SOUND POLLUTION IN EVERYDAY LIFE: SOURCES, UNITS OF MEASUREMENT, METHODS OF DETERMINATION

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Received April 14, 2010

Our body receives external energy to be able to produce a vibration movement. Part of this energy is transmitted to the environment in the form of radiant energy, transported at a distance by acoustic waves. In such cases the body is named acoustic radiator. There have been analyzed and quantified sounds produced by cars, tramways, trains and planes. Most sound measurements were done in closed spaces neither anecoidal nor fully reverberating, being somewhere in between. Several factors can become sound pollution sources in crowded areas. Car horns are the most frequent source. Banning klaxons has significantly reduced noises produced by means of transport. Yet the noise level is still to be reduced for various types of cars.
Conclusions: There are many sources of urban noise. They are perceived differently by human ear. There is to be noted that home and street produced sounds are stronger than sounds produced during the office work.

Key words: Pollution; Sources; Determination; Measurement.

INTRODUCTION

Our body receives external energy to be able to produce a vibration movement. Part of this energy is transmitted to the environment in the form of radiant energy, transported at a distance by acoustic waves. In such cases the body is named acoustic radiator. If wave radiations are characterized by sound, the radiator is also named sound source. Sound sources may be: human voice, musical instruments, loudspeakers a.s.o.

This study has in view the analysis and quantification of sound pollution generated by means of transport and its impact upon the population sanogenity, taking into account the consequences on the environment as well.

MATERIAL AND METHOD

There have been analyzed and quantified sounds produced by cars, tramways, trains and planes.

Most sound measurements were done in closed spaces neither anecoidal nor fully reverberating, being somewhere in between.

RESULTS AND DISCUSSIONS

A. Car produced sounds

As sources of sound pollution, cars are important with two respects: the impact of car produced sounds upon the driver and passengers on the one hand, and its influence upon the environment (residential areas, hospitals) on the other.

The main car produced sounds are: the force aggregate (the engine and transmission), the transmission system proper (cardan shaft, cardan bridge, motor bridge), the brake system, the aerodynamic noise produced by the eddy of the air currents on the edges and surfaces of the coachwork, the configuration of the road on which the car is being driven as well as the car speed.

Research done upon the above mentioned sources has led to the conclusion that heavy vehicles are noise sources more powerful than light vehicles and cars. The noise produced by a bus is estimated to 85–90 dB, whereas the noise produced by a car is about 70–75dB, in similar measurement conditions.

The analysis of a vehicle force has led to the conclusion that the noise is produced by:

– the unbalanced moving parts of the engine or of the gear box. The frequency of these noises is determined by the relation: $f_1 = K\frac{n}{60\Omega}$

– the gas admission and exhaustion during the burning process, the frequency of these noises being determined by the relation: $f_2 = K\frac{n \cdot i}{60\Omega}$

– the functioning of various subparts enclosed in the force aggregate: the distribution, the cooler, the water pump a.s.o. The frequency of these noises is given by the relation: $f_3 = K\frac{n \cdot z}{60\Omega} \cdot j$.

B. Tramway noises

Tramways are important sources of urban noise. The noise level produced by the passing of a tramway depends on a series of factors. The components of a tram produced sound are of low frequency. A growth in velocity leads to a growth in the acoustic pressure level. The noise produced by a tramway is much stronger than the noise produced by a car in similar measurement conditions

Measurements have been done at very small time intervals (about 30 seconds). At the first sight, the environment has not influenced the measurements.

Tram stopping and starting increase the global noise level with about 15–20 dB above the normal value of the global noise. Factors causing an increase in the noise level are: the shoe shock during the braking process, handling the door opening and closing mechanisms, the air compressor functioning, a.s.o.

Another means of public transport is the subway. Subway functioning requires reducing noise inside carriages at arrivals and departures. The noise level inside subway carriages is higher than in the case of tramways, considering the closed environment and higher speed. The reflected sound adds to the incident sound the resulting sound being amplified inside the carriage.

C. Train sounds

The increasing goods transport and the increasing train speed values raise the level of railway noises. The highest noises are registered at the train passage and at marshalling yards.

The main sources of sound pollution in train transportation are: carriage circulation, engine functioning, marshalling yard noises, the loudspeaker noises.

The carriage noise is produced by the vibration and contact of various interior and exterior parts.

The main source of interior noise is the hitting of wheels against the rail especially at encountering small obstacles on the rail surface. Other sources are vibrations, door slams, cooler rail noises, the heating system and others.

Exterior noises are braking system shocks, coupling shocks, dynamo related noises, or noise produced by springs, buffers, a.s.o. These are transmitted into the carriages by air, through holes, leeks, cooling systems, elements of carriage resistance, and take the form of vibrations, through the action produced by exterior acoustic waves upon the carriage walls.

Research done to reduce the noise level at diesel engines has shown that noise sources are numerous and hard to handle.

Some noise sources can be reduced from the design stage (modifying the valve shape, attaching sound reducers at the admission), other modifications refer to the manufacturing proper (the engine or ventilation system case, soundproof film application on the engine room walls, mastic or soundproof painting for the carriage walls, in layers of 4–5 mm).

The most powerful sounds in the marshalling yards are sudden noises such as air exhaustion, carriage coupling strikes, steam engine noises.

D. Aircraft noises

Aircraft noises pose difficult problems. The main source is the eddy noise made at the aerodynamic back end of a moving object

Aircraft noise is produced by eddy formation. The eddy way is not a radiator, except for a minor noise produced at eddy amortization due to viscosity. The eddy moving along a wall can produce noises due to pressure variations.

Recent research has proved ultrasound speed leakages are produced both inside the plane and in the atmosphere, at ultrasound speed (free ultrasound jet).

Supersonic speed flights are controversial. Implications are being analyzed including at the level of sound pollution. At the taking off engines produce noises up to 136 dB, 24dB above the limit accepted at international airports.

Several factors can become sound pollution sources in crowded areas.

Car horns are the most frequent source. Banning klaxons has significantly reduced noises produced by means of transport. Yet the noise level is still to be reduced for various types of cars.

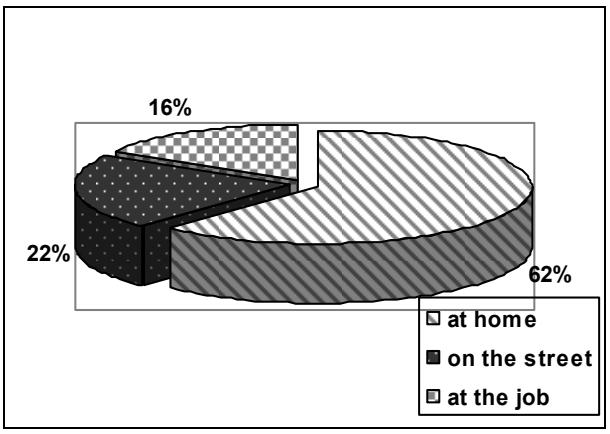

Fig. 1. People (%) influenced by noise.

Pneumatic hammers and compressors used by the road maintenance teams are also important noise sources. Loud music, elevators, TV sets and house appliances may become important noise factors if excessively employed (Figs. 2, 3).

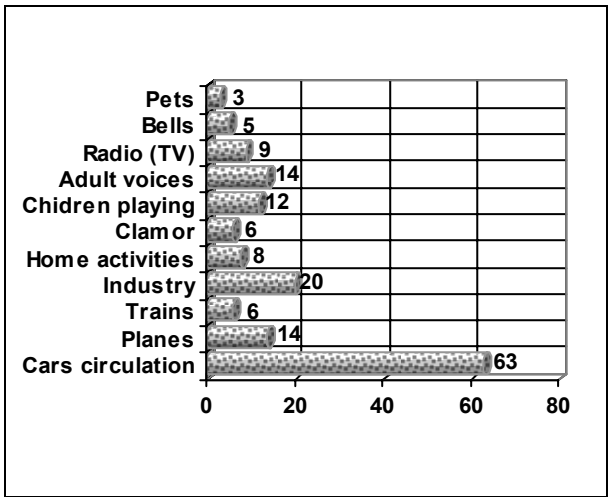

Fig. 2. Sources of noise (%).

Industrial sites close to populated areas are to be taken into account.

CONCLUSIONS

There are many sources of urban noise. They are perceived differently by human ear. There is to be noted that home and street produced sounds are stronger than sounds produced during the office work.

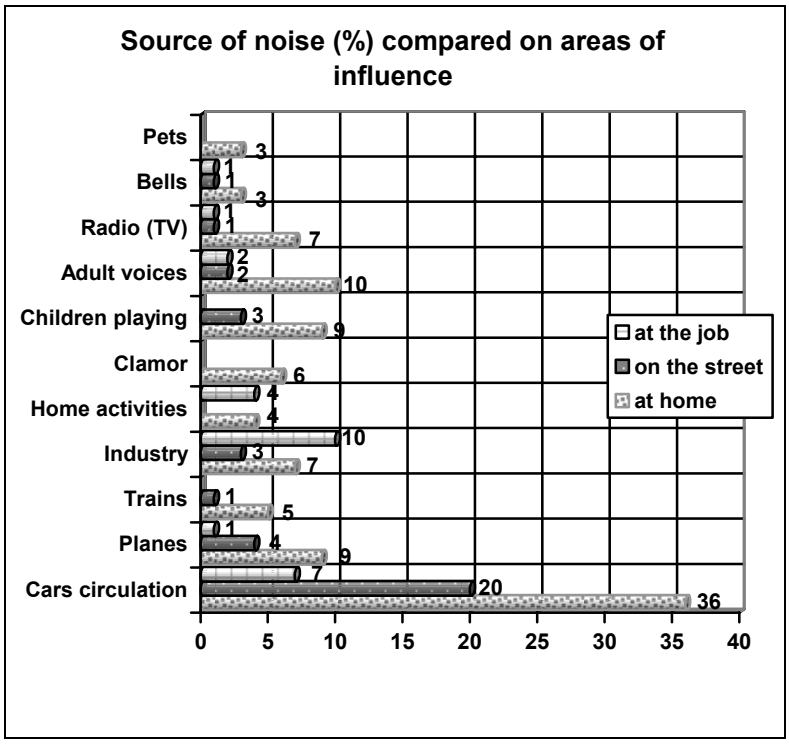

Fig. 3. Sources of noise (%) compared on areas of influence.

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