MODULE 29 - TYPES OF NOISE POLLUTION

OBJECTIVES

By the end of this session students will be able to:

1. Know more about Noise Pollution
2. Understand how noise pollution is measured
3. Differentiate between the various types of noise pollution

SUMMARY

Sound is a natural phenomenon which we encounter every day, in all our activities. Natural and manmade activities all involve sound. However, sound can be tolerated only up to an extent. If sound increases manifold, it becomes unbearable noise. Noise Pollution generally refers to unwanted sound produced by human activities—unwanted in that it interferes with communication, work, rest, recreation, or sleep. Unlike other forms of pollution, such as air, water, and hazardous materials, noise does not remain long in the environment. However, while its effects are immediate in terms of annoyance, they are cumulative in terms of temporary or permanent hearing loss & in some cases even mental disorders. In this module we will learn about the various types of sound pollution.

TRANSCRIPTION

Introduction

The word ‘noise’ is derived from the Latin word ‘nausea’. In Physics, noise is an acoustic, electrical or electronic signal consisting of a random mixture of wave lengths. Presence of unwanted, unpleasant sound is the result of pressure changes in a medium, caused by vibration or turbulence. Sound is a physical phenomenon that stimulates the sense of hearing. The sound which makes animals and human beings uncomfortable or creates adverse effects is called ‘noise pollution’.

It is now a problem of both developed and developing countries. In India the situation has become alarming in many cities.

Measurement

Sound is measured in terms of intensity, with an instrument known as ‘larn barometer’ or ‘sonometer’. The unit of intensity of sound is ‘decibel’ which is equal to 1/10th of ‘Bell’, named after Alfred Graham Bell. However, the unit of measurement of sound is referred to as ‘Hertz’. Environmental sound ranges from 20 to 20,000Hz or 20Hz to 20KHz. It can be grouped into the following:

Infra Sound = Less than 20Hz (Not audible) (infrasonics)
Ultra Sound = More than 20,000Hz (Not audible) (ultrasonics)

Frequency Band = 20 to 12,000Hz (audible)

Environmental noise is measured with a sound level meter using the A–Weighted decibel scale [dB(A)]. The decibel is the scale which is used to describe sound. It is the logarithm of the ratio of the measured sound pressure relative to a reference value. The term 'A-weighting' means that the signal is filtered in a way that approximates to the frequency sensitive to the human ear. The human ear is sensitive to 0-180dB sound; in which 0dB is referred to as the threshold value of hearing, while 180dB is the threshold value of pain. Sound of more than 80dB intensity is considered as a pollutant.

Perception level of different intensities of sound:

The perceptibility of different intensities of sound is:

Zero decibels = Threshold of Hearing
10 decibels = Just Audible
10-30 decibels = Very Quiet
30-50 decibels = Quiet
50-55 decibels = Normal Sound
60-70 decibels = Moderately Loud
70-100 decibels = Very Loud
100-130 = Uncomfortable
130-140 = Painfully Loud
140-180 = Severely Loud

Sources of Noise Pollution: -

Sources of noise pollution can broadly be grouped into two types –

(a) Natural, and,
(b) Manmade

(a) *Natural sources of noise pollution:* Natural sources of noise pollution are the outcome of natural phenomena. Some natural activities which can be placed in this group are: -

(1) Thundering
(2) Lightning
(3) Storm
(4) Sound of a waterfall from a height
(5) Sound of Earthquake
(6) Sound of a Volcano Explosion

Manmade Sources of Noise Pollution: Industrial Sources

(b) <u>Manmade Sources of noise pollution:</u> Manmade sources of noise pollution can further be grouped into following two categories –

(1) Industrial sources, and,
(2) Non industrial sources

(1) *<u>Industrial Sources: -</u>* Various industries produce sound of pollution level. According to Prof. Lehman, "Sound is not the symbol of progress of technology but of its failure". The recommended maximum sound level in factories or Industries is 90dB.The noise levels in some industries are:-

Ceramics industry = 90-100 decibels A-weighted
Glass industry = 82-95 decibels A-weighted
Food Processing Industry = 80-90 decibels A-weighted
Chemicals Industry = 85-98 decibels A-weighted
Paper Industry = 88-96 decibels A-weighted
Machinery Industry = 85-96 decibels A-weighted
Control Room of a Naval Ship = 100-120 decibels A-weighted
Engine Room of a Naval Ship = 93-94 decibels A-weighted
Aircraft Repair Shop = 100-110 decibels A-weighted
Glass Blowing Shop = 70-108 decibels A-weighted
Ammunition Factory = 85-101 decibels A-weighted
Saw Mills = 90-112 decibels A-weighted
Foil Manufacturing Unit = 90-112 decibels A-weighted
Filling Section of Vanaspati oil plant = 76-87 decibels A-weighted
Engine Testing of Automobiles = 80-90 decibels A-weighted
Synthetic Power Industry = 90-116 decibels A-weighted
Power Plant = 90-100 decibels A-weighted
Sugar Industry = 81-104 decibels A-weighted
Plastic Industry = 87-94 decibels A-weighted
Leather Industry = 75-80 decibels A-weighted

Manmade Sources of Noise Pollution: Non-Industrial Sources–I
Domestic & Traffic Noise Pollution

(2) *<u>Non Industrial Sources</u>*

(a) <u>Domestic noise pollution: -</u> Many household electric appliances frequently produce sound and may come under the noise pollution category. If these appliances are not properly maintained the level of sound may increase to noise. Sound intensities of the some of these appliances are:

Alarm Clock = 70-80 decibels
Washing Machine = 82 decibels
Speaking excitedly on Telephone = 79 decibels
Food Mixed = 80 decibels

Hair drier = 70 decibels
Clothes drier = 70 decibels
Table fan = 65 decibels
Refrigerator = 50 decibels
Water cooler = 75 decibels
Ceiling Fan = 70 decibels

(b) Traffic Noise Pollution: Almost all modes of transport, whether by road, rail, air, or sea, produce noise of pollution levels.

Noise levels of some means of transport are:

Small Passenger Car = 77 decibels
Miniature Passenger Car = 84 decibels
Sports Car = 75-80 decibels
Motor Scooter (1Cylinder, 2 Stroke) = 80 decibels
Motor Scooter (2 Cylinder, 4 Stroke) = 94 decibels
Motor Cycle = 105 decibels
Heavy Truck (at 50 ft) = 90 decibels
Train Whistle (at 50 ft) = 110 decibels
Jet (flying over at a distance of 1000ft) = 100-110 decibels
Commercial Jet aircraft (at 100 ft) = 120-140 decibels
Aircraft 707 = 114 decibels
Aircraft 720 = 104 decibels
Aircraft 727 = 103 decibels
Aircraft 737 = 102 decibels
Aircraft 747 = 115 decibels
Aircraft DC8 = 112-116 decibels
Aircraft DC9 = 92-112 decibels
Aircraft DC10 = 110-112 decibels
Concord = 140-450 decibels

Manmade Sources of Noise Pollution: Non-Industrial Sources–II
Construction Work & Religious Activities

(c) Noise Pollution due to Construction Work: Civil engineering works of roads, bridges and houses create sound of noise pollution level. Noise levels of some instruments used in construction work, at a distance of 15 meters, are:

Diesel Converter Mixture = 75 decibels
Large Rotator Diesel Compressor = 80 decibels
Hand-held Tree Saw = 82 decibels
Unmuffled Concrete Breaker = 85 decibels
Rock Drill = 87 decibels
Tractor–Scraper = 93 decibels

(d) Religious and Cultural Activities: Indians celebrate throughout the year, whether in the form of a religious festival or a cultural function. Sound systems used in these functions produce sound of pollution levels. Sound levels at some such functions are:

Deepawali = 73-114 decibels
Ramleela = 78-85 decibels
Rawan Vadh = 90-100 decibels
Durga Pooja = 85-100 decibels
Akhand Ramyan = 85-96 decibels
Urs = 93-101 decibels
Religious discourses = 82-88 decibels
Group dances = 77-93 decibels
Fair = 80-90 decibels
Fire works = 92-99 decibels
Visarjans = 89-102 decibels
Bhagwati Jagaran = 89-94 decibels
Kirtans = 90-102 decibels
Music Functions = 86-96 decibels
Id Festival = 93-101 decibels
X-Mas = 70-90 decibels
New Year Day = 78-80 decibels
Wedding Ceremony = 92-99 decibels
Kumbha Mela = 80-90 decibels

Manmade Sources of Noise Pollution: Non-Industrial Sources–III
Mall & Other Sources

(e) Noise Pollution in Crowded Market or Mall: Crowded markets of every city are sources of sound pollution. In A or B class cities now-a-days such market areas are being replaced by malls. In such places sound generated from various activities produce sound of pollution level. For example:

- The chattering and bargaining of shoppers.
- Foot falls on pavements.
- Sound system used to attract shoppers.
- Starting and stopping of vehicles.

(f) Other Sources of Noise Pollution:

- Launching of satellites, etc. produces noise of pollution level.
- Atomic or other kind of bomb explosions for any purpose, produce noise of pollution level.
- Equipments use in war produce noise of pollution level. (Shooting of gun 160-100 dB, Handgun or torpedoes -140-170 dB).
- Shipping, the mining and petroleum industry, military activities, acoustic thermometry, merchant fleet and fisheries increase sound levels in oceans.

Conclusion:

We can see that almost all activities undertaken by human beings contribute towards the increasing levels of noise pollution in our daily lives. The need of the hour is to modify our consumption practices so as to reduce noise pollution and conserve the environment.

GLOSSARY

1. Sound: Physical phenomenon that stimulates the sense of hearing.
2. Noise: In Physics, noise is an acoustic, electrical or electronic signal consisting of a random mixture of wave lengths. Presence of unwanted unpleasant sound is the result of pressure changes in a medium, caused by vibration or turbulence.
3. Noise Pollution: The sound which makes animals and human beings uncomfortable or creates adverse effects is called 'noise pollution'. >180dB is considered as noise pollution.
4. Sonometer: Instrument used to measure intensity of sound.
5. Decibel: Unit of intensity of sound (equal to 1/10th of 'Bell', named after Alfred Graham Bell).
6. Hertz: Unit of measurement of sound
7. Infra Sound: sound that is lower in frequency than 20 Hz (Hertz) or cycles per second, the "normal" limit of human hearing.
8. Ultra Sound: Ultrasound is cyclic sound pressure with a frequency greater than the upper limit of human hearing. Although this limit varies from person to person, it is approximately 20 kilohertz (20,000 hertz) in healthy, young adults and thus, 20 kHz serves as a useful lower limit in describing ultrasound.
9. Frequency Band: Frequency band is a range of wave frequencies. It most often refers to either a range of frequencies in sound or a range of frequencies in electromagnetic radiation, which includes light and radio waves. The frequency band of sound refers to the range of frequencies that are audible to the human ear and as such fall in the range of 20 to 12,000Hz
10. A– Weighted decibel scale [dB(A)]: It is the logarithm of the ratio of the measured sound pressure relative to a reference value. The term 'A-weighting' means that the signal is filtered in a way that approximates to the frequency sensitive to the human ear.
11. Threshold value of hearing: The minimum sound pressure level at which a person can hear a sound at a given frequency. Zero decibel is considered as the threshold value of hearing.
12. Threshold value of pain: The intensity of acoustic pressure at which pain develops in the ear. 180dB is the threshold value of pain.

13. Natural sources of noise pollution: Noise pollution that is the outcome of natural phenomena like rainfall, storms, lightning, thunder, earthquakes, etc.
14. Manmade Sources of noise pollution: Noise pollution created by with.
15. Industrial Sources of noise pollution: Noise pollution due to industrial activity.
16. Non Industrial Sources of noise pollution: Noise pollution due to human activities other than industrial activity.
17. Domestic noise pollution: Noise pollution due to use of household equipment, usually electrical like fans, hairdryers, food blenders, etc.
18. Traffic Noise Pollution: Noise pollution due to various modes of transport like cars, airplanes, trains, trucks, bikes, scooters, ships, etc.
19. Noise Pollution due to Construction Work: Noise pollution due to equipment used in civil engineering works of roads, bridges and houses, etc.
20. Noise pollution due to religious and cultural activities: Noise pollution due to religious and cultural activities like festivals, spiritual sermons, etc.

FAQs

Q1. What is the unit of measurement of sound?
Ans: Hertz.

Q2. What is ‘Infrasound’?
Ans: Sound less than 20Hz is called ‘infra sound’.

Q3. What is ‘Ultrasound’?
Ans: Sound more than 20Hz is called ‘ultra sound’.

Q4. What is the frequency band for audible sound?
Ans: 20Hz to 12,000Hz, where lowest audible frequency is 20Hz & loudest frequency of 12,000Hz.

Q5. What is dB?
Ans: The decibel (dB) is the scale which is used to describe the sound pressure level.

Q6. What is the sensitivity range of human ear?
Ans: 0-180 dB.

Q7. Which intensity sound is considered as a pollutant?
Ans: 80dB

Q8. What is the difference between noise and sound?

Ans: Noise is an acoustic, electrical or electronic signal consisting of a random mixture of wavelength, whereas sound is the result of pressure changes in medium, caused by vibration, which stimulates the sense of hearing.

Q9. What is the maximum sound level for industries?
Ans: 90dB.