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## Industrial hazards and safety measures – An empirical study

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## ABSTRACT

This paper reviews occupational hazards and safety measures undertaken in Minerals and metals limited companies. Many governments realize that poor safety and health performance result in loss to the state. Safety measures work as a morale booster for the employees working in the plant. Industrial Safety has been one of the major issues of Indian industries. As a secondary effect health and safety also protect employers, customers, suppliers, and members of the public who may experience an impact from the workplace environment. The research is descriptive. Open-ended questions are being prepared and are interviewed among the employee to collect accurate data and results. The process of secondary data collection and analysis is collected for earlier research work. Thus, officious use of secondary data can save both money and time and the sample size is 423 employees and it constitutes managers, staff, supervisors, and workers and the sampling technique is of convenience in nature. The collected data is being carefully analyzed by using the Percentage, Correlation, and chi-square analysis.

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## 1. Introduction

The primary and the view of many, the most prominent reasons for establishing health and safety standards is moral, an employee should not have to expect that by coming to work life. Protecting the health, and welfare of people at work. The goal of all occupational health and safety programs is to foster a safe work environment. As a secondary effect, it may also protect co-workers, family members, employers, customers, suppliers, nearby communities, and other members of the public who are impacted by the workplace environment. It may involve interactions among many subject areas, including occupational medicine, occupational (or industrial) hygiene, public health, and safety engineering, chemistry, and health physics. Table 1.

There are many positions in enterprises that are profoundly inclined to mishaps. Coal mining, marine vehicle, quarry and development, synthetic processing plants, and so on, are riskier when contrasted with correspondence, banking, or IT ventures. Weighty mechanical machines are not dealt with as expected or upkeep is

low. Faulty hardware inappropriately monitored gear, overburdening of machines, wiring of reasonable isn't legitimate. Security gadgets have been taken out, changed, or separated.

The non-presence of emergency exits and exits can cause genuine wounds, particularly processing plants fabricating inflammable items like saltines, papers, chemicals and so forth Fire security hardware and fire quenchers have not been as expected fitted or accessible in the processing plant. Mishap anticipation is profoundly fundamental in industry, to: Prevent injury to and unexpected passing of workers, reduce working and creation costs, Have great business representative relations, High up the resolve of representatives. Most importantly, the anticipation of mishaps is a genuine helpful concern. Mishap anticipation doesn't happen without anyone else; there ought to be the steady execution of wellbeing measures and security programs underlining the need.

The definition reads: (Fig. 1) Occupational health would aim at the maintenance of the degree of physical, mental and well-being of workers; the departures from health caused by their working conditions; the protection of workers in their employment from risks whereby resulting from factors adverse to health; and, to summarize, the adaptation of work to man and of each man to his job". This standard is based on the methodology known as Plan-Do-Check-Act (PDCA).

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**Table 1**  
Socio-Economic Characteristics of Employees of Industries.

Characteristics	No. of Respondents	%	Characteristics	No. of Respondents	%
Age (in years)			Experience (in years)		
Below 30	145	34	<5	61	12
30–40	125	33	5–10	133	31
40–50	98	19	10–15	167	40
Above 50	55	14	>15	62	17
GENDER			MARITAL STATUS		
Male	337	82	Married	296	69
Female	86	18	Unmarried	127	31
OCCUPATION			MONTHLY INCOME		
Supervisors	41	8	<10000	126	34
Operators	98	13	10000–20000	183	36
Skilled	88	15	20000–30000	85	23
Non skilled	196	64	>30000	29	07

(Source: Primary Data)

## VITAL IMPORTANCE ON HEALTH AND SAFETY



**Fig. 1.** (a) first picture; (b) second picture.

### 1.1. Steps to Prevent Industrial hazards

The appropriate wellbeing measures ought to be embraced to stay away from mishaps Government additionally gives rules to instituting measures for really taking a look at mishaps, these ought's to be appropriately followed. Any off-base determination of laborers will make issues later on. In some cases, workers are clumsy; they may not be as expected appropriate for the specific positions. So, the choice of workers ought to be based on appropriately contrived tests so their appropriateness for not really settled. The workers ought to be made aware of different wellbeing measures to be followed.

There ought to be appropriate working trademarks and counsel to the specialist for making them cognizant. Disciplinary move

ought to be made against the people who spurn wellbeing measures. There might be negative disciplines like admonitions, lay off, terminations of laborers. Laborers ought to be given different motivators for keeping up with wellbeing. There may likewise be security contrasts among laborers. The people who adhere to well-being guidelines appropriately ought to be given financial and non-monetary motivating forces.

Security measures are in light of a legitimate concern for the two bosses. There ought to be councils comprising of delegates of laborers and representatives for formulating and authorizing well-being programs. Mishaps might happen by virtue of an issue in machines or gear. There ought to be appropriate upkeep of machines. These ought's to be consistently checked and much of the time assessed by designing. The specialists ought to be given

preparing with respect to security measures. They should know the perils of the machines, the spaces of mishap inclination and the great working potential insurances in the event of some mishap.

## 2. Significance of the research

The fact is that the public enterprise occupies a core position in a country's economic scenario. Public enterprises have made a significant contribution to the development of the respective state, whether an enterprise in the private sector or public sector, its success depends upon good safety planning. The research is centralized to assess the occupational hazards and the safety measures taken by the company.

## 3. Objectives of the study

- To analyze the occupational hazards and safety measures for the employees.
- To examine the various safety measures.
- To identify how safety measures are implemented.
- To know the level of satisfaction of the employees.
- To suggest awareness of safety measures to the industries.

## 4. Literature review

Safety in Industries refers in protecting the workers from the danger of commercial accidents. An accident then is hit or miss and an uncontrolled event during which a substance an individual or radiation leads to personal injury.[1]

The major legislation related to health and safety the steps in the organization have to take to reduce accidents, injury and the major contemporary issues that affect employee health and safety. [2]

The safety of workers is thus important as their health. An accident is an unfortunate accurate resulting in a session of work by a worker or a group of the worker. [3]

Highest degree of physical, psychological, and well-being of workers at work; the preventing workers of departures from health issues by their working conditions [4]. Industrial safety can be defined as the ability to manage the risks inherent to operations or related to the environment. Industrial safety is not a dislike of risks; rather it is a commitment to identify them about production operations, assess them in terms of quality and quantity, and manage them. [5]

Employees have an obligation of the work tasks employees are assigned and will minimize any negative aspects of the situation affecting employees health and safety. [6]

Being safe at work means knowing that your company is doing what it can to decrease and minimize any potential risks, hazards, or threatening conditions in the workplace. [7]

In this study, it was proposed that proper layout design is an important step while considering the safety measures of the industries. during the process of chemical transportation, Layout plays vital importance in minimizing work hazards. It also minimizes the cost and casualties during the work process. [8]

The study stress out the new study STPA (System theoretic process analysis) which was implemented in the industries mainly for minimizing the hazards. The STP is used widely to limit the processing delay while transporting hazardous materials inside the industries. [9]

In this paper, the author discloses the various commercial toxins which are a great concern for the environment. The author stresses that all Chemicals cannot be covered because few of the chemicals are used for agriculture and cattle purpose and livestock

also so he reveals that high-end problems cause to human beings by the usage of hazardous chemicals. [10]

The injuries happen in the organization will reduce the discipline of the employees and makes them to quit the job and safety of the workers creates a drawback and makes the company to lose its good image in the minds of the employees [11]. The discussion about the advancements in wind and solar system in [12-22]

The company provides the conformance to the necessities of the occupational health & safety standard. They influence economic, social and individuals across the globe to covers all the related aspects of the work which comprises job analysis and the environment which can act as a source of creating hazards to the employee avoiding the safety procedures to be taken into account [23]. Systematic management of health and Safety is required to identify the non-possibilities and the opportunity available to the workers can solve the failure in avoiding the precautionary measures to be taken for the wellbeing of the employees.

## 5. Methodology

For this study, the size of the sample taken for the study is 485 from a population of 1500 workers. Out of which 423 samples have been selected.

### 5.1. Hypothesis

H0: There is no significant relationship between the gender of the respondents with the level of satisfaction with regard to safety measures in the industry.

H1: There is significant relationship between the gender of the respondents with the level of satisfaction with regard to safety measures in the industry.

## 6. Tools used for analysis

The study is descriptive. Secondary data has been sourced from Personal records of the HR department of Minerals and Metals Ltd, and also from various books, newspapers, journals, and through access to various websites. Primary data will be collected through Convenience sampling. The collected data were analyzed with the help of the following statistical tools by the researcher Simple Percentage Analysis, Correlation, and chi-square.

### 6.1. Data analysis

Inference: The table depicts, it is apparent that 33% of the respondent is between the age group of below 30 years and they are of non-skilled male labours, married and having 10-15 years' experience and they are earning Rs. 10,000 – Rs.20, 000.

Inference: Table 2, state that 43% feel that they are satisfied with safety in training and 9% and few are dissatisfied. Table 3. Table 4.

Where, X – The mental and physical stress that they experience in their work.

Y – Employees getting safe training about work and receiving guidance on eliminating safety hazards and prevention of accidents.

$$R_{XY} = 0.9021$$

Inference: The majority of the respondents feel that (The mental and physical stress that they experience in their work Employees getting safe training about work and receiving guidance on eliminating safety hazards and prevention of accidents.). As per the analysis done, Neutral, Disagree and strongly disagree expect a change in X and Y.

**Table 2**  
Respondents opinion about safety training of industries.

Safety Training	Highly Satisfied	Satisfied	Neutral	Dissatisfied	Highly Dissatisfied	TOTAL
Respondents	114	183	78	38	10	423
Percentage	27	43	18	9	2	100

(Source: Primary Data)

**Table 3**  
Respondents opinion on the mental and physical stress that they experience in their work and Employees getting safe training about work and receiving guidance on eliminating safety hazards and prevention of accidents using the correlation method.

X	Y	X <sup>2</sup>	Y <sup>2</sup>	XY
122	86	14,884	7396	208
223	233	49,729	54,289	456
58	69	3364	4761	127
10	35	100	1225	45
10	0	100	0	10
423	423	178,929	178,929	846

(Source: Primary Data)

**Table 4**  
ANOVA.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.625	4	0.656	2.792	0.026
Within Groups	98.231	418	0.235		
Total	100.856	422			

(Source: Primary Data)

Inference: From the above ANOVA table, it is inferred that the significance level is  $<0.05$ . Hence, null hypothesis is rejected. There is significant relationship between the gender of the respondents with the level of satisfaction with regard to safety measures in the industry.

## 7. Findings

- It is evident that 34% of the respondent of the age group of below 30 years and they are of non-skilled male labors, married and having 10–15 years' experience and they are earning Rs. 10,000 – Rs.20, 000.
- Safety measures: 64% of the respondent is satisfied with the safety measures of Industries. Working conditions: 54 % of the respondents say the working condition of industries is satisfied.
- Attend safety training program: 81% of the respondents attend the safety training program given by the company. Safety training: Out of 81%, 36 % of the respondent is satisfied with the safety training in industries.
- Workmen compensation: 60% of the respondents say workmen compensation provided by the company is satisfied. Safety awareness program: 62 % of the respondents are satisfied with safety awareness of a program.
- Mental and physical stress: 60 % of the respondents are strongly disagreed that they are free from mental and physical stress problems.
- Disposal of hazardous waste: 65 % of the respondents say that they are satisfied with the measures taken by the company for the disposal of hazardous waste.

- Occupational diseases: 58 % of the respondents are satisfied with the safety measures on occupational diseases. Safe training methods: 52 % of the respondents are agreed to say that they get safe training for their work and can receive guidance on eliminating safety hazards and prevention of accidents.

## 8. Recommendations

Feedback should be taken from the employees regarding the modifications to be made in the safety practices followed by the company. The superiors can have a cordial or friendly relationship with the employees for reducing mental tension. The company may take full advantage of the facilities available to successfully reduce the number of an accident to zero in the coming years. Supervisors should identify the people who have more mental stress and can help them to reduce that. Supervisors may be appointed by the company to ensure that the workers are wearing personal protective equipment's therefore accidents can be reduced to a great extent. The company may impose strict rules regarding the compulsory usage of appropriate respiratory protection devices for employees who handle poisonous gases and fumes.

## 9. Conclusion

Industries provide safety training to each employee every year. The management and the supervisors are accountable for the safety performance in the working areas under control. Employee satisfaction is the main factor of an organization. To ensure employee satisfaction good safety measures should be adopted by the organization and the employees in industries are very much satisfied with the safety measures provided by the company.

## CRedit authorship contribution statement

**J. Anna Thangam:** Conceptualization, Project administration, Supervision, Validation, Writing – review & editing, Writing – original draft. **Subramania Bala Jeshurun:** Investigation, Resources, Writing – review & editing. **A. Thangapoo:** Validation, Writing – review & editing, Writing – original draft. **S. Joe Patrick Gnanaraj:** Investigation, Resources, Validation, Writing – review & editing. **M. Appadurai:** Methodology, Validation, Writing – original draft.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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