Implementation of 11th finger to prevent finger injury in manufacturing sector

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Abstract: In the 2020 scenario, the handling of machineries in the industries has the vibrant role in each and every mechanism. Parallel to this the risk of handling machineries also getting increased day by day which is obviously clear-cut through the incidental rates in each year. Though the safety committee along with safety researchers potentially active in various outlook by making several precautions, rules and regulations with many potential factors the incidental rate is quite fluctuating in high rate along with high standard counter measures

The analysis of the cause and effects of the incidents through statistical data shows serious consequences as they are not handled in the appropriate way. The effective solution on this issue is being discussed in this paper by pointing out the injury especially the finger injury which is potential in the incidental rate in the automobile industry. This paper presents the most appropriate solution using "sacrifice finger ideology" which is the most appropriate explication of reducing finger injury in the manufacturing unit of automobile industry**.**

Index Terms **- Incident, finger injury, improving safety measure, sacrifice finger ideology.**

I. INTRODUCTION

Safety Professionals in the present scenario is highly researching on safety improving factors based on reducing incidental rate. They are targeting on safety culture of the company by various programs like safety education, training, practical knowledge and ideologies. The best way of improving safety climate is to put forth constant implementation of safety measures. This high goal achievement will result in best working morale for the workforce and ensure confident in the working place.

The incidents in the industry is playing vital role in improving the system / work morale. All risks in the industries are unavoidable. But it could be managed with proper evaluation and control measures which results in the decreased incidental rate.

The industry through safety committee has taken immense measures on the reduction of first-aid injury especially finger injury through various steps such as training program, awareness program, providing safety kit and safety equipment. But still safety scenario is becoming tough task for the safety committee and safety researchers. New approaches to safety are becoming mandatory in the present working scenario for best working space with high productivity. It ensures risk free environment, good working morale which combinely makes the workforce to work with confident.

Injury, especially the finger injury is quite common in the manufacturing unit of the automobile industry. It is analysed on how the process was carried out and why the incident is about to happen? Through observation. As a consequence of this observation the increasing incidental rate is also analysed through observation and statical data presentation. The prior most cause is lacking in adoption of new safety measures and methods based on requirements.

II. STUDY POPULATION AND DESIGN

The study area is Plant A and Plant B which includes assembly station, machining and other rework area,

Category of Work Area**:**

Assembly: Area is engaged in bringing together various parts or components.

Machining: Process in which a metal is cut into a desired shape and size by removal.

The work mode of the study area includes manual as well as automated systematic operation. The workers working under this study area underwent many training campaigns, awareness programs and updated workshops. Every program is focused on company policies, materials and mechanism, efficient handling and management tactics with appropriate work procedure. This study includes longitudinal with brain storming and data collection

Brainstorming sessions follow this procedure:

1. Introduce a question, problem or topic both orally and in writing on chart paper
2. Invite participants to respond with as many ideas or suggestions as possible.
3. Record every response on chart paper. Often, the most creative or outrageous suggestions are the most useful and interesting.
4. Prioritize, analyze or use the list to generate discussion or problem solving

III. INCIDENT DATA

Incidents in Plant A and Plant B is being observed and the data is given for the year 2018. Plant A includes three engine shops in which 650 employees are employed to handle automated and semi-automated machineries. In Plant A, the percentage of finger injuries was 33 and other body part injuries was 67, these injuries include head, leg, eye and hand. Similar to that Plant B includes two transmission shops in which 460 employees are employed to handle the same sort of automated as well as semi-automated.

Table 1: Total Incidents [Units in Percentage]

Total Incidents	Plant A	Plant B
2018	46	54

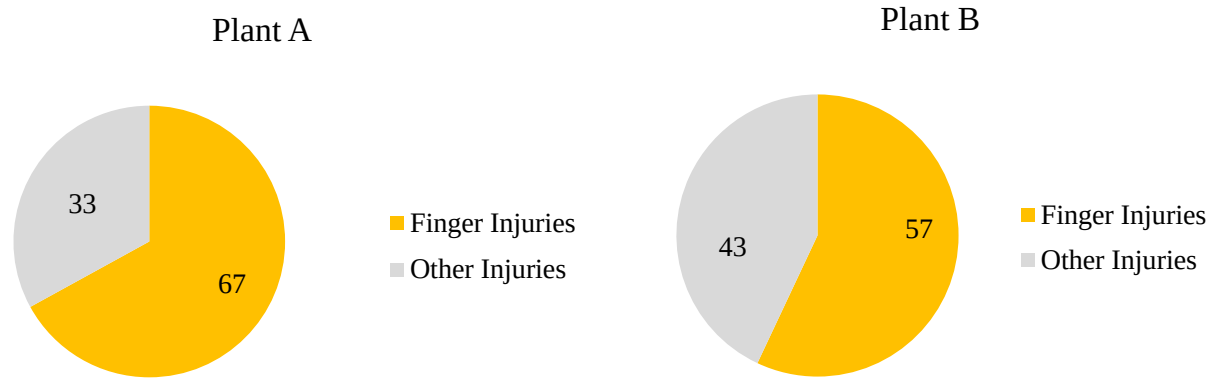

Chart 1: Percentage of finger injuries in total injuries reported (2018).

IV. QUESTIONNAIRE DATA

The study is being observed from natural intervention along with brainstorming technique. This is a newly developed questionnaire that incorporates the category of work area, awareness, training programs, company policies, job covered with risk factors, which also includes safety overview. It covered 40items covering the entire safety culture for plant A and plant B and its work process.

Sample items:

i. What are the main cause of finger injury?
ii. Why to interrupt in running conveyor?
iii. Frequency of interruption?
iv. How to avoid it?
v. Any idea to avoid it?

It is also categorized under four major conditions mentioned as follows: unsafe act, unsafe condition, personal factor , job factor. It is tabulated with the observation based on the questionnaire data provided

V. SAFETY AUDIT

According to the factories act of 1948, Ministry of Labour and Employment in India, it is an occurrence in an industrial establishment causing bodily injury to a person which makes unfit to resume his duties in the next 48 hours". Rapid growth in industries and its technology brings out much advancement in each and every steps of processing. Such advancements have increased the risk factors in the job which results in accidents on and off. The disciplines such as sociology, psychology and engineering have drawn their attention towards the problems of industrial accidents.

Based on factories act of 1948, Ministry of Labour and Employment in India, the industrial accidents are to analysed especially under the terminology 'Safety Audit'. Here in the selected Plant A and Plant B safety audit is conducted in all the three shifts of operation for production. This has a three specialization in three major process as operation, maintenance and safety. As a results of this observation based on the measures of safety audit it is observed that, the finger injury is often occurred in all through the operation due to various causes. The main cause is intervention on running conveyor due to pick up the fallen parts. This results in the finger injury and it is analysed as the major cause factor for the finger injury incidents. This safety audit is conducted twice in the year 2018 and both time the audit gave the same impact in the analysis result as the picking of fallen parts while the conveyor is on process (i.e) intervention on running conveyor due to picking of fallen parts.

The audit results are discussed with the safety team and its respective with proper analysis on statistical data. This is followed by discussion and the materials as along with design to take action plan and in order top derive effective counter measures.

VI. RESULTS

The four major effects of industrial accidents as listed by statical analysis as follows:

i. Loss to industry: Expenditure to be made on the medical treatment of worker and wages to be paid to the worker for the period When he has not able to join the work, etc.,
ii. Loss to worker: A worker has also to suffer more badly and in case of his death, his family has no one to help. If he is unable to work after the accident, he becomes a burden for his family. Family losses the source of income and also to bear increased expense of his treatment
iii. Loss to consumer: The cost of industrial accident is included in the production cost and therefore, the accidents make an increase in the production cost, which has directly, affect the consumers.
iv. Loss to society: If the worker dies or is rendered disabled on account of the accident and the worker's family become helpless and the society has to come to its rescue.

Corrective and preventive actions taken as follows: by discussing with the safety team and its respective by analysing the requirement to fulfil the needs of special equipment in order to pick up the fallen part from the running conveyor without any injury, came to an invention and new techniques termed as 'Eleventh finger ideology' which is also quoted as sacrifice finger ideology. This coinage gives a new solution to the major problem of finger injury in the incidents list. Bu analysing its positive and negative this eleventh finger ideology is implemented in the plant A and Plant B focused on assembly section, Machining and rework area mainly focusing on the auto conveyor where the majority of finger injury occurs The safety team planned to train the work force with the usage of eleventh finger to prevent the finger injury. This is considered as the foremost preventive and corrective measures to avoid finger injury and gives it as zero because of the cause of intervention in the running conveyor in order to pick up the fallen parts. However there are other reasons for finger injury this intervention in the running conveyor is considered as the major cause and the solution is proposed.

Natural Intervention:

No formal or systematic intervention took place during the study period in both plant A and plant B. it is observed that the majority of finger injury occurs in assembly and machining area, wherever the process proceeds with the running conveyor in year 2018. So, the plant A and plant B is decided to be chosen for the implementation of "Eleventh finger technology" which has the combination of both manual as well as automatic operation of the work process. Generally the plant A and plant B covers three shifts. The observation is done by natural intervention nothing is disturbed with any systematic procedure. It is continued to be natural intervention with the successful implementation of Eleventh finger or sacrifice finger.

The long metal rod with magnetic clamps is used to pick up the fallen parts of the engine and transmission. These fallen parts are fasteners from the engine and transmission that are falling on the running conveyors. This is mainly due to increased production with speed up activities on production. Generally the workforce use their fingers manually to pick up the fasteners that area fallen on the running conveyors which results in major percentage of finger injury.

Now the eleventh finger, the metal rod with magnetic clamps is affixed with stand nearby every conveyor which is easily accessible during the fastened processing on production.

This natural intervention is observed and analysed in the year 2019 which results is major reduction of the finger injury in the plant A and plant B

Figure 1: 11th Finger "Sacrifice Finger"

VII. Statistical Analysis

The accident data is observed from plant A and plant B in the manufacturing unit in the year 2018 and 2019 and the incidents count is mentioned in percentage. The incident has been observed in engine plant in the year 2018, in plant A, among the total percentage of the incident, there is 67% of injury is mentioned as finger injury. But after implementation of 11th finger, the finger injury is reduced to 33%. Similar observation is done in plant B in the year 2018 and the observation results in the total percentage of finger injury is 57% and in 2019, after introduction of 11th finger in the plant B the percentage of the finger injury is 25%. This drastic variation is found out by analyzing the accident data in plant A and plant B before and after implementation of sacrifice finger ideology which is a great actual measure on finger injury reduction

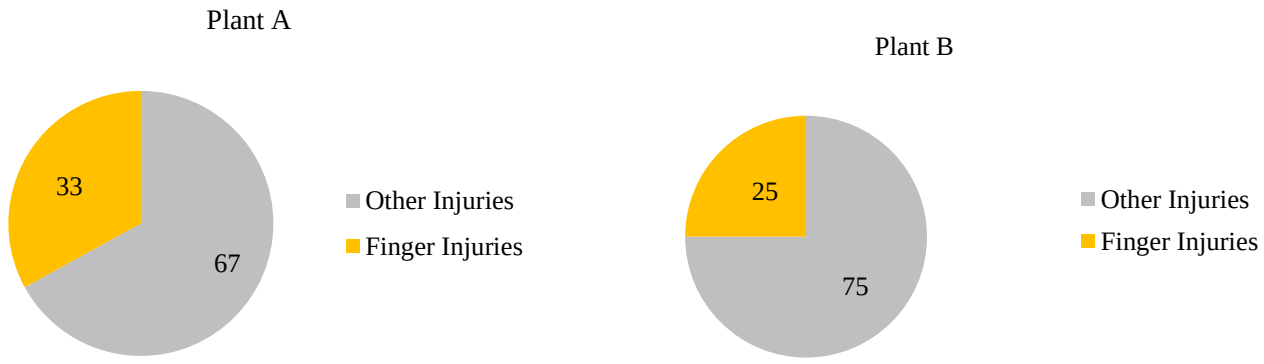

Chart 2: Percentage of finger injuries in total injuries reported (2019)

Table 2: Incident Causes [Units in Percentage]

Category of Incident Cause	Plant A (Engine Shop)		Plant B (Transmission Shop)	
	2018	2019	2018	2019
Unsafe Act	50	45	43	25
Unsafe Condition	17	11	14	25
Personal Factor	17	22	29	25
Job Factor	16	22	14	25

2018: Before Implementation of 11th Finger
2019: After Implementation of 11th Finger

VIII. DISCUSSIONS

The significance of safety climate in the manufacturing plant or industry for the happening and occurrence of occupational accidents has been studied rarely in today's scenario. The limited existing research results in the great state of confusion for the rate of accidents, though there is clear demonstration and training in the safety awareness program. The main result of the present study is a observation based measures of safety culture and self-reported as well as company accidents

Our analysis suggests that there is nearly 50% of reduction in finger injury occurs only after the appropriate remedial measure is implemented with particularly ideology named as usage of "11th finger or sacrifice finger. Whether the mechanical system is completely automated or partially automated, the finger injury occurs on four basic practices. They are unsafe act, unsafe condition, personal factor and job factor

Natural intervention is followed by accurate observation on the ratio of incidents by statistical analysis with appropriate percentage

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IX. CONCLUSION

In conclusion, this study results in a successful implementation of "Sacrifice finger ideology" in a manufacturing unit of the automobile industry. The powerful effect on the reduction of incidental rate is clearly viewed by this well-functioning measure which enhances the safety culture of the company and gives confident work space for the work force. Lower rates of incidents are great achievement for the safety researchers, which also adds effective impact on the workforce to follow the safety measures in an appropriate way. This is obviously observed and presented in this paper such kind of ideology with awareness and implementation never fails to support the safety culture which is always considered as predominant by the safety professional. The possibility of higher rate of safety improvement in the manufacturing industry is directly liable to the higher reductions in injury rates.

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