

Occupational Health And Safety Training Programs For Workers In Manufacturing Industries: An Overview

Satnam Singh^{1*}, Ankur Bahl², S.K. Sahdev³, Guravtar Singh Mann⁴, Jasvinder Singh⁵

^{1,2,3,4,5}School of Mechanical Engineering, Lovely Professional University, Phagwara, Punjab

Abstract

Occupational accidents severely depreciate human capital, and hence negatively affect the productivity and competitiveness of countries. But despite of this, it is observed that manufacturing industries are lacking in providing the occupational health and safety (OHS) training to the workers. The main objective of this study is to overview the different methods and techniques which are currently used for the safety training of the workers, to reduce the level of accidents and to enhance the skill of workers.

Keywords: Manufacturing industries, Occupational training, Training program.

1. Introduction

The program needs to meet the organization's individual needs, and apply the legal requirements for health and safety training to the program design. The training objectives should describe the type of behavioral change which will occur; that is, the skills which will be observed on the job. The objectives show: what has to be done, under what conditions, to what standards and must be accompanied by an effective way of evaluating the results of the training [1,3]. This approach is known as competency-based training (CBT). So far, training in general rather than OHS training but, many health and safety skills should be an integral part of job skills. These relate to increasingly complex levels of activity, as knowledge, comprehension, application, analysis, synthesis, evaluation. This will assume here that the organization is satisfied with the way tasks are currently performed and carried out the training-needs analysis [2,5]. This will affect the content of the program. Two further aspects of organizational needs will be delivery and costs of training, which are interrelated.

1.1 Induction training

For induction training, people may be coming on site daily. It is no use running induction training once a fortnight, so the organization may be looking for a self-paced package with built-in assessment so that people can do it on any day at any time. In the interactive multimedia mode of delivery this can be fairly expensive, but may still be a cost-effective option for some organizations. Simpler print-based computer packages and print and paper-based materials may be sufficient. Some industries now have generic inductions with portability (that is, mutual recognition), and then only an add-on site and workplace specific induction may be required. The same content can be delivered on- and off-the-job [4,6]. On-the-job may involve one-on-one

training under a supervisor or other experienced employee, but these should have had ‘train-the-trainer’ training, i.e. training in how to train, and assess competency.

1.2 Legal aspects

The legal aspects are going to vary depending on the type and level of training and the type of trainee. For anyone in a workplace the minimum requirements in the training should include: appropriate knowledge of legislation, knowledge of employee entitlements under the legislation – training, including safe procedures; safe systems; safe workplace (so far as is reasonably practicable); election of safety and health representatives where applicable; consultation; right to refuse unsafe work; and information, e.g. duties of employees, reporting accidents, hazard identification and risk assessment, like job safety analysis, specific hazards relevant to the workplace concerned [7]. For those working largely with chemicals, the hazardous substances requirements of the relevant act and regulations must be addressed.

1.3 The training course

It is necessary to emphasize here once again that a training course need not consist entirely of trainees sitting and doing activities in a training room. This might be all of, part of, or none of the course. There might be a face-to-face off-the-job segment, an on-the-job segment and some individual work at a time selected by the trainee, all of which is part of the course. Within a training course conducted in a training room, you need to vary the training techniques to suit the objectives, which may include knowledge transfer; problem solving; skills development (of which problem solving is a part); and change in attitudes [8, 9]. You may decide to move out of the training room to do a hazards identification exercise in the workplace, remembering the safety of your trainees. Some training techniques are set out below.

- To transfer knowledge, use group discussions (questions and answers), group or individual exercises, lectures (with handouts) forums, panel discussions, films, videos, etc.
- To practice problem solving, use case studies, brainstorming, discussion groups, exercises, etc.
- To develop skills, use demonstrations for manual skills, role playing for interpersonal skills, peer teaching, programmed instructions, etc.
- To change attitudes, use debates, displays, role playing (for clarifying how others feel), group discussion (for group attitudes), individual exercises, demonstrations, campaigns, etc.

Behavior, including safety behavior, is influenced by attitudes, but often it is easier to change behavior than attitudes. It should now be able to put together a lesson plan, overheads or computer slide show and handouts for the training room segment of your training program and present the segment. Frank Bird Jr. suggests you keep five Ps in mind in a presentation: prepare, personalize, pictures, pinpoint, prescribe. He also suggested FIDO – frequency – how often; intensity – how vivid; duration – how long; and over-and-over – spaced repetition of the issue. In countries such as Australia you will also find assistance in materials which have been produced under the national training agenda [10]. These include OHS competencies for specific

occupational areas and levels of responsibility. In the UK the New Vocational Qualifications relating to safety are of assistance.

2. Training and development models

A shift away from the traditional prescriptive type of safety laws towards self-regulation has required a complementary shift in the training and education models used in the learning process.

The bulk of workplace OHS learning is aimed at adults in industry, which requires the use of adult learning models. The adult learning model will centre on the learner, and what they want to know, rather than traditional learning where a teacher instructs on what they want you to know. This approach to learning places a high demand on the facilitator but is highly motivational and rewarding for the learner [11]. At the core of adult learning remains the attraction of self-discovery, the capacity to be in a self paced learning environment and a suite of competency-based assessments that relate to the work activity.

2.1 Barriers to learning

Depending on the situation, the following items can either assist or be barriers to learning: communication skills: language, literacy and numeracy, physical impairment, previous experience and learning, learning style, cultural background, motivation, personality traits or attitudes.

The first item above, communication skills, is of great importance and will involve varying degrees and types of reading, writing, speaking, listening and numeracy.

2.2. Aids to adult learning

Adult learners generally do best if: The material is meaningful and can be related to the learner's knowledge and experience – Ausubel's 'advance organizer' method of training started with a situation learners could use to provide a frame on which to hang the new material to come.

- There is active participation.
- Learning is holistic, starting with an overall view and then bringing in the components and dealing with them.
- Using as many senses as possible.
- Opportunities to practice what has been learnt are provided and their learning is reinforced through encouragement – some adult students have had negative educational experiences years before and need to discover that it needn't be like that. Feedback on how a lea

2.3 Adult learning characteristics

Remember to keep these characteristics in mind in planning and running training. Generally, adult learners:

- Use life situations, events and objects to organize units of learning, rather than subject matter or course content.
- Are real-life centered in terms of orientation to content and skills that can be immediately applied to areas of personal interest or need.

- Use analysis of their own and others' practical experience as a core problem solving and learning methodology, rather than imposed external methods and algorithms associated with standard textbooks and courses.
- Exhibit great differences in style, place and pace of learning. These differences increase with age and experience as peoples' individual differences become greater.
- Tend to prefer project-oriented problem solving that makes extensive use of tools and resources.

2.4. Assessment methods

2.4.1 Choice of methods

Judgments about a learner's competence can be made by an assessor in many ways. The methods chosen need to be those which are most suited to the competencies involved, and most relevant to the learner's situation. A combination of methods, not just one, is needed. Sometimes simulation will be the method of choice where access to the workplace is difficult or assessment on the job is difficult. The instruments used for assessment need to be able to collect representative, authentic and sufficient evidence. It must be realized that the assessment instrument only takes a sample of the learning of the candidate and infers from that sample the learner's competencies in a more general context. Assessment methods include, first and foremost, evidence of prior learning [13]. It is an important principle of competency-based learning that a person does not have to be endlessly reassessed on the same competencies. Assuming the learner does not have evidence of prior learning, other methods of assessment include: direct observation on the job by the assessor, indirect observation by someone qualified who will provide written evidence to the formal assessor, skills demonstration, simulation, questioning.

In a competency-based training (CBT) course the assessment methods to evaluate whether the required skills transfer or skills acquisition has taken place are usually specified. They may involve having the trainee demonstrate to an experienced person the skill passed on – for example, the series of steps from start to finish in using a danger tag. This is best done under operating conditions because certain visual and other cues, which will assist the trainee, may not otherwise be present, i.e. describing is not doing.

2.5 Aids to assessment

Some of the aids for each particular method of assessment are: direct observation in which use of a checklist, log book, peer assessment, research task and work experience. Second is indirect observation – evidence from supervisors, workmates, clients, or from a portfolio. Next is skills demonstration – work sample, practical project, and structured task. After words simulation – case studies, simulated client, simulated workplace and simulated task [14]. And the last one is questioning – oral or written questions, case studies, interviews, group assessment, short answer, multiple choice, essay, true–false and matching.

3. Key competencies

It is important that the assessment is fair and transparent, so that the person being assessed knows how they are to be assessed, when and why. In addition to specific competencies, there are some key competencies which will be required to a greater or lesser extent, and at varying levels, for the performance of many tasks like collecting, analysing and organizing ideas and information, communicating ideas and information, planning and organizing activities, working with others and in teams, using mathematical ideas and techniques, solving problems and using technology.

An area of competency also has a number of dimensions which need to form part of the training and assessment:

- task skills – being able to carry out the task at an acceptable level
- task management skills – managing several tasks together
- contingency management skills – reacting properly when things go wrong
- role environment skills – meeting the expectations and responsibilities of the workplace
- transfer skills – being able to transfer skills and knowledge to new situations.

Contingency management skill, that is being able to recover from or minimize the effects of a developing unwanted incident, are particularly important when safety and health is part of the competency, as it often is. Clearly, in deciding on an assessment method, consideration needs to be given to the preferred learning style of the learner and also to the types of skill being assessed – psychomotor, cognitive, or kinaesthetic. Some learners can quite easily show an assessor how something is to be done if they are on the job, and they are aided (legitimately), as noted earlier, by the visual, tactile, olfactory (smell) and auditory cues on that job. If on the other hand they are asked away from the job and the cues to explain how they would do something, it may be much harder. It can be even harder again if the explanation is to be written and they do not have strong writing skills. The conditions in a Range Statement for a competency in a training package assist because they may say for example ‘given access to a TR 32 lathe, demonstrate how to safely machine a 5 cm mild steel spindle’. It may be possible to further generalize if a TR 32 lathe has no unusual features compared to lathes generally, and say ‘given access to a lathe, demonstrate how to safely machine a 5 cm mild steel spindle’. If the safety aspect can be generalized in this way, it eases the learning load, widens the area of application of the competency, and reduces the assessment load.

Assessments should be valid (i.e. test what it is intended they should test), and reliable (i.e. should produce the same result in the hands of a second assessor). They should also be holistic – that is, allow the testing of a combination of skills, knowledge and understanding. Safety and health skills need to be assessed as part of the doing of the primary task [7, 15]. They should also take into account the level of skill expected of a learner appropriate to their level of responsibility in the workplace. Finally, assessment needs to be flexible, suitable for the situation and meet cost constraints.

3.1 Options for training delivery Trends

Currently, the most significant group turning to formal OHS education is found in the work environment that is people already employed in some capacity requiring OHS skills and seeking formal qualifications. The trend is away from short courses to a longer term learning commitment. There are several learning opportunities available to meet the needs of those seeking formalized education programs. There remains the traditional method of institutional attendance. However, people are finding the commitment financially demanding. The requirement to give up their job to study full-time is, in most cases, not an option. Part-time education goes some way to satisfying the demand but the courses generally offer extended time lines and persistence could give way to alternative attractions [12]. The more progressive view is to see the workplace as the adult classroom and deliver the course directly into the learner's work environment. Information technology has made this option viable and when supported by relevant learning materials and, competency-based curriculum, courses can be delivered in real time. This learning and delivery style provides an immediate benefit to the learner, the industry and the community, and the style may well engender a whole-of-life learning approach to a person's work.

4. Conclusion

In the present study, various methods for occupational health and safety training have been discussed. It has been found that safety training programs for workers are play a very important role for the industrial growth. It is concluded that factors like learning characteristics, assessment methods, aids to assessment and key competencies are having the prime importance in occupational health and safety trainings. It is recommended that every manufacturing industry must conduct the training programs to enhance the skills of workers, for safe environment and to uplift the overall level of occupational safety at the workplace.

References

1. Bayazit, O. (2005). "Use of AHP in decision-making for flexible manufacturing systems". *Journal of Manufacturing Technology Management*, 16(7), 808-819.
2. Marhavilas, P.-K., Koulouriotis, D., and Gemeni, V. (2011). "Risk analysis and assessment methodologies in the work sites: On a review, classification and comparative study of the scientific literature of the period 2000–2009". *Journal of Loss Prevention in the process Industries*, 24(5), 477-523.
3. Mital, A., Pennathur, A., Huston, R., Thompson, D., Pittman, M., Markle, G., Kaber, D., Crumpton, L., Bishu, R., and Rajurkar, K. (1999). "The need for worker training in advanced manufacturing technology (AMT) environments: A white paper". *International Journal of Industrial Ergonomics*, 24(2), 173-184.
4. Nordlof, H., Wiitavaara, B., Winblad, U., Wijk, K., and Westerling, R. (2015). "Safety culture and reasons for risk-taking at a large steel-manufacturing company: investigating the worker perspective". *Safety science*, 73, 126-135.

5. Singh, L. P., & Singh, S. (2018). Safety index: a systematic approach to measure the level of occupational safety in manufacturing industry. *International Journal of Human Factors and Ergonomics*, 5(3), 210-224.
6. Singh, S., & Singh, L. P. (2017). Occupational Safety Culture of Workers at Shop Floor in Medium Scale Iron and Steel Industries of Punjab State in India: Development of Safety Index. *J Steel Struct Constr*, 3(126), 2472-0437.
7. Singh, S., & Singh, L. P. (2017). Prioritization of Occupational Safety Parameters in Small Scale Manufacturing Industry-Analytical Hierarchy Process.
8. Singh, S., Singh, L. P. (2016). "Selection of occupational safety factors related to small scale manufacturing industry". 14th International Conference on Humanizing Work and Work Environment HWWE-2016.
9. Singh, S., Singh, L. P., and Kaur, M. (2016). "Analytical Hierarchy Process-Based Methodology for Selection of Safety Parameters in Manufacturing Industry". *Advances in Safety Management and Human Factors* (pp. 357-366): Springer.
10. Stuart, A. (2014). "A blended learning approach to safety training: Student experiences of safe work practices and safety culture". *Safety science*, 62, 409-417.
11. Takala, J., Hämmäläinen, P., Saarela, K. L., Yun, L. Y., Manickam, K., Jin, T. W., Heng, P., Tjong, C., Kheng, L. G., and Lim, S. (2014). "Global estimates of the burden of injury and illness at work in 2012". *Journal of occupational and environmental hygiene*, 11(5), 326-337.
12. Taufek, F. H. B. M., Zulkifle, Z. B., and Kadir, S. Z. B. A. (2016). "Safety and health practices and injury management in manufacturing industry". *Procedia economics and finance*, 35, 705-712.