour

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Why should we care about noise?

Our health is becoming increasingly affected by noise through:

- sleep disturbance
- annoyance
- hearing damage

More people are affected by noise than ever have been. Due to growing populations and infrastructure demands.

Animals alter their behaviour or move to avoid noise. This has a flow-on effect for whole ecosystems and us!



What are the worst offenders?

- Transportation Noise (Road, Rail, Air and Sea)
- Industrial Noise (Waste, Recycling & Manufacturing)
- Mining
- Power Generation & Transmission
- Entertainment Venues and Outdoor Events
- Construction
- Domestic

When should we look at noise and vibration issues?

- After a complaint?
- At commissioning stage?
- At the construction stage?
- At the planning stage!





• Noise complaints are on the rise

• Receptors and industry/infrastructure are getting closer together.

 Consideration of acoustics often comes last or not at all.
Then a problem hits and it's painful for residents, users and operators

There's lots of space in Canada! We don't need to worry about noise from waste sites right?



- It's expensive to resolve retrospectively due to
 - Increased public awareness causing more headaches for operators and planners
 - Assessment and legal processes lasting a long time
 - Mitigation options are implemented which reduce:
 - Operating hours
 - Flexibility of permitted operations or processing areas
 - Types of waste that can be processed
- All of these things can be reduced or avoided!!

There's lots of space in Canada! We don't need to worry about noise from waste sites right?



When is an acoustic assessment required in Alberta?

• Energy developments under the Alberta Energy and Utilities Board (AER Directive 038 Noise Control)

For:

- Energy developments Oil and Gas Conservation Act and Regulations
- Developments under the **Coal Conservation Act and Regulations**
- Oil sands projects Oil and Gas Conservation Act and Regulations
- Industrial operations Oil and Gas Conservation Act and Regulations and Coal Conservation Act only
- Electrical generation facilities (incl. wind turbines) Hydro and Electric Energy Act



When is an acoustic assessment required in Alberta?

• Utilities developments (AUC Rule 012)

For:

- Gas utility pipeline
- Hydro development
- Power plant
- Substation
- Transmission line
- Canada Occupational Health and Safety Regulations (SOR/86-304)
- Where sound exposure in work place is equal to or greater than 84dB(A)



When is an acoustic assessment not required in Alberta?

- Industrial (non oil and gas and coal)
- Construction
- Mining
- Transportation (air, rail, road)
- Entertainment Venues and Outdoor Events
- Residential Development
- Commercial Development (internal and external)



What about Bylaws?

- Yes! Noise is typically within Bylaws
- Noise Bylaws exist and sometimes specify sound level limits or guidance but not always. We need limits but appropriate ones!
- But they are not in line with current understanding of how sound affects humans
- They are more suited to residential to residential sound
- The limits are too high for considering the impact of a sound on an acoustic environment
- Let's look at an example Bylaw!



Calgary Bylaw 5M2004

- No Person shall cause or permit to be caused a Continuous Sound that exceeds the following Sound Levels:
 - A) 65 dB(A) L_{eq} measured over a one (1) hour period during the Day-time; or
 - **B)** 50 dB(A) L_{eq} measured over a one (1) hour period during the Night-time.

Daytime (0700hrs to 2200hrs) Night Time (2200hrs to 0700hrs)

- If we were trying communicate in an acoustic environment of 65 dB(A) we would have to shout at each another
- Assuming an open window, 50 dB(A) would result in around 40 dB(A) within a property. World Health Organization guidance indicates that this is 10 dB above the level where adverse impacts are observed. This is twice as loud!
- Only deals with average sound levels. Sleep disturbance is also linked to maximum sound levels.

AUC Rule 012 and AER Directive 038

- Guidance is very similar in both documents
- Assessment methods are based on broad and unrealistic assumptions
- Wind energy sound sources included but methodology is inappropriate
- Assessments are undertaken in the wrong order with assumptions made for baseline sound levels
- Generally assessment of project sound only then apply for correction to increase criteria if it can't be achieved

AUC Rule 012 and AER Directive 038 (cont.)

- Assume maximum sound emission conditions, which isn't suitable for wind energy
- Assessment process is typically unnecessarily long and arduous
- No limits for construction sound, brief discussion only
- Assessment of average, steady state sound only no subjective perception considerations

What does that mean and why does it matter?

 What's the difference between a constant, broadband sound and one that isn't?

 Is one more annoying that the other?



Can we use the existing guidance for all acoustic assessments? Can we apply AER **Directive 038 or AUC** Rule 012 to the instances where there is currently no requirement to undertake an acoustic assessment?

• No!

Why not?

• Each type of sound source is different in the way we perceive it.



World Health Organization

Specific environment	Critical health effect(s)	L _{Aeq} [dB(A)]	Time base [hours]	L _{Amax} fast [dB]
Outdoor living area (noise from sources other than road traffic, railways, aircraft or wind turbines)	Serious annoyance, daytime and evening Moderate annoyance, daytime and evening	55 50	16 16	1 1
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening Sleep disturbance, night-time	35 30	16 8	45
Outside bedrooms (noise from sources other than road traffic, railways, aircraft or wind turbines)	Sleep disturbance, window open (outdoor values)	45	8	60
School classrooms and pre-schools, indoors	Speech intelligibility, Disturbance of information extraction, Message communication	35	During class	-
Pre-school bedrooms, indoors	Sleep disturbance	30	Sleeping time	45
School playground, outdoors	Annoyance (external source)	55	During play	
Hospital ward rooms, indoors	Sleep disturbance, night-time Sleep disturbance, daytime and evenings	30 30	8 16	40 -
Hospitals, treatment rooms, indoors	Interference with rest and recovery	#1		
Outdoors in parkland and conservations areas	Disruption of tranquillity	#3		

#1 As low as possible

#3 Existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background sound should be kept low



What are others doing?

It depends on the source being considered.



What are others doing? (cont.)

For industrial style sources (including mining), many countries are opting for a comparison against baseline ambient sound level approach including penalties for the presence of acoustic features



What are others doing? (cont.)

For transport sources, sound level maps are produced and updated every 5 years in Europe (use increasing in Australia too). Acoustic impacts from proposed projects are assessed and mitigation designed into the schemes rather than managed retrospectively



What are others doing? (cont.)

For wind energy sources, assessment criteria is based on ambient sound level in each wind speed and unique sound level limits.



What are others doing? (cont.)

The acoustic environment for proposed residential or commercial developments is assessed for suitability and mitigation implemented to achieve guideline levels published by WHO.



What are others doing? (cont.)

In Europe, internal acoustic requirements are included within the building codes and standards for sound insulation and reverberation for homes, schools and hospitals





What are others doing? (cont.)

Various other countries conduct prior sound level surveys to determine baseline sound levels to understand the existing situation

This is done in Alberta sometimes but not the typical procedure

But we monitor sound in Alberta don't we?

Only typically done to show compliance with sound level criteria

Ambient sound surveys are done but generally in exceptional circumstances and only for a brief time period

The methods are out of date

Occupational noise control options

What's the default solution to occupational noise?

Earplugs!

They are PPE and should be the last line of defence



Hearing protection assessments

- Measure the sound level in work areas
- Spot level measurements
- Dosimetry
- Determine the frequency content (Hz) of sound in work areas
- Specify hearing protection to achieve below Health Canada Hearing Damage Levels at the ear



Hearing protection implementation

Care should be taken to not under or over protect workers

Provide training to workers on the importance of hearing protection and how to use it

Don't rely on hearing damage as an indicator of an issue

Why do this?

Because if hearing protection is not specified correctly then the employer is liable down the road What are the main issues with acoustic assessment in Alberta? The current approach, guidance and rules:

- are complicated to follow and inefficient in their approach
- use out of date approaches and criteria
- use a one-size fits all approach
- The worst sound emitters and associated health effects are not considered in Alberta. Such as:
 - Road traffic
 - Rail traffic
 - General Industry
 - Construction

For currently regulated/assessed developments?

No!

Less onerous sound level restrictions are possible and likely in many cases if we align with best practice from the rest of the world. We need to be more logical and practical in our approach to benefit everyone.

For instances where it would be more restrictive, we need to remember that we are the receptors!

The reason we have environmental assessment is to minimize the effects on the environment including us.

Won't making all these changes be too restrictive on developers, operators and project planning?

Let's lead the way!

Let's start considering noise as the pollutant it is and be more proactive in Alberta and lead the way for Canada.

Its not all bad news

- Health Canada released guidance for evaluating Human Health Impacts in Environmental Assessment. A good start but needs more focus.
- Rocky View County are trying to establish local guidance and criteria for assessment of sound for aggregate operations. Criteria based on baseline sound level surveys.
- NCIA Regional Noise Model for Industrial Heartland Area in Alberta.

Its not all bad news



What should we change in Alberta?

More sophisticated parameters

For most sources using Average (L_{Aeq}) sound levels is not a good indication of the baseline sound levels and inappropriate for assessing the impact of the sound, we need to consider other parameters such as L_{A90} , L_{A10} , and L_{amax}

Move away from the action after a complaint mentality.

Once there's a complaint, it's too late!! It costs more money and time to resolve. Get us in early to plan and help!



What should we change in Alberta? (cont.)

Introduce sound level and/or acoustical criteria for all natures of development, separate them accordingly and make them a requirement.

Such as:

- general industry
- Residential, educational, healthcare and commercial property feasibility
- rail operations
- construction
- mining
- entertainment Venues



What should we change in Alberta? (cont.)

Start to consider tranquility and acoustically important areas

Implemented Soundscaping Assessment and Mitigation





Conclusions

Acoustic assessment and design prior to operation saves time and money; minimizing impacts on people and the environment.

Alberta needs to introduce noise regulations, guidance and standards for operators outside of energy and utilities

Each type of sound source needs its own guidance and criteria

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Questions THANK YOU!

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