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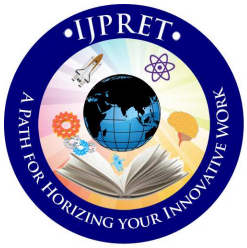

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NOISE POLLUTION AT WHAT COST: ASSESSMENT IN FERTILIZER INDUSTRY

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Abstract

Sound means the vibrations composed of frequencies capable of being detected by ears while noise means the unwanted sound. Noise generated from various industrial activities can disrupt the activities or balance of human or animal life. Noise can cause adverse health effects on human beings. Thus control technology should aim at reducing noise to acceptable levels. The priority must always be to reduce the noise at source by engineering means once the main noise source has been verified. The most common noise sources can be divided into Aerodynamic (fans, pneumatics, and combustion) and Mechanical (impacts, friction). Noise control methods can be classified as noise control at source, during transmission and at the receiver. Noise control may take the form of altering any one or all of these elements. The noise source is where the vibratory mechanical energy originates. If noise cannot be controlled to an acceptable level at the source, attempts should then be made to control it at some point during its propagation path. As a last the noise control problem may be approached at the level of receiver. This research paper present the principles of noise control various noise control techniques, study at a fertilizer factory involving analysis of noise problem and practical remedies for control of noise.

INTRODUCTION

Sound Pressure Level:

As the air particles vibrate, momentary tiny fluctuations occur in the atmospheric pressure. It is these pressure changes that our ears detect as sounds or that a microphone responds to. The *sound pressure* changes alternatively positive and negative relative to atmospheric pressure, as the air is compressed and rarified.

The *word level* is used to designate that the *rms* pressure is relative to the universal base sound pressure. The sound pressure level (SPL) for any measured sound is defined by:

$$\text{SPL (in decibels)} = 10 \log \frac{(\text{rms sound pressure measured})^2}{(20 \text{ micropascal})^2}$$

Or

$$\text{SPL (in decibels)} = 20 \log \frac{(\text{rms sound pressure measured})}{(20 \text{ micropascal})}$$

In practice, a sound level meter is calibrated to read decibels relative to 20 micropascal, so a person is seldom aware of the s pressure of the actual sound .We are aware that very quiet sounds (a quiet whisper, or the rustling of grass in a very slight breeze) may range from 10 to 20 dB, while very loud sounds (a nearby diesel truck or an overhead aircraft shortly after takeoff or a loud clap of thunder) may range from 85 dB to over 130 dB. 'Instantaneous sound pressure levels of 160 dB can rupture the 'eardrum, and the risk of permanent hearing impairment increases as a function of sound levels above 80 dB.

Noise Pollution

Noise pollution is displeasing human or machine created sound that disrupts the activity or balance of human or animal life. A common form of noise pollution is from transportation, principally motor vehicles. The word "noise" comes from the Latin word *nausea* meaning "seasickness", referring originally to nuisance noise.

I. SOURCES OF NOISE

The source of most noise worldwide is transportation systems, motor vehicle noise, Other sources are office equipment, factory machinery, construction work, appliances, power tools, lighting hum and audio entertainment systems. [2]

Acoustics

The word "acoustic" is derived from the ancient Greek meaning able to be heard .The Latin synonym is "sonic". After acousticians had extended their studies to frequencies above and below the audible range, it became conventional to identify these frequency ranges as "ultrasonic" and "infrasonic" respectively, while letting the word "acoustic" refer to the entire frequency range without limit.

Noise control is an active or passive means of reducing sound emissions, often incentivized by personal comfort, environmental considerations or legal compliance. Practical and efficient noise control is wholly reliant on an accurate diagnosis of what is causing the noise, which often involves some degree of 'detective work'.

Noise control materials most often used in noise control are absorber and Isolators for airborne sound, and vibration isolators and damping materials for controlling vibration solid borne sound.

METHODOLOGY OF NOISE ASSESSMENT AT FERTILIZER FACTORY

Problem description

The Factory division produces a mixed chemical fertilizer using Urea, single super phosphate, potash and diammonium phosphate as Raw material. The mixture has to be passed through cylindrical drums rotating continuously at 10 RPM, place horizontally. The fertilizer (at around 600 °C at beginning of drum) sticks up to the inner surface of the drum . To avoid this hammers weighing 15 kg each are employed along the periphery of drum, due to impact hammer the fertilizer mixture that is deposited at the inner surface is remove the main source of noise is the impact of hammer with outer surface drum.

Noise measurements using sound level meter:

- Check the calibration of the sound level meter (SLM) and adjust if necessary.
- Compensate for the use of any extension cable by calibrating the SLM with the extension cable connected. Calibration must be carried out at regular intervals if extensive measurements are made, or if a tape

recorder is moved, affecting the settings.

- Calibrate/adjust any level recorder that is to be used. (The range control (if fitted) of the SLM may be used to check that the SLM and level recorder readings agree.)
- Accurately mark and identify all the noise levels registered on the level recorder which are caused by noise from the source or premises of interest and which are unaffected by extraneous noise. Other sources contributing to the ambient noise at the measurement position may be marked and identified for reporting later.

Measurement positions:

A) Outdoor measurements**:**

Outdoors where representative maximum adjusted noise levels are expected or indicated by complainants. [4] The position(s) should be located:

• Within the apparent boundaries of land:

✓ At or near the boundary;

✓ Within 20m during the day and evening period, and 3.5m during the night period, of buildings normally used for human habitation (not hotels, motels and similar);

✓ Within 3.5m of the external walls of educational buildings, the wards or bedrooms of hospitals, hotels, motels and similar. The time periods commonly used for noise measurement purposes are:

Day: 7am–6pm

Evening: 6pm–10pm

Night: 10pm–7am

• At noise-sensitive locations on the boundaries of established commercial or industrial premises;

B) Remote points:

Measurement point's closer to noise sources, or within or outside commercial or industrial premises and providing the worst-case noise situation, might be selected to assist assessment by:

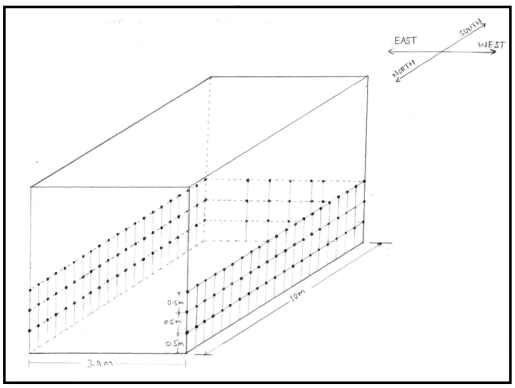
- Avoiding contributions from other sources;
- Reducing atmospheric influences on noise propagation; or
- Ensuring ready access to measurement points not associated with affected premises.

C) Indoor measurements:

- Representative outdoor measurements cannot be made even by supporting the microphone outside windows of habitable rooms; or
- Special investigations are needed to resolve complaints. One typical example occurs with low frequency noise intrusion where the noise level does not exceed a dB(A) limit but is still annoying. In such cases, special investigation by acoustical consultants is preferred.
- Measurements should be made in habitable rooms with doors and windows open or closed to represent typical 'worst case' conditions. Measurements should be made at least 1m from walls, and from 1.2m–1.5m above the floor, and at least 1.5m from the window(s).[5]

Measurements should be made as close as practicable to times when the greatest subjective intrusion is likely. The time interval for measurement, T, should be long enough to ensure that recorded data provide a representative description of measured noise.

Photograph 1. Showing position of hammer on Rotating drum with 10 rpm speed



Observation tables

Table 1. Noise level at distance of 1m from the drum (West directions)

Height from the ground	0.5	1m	1.5m
1	98.6	98.4	**99.6**
2	98.6	98.8	**99.4**
3	99.6	97	**98.8**
4	101.1	96.3	**98**
5	102	95.4	**95.9**
6	102	95.5	**99.6**
7	102.4	101.1	**101.5**
8	99.5	100.4	**101**
9	99.8	101.1	**101.1**
10	99.1	100.5	**101.6**
11	97.8	101.8	**101.6**
12	98.9	97.6	**97.4**
13	97.2	97.4	**96.8**
14	98.6	97.2	**96.6**
15	99.9	97.2	**97**
16	101.6	97.2	**96.6**
17	101.9	97.8	**97.4**
18	102.7	97.6	**101.9**
19	-	96.3	**98**
20	**-**	**100.2**	**97.2**

Table 2. Noise level in dB (A) at distance of 2m from the drum (West directions)

Height from ground	0.5	1m	1.5m
1	101	97	**97.6**
2	101.1	96.8	**97.2**
3	101.1	96.6	**96.8**
4	95.4	96.1	**100.4**
5	99.8	95.6	**100.2**
6	99.6	95.9	**100.5**
7	95.1	95.9	**101.1**
8	99.6	95.4	**99.8**
9	95.6	101.2	**101.4**
10	96.6	102	**101.8**
11	97.2	103.1	**101.1**
12	97	101	**97.6**
13	100.7	98.6	**98.2**
14	99.5	98.9	**99.9**
15	100.4	97.8	**102.5**
16	100.2	100.1	**102**
17	101.4	101.8	**99.8**
18	101.2	100.2	**102.1**
19	101	98.2	**102**
20	-	-	-

Table 3 Noise level in dB(A) at distance of 3m from the drum (West directions)

Height from ground	0.5	1m	1.5m
1	101.1	100.2	**96.6**
2	98.9	97.2	**99.1**
3	95.4	96.1	**96.8**
4	95.9	101.4	**100**
5	101.5	101.1	**101.1**
6	101.4	100.5	**98.2**
7	101	100.8	**97.8**
8	99.9	98.2	**97.6**
9	97.4	98.2	**96.8**
10	97.2	97.4	**97.2**
11	96.8	98.2	**96.6**
12	96.8	97.4	**97**
13	95.3	98	**98**
14	97.2	97.4	**97.4**
15	96.6	97.2	**98.4**
16	96.8	96.6	**97.6**
17	96.3	97.4	**98**
18	96.6	98.2	**99.5**
19	98.9	97.6	**99.5**
20	-	-	-

Table 4. Noise level in dB(A) at distance of 1.5m from the drum (East directions -wall side)

Height from ground	0.5	1m	1.5m
1	99.6	98.9	**98.2**
2	100.2	100	**98.2**
3	99.8	99.2	**97.6**
4	100.2	97.4	**97.5**
5	99.7	98.2	**98.2**
6	100.2	99.2	**99.2**
7	101.2	99.2	**100.2**
8	100	98.8	**99.8**
9	99.3	99.6	**99.6**
10	98.6	100.1	**101.2**
11	98.4	100.2	**100**
12	99.1	97.2	**98.2**
13	98.2	97.6	**99.2**
14	99.2	98.8	**99.2**
15	99.4	99.2	**97.2**
16	100	99.2	**96.2**
17	98	97.6	**97.6**
18	97.4	98	**99.6**
19	-	97.2	**97.5**
20	**-**	**-**	**-**

Table 5. Noise level in dB(A) at distance of 1.5m from the drum (South directions -wall side)

Height from ground	0.5	1m	1.5m
1	96.2	96.3	**97.2**
2	96.2	97.2	**96.8**
3	97.1	97.1	**97.1**
4	**96.2**	**96.8**	**97.1**

RESULT AND DISCUSSION

It is observed that the readings from all above tables the noise levels limit is more than prescribed limit .Therefore it is necessary to control the noise level so that it should be below the maximum upper limit .Following table depicts standard noise levels range.

Table 6.Typical sound levels found in the Environment, Source [2]

Sound Level	Location
0 to 10 dB(A)	**Threshold hearing**
10 to 20 dB(A)	**Broadcasting studio**
20 to 30 dB(A)	**Quiet Bedroom at night**
30 to 40 dB(A)	**Living room during the day**
40 to 50 dB(A)	**Typical office**
50 to 60 dB(A)	**Inside a car**
60 to 70 dB(A)	**Typical high street**
70 to 90 dB(A)	**Inside a factory or noisy pub**
100 to 110 dB(A)	**Burglar Alarm at 1 m**
110 to 130 dB(A)	**Pneumatic drill at 1m away**
140 dB(A)	**Threshold of pain.**

For a longer duration of stay or working inside a factory, noise level of factory should not more than 90 dB (A) levels. Precaution must be taken to install new

fertilizer factory by adopting noise standards norms with permission of pollution control department by adopting legal aspect.

CONCLUSION

Following measures conclusion must be considered for noise control programs:

- Applying a non sticky coating to inner surface of the drum so that hammer is not at all required.
- Modification in production processes such that sticking of fertilizer can be avoided (Ex. Chemical Pre-treatment of Raw material etc.)
- Using hammers made up of high density rubber.
- Padding the impact by applying suitable damping material at the point of contact between hammer and the drum surface.

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