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A COMPREHENSIVE STUDY OF HOT PRESSING NOISE IN AN ITALIAN SUBALPINE SCENERY: A NEW POLICY FOR DECISION MAKERS

F. Bertellino*, S. Roletti, D. Sartore**, F. Mana***

* Environment Park S.p.A., via Livorno, 60, 10144, Torino, Italy

** A.R.P.A. Piemonte, via Servais, 10015, Ivrea, Italy

Tel.: + 39 011 2257 418 / Fax: +39 011 2257 431 / Email: microbel@envipark.com

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ABSTRACT

Hot pressing plants have been since the first decades of the last century one of the main industrial resources of the Canavese region, a Piedmontese area well apart from the industrial concentration around Turin. In this subalpine area many pressing and forging plants grew up in close relationship with the urban context of the local small villages: causing a serious noise pollution problems that arouse in recent years. In the work 23 cases of industrial sites have been discussed, with the main purpose of offering a real understanding of the situation to decision makers and investigate noise abatement solutions.

1 - HOT METAL FORGING AND PRESSING NOISE

Industrial plants have often some common noise sources and other plants that are typical of the industrial sector.

Some plants found in almost every industrial site are compressors, air-conditioning units, refrigerating units, energy plant. In the hot metal pressing and forging industry, the productive line is made up of:

- Punch presses or mallets;
- Induction or fuel furnaces;
- Shearing machines;
- Sand-blasting machines

All of these machines are usually highly noisy, with an additional impulsiveness that gets worse the annoyance.

Typically, the levels in the operator positions of these last machinery lie in the range 90 – 120 dBA.

Mallets are historically the hearth of the metal forging plants, used in ages when noise was still considered an expression of progress.

Recently, punch presses have substituted the old mallets, that yet survive in some of the eldest factories, especially used for little series of forged pieces.

Even if the emissions of such machineries are very high, often noise problems arise from some typical problems, and mainly:

- Extreme vicinity of residential area to industrial plants (in the oldest factories the industrial plants are integrated in the urban center of the villages);
- Erroneous positioning of the plants with respect to sensitive receptors;
- Insufficient insulation of the protective building containing the productive plants (holes in the walls, glazing, semi-open roof, light materials used as external envelope);

- Presence of auxiliary plants (air-conditioning units, energy plants, compressors...) in the outdoor environment.

A correct approach in order to understand the environmental behavior of such plants should include a mathematical modeling, since the variability and the complexity of such sources is very difficult to be represented in the outdoor environment.

2 - ANNOYANCE INDUCED BY INDUSTRIAL NOISE

Even if industrial noise is often well far away from being considered the main source of environmental noise, in many cases at regional level it becomes the very subject of any community reaction.

This is especially due to "non-acoustic" factors, that may completely change the usually found statistics about noise annoyance, typically dealing with traffic noise.

In the present work the reasons behind the complaints have been investigated, and the results are shown in table 1.

What was found out is summarized in the following assumptions:

- Industrial noise annoyance cannot be determined through direct relationships noise-annoyance;
- The relative weight of non acoustic factors is prevailing on acoustic ones;
- Industrial noise is often very variable and cannot be determined by a brief L_{Aeq} measurement: it is often necessary a modeling of the acoustic situation;
- Industrial noise is often an engineering problem depending on many factors (technological, logistic, economical ...) and should be examined in a solution-oriented point of view;
- Industrial noise is often due to multiple sources, and each of them may be extremely varying in its emission: measures must be carried out with the exact knowledge of what's going on.
- A mathematical model may allow to forecast different scenarios in order to decide the right solutions for a noise abatement policy.

Physical factors	Social factors	Psychological factors	Other factors
(acoustic)	(non acoustic)	(non acoustic)	(not strictly acoustic)
Overall level expressed in dBA	Social-economic conditions of the annoyed people	Positive attitude towards noise or to a peculiar kind of noise	Noise occurrence during the day
Spectral content (tonality)	Life behavior and duration of indoor life	Individual hydiosyncrasy towards noise and mood of the annoyed people	Number of disturbing events during the day
Duration of the disturbing event, intermittency	Activities disturbed by noise	Previous problems aroused between disturbing and disturbed people	Activities carried out during nights, Saturdays, Sundays, Holydays
Impulsiveness of the disturbing event, associated to repetitiveness	Urban context in which the annoyed receiver is positioned	Skill in the identification of particular noises judged highly disturbing	Other annoying sources are co-existing on the same area
Fluctuation	Friendly relationship of neighborhood between disturbing and disturbed	Previous exposure to noise	Other polluting sources are linked with the same disturbing subject
Background noise	Social-economic relationships of the disturbing towards the territory	The disturbing people can be easily identified	Age of the annoyed people
Acoustic climate	Historical and chronological relationship of the disturbing with his territory	The disturbing people seem to have a high social level	Health of the annoyed people

Table 1: Factors involved in noise induced annoyance caused by industrial plants.

3 - HOW TO SOLVE NOISE PROBLEMS THROUGH PUBLIC MEDIATION AND FINANCING

Often environmental problems represent a serious economical damage for both industries and communities: the former have to limit its working hours and to implement noise control measures consisting of noise limiting procedures, noise abatement, restrictions in many aspects. The latter suffers from noise immissions, that may bring some individuals to real psycho-physical diseases.

The best way to approach the problem is to rigidly separate industrial and residential areas through a correct planification and obviously taking into account noise emission restrictions.

Yet, especially in our croudly Europe, the available spaces are more and more reduced, and in many situations historical reasons brought to very difficult situations in terms of coexistence of productive plants and residential area.

In these cases, public institutions have to approach problems from a solution-oriented point of view, in order to help the whole community and the productive system: in the present case the industrial plants analyzed were considered in order to put into evidence the environmental incompatibilities, that were classified through a priority of intervention, that took into account the following parameters:

- Exceedance of the noise typical climate (determined with traffic measures and modeling);
- Number of people involved;
- Claims received by the environmental agency;
- Cost of the noise abatement measures.

The following solutions were proposed at the end of the study:

Final judgement of the study	Proposed solutions
Noise emissions are slightly exceeding the compatibility criteria and the annoyance is very limited	Limited noise abatement measures are needed (financing requires < 50 kEUR)
Noise emissions are exceeding the compatibility criteria and the annoyance is relevant	Consistent noise abatement measures are needed (financing exceeds < 250 kEUR)
Noise emissions are not compatible with the present location of the industrial site	Re-location (financing may be very relevant)
Noise problems are not relevant	No public intervention is required

Table 2: Conclusions of the study.

4 - CONCLUSIONS

The Piedmontese regional public authority decided to finance a comprehensive study of the industrial noise coming from the hot metal pressing plants historically housed in a subalpine valley, as more and more often the population seems to arise with violence against the industries, that often are still located too close to residential areas, thus seriously annoying people.

The study was successful, since about 80% of the industries involved participated voluntarily.

This fact allowed public decision makers to find solutions (in terms of financial resources and coordination of private and public institutions) to overtake this long lasting environmental problem.

A main result of the study was also the acknowledgement of the complexity in the determination of the annoyance of industrial noise, determined mostly by non-acoustic factors.

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