International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 10 Issue 8 ǁ August 2022 ǁ PP. 652-655

Noise Sources, Exposure, Health Effect and Conrol in Iron & Steel Foundry

K. Velusamy[1], S. Sathishkumar[2], S. Kavikumar[3]

ABSTRACT: *Foundries are one of the oldest industries and the most basic of all metallurgical processes, with two main procedures performed in a foundry: molding and metal casting. Workers are exposed to a wide range of hazardous compounds in the workplace due to the variety of materials and procedures performed in this industry, which can lead to chronic exposure to hazardous substances. Noise is a major physical hazard in the foundry process, and its health effects are exacerbated by a number of other risk factors. The purpose of this project is to discover the effects of occupational noise by conducting a literature search in PubMed, Web of Science, Scopus, Science Direct, and Google Scholar using appropriate keywords on the combined effects of occupational noise and health effects in foundry workplaces. Noise-induced hearing loss is the well-studied and recognized health impact connected with noise exposure. Other health impacts linked to noise exposure include digestive and behavioral problems; sleep difficulties, changes in serum cortisol levels, cardiovascular disease, and an increase in workplace accidents and injuries. The majority of studies have only looked at the combined effects of risk factors on hearing, and the evidence for non-auditory effects is still limited, so more research is needed. As a result, in Hearing Conservation Programs, aggravating factors of noise effects should be considered in addition to noise.*

Keywords: *NIHL, TTS, SMEs, OSH, EICC.*

Date of Submission: 18-08-2022 Date of acceptance: 02-09-2022

I. INTRODUCTION

The casting industry gives employment to more than half a million people directly and three times as many indirectly. Many studies showed that there is a dose response relationship between noise intensity and hypertension incidence in the occupational population. Patel and Ingle indicated that the prevalence of hearing loss is greater among mill workers and that these workers are more susceptible to NIHL compared with grain market workers. Impulse noise may damage the cochlea by direct mechanical processes. Impulse noise can interact with background continuous noise to produce greater hearing loss than would have been predicted by the simple sum of the individual noises. Another practical method of reducing noise in metal products industry is by increasing the distance between the source and work vicinity. Machines, processes and work areas which are approximately equally noisy should be located together. Areas that are particularly noisy should be segregated from quiet areas. Hearing protective devices attenuate industrial impulse noise effectively but do not prevent advanced hearing loss among workers. Therefore, it is reasonable to assume that the qualities necessary for ear protectors to protect hearing from impulsive noise differ from those necessary to protect from continuous noise. This paper discusses the principles behind ideal collaboration between health professionals, engineers, computer scientists, and health informaticians to co-create health solutions, and cite literature based examples and challenges inherent in animating this collaboration between health professionals and technology experts. This paper will conclude with recommendations to stimulate and nurture inters professional synergy towards success [1]. In this project, the existing OSH working environment and operational practices have been reviewed. Accordingly, effective OSH management program has been established for the recycling industry. The subsequent implementation will enable systematic OSH management to collect injury statistical data, identify mitigation measures and thus improve the OSH performance [2]. A feasibility study on a novel sensor to monitor the worker's sitting time for Industry 4.0 environments is presented. A sedentary job considerably affects the worker's health but at the same time, the dramatic lack of valid aids is well assessed. The proposed sensor is capable of recognizing the presence of an adequate worker's activity, highlighting the movements from the workstation [3]. As a result top 11training courses were identified and were recommended for conducting on-the-job training for the safety and hygiene workforce in nanotechnology industries to reduce the incidence of occupational illness [4]. This system is designed as a tool which solves some challenges imposed in community mental health care. Using a computer network, the electronic-bulletin-board-like system which uses ICF-based data input is applied, for the purpose of sharing community mental health care consumer information [5]. This paper proposes a cloud based PHM framework, its objective is to achieve Max-OEE through PHM technology and standardization algorithm in order to meet the increasing requirement from the different industry [6]. The

results are consistent with our hypothesis that the performance of environmental, health and safety is related to the location of corporate. It also related to the supplier published corporate responsibility/ environmental report or not. Our study contributes to the literature on empirical examination of green supply chain management in ICT organizations [7]. It has eliminated weeks of manual work from each inspection, saving significant amounts of money, and making the inspection exercise safer and easier to conduct [8]. The results of the present study showed a significant hearing loss, that is, PTS, in both ears at 1.0 to 8.0 KHz for metallurgy workers. Therefore, the industry workers showed a significant hearing loss within less than 9 years of work exposure at all frequencies, as compared with the control group. Whereas previous studies reported a significant difference within the first 10 years of noise exposure only for the thresholds obtained at 4 KHz in a group of noise-exposed industrial workers and the control group with normal hearing. Other researchers reported that long-term exposures of 10 years or more in the drop-forging industry resulted in hearing losses as great as or greater than those resulting from equivalent continuous noise.

II. People's lives have been changed dramatically due to tech-
III. nological advancement in smart and diverse types of consumer
IV. electronics. These devices, known as the Internet of Things
V. (IoT), are connected by advanced communication technolo-
VI. gies to the Internet to exchange information
VII. People's lives have been changed dramatically due to tech-
VIII. nological advancement in smart and diverse types of consumer
IX. electronics. These devices, known as the Internet of Things
X. (IoT), are connected by advanced communication technolo-
XI. gies to the Internet to exchange information
XII. People's lives have been changed dramatically due to tech-
XIII. nological advancement in smart and diverse types of consumer
XIV. electronics. These devices, known as the Internet of Things
XV. (IoT), are connected by advanced communication technolo-
XVI. gies to the Internet to exchange information

II. MATERIALS AND METHODS

The initial questionnaire documented use of protective equipment and awareness about benefits of personal protective equipment (PPE), NIHL, hearing disability, and noise-induced syndromes, such as speech interference, noise annoyance, headache, anxiety, and sleep disturbance. The questionnaire was pretested and validated by the independent observers before it was used to assess the information. Data were collected through one-to-one interaction, as workers of these units were mostly illiterate or less educated; therefore the questions and statements were translated in Punjabi and Hindi and then workers were asked to fill out the questionnaires.

- **Noise and Dose Assessment:** The dosimeter was attached to the worker at the belt, and the microphone was attached to the collar. A weighted ambient noise was assessed through the use of a Quest sound-level meter. OSHA norms for hearing conservation were incorporated, including an exchange rate of 5 dB(A), criterion level at 90 dB(A), criterion time of 8 hr, threshold level equal to 80 dB(A), upper limit equal to 140 dB(A), and with F/S response rate.

Occupation	Mean L_{eq}(A) dB	Mean % Dose
Punching/Blanking	99.30	367.50
Forger	105.10	811.0
Furnace job taker	103.30	635.30
Roap puller (hammer operator)	104.50	749.20
Molding/Casting	90.60	110.40
Grinding	97.90	302.80
Tool and die	89.60	95.10
Broaching	90.70	111.10
Gas cutting/Welding/Plating	89.40	92.00

- **Audiometry:** Pure-tone threshold audiometry is the measurement of an individual's hearing sensitivity for calibrated pure tones. The audiometer was calibrated and tested before the test; calibration was outsourced from Arphi Electronics. The participants were instructed about the audiometry test and the same was conducted. The prevalence of hearing loss was determined on the basis of hearing threshold levels with a lower limit of 25 dB.
- **Statistical Analysis:** All data are given as mean values with standard deviations. We made comparisons for hearing threshold at different frequencies between the exposed and control groups by using Student's test. ANOVA was used for the comparison of hearing threshold at different frequencies among occupation and of experience.

➢ **Personal protective equipment:** Personal Protective Equipment helps prevent staff emergencies on the job due to inhalation, absorption, irritants, or other prolonged contact with a cleaning chemical. This actively reduces accidents, improves the health of your employees, and makes for a safer, secure work environment.

➢ **Use of PPE system:** Although a majority of workers reported that they are aware of the benefits of using PPE, a large proportion of workers do not use PPE. Workers without proper ear protection at workplaces are shown in Figure. The photographs give a good picture of the type of workshops studied and the location of microphones during personal exposure recording.

PPE	Total *n*	Always	Often	Some-times	Seldom	Never	Score on Scale (0-4)
Dungarees	572	7	10	8	5	70	0.79
Gloves	572	9	12	10	9	60	1.01
Goggles	572	12	15	13	10	50	1.29
Gum shoes/boots	572	10	12	15	10	53	1.16
Nose-mouth mask	572	9	14	12	9	56	1.11
Earplugs/muffs	573	5	12	10	9	64	0.85[a]
Helmet	572	7	15	11	5	62	1.00
Others (turban/Safa/cap)	572	20	35	15	5	25	2.20[b]

➢ **Hearing Threshold:** Hearing loss significantly increased with work experience: As the duration of experience increases, there is significant loss of hearing in the left ear at all frequencies. In the present study, the post hoc Tukey's analysis reveals that workers with work exposure from 10 to 15 years and more than 15 years experienced significant hearing loss in the left ear at all frequencies as compared with workers with work exposure of 5 years or less.

III. CONCLUSION

Workers in the Indian steel industry are highly exposed to occupational noise. The majority of workers are not being protected from occupational NIHL, as they work without proper ear protection. This study shows alarming evidence of NIHL among the industry's workers, especially forge workers as compared with others. Exposure to high levels of impulse noise despite the use of ear protectors is more detrimental to hearing than are high levels of continuous noise. It should be recognized that ear protectors in a context of impulsive noise should have different technical characteristics than those to be used in a context of continuous noise. Therefore, it is more important to ensure that good-quality and appropriate ear protectors are provided. The design of the ear protectors should be such that workers feel comfortable wearing them while they work. At the same time, job rotation should be introduced so that the overall noise dose can be reduced. There is a strong need to take immediate measures at the management level. However, the workers also need to become more aware of the benefits of ear protection. Overall, compared with the United States and Europe, managers of smallscale industry in India are lagging behind in implementing the use of ear protection, setting up hearing conservation programs, and addressing the problem of noise control.

REFERENCES

[1]. K. Ho, E. Borycki, A. Kushniruk, C. Juhra and M. Hernandez, "The health perspective in using digital media for health and wellness," 2016 Digital Media Industry & Academic Forum (DMIAF), 2016, pp. 29-31, doi: 10.1109/DMIAF.2016.7574895.

[2]. M. K. H. Leung, A. W. Y. Ng and A. H. S. Chan, "Occupational safety and health management for the recycling industry," 2009 16th International Conference on Industrial Engineering and Engineering Management, 2009, pp. 1027-1030, doi: 10.1109/ICIEEM.2009.5344444.

[3]. E. Cardillo and A. Caddemi, "Feasibility Study to Preserve the Health of an Industry 4.0 Worker: a Radar System for Monitoring the Sitting-Time," 2019 II Workshop on Metrology for Industry 4.0 and IoT (MetroInd4.0&IoT), 2019, pp. 254-258, doi: 10.1109/METROI4.2019.8792905.

[4]. F.-M. Hsieh, P. . -J. Tsai, W. -Y. Chen and C.-P. Chang, "Developing on-the-job training program for the Occupational Safety and health personnel in nanotechnology industries," 2009 IEEE International Conference on Industrial Engineering and Engineering Management, 2009, pp. 2009-2013, doi: 10.1109/IEEM.2009.5373212.

[5]. S. Manabe, N. Ashida, T. Takemura, K. Murase and N. Nishiura, "ICF-based community mental health care," Proceedings. 6th International Workshop on Enterprise Networking and Computing in Healthcare Industry - Healthcom 2004 (IEEE Cat. No.04EX842), 2004, pp. 110-113, doi: 10.1109/HEALTH.2004.1324487.

[6]. D. Ning, J. Huang, J. Shen and D. Di, "A cloud based framework of prognostics and health management for manufacturing industry," 2016 IEEE International Conference on Prognostics and Health Management (ICPHM), 2016, pp. 1-5, doi: 10.1109/ICPHM.2016.7542871.

[7]. Ching-Ching Liu and Yue-Hwa Yu, "Study for environmental, health and safety performance of Electronic Industry Code of Conduct - Case study for green suppy chain management in Taiwan computer industry," 2011 International Conference on Remote Sensing, Environment and Transportation Engineering, 2011, pp. 4450-4455, doi: 10.1109/RSETE.2011.5965319.

[8]. E. Sayilgan and Y. İşler, "Medical devices sector in medical industry 4.0," 2017 Medical Technologies National Congress (TIPTEKNO), 2017, pp. 1-4, doi: 10.1109/TIPTEKNO.2017.8238036.

BIOGRAPH

Dr.K.VELUSAMY
Received the B.Engineering Degree from Thigarajar College of Engg at Madurai in 1988. The M.E Degree Jayaram college of Engg and Technology at Tiruchirappalli in 2009. The Ph.D Degree Anna University at Chennai in 2018. He has been working as Professor in Annai Mathammal Sheela Engineering College, Erumapatty, Tamilnadu, India. His research interest in manufacturing technology.

Mr. S.SATHISHKUMAR
Received the B.Engineering Degree from KSR College of technology at Namakkal in 2013. The M.E Degree from Annai Mathammal Sheela Engineering College at Namakkal in 2015. He has been working as an Assistant professor in Annai Mathammal Sheela Engineering College, Erumapatty, Tamilnadu, India. His research interest includes Safety In Engineering Industry.

Mr. S.KAVIKUMAR
He obtained his ME degree of ISE at Annai Mathammal Sheela Engg College at Erumapatty in 2022. He obtained his B.E degree from Agni college of technology at Chennai in 2014.His research interest include safety in engineering iron and steel industry.