Iranian J.Publ. Health, 1993, vol 22, Nos. 1-4

ANALYSIS OF THE ACCIDENTS OF THE CAR MANUFACTURING INDUSTRIES

J.Adl [1], PhD ; Z. Mohammadi zad [1], MSPH

Key Words : *Accident , Accident prevention , Accident Analysis.*

Abstract

Car manufacturing industry accident's rates from three major companies are analysed. Totally 1325 accidents with 4 cases of fatality were recorded.

Accident rates per 100 full-time workers have gradually increased from 5.3 to 8.7 during 3 years of study. Most of the accidents occured during the primary hours of the work. Strains and sprains represented the most frequently occuring type of injury, accounting for 37.9% and the greatest number of injuries occured by flying particles (31.6%), resulting in eye injuries.

Other aspects of accidents in this industry is discussed and recommendations are given for their prevention .

1-Dept.of Occupational Hygiene, School of Public Health, Tehran University of Medical Sciences. P.O.Box 14155-6446, Tehran, Iran.

Introduction

Accident is defined as an unplanned and sometimes injurious or damaging event which interrupts the normal progress of an activity and is invariably preceded by an unsafe act or unsafe condition or some combination thereof. An accident may be seen as resulting from a failure to identify a hazard or from some inadequacy in an existing system of hazard controls(1). Therefore the accident prevention is a program for improving safety. If one looks at the cost of accidents, which is very high(as an example in the U.S.A. the total cost of accidents for year 1991 was as high as $ 177.2 billion, from which $ 63.3 billion belong to the work accidents(2)) , then it can easily be understood that the accident prevention is directly related to the productivity and profitability .

An adequate safety management program , which is in fact the accident prevention program, contains a wide variety of activities. A few examples of such activities are:

Management training, Inspection, Accident/incident investigation, Accident/ incident analysis, Employee training , Health control and services, Engineering control , Records and reports, Off-the job safety.

It is ideal to think and act on prevention when the accident has not yet occured. Hazard identification program followed by hazard analysis will lead to the proper ways, such as engineering control, of accident prevention.

Different techniques such as operability study are used for hazard identification. The fault tree analysis is one of those techniques which are used for evaluation and analysis of hazards.

When the accident is already occured the accident investigation is vital for prevention from recurrence. There is also special methods and techniques for accident investigation.

In the order of importance now we can locate the analysis of accident data as the next important act on the accident prevention program. Analysis of accident data is classification of data about a group of accidents into various categories. Analysis of accident data is key to any safety program. Such analysis can provide an indication of changes over time, which serves as a measure of safety trends. They are also useful in identifying factors that

influence accident. This information can then be used to develop actions for improving safety through accident avoidence.
This article summarizes results from an analysis of car manufacturing industry accident data.

Materials and Methods

Accident data were collected from 3 major car manufacturing companies. Data were from three consecutive years and contained totally 1325 accidents with 4 cases of fatality.
The number of 1325 include not only the accidents for which the insurance compensation form were filled but also all the incidents for which the internal record keeping was adequate.

By using the factors that influence accidnets, one can effectively focus on acident prevention efforts. The influence of factors were evaluated in this study.

The key factors were set up as follows:
Length of service, Different job groups, Part of body (directly affected by the injury), Accident type (causes of injury), Time of the day, Nature of injury.

Results and Discussion

1) Accident rates

Since work force size varies between companies and with the time, one must consider the rate at which accidents occur or the number of accidents for a given number of workers.
Figure 1 shows accident rates. Rates per 100 full-time workers were obtained by dividing the number of accidents by the number of workers divided by 100.

The trend shows gradually increase in accident rates. Rates of 5.3 increased to 6.3 from 1367 to 1368 and 6.3 to 8.7 from 1368 to 1369. Total

number of workers in three companies, which were under consideration, were changed from 1367 to 1369. Therefore the number of accidents did not follow the same trend as acciedent rates. Any how the situation has been worsened year by year and this is alarming and needs a careful considerations.

2) Distribution of accident by time of the day:

In car manufacturing plants the majority of departments and sections were working during the day time only and all accidents occured between 07 to 15 hours. Therefore total 8 hours work were divided in three periods as:

07 to 09 hours Primary hours
10 to 12 hours middle hours
13 to 15 hours latest hours

Figure 2 lists distribution of accidents by time of the day. The percentage of accidents occuring during each period varied throughout the day. The greatest number of accidents occured on the primary hours. The percentage of accidents occuring on the middle hours was significantly lower than primary hours. This can be due to conforming of workers with work environment after 2 hours work. Perhaps they are sleepy at the start of work. Latest hours' accidents can be related to tiredness.

3) Duration of employment or length of service is another element included in this study. The relationship between the incident rate of accidents and length of service is shown in figure 3. The incident rate was calculated as follows:

$$\text{Incident rate} = \frac{\text{number of accidents(in a definite period)} \times 10^3}{\text{Average number of workers exposed to accident}^1}$$

The highest incident rate(137) belongs to emoloyees with less than 5 years of service. With more than 20 years of service this rate decreased to approximately 21. This trend was not influenced significantly by workers age. This shows the importance of experience from accident point of view.

1- (in the same definite period)

4) Distribution of injury causes or accident type is shown in figure 4. Flying particles, resulting eye injuries, caused the greatest number of injuries - 31.6 percent of the total. Injuries resulting from struck against an object such as tools and machines were quite a lot-12.3 percent. Lifting heavy weights and pushing cars ranked third as a cause of injury and injuries resulting from caught in/between machines and tools were almost as frequent.

5) Figure 5 illustrates the nature of car manufacturing injuries. Stranis and sprains represented the most frequently occuring type of injury, accounting for 37.9 percent of the total. Eye injuries were the next most frequent type of injury, occuring in 30.6 percent of cases.

Although the percent of death is as low as 0.3 but it is very alarming, as the total number of 4 deaths all happened in the same company but in two different years; one death in 1368 and 3 in 1369.

6) Frequently with which various body parts were affected by accidents is shown on Table 1 . The eye was the most frequently affected body part, being involved in 34.3 percent of accidents. Fingers, which were ranked second, were affected in 22.6 persent of accidents. Trunk-abdomen, head and testicle injuries occured much less frequently - 0.83 percent, 1.5 percent and 1.8 percent, respectively.

7) Distribution of car manufacturing accidents among different job groups is shown in figure 6. Lathe operators accounted for 18.6 percent of accidents; car body makers accounted for 15.8 percent and welders 13.1 percent. The lowest percent of accidents went to molders; 1.1 percent. Generally it is possible to mention that the risk posed to the workers with different jobs does not vary too much. The number of accidents for different jobs is almost the same, except for molders. The fluctuation is within 10 percent only.

The following conclusions were reached in the overal study:

1) Average car manufacturing accident rate per 100 full-time workers for the 3 companies during the three-year period has gradually increased from 5.3 to 8.7.

2) For the normal eight-hour work day the greatest number of accidents occured between 07 to 09 hours.

3) The higher percentage of accidents occured during the first 5 years an employee worked for car manufacturing industry.

4) Flying particles caused the greatest number of injuries, comprising 31.6 percent of the total. Injuries resulting from being burned were at the bottom with 3.6 percent only.

5) Strains and sprains represented the most frequently occuring type of injury, accounting for 37.9 percent of the total. Eye injuries were the next most frequent type of injury, occuring in 30.6 percent of cases.

6) Eyes were the most frequently affected body part, being involved 34.3 percent of the time.

7) Lathe operators were involved in accident more than other job groups with 18.6 percent of the total accidents. The other job groups, except molders, were involved in accident with a percentage in the range of 10 percent less than that for lathe operators.

8) The safety program, as extracted from the results, is very weak in car manufacturing industry and needs a careful replanning.

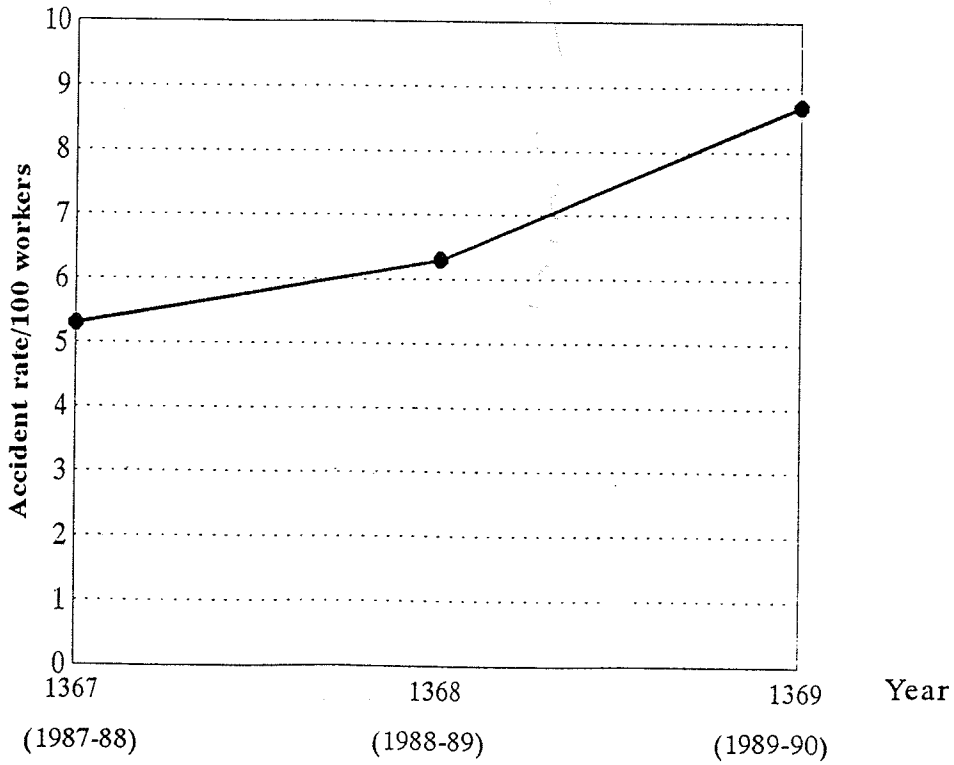

Figure 1- Accident rate vs. year

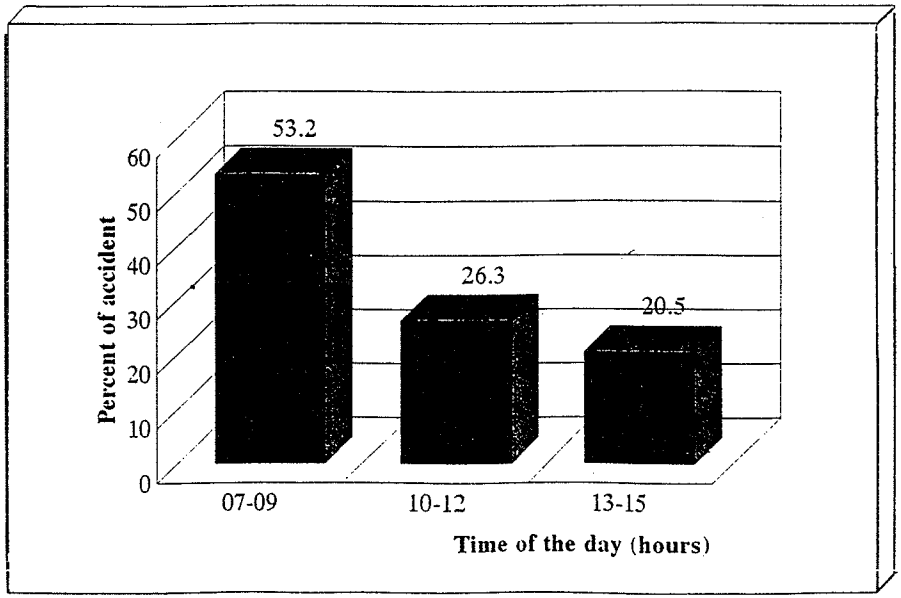

Figure 2- Distribution of accidents by time of the day

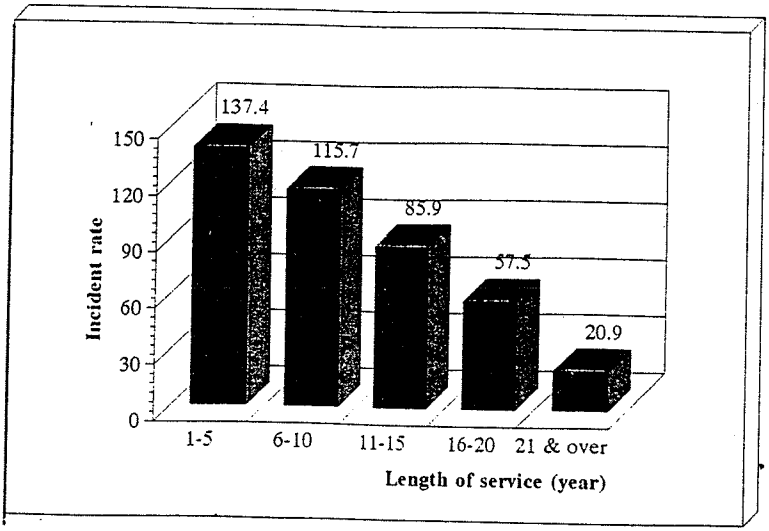

Figure 3- Incident rate vs. length of service

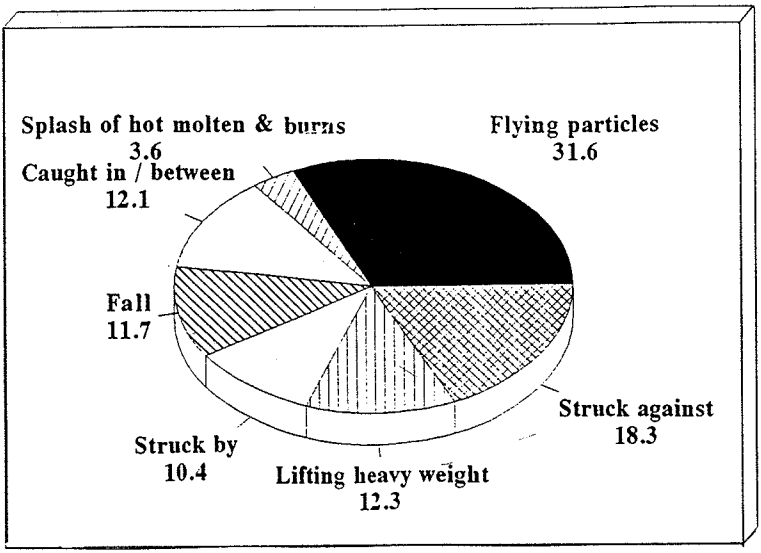

Figure 4-Distribution of accident type

Figure 4-Distribution of accident type

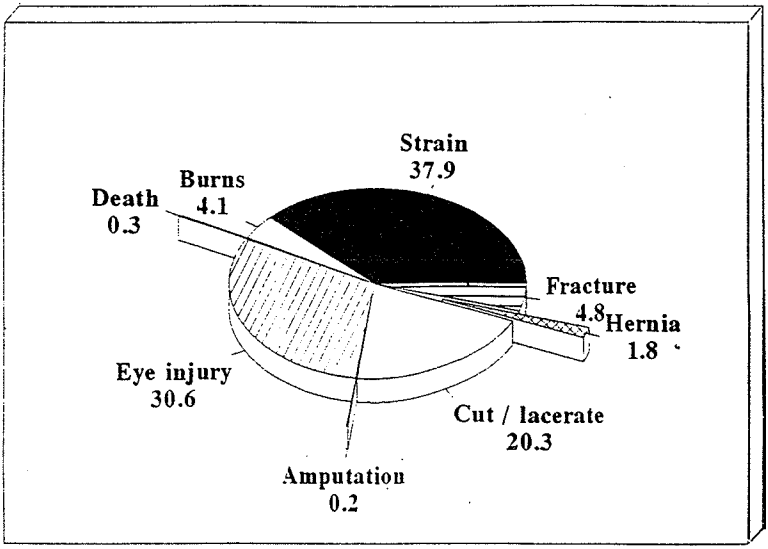

Figure 5- Distribution of nature of injury

Part of Body	Afflected Frequency %
Head & Face (except eyes)	1.5
Eyes	34.3
Back	10.3
Trunk-Abdomen	0.83
Hand	11.6
Finger	22.6
Testicle	1.8
Foot	17.0
Others	0.07

Table 1-Distribution of injuries and illnesses by Part of body.

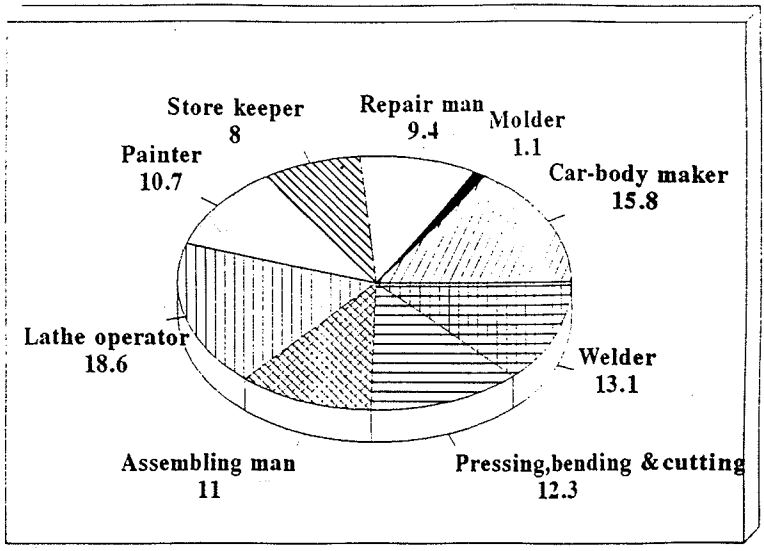

Figure 6- Distribution of accidents by different job group

References

1) The dictionary of terms used in the safety profession. third edition, American society of safety engineers, 1988.

2) Accident facts, 1992 edition, National safety council.