CHARACTERISTIC DATA ANALYSIS OF OCCUPATIONAL ACCIDENT IN HEAVY ENGINEERING INDUSTRY

K.Dhanasekar[1], V.S.Manigandan[2], H. Abdul Zubar[3], K.Visagavel[4]

[1]*PG Research Scholar, Department of Industrial Safety Engineering, Knowledge Institute of Technology, Salem*
[2]*Assistant Professor, Department of Mechanical Engineering Knowledge Institute of Technology, Salem*
[3]*Assistant Professor, Department of Mechanical Engineering Knowledge Institute of Technology, Salem*
[4]*Professor, Department of Mechanical Engineering, Knowledge Institute of Technology, Salem*

Abstract

The objective of this paper is to analysis the occupational industrial accident in a Heavy Engineering Industry from 2012 to 2013.The data was collected, observed and reviewed from Occupational Health Centre & Health Safety and Environment department. Then accident was categorized by the age wise, shift wise, type of employment, injury on human anatomy, nature of injuries and type of accident. This will be statistical analysis by calculate the total accident rate, chi square, severity and frequency rate. This analysis show higher accident rate in A shift, in 20-29 age group, by contractor workers, cut and contusion injury at finger. The reason is due to workers involved hazardous activity, non-routine and temporary activity is causes of accident, and they were newly employed, insufficient training, contract labour are uneducated and not aware about safety rules. To reduce occupational accident the organization to enhance accident analysis and find causes of accident to preventive similar kind of accident. Then implement the effective safety practice and enhance continual improvement.

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1. INTRODUCTION

Accident is unplanned, unexpected, and un designed (not purposefully caused) event which occurs suddenly and causes injury or man day loss, decrease an abilities. The manufacturing industry is one of the most dangerous branches in occupational accidents. In 2007, the number of accidents causing more than 3 days' absence at manufacturing companies in EU-15 countries and Norway totalled about 942,000. In the same year, 667 fatal accidents were recorded in the manufacturing industry **(**Eurostat, 2009c, S.nenonen). According to (Eurostat (2009a***)*** about 4.5% of the workers employed in manufacturing businesses faced accident(s) at work in a 12-month period. The socio economic and human cost of a occupational and industrial accidents to organizations are globally is alarming. Globally, over 264 million industrial and occupational accidents with over 350,000 fatalities occur each year (Hamalainen, 2009). In US, industrial accidents cost are economy a staggering $156.5 billion, in lost wages, lost productivity and other expenses, and an estimated 3,400,000 disabling injuries each year. Each weekday a fatal injury occurs every 2 h and a disabling injury every 8 h (Bureau of Labour Statistics, 2007**).** According to (c.w.chegu).In more specifically, in order to stay economically competitive and sustainable to earn maximum profits, the contractors only execute basic safety measures and eliminate many important hazard prevention training programs during construction and project implementation. The death rate in project industry is much higher than that in other industries in 2007 according to the annual statistical report by the governing agency. Such cost reduction practices are adopted by small construction and the project enterprises even more extensively due to limited monetary circulation (Hinze and Raboud, 1988; Hinze and Gambatese, 2003; Tam et al., 2004).*To*The first aim of accident research is to understand accidents; this is generally done through the search of their causes, so that adequate prevention measures can be designed(C.jancinto; 2008, M.Canoa, 2008.*) FAII, 2009* According to the accident frequency, the manufacturing industry was the third most risky branch after construction and private households with employed persons. The number of accidents in the manufacturing industry was the same as the previous year, but the frequency decreased a little as the number of work hours increased. Chi and Wu, 1997 ,Hinze et al. 1998 Number of divided categories and the actual cut offs could have enormous impacts on the result of the analysis, both required extensive literature survey and trade-offs. As indicated by),Hinze et al. 1998 carefully developed categories of accident causation would provide a viable basis for implementing effective accident prevention programs. One major objective of the current research was to develop a coding system that would facilitate the categorization of fatal. According to aFAII2009,the most common modes of injuries were contact with sharp, pointed, rough, coarse material agents (23% of the accidents) and the most common injuries resulting from the accidents were wounds and superficial injuries 47& of the accident. Haslam et al., 2005 Accident is analysed, many variables and factors are present. For example, a study about contributing factors in construction accidents in the UK concluded that problems arising from workers or the work team were present in 70% of the accidents, workplace issues in 49%, shortcomings with equipment (including PPE) in 56%, problems with suitability and condition of materials (27%), and deficiencies with risk management in 84% of accidents. By review of literatures, accident is unplanned event that causes injuries and lose of man power. The manufacturing industry

is one of the dangers in occupational accident more that 4.5% of worker employed in manufacturing industry face occupational accident and globally occupational accident increased over 3,50,000 fatal accident. In order to stay economic many construction and contractor company only spent basic safety measure and in heavy industry implementing safety but worker not aware of safety measure. This study will employed to characteristic accident data base and find the causes of accident by chi square & severity rate, frequency rate and total accident rate to find significant difference and impact of accident.

2. METHOD AND MATERIAL

The study is conducting of 153 occupational accidents in heavy engineering industry for past two year 2012 and 2013. Occupational accident was collected observed and reviews formoccupational health centre and head safety & environmental department in heavy engineering industry at Chennai.

2.1 Categorize Data

For this study occupational accident are classified as per IS 3786:1983 by Age, shift, Type of employment,Location of injury**,** Type of Accidents**,** Nature of Injury.**Shift Wise**: The accident is classified by Shift wise to find major accident in shift wise, the data is segregate by three shift A shift (7.00am to 3.00pm), B shift (3.00pm to 12.00am), C (12.00am to 7.00am).**Age wise**: The accident is classified by age wise to find that in which age group the accident is higher and what is a cause of accident in particular group. The age is segregate in 5 way, 18-20, 21-29,30-39,40-49, 50 and above. **Type of Employment:** The accident is classified by type employee in two way i) company employee, ii) contractor employee to find the worker major causes accident. **Location of Injury**: Location of injury identifies the part, of the injured person's body directly affected by the injury. **Nature of Injury**: This is classified by nature of injury to identify the injury in terms of its principal physical characteristics. To attributes of potential causes for this to find the causes of accident the questionnaire examined with interaction between employee and top management by education skill, training program, experience, hazards on work etc.

2.2 Statistical Analysis

For this study, we have used statistical analysis such as total accident rate (TAR%)to find percentage of accident rate was obtain by dividing Number of Accident In Chosen Community/Total Number of Accident)*100%. The First aid accident rate (FAR): dividing Number of first aid accident /Total Number of Accident)*100%.. reportable accident(RAR): dividing Number of reportable (major accident) accident /Total Number of Accident)*100%.

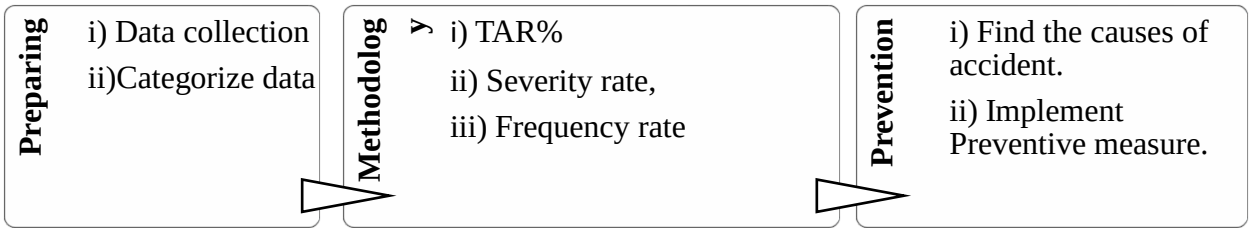

Fig 2.1 research method flowchart

3. RESULTS AND DISCUSSION

The occupational accident is classified as IS 3786:1983 Method for Computation of Frequency And Severity Rate For Industrial Injuries And Classification of Industrial Accident. The accident is classified by Age, shift, Type of employment, Location of injury**,** Type of Accidents **,** Nature of Injury. The table 3.1 show the accident data analysis in categorized wise and data is analysis a first aid accident rate, reportable accident rate and total accident rate.

Table 3.1 Total number of accident rate

Number of accident in shift wise	FAR%	RAR%	TAR%
A(7.00 am to 3.30pm)	70.46	2.8	73.22
B (3.30pm to 12.00am	17.60	3.2	20.20
C (12.00 to 7.00 am)	4.92	.70	5.62
Number of accident in age wise			
20-29	52.17	.72	52.89
30-39	23.91	1.44	25.35
18-20	10.14	.72	10.86
40-49	6.34	0	6.54
50-60	2.88	1.44	4.32

Number of accident type of employment			
Company	30.38	1.40	36.78
Contractor	62.70	4.92	67.62
Number of Occurrence By Location of Injury			
Hand & face	3.60	0	3.60
Hands	21.60	.90	22.50
Right Hand Fingers	28.42	2.70	31.52
Left Hand Fingers	23.42	0	23.42
Right leg	7.20	.90	8.10
Left Leg	5.40	1.80	5.58
Foot & toe	3.60	0	3.60
Number of Occurrence Nature of Injury			
Abrasion	14.96	0	14.96
Amputation	2.0	0	2.0
Broken bone	0	.68	.68
Contusion injury	3.40	0	3.40
Crush Injury	6.80	.68	.748
Cut laceration	23.80	.68	24.48
Hit injury	10.20	0	10.20
Illness	6.80	0	6.80
Number of Occurrence Type of Accident			
Falls of Persons	11.47	.19	11.68
Fall of Objects	9.8	.89	10.2
Sliding	3.9	3.9	7.8
cutting	24.50	.19	24.69
Striking against stationary objects	9.8	3.9	13.7
Caught in or Between Objects	4.9	0	4.9
Wrong movements	9.8	2.9	12.7

According to the result obtained in Table 3.1 showed that accident rate in shift wise, In A shift 73.22%, B shift 20.20% and in C shift 5.62 of accident is occurred and in A shift accident rate is higher compare to other two shift. Because in A shift most of activity under take like height work, hot work, New activity most hazardous activity. Non routine and temporary work take over so accident occurred in A shift. According to the result obtain for age show that accident rate in 20-29 age is 52%of accident,30-39 age group 25.35% of accident, 18-20 age group 10.86% of Accident, 40-49 age group 6.54% of accident and from50-60above age group 4.32% of accident took place, This show that accident is higher on 20-39 age employee. Because they are carry out highly hazardous work in company like casing and fabrication, cutting of tool and contractor work also is one the reason because they are un trained and un educated.According to the result obtained from the table for type of employment showed that number of accident in contractor's employee is 63.33% and 23.79% of Accident rate for company employee. The accident rate is higher in contractors because they involved lot of hazardous activity like construction, erection& fabrication, electrical, maintenance work.The Result obtained from the Table 3.1 showed that. The total accident rate in hand & face 3.60%, hand22.50%, right hand31.52%, left hand 23.42% leg 13.68%. This result shows that accident rate is higher in right and left finger in because of In maintenance work accident is causes by crushing, In machine operation causes of hit and cut by drill pit, Manual lifting causes of cut by sharp edge and sharp blade. The result obtain from table for nature of injury show that accident rate is higher in a abrasion 14.96, cut laceration 24.48%, hit injury 10.20%, contusion injury 3.40%, the result show that cut injury is higher so that causes of cut injury should be reduced. The result show that for type of accident occurrence fall of object is 11.68, fall of person is 10.2, cutting 24.69, wrong movement 12, in this reportable accident is occurred in wrong movement, Strucking between object is causes due to the unsafe act and unsafe condition.

The categorized accident is studied by first aid, reportable and total accident and find the majority and minority of accident in every categorized then this data will be further it will be studied the causes of accident in deep to prevent similar type of accident in future.

The accident data is further classified and find the causes of accident and by routine activity and non-routine activity education level and experience level.

Table 3.2 Causes of accident.

Causes of accident in shift wise			
Shift	No. of Employee	Activity	
		R	NR
A(7.00 am to 3.30pm	215	60%	40%
B (3.30pm to 12.00am)	110	80%	20%
C (12.00 to 7.00 am)	75	100%	-

R-routine activity, NR-non routine activity

The **Table 3.2** show that causes of accident in shift wise according to result in A shift more that 40% non-routine activity is taken and 215 employees are working compare to other shift the number of employee and non –routine hazardous work involved in A shift . The non-routine activity causes accident un plan and un trained works involved in A shift.

Table 3.3 Causes of accident in age wise

age wise	No. of Employee	Work experience	Activity		
			Working on machinery	Other work	Management work
20-29	208	0-3	70%	20%	10%
30-39	110	3-5	30%	20%	50%
40-58	82	5 Above	-	50%	50%

The table 3.3 show that age wise experience and nature of work activity. Accident rate is higher in 20-29, 30-39,40-58 so that o this age categories we have studied works experience and work activity this data analysis show that when work experience is get low and accident rate is get increased and where while working on near machinery and age wise accident rate goes higher. So those experienced people are requested worked on dangerous machinery.

Table 3.4 Causes of accident by type of employment

Type of Employment	Activity		No. of Employee	Education level	Safety awareness	Experience Year
	R	NR				
Company Employee	70%	30%	300	Min: Diploma	70%	1-5
Contractors	25%	75%	100	Max: +12	30%	Max: 1

The result show that causes of accident in type of employment, contractors are involved 75% of non –routine, educational level of contractors is maximum +12 only, awareness of safety among the contractors are very less so that accident and experience level among the contractors workers also less than 1 year so because they were not aware about safety and they not follow the safety rule

Table 3.5 Cause of accident by unsafe act

Unsafe Act	First aid accident rate	Reportable accident rate
Operation without permission	11	--
Operation at unsafe speed	5.6	.11
using defective equipment	5.6	--
Unsafe Lifting	12.6	--

Taking unsafe Posture	5.6	--
Lack of safety awareness	8.9	12.6
Failure to wear the PPE	7.3	.03
Over confidence	0.22	--
In corrective method	--	.04
Negligence	0.012	7.3

Table 3.6 causes of accident by unsafe condition

Unsafe condition	First aid accident rate	Reportable accident rate
Improper Guard	0.008	0
Hazardous Arrangement Layout, Equipment	0.08	0.05
Improper Dress or Appearance and PPE	0.21	0
Lack of need PPE	0.10	0.08
Slippery	.10	0
Minor Leak in gas hose	0.04	0
No Training awareness	0.17	0.04
Unsafe condition	First aid accident rate	Reportable accident rate
Improper Guard	0.008	0
Hazardous Arrangement Layout, Equipment	0.08	0.05
Improper Dress or Appearance and PPE	0.21	0
Lack of need PPE	0.10	0.08
Slippery	.10	0
Minor Leak in gas hose	0.04	0
No Training awareness	0.17	0.04

The table 3.5 show that accident rate by unsafe act, result show that unsafe lifting and lace safety awareness among workers and this should be trained the workers about safety among the workers. The table 3.6 shows that workers not wear proper personal productive equipment in work place so that number accident in wok place increased.

4. CONCLUSIONS

This study discussed about occupational accident in heavy engineering industry from 2012 and 2013 . The result was identified and discussed the occupational accident and find causes of accident to prevent similar kind of accident. This accident result is concluded that. In Shift Wise Analysis of data show that accident rate higher in A shift because in A shift work involved like height work, hot work, new activity most hazardous activity. In Age Wise Analysis of data show that accident rate higher in 20-39 because they are carrying out highly hazardous work like casing and fabrication, cutting of tool and manual lifting, material handling.In Type of Employment analysis of data show that accident rate higher for contractor as they involved lot of hazardous activity like construction, erection and fabrication, electrical, maintenance. The Injury on of part human body. Analysis of data shows that accident rate higher in right & left finger due to point of operation.The Nature of injury. Analysis of data show that accident rate higher in internal injury, other wound, superficial, contusion and hit injury is 13% due to fall of object, fall of person and struck between object. Future work will be This type of accident and injury are prevented by conducting the questioners to employee find the difficult and cause of accident. Then give effective training and safety awareness and improve safety work place.

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