Assessment of Health and Safety Practice in Engineering Workshop

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ABSTRACT

Engineering workshop safety and health is a category of management responsibility in places of employment. Maintaining a safe working environment requires dedication and attention to safety rules or precautions. This aspect of engineering practice is not only important to ensure workers safety, but also to increase the efficiency of the work process. A survey was recently conducted in order to determine the level of safety practice in University of Benin Engineering Workshop. The survey was conducted with the aid of questionnaires. Questionnaires was analysed using the principal factor algorithm in StatisXL. The result revealed that there is a low level of health and safety practice in the workshop. The reason behind this state of affair is majorly inclined with the lack of maintenance practice and improper measures to prevent health damage.

1. Introduction

Health and safety in workplaces has improved in most industrialized countries over the past 20 to 30 years [1]. However, the situation in developing countries is relatively unclear largely because of inadequate accident and disease recognition, record-keeping and reporting mechanisms [2]. It is estimated that at least 250 million occupational accidents occur every year worldwide while 335,000 of these accidents are fatal [3]. Since many countries do not have accurate record-keeping and reporting mechanisms, it can be assumed that the real figures are much higher. The number of fatal accidents is much higher in developing countries than in industrialized ones [4]. This difference is primarily due to better health and safety programmes, improved first-aid and medical facilities in the industrialized countries, and to active participation of workers in the decision-making process on health and safety issues [5]. Some of the industries with the highest risk of accidents worldwide are include mining, agriculture (forestry and logging) and construction [6]. The cause of an industrial injury is easy to identify. However, very often there is a hidden chain of events behind the accident which led up to the injury [7]. For example, accidents are often indirectly caused by negligence on the part of the employer who may not have provided adequate worker training, or a supplier who gave the wrong information about a product, etc [8].

In Nigeria, the issue of safety and health in workplaces is treated with levity [9]. One such case that could not be forgotten in a hurry was the fire incident that razed a plastic factory somewhere in Lagos, when many workers were roasted to death at night because the employers of the company locked the workers in the factory and went to sleep at their highly secured residence [10]. A similar incident almost took place in the production workshop of the University of Benin, where a technician was almost electrocuted to death [11]. The consistent high fatal accident rates in developing countries emphasize the need for occupational health and safety education programmes that focus on prevention. It is equally important to promote the development of occupational health services, including the training of doctors to recognize work-related diseases in the early stages [12]. Some occupational diseases have been recognized for many years, and affect workers in different ways depending on the nature of the hazard, the route of exposure, the dose, etc. [13]. Some well known occupational diseases include: asbestosis (caused by asbestos, which is common in insulation, automobile brake linings, etc.), silicosis (caused by silica, which is common in mining, sandblasting, etc.), lead poisoning (caused by lead, which is common in battery plants, paint factories, etc.), and noise-induced hearing loss (caused by noise, which is common in many workplaces, including airports, and workplaces where noisy machines, such as presses or drills, etc. are used) [14]. There are also a number of potentially crippling health problems that can be associated with poor working conditions such as heart disease, musculoskeletal disorders (permanent back injuries or muscle disorders), allergies, reproductive problems, stress-related disorders [11]. Many developing countries report only a small number of workers affected by work-related diseases. These numbers look small for a variety of reasons that include: inadequate or non-existent reporting mechanisms, lack of occupational health facilities, lack of health care practitioners who are trained to recognize work-related diseases [14]. Due to these reasons and others, it is fair to assume that in reality, the numbers of workers afflicted with occupational diseases are much higher [12]. In the overall issue, the number of cases and types of occupational diseases are increasing, not decreasing, in both developing and industrialized countries [15]. Thus it is imperatives to examine the existing issue concerning health and safety practices in our work places.

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Methodology

The University of Benin engineering workshop was used as a case study. Questionnaires were developed to obtain information on staff and students opinion. The questionnaires were distributed to and collected from respondents, mostly by hand. Respondents were asked to reflect on a Yes or No option. Sample consisted of 36 respondents. Data obtained from questionnaires was analysed using StatisXL software. The ratings used for the analysis are 1-very low practice health and safety practice, 2-low practice health and safety practice, 3-medium practice health and safety practice, 4-high practice health and safety practice and 5-very high practice health and safety practice. The workshop assessed includes: (a). Strength of materials workshop (b).Thermo-Fluid laboratory (c). Auto shop (d).Machine shop (e).Hot shop (f). Store and inventory (g).Bench fitting workshop (h). Applied mechanics laboratory (i) Metallurgy laboratory (j) wood workshop (k). Mechatronics and Autotronics laboratory. The factor loading correlation (R) and matrix (Y) was used with an initial estimate of R-Y. The initial estimate was obtained by substituting the communalities into the diagonal of the Y matrix, and was iterated. Table 1 shows the factor variable loading of each workshop division; Table 2 shows the correlation matrix and Table 3 show the summary of results which was deduced using the principal factor algorithm in StatisXL.

Table 1. Factor variable loading of each engineering workshop division

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Table 2. Correlation matrix of each engineering workshop division

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3. Results and Discussion

From Table 1, since each workshop division corresponding to each factor which was obtained by component factor analysis has a single variable number, this implies that all the division has a common status of health and safety practice management. Table 2 shows the correlation matrix of each workshop division. The values indicated shows the difference to which each workshop carry out health and safety practices. For instance, the ratio of health and safety practice between applied mechanics laboratory and Metallurgy laboratory is 1:0.563. This ratio reflects the difference in degree in which maintenance practice is carried with respect to the status quo obtained in Table 3. From Table 3, based on the insignificant error rating of 0.08 (limited error during loading) and a mean value of 2, the Applied Mechanics laboratory has a low health and safety practice in the workshop with reference to the rating used. In Metallurgy laboratory, the mean value was found to be 2.186 with an insignificant error rating of 0.112 and standard deviation of 0.732. This value shows that there is a low health and safety practice in the Metallurgy laboratory. However, the condition of safety practice is a little higher than the applied mechanics laboratory. The Thermo-Fluid laboratory also experiences a low health and safety practice with a mean value of 2.047. All other laboratories or workshops also have a low safety practice, except the wood workshop, which is almost not certainly having a ‘very low health and safety practice’ with a value of 1.977. The sheet-metal workshop has the highest rating value, consequently exhibiting the best health and safety practice amongst all other workshop division. By grouping the questionnaire into constructs which is our data source, the low health and safety practice in the workshop is related to; Inadequate fire extinguisher in the laboratory and workshop, high noise level of the generator supplying power, poor servicing record for fire extinguishers, poor ventilation including hot shop and machine shop, faulty and old door locks, especially in the thermo-fluid laboratory, blocked or locked secondary exits in the applied mechanics laboratory and the production technology workshop, little or no use of personal protective equipment (PPE), no working fire alarms, uncovered electrical panes and fuse boxes especially in the strength of material laboratory, uncovered trenches within the workshops, floor space are not fully clear of debris, tables, stools and chairs, some wash basins are blocked with debris. If these constructs stated are properly maintained or given dedicated attention, there will be an optimal reduction in risk factors which will consequently lead to high or very high health and safety practice in the engineering workshop. Engineering workshop safety rules are important to follow because workshop rules and regulation are not only to ensure worker safety but also bring efficiency to the work process.

4. Conclusion

In this paper, the engineering workshop health and safety practice has been assessed to be low. Having identified the relative course of this low level of health and safety practice in the workshop, it is necessary to make adjustments by putting certain safety polices in place. Thus, practicing safety guidelines and general work rules will go a long way in ensuring the best safety policy practice in the workshop.
References


Appendix

Questionnaire

- Is floor space clear of objects/debris?
  Yes No
- Are safe work method statements/warning signs clearly visible?
  Yes No
- Are machines adequately guarded/protected to prevent contact, entanglement or damage?
  Yes No
- Are the Personal Protective Equipment (PPE) requirements for the workshop clearly displayed?
  Yes No
- Are the PPE requirements followed?
  Yes No
- Are lighting levels satisfactory for operators to utilize equipment safely?
  Yes No
- Is the plant and equipment located in an appropriate location within the workshop? (i.e. explosion proof etc.)
  Yes No
- Does the workshop floor have clearly outlined safe walkways?
  Yes No
- Is there a preventative maintenance program in place for plant and equipment in the workshop?
  Yes No
- Are there records of maintenance to plant and equipment?
  Yes No
- Are Residual Current Devices in use for portable electrical equipment, if appropriate?
  Yes No
- Are there any sources of excessive noise in the immediate work area or from an external source?
  Yes No
- Are people appropriately trained in plant and equipment?
  Yes No
- Are records of training held for appropriately trained people?
  Yes No
- Are all access and egress points clear of obstructions?
  Yes No
- Is emergency exit signage adequate and functioning correctly?
  Yes No
- Are appropriate fire extinguishers visible and clear of obstructions?
  Yes No
- Have fire extinguishers/equipment been serviced in last 6 months?
  Yes No
- Is the Emergency Evacuation procedure clearly displayed?
  Yes No
- Have designated building wardens been identified?
  Yes No
- Are First Aid Kits readily accessible?
  Yes No
- Are there First Aid personnel identified?
Yes  No
- Is there a Hazardous Substance register for the workshop?
  Yes  No
- Are chemicals labeled appropriately?
  Yes  No
- Are poisons or other drugs kept in locked storage?
  Yes  No
- Are chemicals stored correctly (i.e. only with other compatible chemicals)?
  Yes  No
- Is all shelving compatible with chemicals stored?
  Yes  No
- Is there not more than one flammable liquid cabinet per 250m² of floor space?
  Yes  No
- Are flammable liquid cabinets at least 3m away from any potential ignition source?
  Yes  No
- Is there security-restricted access to store areas?
  Yes  No
- Are spill cleanup kits and decontamination material available where needed?
  Yes  No
- Are there approved methods for disposal of all chemicals in the workshop?
  Yes  No
- Are staff and students aware of procedures in place for use of chemicals in the workshop?
  Yes  No
- Are gas cylinders in the store segregated by Dangerous Goods class, with correct separation distances?
  Yes  No
- Are all gas cylinders securely chained and the valves safe?
  Yes  No
- Are specialized trolleys available for moving gas cylinders?
  Yes  No
- Are all cylinders at least 3m away from potential ignition sources?
  Yes  No
- Are gas cylinders stored appropriately within the workshop?
  Yes  No
- Are staffs appropriately trained in performing welding tasks?
  Yes  No
- Are students appropriately supervised by a competent person when welding?
  Yes  No
- Are welding operators provided with the appropriate PPE for the task?
  Yes  No
- Is there adequate ventilation for welding tasks?
  Yes  No
- Are there appropriate warning signs in welding areas?
  Yes  No
- Are welding screens used when performing welding tasks?
  Yes  No
- Are dust/ventilation systems working adequately?
  Yes  No
- Are electrical appliances correctly tagged?
  Yes  No
- Are floors and passageways clear of electrical leads?
  Yes  No