



IAGT 2015 SYMPOSIUM

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Environmental Noise

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Introduction to Speaker

- 5 years: military aerospace
 - F404-GE-400 gas turbine engine (F/A-18)
- 10 years: acoustical consultant
 - extensive work with industrial gas turbine applications



A Brief “Noise 101”

- Sound Pressure Level
 - Measured logarithmically in decibels [dB]
 - Human perception
 - +/- 10 dB perceived as doubling/halving of loudness
 - +/- 5 dB perceived as +/- 25% of loudness
 - +/- 3 dB or less, generally imperceptible
 - Attenuation over distance

A Brief “Noise 101”

- Pitch and Frequency
 - Measured in units of Hertz [Hz]
 - 1 Hz = 1 oscillation per second
 - Low frequency sound → tuba, thunder
 - High frequency sound → piccolo or hissing air leak
 - Human hearing range: 20 Hz to 20 kHz

A Brief “Noise 101”

- A-weighting and Octave Bands
 - We have different sensitivities to sounds of different frequencies
 - A-weighting [dBA] represents spectral sum, mimics response of human ear
 - Octave bands are “bins” of frequency ranges

What is Noise?

- Simply put:
Unwanted Sound
- Can interfere with:
 - Sleep
 - Enjoyment of property
- Can lead to complaints

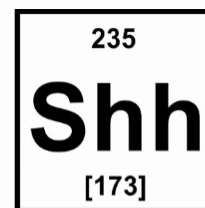


The Importance of Environmental Noise

- Regulations/ordinances, etc.
- Environmental Approvals, Assessments
- Financing obligations
- Corporate Social Responsibility

Types of Noise Limits

- Where they apply
- Qualitative vs Quantitative
- Fixed vs Relative
- Limits by type of activity,
date or time



**The Element
of Silence**

Regulatory Frameworks Ontario, Canada

- Ontario Ministry of the Environment and Climate Change Guideline NPC-300
 - Quantitative limits applicable at noise-sensitive points of reception
 - Fixed and relative limits, depending on background sound in area



Regulatory Frameworks (cont'd) Ontario, Canada

Acoustic Environment	Daytime (07:00-19:00)	Evening (19:00-23:00)	Nighttime (23:00-07:00)
Urban	50 dBA	50 dBA	45 dBA
Rural	45 dBA	40 dBA	40 dBA

- Predictable worst case hour
- Adjustments for unique sounds
- Emergencies exempt



Regulatory Frameworks (cont'd)

Alberta, Canada

- Alberta Energy Regulator Directive 038
 - Applies to oil/gas production, storage and transportation, coal mining and electrical generation facilities
 - Limits apply at dwellings
 - If no dwellings, must meet 45 dBA at 1.5 km from property line



Regulatory Frameworks (cont'd)

Alberta, Canada

- Permissible Sound Level:

Basic Sound Level + Daytime Adjustment + Class A Adjustment + Class B Adjustment

- Emergencies exempt
- Low frequency noise (< 250 Hz)



Regulatory Frameworks (cont'd)

State of New Jersey, United States

- Applies to industrial facilities
- Maximum SPL at property line
 - Residential (07:00 to 22:00): 65 dBA
 - Residential (22:00 to 07:00): 50 dBA
 - Industrial/Commercial: 65 dBA
- Also octave band limits



Regulatory Frameworks (cont'd)

Norcross, Georgia, United States

Land Use Category	Point of Reception	Maximum Permissible Sound Level	
		07:00 – 22:00	22:00 – 07:00
Residential	Outdoors	70	65
Multi-family dwelling	Indoors	65	60
Commercial	Outdoors	75	70
Industrial	Outdoors	85	

Regulatory Frameworks (cont'd)

State of Pennsylvania, United States

- Proposed noise control requirements for “Unconventional Wells”
- Must have plan to “minimize noise”
 - Assess background noise, receptor sound levels and noise mitigation plan
 - No defined limits of acceptability
- Ultimately retracted



Regulatory Frameworks

Europe

- European Union
 - Environmental Noise Directive
- Denmark
 - Guideline No. 5/1984
 - Unique limits for 8 area types, weekdays, weekend days, and nighttime periods



Acoustical Design Considerations

- Identify/understand any legal obligations
 - If none, consider those of similar locale
- Acoustical modelling to quantify impacts
 - Compare to limits (or existing sound levels in the area)

Acoustical Design Considerations (cont'd)

- Tonal sounds (compressor whine)
- Piping noise
- Blowdown events



Noise Control Measures

- Silencers
- Enclosures
- Barriers
- Lagging



Consequences

- Regulations/Ordinances have teeth:
 - Fines
 - Legal orders
 - Suspend operations
- Jeopardizing the respect of the community



Thank you!
Questions?

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