Research Paper Engineering

A Brief survey Into Health Hazards In Casting Industries

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ABSTRACT

In this research work various industries are analyzed for health hazards in important aspects like heat exposure, working hours use of protective equipments, heavy work and awareness about benefits of PPEs, NIHL, noise annoyance etc.

Keywords: Health Hazards, Heat exposure, Speech interference, Noise annoyance Audiometric

I. Introduction

Though India is now considered a major power and is turning into a developed country from a developing country, a large section of its population still belong to the poorest of the poor. In developing countries, great efforts are directed towards the advancement of small-scale industries as these are considered the engine for their economic growth. According to WHO, over 1000 million people worldwide are employed in small-scale industries.

II. Methods and Materials

This study included randomly selected small and medium scale (SMEs) casting and forging units (each three) located in northern India. The approachability to the management of the organization and their willingness to participate in the study was more of a concern than randomization as work conditions of most casting and forging units in this region are almost similar. Hence convenience of approaching the management was the basis of selecting units for the study. The sizes of units vary from 50 to 1200 workers. The study has been conducted involving randomly selected 350 workers of these units. The questionnaire includes heat exposure, working hours, use of protective equipments, heavy work and awareness about benefits of PPEs, NIHL, noise annoyance etc.

The questionnaire was pretested before it was used to assess the information. As workers of these units are mostly illiterate or less educated, statements of the questionnaire were translated to both local language of the state i.e. Punjabi and Hindi. The interview was conducted by the authors in the local language and responses were entered in questionnaire.

Heat stress monitoring

Ambient temperature was measured using area heat stress monitor "Model Quest Temp 36/6º". The WBGT in index has been measured in various sections of these units. Results of the study revealed that occupational heat exposure is high as prescribed by NIOSH/ACGIH. Most of the work locations have an almost high temperature. The ambient temperature was recorded for 15 minutes each time on each work station and one long term recording for eight hours was done. At each section temperature was recorded at least five times at different locations where the movement of the workers was most frequent. There was hardly a difference of 0.5 to 1.5 degree between long term recoding and short term recording. The temperature near the worker's place of work and at five to 10 feet away differed by 0.5 to 1.5 degree at cupola furnace, induction furnace and oil fired furnace and 0.5 to 1.0 degree at drop forge section. The WBGT index at various sections like molding, melting/pouring, drop hammer, grinding and barreling sections was found very high than the permissible limits.

Noise measurement

A weighted (Led) ambient noise was assessed by using a quest sound level meter "model SOUNDPRO SP-DL-1-1/3". OSHA norms for hearing conservation were incorporated including an exchange rate of 5 dB(A), criterion level at 90 dB(A), criterion time of eight hours, threshold level equal to 80 dB(A), upper limit equal to 140 dB(A) and with F/S response rate.

In the molding section at different locations, noise was impulsive or intermittent; in grinding and melting sections there was almost steady noise. The sound pressure was recorded for 15 minutes each time on each work station and one long term recording for eight hours was done. At each section sound pressure was recorded at least four to five times at different locations where the movement of the workers was most frequent. There was hardly a difference of 0.5 to 1.0 dB(A) between long term recoding and short term recording. Most of the work locations have an almost steady noise production except the drop forge hammers, punching, blanking, trimming, and molding sections. Noise level at various sections like drop hammer, cutting / blanking presses, punching press, grinding, barreling and machine molding sections, was found greater than 90 dB(A) permissible limits.

Pure tone audiometric

A sample of 60 workers was deliberately selected from sections like forging, molding grinding, and tool room and invited to conduct pure tone audiometric at the institute laboratory. The hearing threshold was measured in an audiometric room at different frequencies. The workers were explained about the audiometric test and the same was conducted. Workers engaged in forging sections were found with higher loss of hearing as compared to workers engaged in other sections.

III. Results and discussion

The results of heat measurements reveal that WBGT index for temperature in casting units ranged from 32.17°C to 37.31°C and in forging units from 33.47°C to 38.03°C. The main sources of heat in Iron and Steel units are cupola furnace, induction furnaces, oil fired furnace and heat treatment. In casting units the main sources of noise are machine molding, sand mulling/mixing, over-head cranes, fettling and pneumatic chipping, cupola-feeder and its motor drive. In forging units, drop hammers, punch and blank cutting press, grinders, barrels, vibrator, shot blasting machines are the sources of noise. In the grinding, finishing and shot blasting sections the noise was mainly continuous, however, in blanking, forging, punching/trimming, fettling and barreling processes the noise was intermittent or impulsive. The WBGT values observed in study are very high as compare to the permissible heat stress criteria. In casting units, activities like; shoveling

dry sand, machine and manual molding, carrying moulds, carrying molten metal form furnace to moulds and pouring of molten metal into moulds are all heavy work with higher relative metabolic rates (HRMR). In forging units the tasks of transferring hot work piece from furnace to forger, blanking and forging are heavy work activities; workers engaged in these heavy activities are more prone to heat stress, heavy sweating and hence daily tiredness.

In casting units, the noise level varies from 88.9 dB(A) to 103.5 dB(A) and in forging units ranged from 86.5 and 110 dB(A) Leq which also exceeds the permissible limits (90 dB A) of OSHA. The daily exposure of workers in sections like blank cutting, forging, punching, machine molding, wheel and belt grinding, barreling section, broaching, gauging and sizing exceeds maximum exposure limit of 90 dB(A) specified by OSHA. Noise exposure in other work areas like nickel plating, machine section, die section is recorded less than 90 dB(A), but is quite higher than the limits used for assessment of noise for community noise. OSHA norms are not valid in Indian SMEs because in most of these units workers work 10-12 hour/day and six days/week i.e. exposure time is 60 to72 hours per week. Most of the workers opted for two to four hrs/day over time i.e. 12 to 24 hours/week and this fact was also established by the managers of the plants. Therefore workers are under total exposure of 20 to 32 hour per week (i.e. 50 to 80%) higher than work exposure time standards (40 hrs per week) in USA or European countries. The overall noise exposure of casting workers is relatively lesser than forging workers; the casting workers are, however, more exposed to heat stress. Workers of casting processes mainly ignore noise hazards and thus the use of protective equipment at the same time. Workers of forging units accept noise as an integral part of the job.

Subjective responses

About 75% of workers are supposed to lift heavy load during their work. This kind of job requirement with metabolic heat production also makes considerable addition to heat stress. Around 85% of the workers reported unnecessary tiredness (of various levels) after working. The overall level of un-necessary tiredness (on five point rating scale) was 1.8. About 80% workers reported heavy sweating during work hours along with water intake of more than four liters /day and overall level of sweating was 3.75 (on five point rating scale). Subjective data also revealed that 85% of the workers do not take glucose/salt with water during work schedule. It is very obvious that mere water intake without salt or glucose is not sufficient to compensate for sweat (salt) loss. Although management of a few units had offered to provide lemon and salt water in place of tea, the workers preferred to tea. Interviews with workers revealed that un-necessary tiredness is very common and more among workers engaged in i) forging, ii) transferring hot work piece from furnace to forger, iii) molding, iv) molten metal pouring man, v) cupola and induction furnace workers. The extent of tiredness was less among workers engaged in grinding, gas cutting/welding, tool room, maintenance and quality check. Hence workers engaged in forging and molding sections, cupola/ induction furnace are more prone to high level of heat stress since these workers are doing heavy work with very high WBGT index as compared to permissible criteria. Consequently, majority of the workers have reported un-necessary tiredness after working hours. The chronic effect of the same can lead to heat stroke and overall health degradation of workers.

Speech interference

As far as noise effects are concerned, speech interference was experienced by 95% workers, of which 40% reported 'always' - majority of them were engaged in forging, blanking, punching, trimming, barreling, broaching and grinding sections; 30% reported 'often' and were mainly engaged in machine molding, shot blasting, sizing gauging. Rest of the workers reported low speech interference and were engaged in tool room, nickel plating, quality and cupola/induction furnace operators. The overall level of speech interference was 2.9 (on five point rating scale).

Noise annoyance

Five per cent of the workers reported 'always' annoyed, 15% 'often', 42% 'sometimes', 10% workers 'seldom annoyed' and 28% 'never felt annoyed' by high noise levels. The overall level of noise annoyance on five scales was found to be 1.59. The less per cent of high annoyance is attributed to the two reasons; (a) workers have accepted noise as a part of their job, (b) workers get adapted to noisy work conditions with the increasing work exposure to high noise levels.

Majority of the workers who reported noise annoyance were with less than five years of work exposure, as long as exposure increases noise annoyance is reduced .Concurrent to increased adaptability, workers also undergo noise induced hearing loss (NIHL) which explains why workers feel less noise annoyance.

Hearing disability (NIHL)

A pure tone audiometric was conducted on a sample of 60 male workers of age group 30 to 35 years with experience of seven to 10 years, threshold level of both ears was checked. These workers were selected from forging, molding, grinding and other sections like broaching, shot blasting welding gauging sizing of these shops. Pure tone audiograms of workers engaged in sections like forging, molding, grinding and other sections. Audiograms of forging worker are significantly different from the others. Depression in audiogram shows that workers engaged in forging sections have high level of NIHL i.e. loss of hearing at frequencies 2 kHz, 3 kHz, 4 kHz 6 kHz and 8 kHz as compared to the workers engaged in molding, grinding and other sections. There is moderate to severe loss of hearing threshold (dB) in at higher frequencies however minor to moderate loss at lower frequencies. Workers of other sections were found with minor loss of hearing threshold. The grinding and forging are found to be more hazardous than other processes. It is already mentioned that majority of the workers do not use PPE; managements of these units also do not bother much about the protection of workers' ears. Hence hearing health is prominently ignored in these SMEs. There is a strong need to provide proper ear protection and noise isolation in these units.

Although 70% workers reported that they are aware of the benefits of using PPE subjective data also revealed that a big proportion (68%) of workers did not use PPE in both casting and forging units. Only 25% of the workers wear dungarees, 45% use gloves, 35% report using eye protection (goggles) and 25% workers wear gum shoes or boots and nose mask was used by 40% workers. The ear protection was found to be the least preferred or ever used PPE, and only to 12% workers used it.

The reasons stated for not using PPE: 35% did not feel uncomfortable, 10% are not used to wearing the same, 30% admitted to negligence and around 25% said management did not provide PPE at work place. About 85% of workers reported that management did not enforce use of PPE; in most small scale units management did not even bother about it. Reason, management concentrates on executing the orders and shipments. Another significant factor is that workers in small scale casting and forging units also work under contractors who ignore this aspect. It is also true that workers do not expect health and safety care from the management; rather they have accepted hazards conditions as a part of their job as well as life. Whatever the reason may be, workers do not use PPE; thus it is obvious that majority of the workers are directly exposed to noise, temperature / heat radiations and dust also. Around 85% of workers work more than eight hrs/day with additional over time of two to four hrs/day (12 -24 hrs/week) which is a major factor contributing towards very high noise exposure (more than the OSHA norms). Such long working hours may increase risk of hypertension and cardiovascular disease along musculoskeletal injuries, depression and other psychological conditions. This gives sufficient sup-

port to consider ethical considerations regarding long working hours and poses a new question about the type of society we want to create and the ethical implication on unconventional shift work and long work-hour schedules. The prevailing performance standards in SMEs generally do not include sufficient rest allowances. Thus there is also a strong need to set reasonable performance standards for various activities with appropriate rest allowances.

Satisfaction level of workers

As far as overall satisfaction level of workers with respect to work environment was concerned, it was 2.45 on a five point rating scale. Within the scenario of un-employment workers are scared of losing the job. They have accustomed themselves to the working conditions and do not expect much health and safety facilities from the management; rather they felt satisfied with the job in hand. Whole data reveals that, the workers engaged in various processes of casting and hot forging processes of SMEs units are highly exposed heat stress, as well as noise. Management of the SMEs are more focused on overall production and quality for fetching more and more orders from their customers at the cost of occupational health and safety of workers. The crux of the present study can be enumerated as “managements of SMEs are not giving due consideration to health and safety of workers”, but ignoring the health and safety factors. In other words management is defying the fact that “only a healthy worker can give better quality with best output than any unhealthy worker”

IV. CONCLUSION

e Different sorts of morbidities with special reference to Health problems among small scale industry workers are giving a warning signal. Therefore it is the actual need of the hour for right action for solving their job related disputes so that they can have a better living. Proper counseling and health education through campaign can work as magic to improve their condition on many aspects. To make conscious about work-related problems audiovisual training program suitably designed by experts for different sectors of industry can be implemented to get best results. Periods of rest in between long hours of work, provision of seats with adjustable back rest for support to lumber region may be helpful to reduce low back pain. To conclude, it is the responsibility of everyone to provide health care for making urban slum to be a living place.

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