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NOISE IN THE INDUSTRY – THREAT FOR HEALTH

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Abstract:
The success of certain industrial activities bring both benefits and negative effects such as pollution, occupational diseases, exposure of workers and residents of neighboring areas and high risk in case of technological failure.
An undesirable effect of industrial activity which may be considered a threat to workers and residents in the immediate vicinity of industrial sites is the noise. Due to the presence of technology in all activities, is a major problem considering its nature and harmful repercussions on health. Hearing loss and deafness caused by occupational exposure to noise at work are the most common occupational diseases that occur in the European Union.
The development of modern technology by increasing the power and speed of the technical equipment, contributed to diversify and increase the number of sources of noise and vibration, and thus to increase the number of people exposed.
This paper analyzes the effect of noise from industrial equipment and health risks.

***Key words**: health, hearing loss, noise, noise pollution, occupational noxious, safety*

INTRODUCTION

Noise pollution is an important component of environmental pollution with harmful character and by its presence in all compartments of modern life, noise pollution is a major problem for all economically developed countries or emerging. Noise pollution is a continuous aggression, caused by various noises of machinery, industrial equipment and domestic, inside or outside their construction.

The physiological, psychological and social implications of the noise are known in the contemporary world, being one of the most widespread pollutants in the world. From exposure to dust and chemical pollutants, which have greatly reduced with the extent of mechanization and automation of production processes, not the same was done on noise exposure.

Noise is defined as disordered overlapping sounds of different frequencies and intensities that produce a disagreeable sensation and aggressive. As a consequence of human industrial activity appears as mechanical waves represented by vibration, sound, infrasound and ultrasound vibrations with a harmful action on health.

Prevention and information on health risk are of a major importance. Noise generates additional fatigue efforts not only to the difficulty of collecting verbal information (orders, commands) or by voice overuse but mostly through brain overload.

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Noise issues are unquestionably economically importance and, in some cases decreased work capacity reaching up to 60%, particularly intellectual work is affected. The negative influence on the efficiency and effectiveness at work can be illustrated as follows: general industrial efficiency is 25% higher in quiet jobs compared to the noisy, the errors due to the noise are 70% of rejects in the electronics industry, 29% of accounting errors.

The development of modern technology by increasing power and speed of working machinery contributed to the diversification and increased sources of noise and vibration, and thus to increase the number of people exposed.

Noise is one of the most important industrial emissions that generate hazards to health of workers are forming harmful factors arising from damage and/or malfunction of working equipment [1].

Noise affects not only those involved in industrial activities, harmful effects of noise exposure are felt by people living or working in areas adjacent to one or more sources of noise.

To stimulate measures to improve working conditions and provide the best level of protection of workers have developed specific directives on health and safety at work.

Most countries, especially the European countries imposed anti noise directives to improve acoustic comfort in new buildings.

THE NOISE AT WORKPLACE

The Directive 2003/10/EC of the European Parliament and of the Council from 6 February 2003 regarding on the minimum health and safety requirements for exposure of workers to the risks arising industry from physical agents (noise), determine the physical parameters used as risk predictors and limits thereof:

- peak sound pressure, which is the maximum instantaneous noise pressure,
- daily noise exposure level that covers all noises present at work,

- weekly noise exposure level or time-weighted average of the daily noise exposure levels for a nominal week of five working days of 8 hours.

In the industrial environment, infrasound, sound and ultrasound overlap both in terms of spectral components oscillations generated by machinery, and in terms of their action on the body worker. Exposure to ultrasound destroy red blood cells causes headaches, nausea, or loss of balance.

To improve health and safety conditions at work, must be considered the following general principles relating to:

- noise risk assessment by competent services or persons,
- prevention of occupational risks,
- protection of health and safety at work,
- elimination of risk factors for injury and occupational disease,
- consultation, the balanced participation in accordance with national laws and/or practices and training of workers and their representatives,
- checking to determine whether there have been some changes in the work process to be followed by the adoption of amendments accordingly the assessment and control measures [4].

HEARING DISORDERS DEPENDING ON LEVEL OF NOISE

If the ear is exposed to high levels of noise for a short period, a ear sensitivity test carried out immediately afterwards, shows a slight hearing loss known as temporary deviation threshold of hearing. Hearing threshold is the lowest sound pressure level which can be detected by the subject and it can grow up to 20 dB at certain frequencies, even after a relatively short exposure. The sound should be much louder than it was before exposure to be heard afterwards. Fortunately, the phenomenon is temporary, any permanent deviation threshold is too low to be measured. If exposure periods are relatively short, and the intervals between them are long permanent effects are not significant. A large number of people working in technological processes where noise levels are always high and when the exposure occurs for 8 hours a day, year after year, the effects are not temporary.

It develops a permanent hearing loss which is sufficiently severe as to make it difficult for normal conversation, and then get to chronic disease. Damage becomes permanent and irreversible in this phase, and any "rest" will not lead to a significant rebound.

Permanent damage begins, as the temporary with decrease in sensitivity around 4 kHz frequency and with increasing exposure time, the deviation becomes larger and gradually extends down to include the lower frequencies

The frequency content of the noise with the type thereof (for example pulse and non-pulse character) may also be a disturbing factor.

Exposure to loud noise for a long time trigger the body's protective mechanisms against hazards, these mechanisms manifested by following vegetative reactions: hypertension, tachycardia, skin vessels constrict, increasing metabolism, increasing muscle tension. Noise-induced hearing loss is recognized by the World Health Organisation as "the most common and irreversible industrial disease". Hearing loss, besides it can stop a person working at full capacity, it can destroy social life, isolating it from the community.

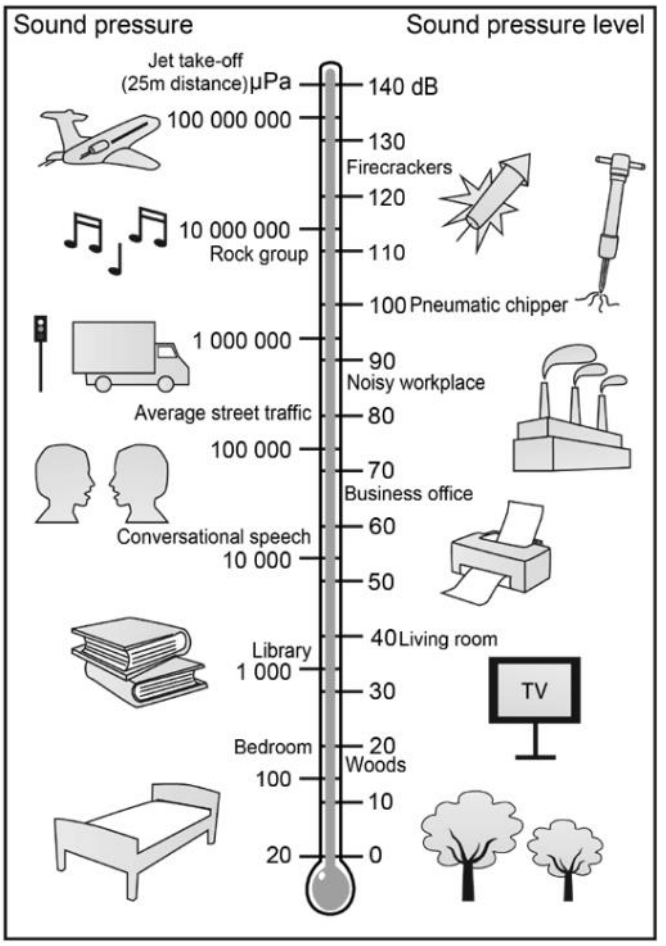

Fig. 1 Graphical presentation of noise levels in daily activities

THE EVOLUTION OF HEARING LOSS AS A RESULT OF EXPOSURE TO NOISE

Measurement of noise emitted by machinery and equipment is carried out by measuring the sound pressure level at work.

People regularly exposed to noise may present hearing loss with variable severity. Because hearing loss can damage speech understanding, perception of the daily signals or appreciation of music acoustic. Except exposure to explosions, high impulse noise and extremely high levels of stationary noise, the permanent damage to the hearing organ takes time and is progressive in months, years or decades of exposure. NIPTS is usually preceded by a temporary effect, reversible upon hearing called, temporary change threshold "(TTS) caused by noise (Fig. 2).

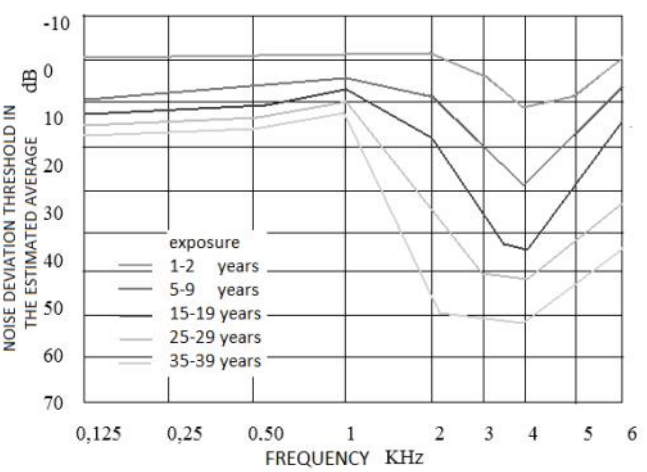

Fig. 2 Evolution of hearing loss due to noise exposure

Gravity TTS and recovery depend on the level of exposure and time. For one person, it is not possible to determine precisely which changes in the level, the threshold of audibility are caused by noise and which changes are caused by other factors, although in individual cases where there is doubt, these data may represent an additional means for estimate the most probable causes of audiologic diagnosis. However, for a large population exposed to a specific noise, can cause changes in the statistical distributions of hearing threshold levels.

To describe different levels of hearing thresholds between two populations which are similar in all important aspects except that one population has a noise exposure (occupational usually) well-defined parameters can be used as NIPTS average median NIPTS, and so on The term "NIPTS" applies to permanent changes of displacement produced by the noise threshold, the statistical distributions of groups of people; the term does not apply to individuals.

The measure of noise for a population exposed at noise risk is weighted sound exposure -), EAT, and the equivalent continuous sound pressure level weighted accordingly Aech L, t the average working day (considered equal to 8 hours) for a given number of years of exposure.

For the determination of hearing damage due to exposure to noise are shown relationship for the calculation of NIPTS at audiometric frequencies from 0.5 kHz to 6 kHz for the A-weighted sound exposure daily for 8 hours/day 364; Pa^2 xs up to 1,15.x 105 Pa^2 xs (A-weighted sound pressure levels equivalent continuous for a normal work day for 8 hours at 75 dB to 100 dB) and exposure times from 0 to 40 years .

Extrapolation to higher levels are not supported by quantitative data. NIPTS are stated as median statistical distribution above and below the median for the quantum of from 0.05 to 0.95. NIPTS data. are the same for male and female populations

Forecasting method presented is based primarily on data especially for stationary broadband noise. Application of database on tonal noise or impulse/impact represents the best available extrapolation.

To calculate the audibility threshold levels and the risk of hearing damage or hearing impairment due to noise exposure, must know the threshold of audibility of a comparable age population unexposed to noise.

To estimate the risk of damage to hearing and deaf as a result of exposure to noise, noise exposure weighted average EA 8h, and/or noise exposure level normalized to a nominal working day of 8 hours, LEX, 8h should be measured with instruments for acoustic exposure i or integrating sound level meters or must calculated from measurements of sound pressure and exposure time. Such measurements can be made with instruments that are stationary or attached to the person.

Measurements positions and their duration should be chosen to represent noise exposure during a typical day for the population exposed.

EQUIPMENT USED

For direct measurement of sound pressure levels equivalent continuous A-weighted, integrated sonometers used meet the requirements of IEC 804, they are calibrated both before and after determinations. Calibration is required having quality results, also contributing to increased confidence in the accuracy determinations.

Sonometers used are made byBruel & Kjaer Danish company. They are equipped with filters of one octave or 1/3 octave pass band width.

Type 2250 noise analyzer (Fig. 3) is used for individual measurements or series of measurements for laboratory and field analysis.

Measurement of sound pressure to determine the A-weighted sound exposure and/or level equivalent continuous A-weighted sound pressure were performed with the microphone placed in the position (s) occupied (filled) normally by the head worker.

Fig. 3 Analyzer Type 2250

Fig. 4 Acoustic Calibrator Type 4231

If a worker was required to be present or to move around, the microphone was positioned 0.10 m ± 0.01 m from the entrance to the ear canal that receives high value weighted sound exposure sound pressure level or equivalent continuous a-weighted [2].

Important details of the measuring apparatus and the conditions prevailing during measurements must be recorded and archived for reference [2]. In reporting the results of measurements, it includes an estimate of the overall uncertainty of the measurements, taking into account the influence of factors such as measurement equipment; microphone; number of measurements; variation in time and space of the noise source.

The minimum requirements for the protection of workers from risks to health and safety arising or likely to arise from exposure to noise and in particular the risk to hearing, apply to all activities in which workers are or may be exposed through their work, the risks arising from noise provided for in national legislation transposing Directive 89/391/EEC applies to all activities without prejudice to more stringent and/or specific.

The physical parameters used as risk predictors, have the following meaning:

- peak sound pressure (p_{peak}),
- daily noise exposure level ($L_{EX,8h}$) defined in the standard SR ISO 1999:1996 [6],
- weekly noise exposure level ($L_{EX,8h}$).

CONCLUSIONS

Noise pollution has become a major problem affecting all components of modern life turning into a more aggressive risk factor.

Noise, despite technical progress in sound insulation is becoming more and more an intrinsic part of our daily lives, so noise is an issue of immediate concern to all persons working in a noisy space exceeding the permissible limits, making disruption from work.

Public awareness of the risk of exposure to noise and its irreversible effects on the auditory organ leads to lower reluctance on measures to reduce noise levels in industrial environment.

Noise Certification of equipment used in industrial environment leads to better information on the possibilities for the selection of new equipment in terms of noise emission.

Using industrial noise maps provide information for the sites of new equipment, so as not to disrupt existing jobs.

In Romania there is a major difference between equipment used in industrial units owned by the state and private companies in terms of noise reduction, due primarily to higher financial strength of private companies that have invested in new technologies less polluting compared those belonging to the state who have used noise reduction methods for older equipment and noisiest, for which technological change is extremely expensive and difficult to implement in a technological chain designed a few decades ago.

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