HR INTERVENTIONS IN REDUCING ACCIDENTS IN THE MECHANICAL ENGINEERING INDUSTRY

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ABSTRACT

Henrich, father of Industrial Accident Prevention, studied 75,000 cases of insurance claims and accident records of industrial plant owners. He found that 88% of accidents were caused due to unsafe actions of human beings. The objective of the present study was to analyze the reasons for accidents related to unsafe behavior of personnel. It further aimed to develop and recommend a workable model to the engineering industry to reduce accidents caused due to unsafe human behavior. Data were collected on accidents and their causes from 5 mechanical engineering companies selected in and around Pune region of India. Only those companies which had more than 100 employees working for it were selected. Only accidents of high potential and those resulting into man-days lost were selected from the list of accidents. A total of 17 accident cases were selected. A personal interview cum questionnaire method was used to collect data from the workers who met with the accident, line supervisors, safety officers and factory managers of the concerned factory. Results showed that in most accidents, working conditions were proper, the design and equipments were safe to work with and it was possible to operate the equipments safely. Hence this weakened the fact that accidents are mainly caused by unsafe conditions. In most accidents, unsafe actions had played a major role. “Hurry up attitude” encouraged the worker to take shortcuts and bypass safety procedures. Majority of workers who met with the accident had no disease/stress and were of average physical fitness levels. Their unsafe behavior was due to there being a lacuna on the part of the management in imparting “On the job training” for performing the job safely, which would have given more information about the hazards present in the job and the risks, their levels along with the safe way of performing the job. This training would have played a vital role in accident prevention and forced the worker to think and act on the safe line of action. Based on the above research, an Accident Reduction Model was developed. This model focuses mainly on identifying and correcting the unsafe behavior of workers. The model will help in dealing with these requirements in a systematic Plan-Do-Check-Act manner; hence, users will find it as a very useful tool to comply with related requirements.

Keywords: Accidents; Engineering industry; unsafe actions; Accident Reduction Model

INTRODUCTION

Safety is as simple as ABC - Always Be Careful

Occupational safety is an important concern for all HR personnel. Work related injuries and death occur at an alarming and unacceptably high rate throughout the industrialized and developing nations. The World Health Organization identified the main contributing factors to unintentional occupational injuries as: poor worker-employer collaborative mechanism, lack of safety management systems, poor safety culture, poor training and lack of knowledge, and lack of incentive-based compensation systems. Henrich, [(4)] the father of Industrial accident prevention, studied 75,000 cases of insurance claims and accident records of industrial plant owners. He found that 88% of accidents are caused due to unsafe actions of human beings, which is being validated by many of the modern times researchers.

Objective: To analyze the reasons for accidents related to unsafe behavior of personnel and recommend a workable model to the HR personnel of the engineering industry to reduce accidents caused due to unsafe human behavior.

REVIEW OF LITERATURE

Garret [(3)] in his study reported that, human error is the main reason for up to 80% of all incidents and accidents in complex high-risk systems that exist in the aviation, petrochemical, healthcare, construction, mining and nuclear power industries. Gordon and Mearns [(5)] found that unsafe acts of human were responsible for more number of accidents as compared to unsafe conditions.

Industrial Safety and Hygiene News (ISHN), a monthly magazine for safety professionals with 62,000 company subscribers in USA conducted a survey on "Implementing Behavior Based Safety" in industries. The aim was to assess knowledge and interest in the Behavior Based principles and procedures for reducing industrial injuries, improving communication and to explore new ideas. An appreciation of the Behavior Based approach was shown by 80% (n=129) of the respondents answering "yes" to the question on whether they believed that behavior-based safety was a viable approach for reducing at-risk work behavior and activities. Only 3% responded "no" to this question; the rest said they did not know. Hence it gave a clear indication about the importance of Behavior Based Safety in the field of accident prevention.

METHODOLOGY

Five mechanical engineering companies with more than 100 employees working for it in and around Pune (India) region were selected. The companies selected were:

a. Mahindra Forging Ltd, Chakan, Pune.
b. Exide Batteries Ltd, Pimpri, Pune.
c. Vickers Limited , Pimpri, Pune.
d. Virgo Engineers Ltd, Hinjewadi, Pune.
e. Cummins Sales & Service (I) Ltd, Erandawana, Pune.

Only accidents of high potential were selected from the list of accidents. A total of 17 accident cases were selected for the study. Four sets of questionnaires were developed which

were administered along with a personal interview to the Factory Manager, Safety Officer, Line Supervisor and the employee who met with the accident. They were also asked to rate on a scale of 1 to 10 the safety management aspects in the company.

HYPOTHESES

1. Unsafe behavior is the main reason for accidents.
2. More emphasis must be given on implementing Behavior Based Safety Programs.

RESULTS

1. Relationship of shift and accidents

It was found that there was no relationship between the shift in which the worker was working and the frequency of accidents.

2. Relationship between age and experience of worker with accident

No relationship was found between age or work experience with the accidents. Majority personnel involved in accidents were in the range of 31-35 years and 41-45 years. It can be assumed that personnel become complacent regarding following of safety rules and behaving safely after attaining certain age and experience.

3. Relationship of accidents with habits, diseases/stress and physical fitness level of worker

Table 1 below shows that majority of workers had the habit of chewing tobacco, which can be seen as a common habit among the workers in Indian industry. 82% of the workers who met with accidents had no history of any disease. 12% reported having blood pressure and only one worker suffered from vertigo. When questioned about stress levels, most of the workers who met with accidents answered in the negative. Only 35% reported having stress at a personal level, whereas 18% had work related stress.

Table 1- Personal details of workers who met with an accident

S. No	Habit	Percentage of Accidents studied
1	Chewing Tobacco	40
2	No Habit	24
3	Liquor	12
4	Smoking	24
	Diseases	
1	None	82
2	Blood pressure	12
3	Vertigo	6

	Stress	
1	Personal	35
2	None	47
3	Work	18
	Physical fitness level	
1	OK	88
2	Good	6
3	Not Good	6

Majority of the employees had adequate physical fitness levels when they met with the accident, which is in concurrence with the study done by Bruce Waxman et al where it was found that, out of 5256 accidents studied, only 17% people were not physically fit.

4. Relationship of routine activity carried out on the day of accident with the accident

Most of the personnel who met with accidents had carried out routine activities on the day of the accident. Therefore it can be implied that they were in the normal state of behavior while working. However, of the 24% of workers who did not carry out the routine activity on the day of the accident, it could be assumed that they were under some mental stress while performing the job. This could have triggered off the unsafe behavior leading to the accident. It can also be said that no work can be completed without some degree of stress, but increase in the level of the same stress could lead to poor performance and may lead to accidents.

5. Occurrence of accidents department wise

As per Figure 1, the maximum number of accidents had occurred in the Production department followed by the Assembly and Maintenance departments. It is quite normal to have more number of accidents in the Production department as maximum work is performed here and the manpower involved is more. Moreover, there are numerous high potential hazards present in the production department.

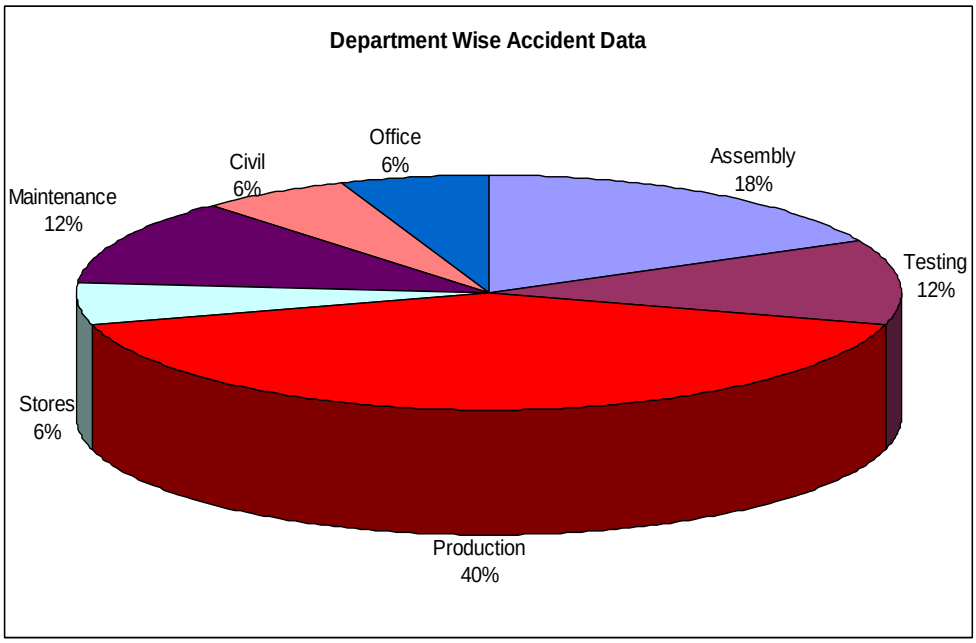

Figure 1 – Department wise accident data

6. Relationship of "On the job training", "General Safety training" and "Hazard communication" with the accident

Most of the employees had received general safety training and communication of hazards from the management, which is of general nature for the particular task they were performing on the day of the accident. There was a lacunae on the part of the management in imparting "On the job training" for performing the job safely, which would have given more information about the hazards present in the job and the risks, their levels along with the safe way of performing the job. This training would have played a vital role in accident prevention and forced the worker to think and act on the safe line of action.

7. Relationship of planning of work with the accident.

Planning of work is an important factor for doing the work safely as it gives proper time to organize resources like tools and equipments along with the skills and the knowledge about the risk involved in doing the job and the safe operating procedure. However the data collected reveals that in most of the cases the work was not planned properly which must have put some mental stress on the worker who was asked to perform this operation resulting in an accident.

8. Relationship of working conditions/machinery conditions with accidents

In most of the cases the working conditions were proper, the design and equipments themselves were safe to work with and it was possible to operate the equipments safely. Hence this weakens the fact that accidents are mainly caused by unsafe conditions. Although

there were safe conditions for working, in majority of accidents unsafe actions had played a major role, which also validates the theoretical rationale of this study.

These results prove the hypothesis no: 01 correct which says that "Unsafe behavior is the main reason for accidents".

These findings are in accordance with the findings of Green and Senders [(6)], who, after studying 500 industrial accidents, found that, "human error was the sole cause in 57% of all accidents and was a contributing factor in over 90%. In contrast, only 2.4% were due solely to mechanical faults and only 4.7% were caused by environmental factors". The above findings are also in accordance with the findings of Barling & Frone, [(1)] from European Organization For the Safety for Air Navigation[(7)] and Gordon and Mearns [(5)] who found that although safe machinery is provided for working, most of the accidents occur due to mistake of operators / human error.

9. Time taken to complete the job and its relationship with the accident

It was found that majority of workers had completed / tried to complete the job before the time required to complete the job safely. This shows the "hurry up "attitude, which encourages employees to take short cuts and bypass safety procedures resulting in accidents which are again an unsafe behavior. There may be many reasons for attempting to complete the job before given time, like management / peer pressure, incentive program, etc. Sankey[(12)] from National Safety Council- USA, has cited "Hurry up attitude" as one of the major causes of industrial accidents, which is in line with the results of the present study.

Physical hazard present / Risk Assessment done prior to starting the job

It was learnt that most of the tasks performed by the employees when they met with the accident had potential hazards. Moreover, in most of the cases there was no risk assessment done to quantify the risk and take efforts to reduce the risk and develop safe job procedures for the same. It is quite natural that in these cases human interaction with machines / work was also not considered or looked into. Hence there is a straight forward relationship between high risk in the job and not performing the risk assessment with the occurrence of accidents.

These above findings are in accordance with the findings of IOCL Enquiry Commission [(9)] where a detailed analysis was done of one of the major IOC fire outbreaks. The report mentions that one of the major reasons for the fire was failure to perform a Quantitative Risk Assessment of some of the processes along with failure to create awareness regarding the same.

The present results also concur with the studies of. Patel [(10)] in the 25th State Level Annual Safety Conference (Gujarat), emphasized the importance of adopting appropriate Risk Assessment techniques to eliminate hazards or reduce the consequences of risk to an acceptable level by incorporating control measures. The European Agency for Safety and Health at Work [(7)], reported that "Risk assessment **is the cornerstone** of **the European approach to prevent occupational accidents and ill health". Besides,** Peters [(11)], in 2004, found that "performing quantitative risk assessment of a job is important to find the hazards

associated and likelihood of failures before the task is started". As is seen above, in most of the tasks, risk assessment was not carried out which led to accidents and injuries due to lack of knowledge of hazards present.

10. Behavior Based Safety programs

It can be seen from the data that none of the companies had established "Behavior Based Safety" programs in place. Moreover, while interviewing the management it was observed that there is a mis-conception about these kinds of programs. They think that counseling a person after he meets with an accident is akin to behavior based safety programs. Hence most of the efforts are towards correcting the unsafe conditions and counseling the person ***after*** occurrence of an accident rather than accident prevention through implementation of behavior based programs.

These results validate the Hypothesis No: 02, which states that "More emphasis must be given on implementing Behavior Based Safety Programs".

Results of Interviews held with Safety Personnel of Concerned Factory

1. Supervisors felt that there should be strong safety training and safety communication process in industry to reduce accidents which occur due to unsafe behavior.
2. Safety officers advocated the importance of an effective safety training and communication process in an industry to reduce accidents.
3. Hazard identification and Corrective action taking process should be strongly linked to reduce accidents.
4. Safety Officers felt that, it is very important in a good safety management system to identify the hazards and communicate the same to the employees who may be affected by it.
5. Supervisor and Safety Officer had the same thoughts of emphasizing on taking corrective actions on the unsafe conditions / near misses which would result in preventing an accident.
6. A mismatch was found between the expectation of factory managers on hazard identification process and taking corrective action on the same in comparison with the expectation by the supervisors. This can be one of the reasons where it would become difficult to identify hazards (unsafe conditions) on the shop floor and minimize them to prevent accidents.
7. In most of the situations there was no proper method / channel for identification of hazard and taking corrective action on the same. Moreover as there is no laid out method of doing it. Also, a mismatch was found in the expectation of the top management and line management about the process
8. Supervisors felt that currently there is lacuna in the system to communicate the hazards present in the job to the workers doing it.
9. A difference of opinion was seen between supervisors and factory managers regarding the participation level of the top management in the safety program. Supervisors expect more

involvement of top management in these programs, which would boost a good safety management system in the company.

10. It was found that the line managers / supervisors and workers are willing to participate in the safety programs which are run by the company.
11. It was found that both the top management and line management agree that there should be a definite method / process for taking corrective actions on unsafe actions / conditions.

Statistical analysis showed that there was a positive correlation between V1 & V2 at 5% level of significance, suggesting that both the Supervisor and Safety Officer had the same thoughts of emphasizing on taking corrective actions on the unsafe conditions / near misses which would result in preventing an accident.

CONCLUSION

Although most workers who met with the accident had no disease/stress and were of average physical fitness levels, their unsafe behavior was due to the following reasons:

a) There was a lacuna on the part of the management in imparting "On the job training" for performing the job safely. This would have given information about the hazards present in the job and its risks, along with the safe way of performing the job. Training would have played a vital role in accident prevention and forced the worker to think and act on the safe line of action.
b) In most accidents, working conditions were proper, design and equipments themselves were safe to work with and it was possible to operate the equipments safely. Although there were safe conditions for working, in most accidents unsafe actions had played a major role.
c) "Hurry up attitude" encouraged the worker to take shortcuts and bypass safety procedures. 53% of operators tried to complete the job before time due to either pressure from peer / management or due to personal traits which are the key factors which can increase the probability of human mistakes.
d) Risk Assessment was not done by the management to quantify the risk (unsafe conditions / hazards) and take effort to reduce the risk and develop safe job procedures.
e) There was no "Behavior Based Safety" program in place which would have helped to identify unsafe behavior of the worker before the accident and also it would have helped to foster / reward safe behavior at work place.
f) In 59% of accidents there was no proper work planning done prior to starting of job, which is the primary responsibility of the management.

RECOMMENDATIONS

- More inputs are needed from the management in the form of "Supportive Organizational Culture" for reducing accidents.
- Strong communication channels should be established for training personnel and hazards present in the work should be communicated to all personnel involved.

- Strong hazard identification and corrective action taking process should be established through "Human Risk Assessment" system.
- Human engineering factor must be considered for fitting the job to the workers, physically, mentally and skill wise.
- "Behavior Based Safety" programs should be implemented to focus on the correction of behavior of personnel if he / she is working in an unsafe manner.

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