International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 04 | Apr 2019 www.irjet.net p-ISSN: 2395-0072

Controlling Techniques of Noise Pollution in the Forging Industry

Prof. M. B. Kumthekar[1], Ar. Anjali P. Kshirsagar[2]

[1]Principal, Govt. College of Engineering, Nagpur, Maharashtra, India
[2]Asst. Prof. School of Architecture, Sanjay Ghodawat University, Kolhapur, Maharashtra, India

---

Abstract - *High level of noise is a disturbance to the human environment. Noise in industries is also an occupational hazard because of its attendant effects on workers' health. Noise presents health and social problems in industrial operations, and the source is related to the machinery used in the industries. Noise has become a crucial occupational hazard to its workers. Maximum noise level of mechanical press and drop hammer is as high as 104 dB. So the noise level inside a forging industry is well above the limits specified by NIOSH and it amounts to be hazardous. In this study, the different types of noise control techniques have been studied.*

Key Words: Industrial Noise Pollution, Noise Control, Forging Industry

1.INTRODUCTION

Noise is commonly described as unwanted sound. This definition implies a strong element in any assessment of the effects of noise. Since the level of sound may be tolerated by one person may be intolerable to another. Noise is by no means a recent phenomenon; it is only with the rapid industrialization of the last century and the accelerated development of powerful high-speed machinery that it has become a pollutant of major concern. The effects of noise exposure on humans range from disturbance or annoyance to temporary or even irreversible deafness. Industrial noise control is aimed at alleviating conditions likely to lead to hearing impairment.

The scope of the study is to concentrate on the forging Noise level which is generated mainly due to mechanical press and drop hammers. There are 6 types of equipment in the forging industry and several operations including pre-cleaning, primary cleaning, secondary cleaning, and polishing, salvaging, quality check, packaging, and dispatch.

In India, occupational permissible exposure limit for 8 hr time is 90 dBA. There are several areas observed having a noise level above the accepted limit. The aim is to concentrate on high noise area and take measures to avoid it or reduce it by certain measure and techniques.

2. METHODOLOGY ADOPTED

Noise pollution prevention and mitigation in industries is very important after studying noise sources and measurement of noise exposure. Noise control in case of industries is achieved with extensive use of advanced engineering equipment, investigation, proper planning, design, and execution.

2.1 Noise Measurements

As shown in Table 1, the noise was measured at the forging industry during its operation at different Press Machine and drop forge hammers. The noise measured varying from 92 dB to 104 dB. Comparison of these results with OSHA or WHO standards shows that the industry is not meeting the associated standards.

Press Machine Model	Noise Measurement Readings (dB)			Average Noise Level at the workplace due to the source in dB
MF-MP-01	97	94	92	**94**
MF-MP-02	100	95	92	**96**
D. F. 0.5 T	94	94	93	**94**
D. F. 1 T	101	97	93	**97**
D. F. 2 T	102	99	92	**98**
D. F. 2.5 T	104	101	98	**101**

Table -1: Average Noise Levels Calculation for Press Machines and Drop Hammer

2.2 Noise controlling measures

Various existing noise control methods for the industry with highly noisy places are explained below:

1) **Equipment Modification Technique:**

All the noise control works are carried out at the source, along the path, and at receivers end but the emphasis is always given to first two. Modification and alterations at the source are not quite easy or cost effective but they should be considered before advising a more complex solution. Various control measures do not involve equipment design and changes in the process but effective in reducing the noise exposure are explained as below:

a) **Proper Maintenance:**

Proper maintenance for equipment is very essential because poorly maintained equipment makes more noise than properly maintained equipment. For example, excessive noise from a roller bearing may indicate wear failure in one of the rollers in bearing. Steam leakages, worn gears, conveyor belts, improperly balanced rotating parts or insufficiently lubricated parts can also produce high noise. This type of noise emission is greatly controlled through proper maintenance and appreciable noise reduction can be achieved.

b) **Replacing component of Equipment:**

In some cases of old equipment, the older component generating high noise can be replaced with a new component. For example, noisy electrical motors or compressors are replaced with a quieter version, which reduces noise exposure significantly and also increases the efficiency of the machine

c) **Applying administrative controls:**

There are two forms of administrative noise control, first, one is stretching the daily production activity and minimizing the number of noisy machines running at one time (i.e. keeping a few sources off). The noise levels can be brought to acceptable limits of noise with the help of the above-mentioned control.

Second is the rotating the possible workers. Exchange the workers those who work in noisy areas with those who work in quieter areas. This form of administrative control can be used on occasion, but because of labor skills, wages and lack of labor resources, the implementation of this form of noise control is not usual.

d) **Proper Operating Procedures:**

The way of operating equipment by the workers can cause overexposure of noise. There must be sufficient distance between worker and machine or worker should be at a quieter location without degrading his work performance. Some operation can be monitored by the worker from the booth or a cabin. If the operator booth is employed, noise exposure can be reduced to a range from 10dB to 30dB.

2) **Shields and Barriers:**

An acoustical shield is a solid piece of material placed between worker and noise source, which is often mounted on the machine. An acoustical barrier is a larger piece of solid material, usually free-standing on the floor. The function of both the shield and barrier is the deflecting the flow of acoustic energy away from the worker hence it may sometime be called as 'deflector'.

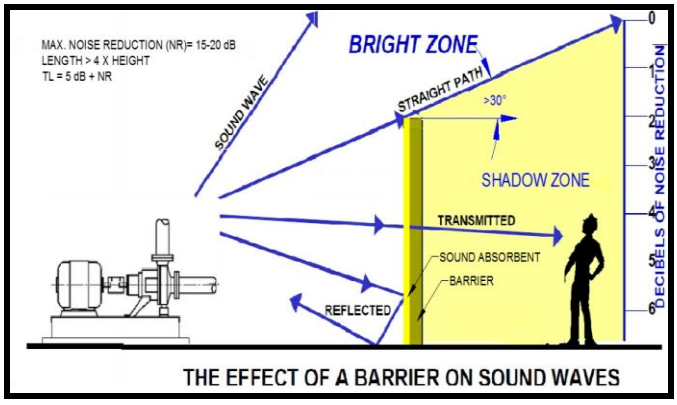

Fig. 1: Noise Barrier

3) **Enclosures:**

A well-insulated enclosed space created with thin panels isolated from vibrations on the floor of the industry is called as an 'Enclosure'. It is the most commonly used form of passive noise control measure as basis of sound insulation. The assembly of the enclosure is made of sound boarding and absorption material to prohibit the radiation of sound waves. The construction of the enclosure assembly can be done in the following ways:

a)The sound boarding consists of a layer of metal plate and two layers of different absorption materials of the different or same thickness. Thus, the absorption region of the enclosure is enlarged because of different absorption coefficients of two materials in the different frequency domains. Fig. No.2(a).

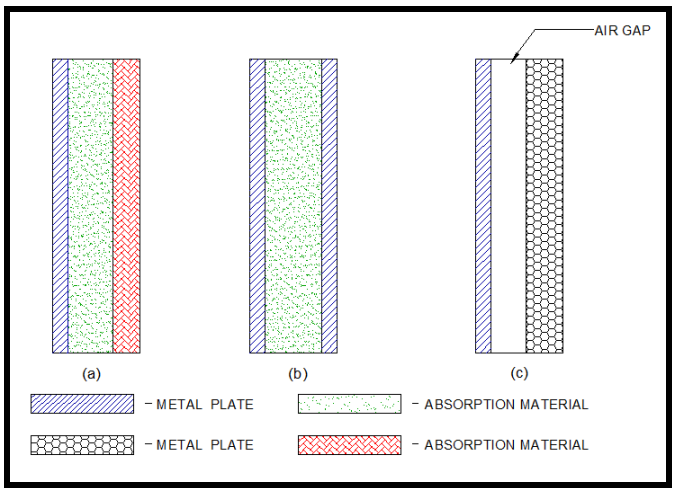

Fig. 2: Components of Enclosures (Sound Boarding)

b) The Sound boarding consisting of two layers of same metal plates within which sound absorption material is embedded. The materials insulate noise and the sound insulation property is enhanced because of the different

insulation coefficients of the two materials in the different frequency domains. Figure: 2(b).

c) The sound boarding consisting of two layers of metal plates with different materials and thicknesses. There is an air gap between the two layers, and the inner surface of the boarding is lined with the absorption material. In the structure, the air gap works as an added layer to enhance insulation without additional costs. Figure: 2 (c).

4) **Noise Reduction Using Curtains:**

Presently the use of curtains for noise reduction is more popular in the industry. This may be attributed due to its acoustical effectiveness, versatility, and ease of installation. Curtain materials are usually smooth vinyl, which are limp and highly resistant to the industrial environment.

5) **Reverberation Control:**

In the case of enclosures (i.e hall or auditorium) reverberation time depends upon the purpose for which it is to be used. The reverberation time can be controlled by selecting a suitable type of absorptive material. If reverberation time of industrial building unit is too long it can be cut down by increasing absorption or reducing volume. Since the open windows allow the sound energy to flow out, there should be a minimum number of windows. They may be opened or closed to obtain optimum reverberation time.

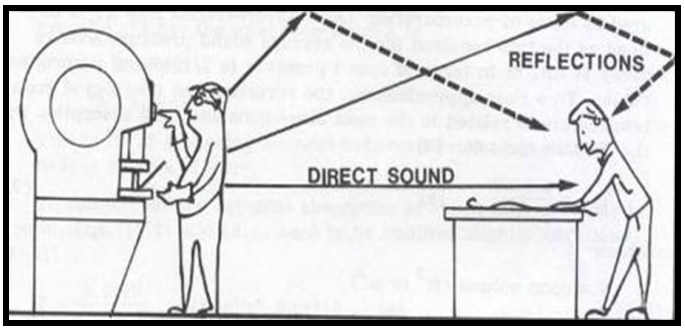

Fig. 4.9: Reverberation Control

6) **Noise Reduction using Louvres:**

Acoustic louvers are manufactured from folded galvanized steel or aluminum with its all external faces coated in polyester powder paint. Therefore, has a pleasing aesthetic appearance and retaining a high-density acoustic medium. The louver elements are aerodynamically designed and used for the reduction of machinery noise from industrial buildings and ventilation systems. They are most suited to process air intakes, air exhausts, cooling tower enclosures and providing and maintaining clean air flow. The density of louvers varies from the 40-50 kg/ m^2.

7) **Active Noise Control (ANC):**

Currently, this form of noise control becomes more popular in the scientific research area. Active noise control is also known as noise cancellation or active noise reduction (ANR). When a secondary source is used to generate a secondary sound field to cancel the primary sound field generated by the primary noise source is called Active noise control (ANC). How much of the primary noise that gets canceled is dependent on how accurate the amplitude and the phase shift are of the secondary sound field.

8)Existing Noise Control Materials:

Typically acoustic materials are soft, porous in nature due to which they convert sound energy into heat. Acoustic material works in noise control by two significant processes; absorption of sound energy which dissipates sound as heat energy and reflection, which reflects noise away from a location where quieting is desired. These materials greatly contributed to improving the acoustical performance of many passive noise control techniques. Various forms of acoustic materials have been used as noise control measures are explained as below:

a) **Synthetic Material:**

Synthetic materials such as polypropylene, polystyrene, Para amide fiber, ceramic, rock wool, glass wool, slag wool, flame redundant foam, etc. used as acoustical material during last few decades and proven good for noise control. However, at the same time, there is a realization that processing on the synthetic material is harmful because it causes many problems to the health of the worker.

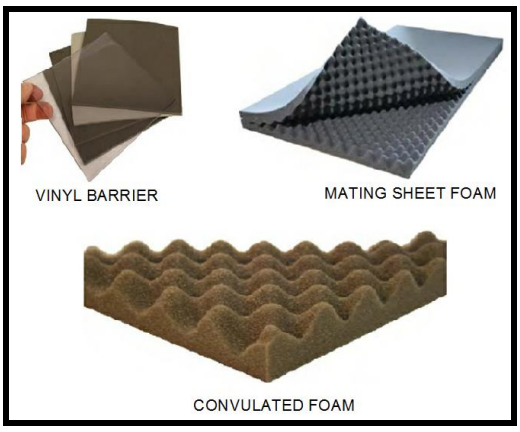

Fig. 3: Synthetic Absorbents

b) **Natural absorbents:**

Natural sound absorbing material has many benefits, such as less cost, nonabrasive, and renewable. Therefore, researchers have looked into natural and agricultural waste to find alternative materials. In practical applications, most sounds absorbing materials are synthetic; they induce health risks to lungs and eyes. Various natural sound absorbing materials are easily available in an adequate quantity such as

coconut coir, durian peel, tea leaves, date palm fiber, etc. These materials found economical, safe and best effective at both higher and lower frequencies.

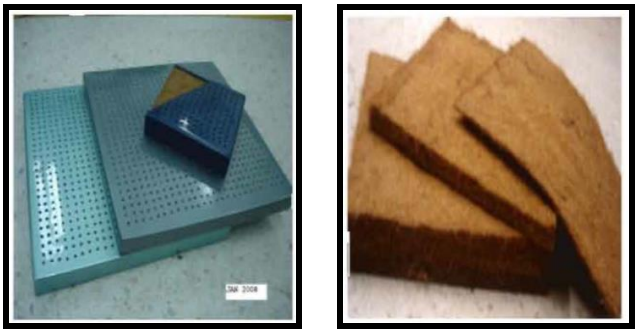

Fig. 4: Perforated Panel Using Coconut Coir Fiber

9) **New sustainable sound absorbing materials**

As for natural materials, the less treated they are, the higher they perform in energy saving; native materials have to be preferred to reduce transport energy. Moreover, natural fibers have negative impacts There is a great variety of natural fibers proposed for acoustical applications such as Hyacinth, Maize, Coconut Coir Dust, etc.

.

Further study can be carried out with the help of the sound absorption of material combinations of Hyacinth, Maize and coconut coir.

3. CONCLUSIONS

Concerns about reducing noise pollution in the industry are multiple and directed to problems aimed the noise in the three directions: at source, on the propagation paths, and at receiver. Noise control methods are effective when they have studied all the factors related to the nature of noise, the device which produces noise, the propagation pathways. Noise controlling techniques should be applied at the source by providing barriers, enclosures, in propagation pathways by introducing agriculture waste/natural absorptive materials.

REFERENCES

[1] T.S.S.Jayawardana, M.Y.A. Perera, G.H.D.Wijesena, Analysis and control of noise in a textile factory, International Journal of Scientific and Research Publications, Volume 4, Issue 12, December 2014 ISSN 2250-3153

[2] Tomozei Claudia, Nedeff Valentin, Lazar Gabriel, Actual Stage of Industrial Noise Reduction, Journal of Engineering Studies and Research – Volume 17 (2011) No. 4

[3] Randall F. Barron, Industrial Noise Control and Acoustics Library of Congress Cataloging-in-Publication Data ISBN: 0-8247-0701-X

[4] Vaishali Jain, Analysis of Noise Level Reduction for Plant Machine Monitoring, International Journal of Scientific & Engineering Research Volume 3, Issue 9, September-2012 1 ISSN 2229-5518

[5] Savage P. A., Effect Of Noise Pollution on Human Being: Its Prevention and Control, *J. Environ. Res. Develop.* Journal of Environmental Research And Development Vol. 8 No. 4, April-June 2014

[6] E.R. SPENCER AND E. REEVES, Assessment of engineering noise controls at a talc processing plant

[7] Francesco Asdrubali, Survey on The Acoustical Properties of New Sustainable Materials for Noise Control, Euronoise 2006, Tampere, Finland

[8] Azimi M, 'Noise Reduction in Buildings Using Sound Absorbing Materials' Journal of Architectural Engineering Technology DOI: 10.4172/2168-9717.1000198

[9] Amelia Trematerra*, Mezzero Antonio, Gino Iannace, 'Use of Green Material for Acoustic Correction inside Rooms', Journal of Sustainable Architecture and Civil Engineering, ISSN 2029–9990, 2013. No. 3(4),http://dx.doi.org/10.5755/j01.sace.3.4.4708