

Risk Assessment in Automobile Assembly Shop

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Abstract - India became the fourth largest auto market with sales increasing 8.3 per cent year-on-year to 3.99 million units. It was the seventh largest manufacturer of commercial vehicles in 2018. But at the same time thousands of workers suffer injuries every year due to accidents in automotive factories almost 1369 accidents reported in automobile industry. Now safety has become a routine of each worker in any industries and also demand for safety at work places increases rapidly because of increasing number of accidents. Also organizations are now showing specific interest regarding the health and safety of their workers. For the success of any industry, it has been essential to identify the Hazards, to assess the associated risks and to bring down the risks to tolerable level. Automobile industry involves various process like Assembling, Welding, pressing, painting and material handling by manually or mechanical. In fact in automobile industry accidents and Ergonomically hazards are occurred repeatedly by the flaw in design of tools and failure in safety commitment by the top level management of organization. The project focuses on the preventing the accidents form the tools and material handling and utility and facility equipments. The project intention to reduce the hazard consequence turns to catastrophic hazards. Risk assessment used as a tool to identify, Evaluate the risks by observing process of activity was done.

KEY WORDS - Health and safety, Hazards and Risk, Equipments, Material Handling

I. INTRODUCTION

Nowadays providing a healthy working environment has been a very important issue for companies for years, because improper and unsafe execution of work results in too many difficulties and which may affect negatively on the well being of each employee, productivity as well as morale of the organization. Now safety has become a routine of each worker in any industries and also demand for safety at work places increases rapidly because of increasing number of accidents. So a proper and systematic risk assessment methodology is essential for achieving a higher level of safety in any organization. Risk is defined as measure of the probability and severity of a negative effect to environment, equipment / property, or health. It is essential that the risks arising from various kinds of hazards should be controlled in such a way that the loss to Human life and property is negligible or zero. These are mainly the results of slackness on the part of workers in the use of improper tools, tampering with safety equipment and procedures, neglect of personal protective equipment etc. Risk analysis is the utilization of currently available information on hazards to determine the risk to individuals or groups, equipments/properties or the environment. The potential hazards which cause accidents can be identified by conducting proper risk analysis and assessment. Risk assessment constitutes the process of risk analysis and risk evaluation, which can be applied to fulfill. A suitable and sufficient assessment of workplace risk. Risk assessment problems are deals with the selection of an optimum risk for its evaluation and subsequent control measures. Risk assessment is usually carried out by using traditional approach consists of multiplication of failure likelihood of a harmful event and consequence severity. It is a widely used method for risk estimation and has been successfully applied in different industries involving hazardous operations.

II. METHODOLOGY

2.1 Study of workplace operations

2.2 Hazard identification

2.3 Evaluation of existing controls methods

2.3 Risk estimation

2.4 Risk evaluation

III. RISK CALCULATION METHOD

Risk is calculated by the formula;

$$\text{Risk} = \text{Likelihood (I)} \times \text{Consequences(L*C)}$$

3.1 RISK LIKELIHOOD

Weight age	Probability	Risk likelihood
1	> month	Highly unlikely
2	< month But > week	Unlikely
3	< week But > day	Likely
4	<day	Very likely

3.2 RISK CONSEQUENCE LEVEL

Weight- age	Risk consequence	Description
1	Slightly harmful	First aid
2	Harmful	Minor < 48 hrs absence
3	Very harmful	Major, reportable, temporary disability
4	Extremely harmful	Fatal, permanent disability, major & involves large no. Of people

3.3 RISK MATRIX

Consequence level → Risk likelihood ↓	Slightly harmful (1)	Harmful (2)	Very harmful (3)	Extremely harmful (4)
Highly unlikely (1)	Trivial (2)	Tolerable (3)	Moderate (4)	Substantial (5)
Unlikely (2)	Tolerable (3)	Moderate (4)	Substantial (5)	High risk (6)
Likely (3)	Moderate (4)	Substantial (5)	High risk (6)	Very high risk (7)
Very likely (4)	Substantial (5)	High risk (6)	Very high risk (7)	Intolerable (8)

IV. RISK ASSESSMENT SHEET

Department:

Assessed by:

Reviewed by:

Date of Assessment:

S.NO	ACTIVITIES <i>List each step in the activity in the order they occur</i>	HAZARDS <i>List the hazards observed in connection with each step</i>	CONSEQUENCES <i>without control measures (Hazards)</i>	RISK RATING CALCULATION			EXISTING PRECAUTIONS/CONTROLS <i>List the necessary safety precautions or controls to</i>
				Likelihood / Freque	Severity Rating	Risk Rating	

			<i>exposure /effect)</i>	ncy Rating			<i>be followed to eliminate the hazards indicated</i>
24	SPOT WELDING	The spindle can touch the hand and cause a serious injury while welding manually.	Personnel injury	2	4	6	keep the safe distance from the spindle / provide the guard to the spindle
		Spindle or electrode is very hot due to electrical heat	burn injury	2	3	5	Wear Heat resistance gloves
		Twisted wires can disturb the worker's feet may cause injury.	Slip and trip of personnel	2	2	4	Tight the spot welding wirings with clamps
		If the surface of sheet is not smooth then the electric current may pass through the metal sheet.	personnel injury	2	3	5	Attach clamps to metal sheet to avoid electric shock
		Transformer failure can burn and catch fire	Property Damage	2	3	5	Provide relay and miniature circuit breakers
		The sparks produces while welding cause burn injuries to the workers.	personnel injury	2	3	5	provide the fiber glass barriers to avoid the spatters
		Include cutting, and brazing operations include exposures to metal fumes and to ultraviolet (UV) radiation.	Effect on lung function	2	3	5	provide Air purifying equipment
		Flashing of sparks on fire prone materials	Fire Hazards	2	4	6	Keep the all fire prone materials away from the spatters
		Electrical shock form the transformers by leakage current	Electrocution	2	3	5	Provide the earthing to the electrical equipment. Confirm the functioning of earth leakage circuit breaker
		fire by the overload of current on wires	Fire Hazards	2	3	5	Install the current supply tripping devices
25	Gas cylinder storage area	Formation of flammable gas air mixtures in case of leakage of flammable gas	Explosion Hazards	1	4	5	keep the gas cylinders well ventilation area / install gas detectors
		Leakage of oxygen gas.	Oxygen enriched atmosphere	1	3	4	Confirm the gas cylinder valves free from the mechanical damages
		fall of gas cylinders during handling	Personnel injury	2	3	5	Always carry the gas cylinders by the trolleys and Avoid rolling of gas cylinders

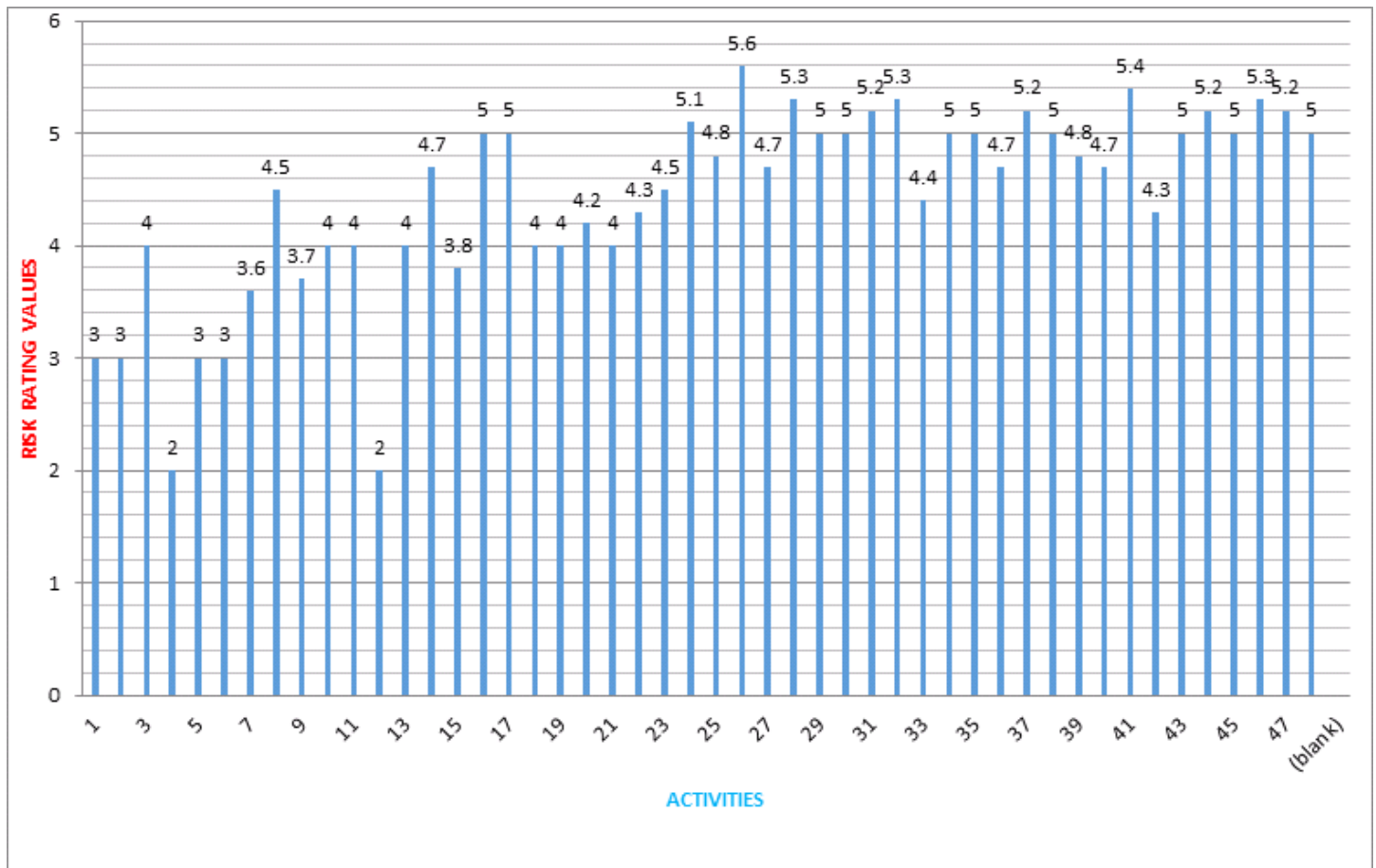
		GAS leakage by valve Damage,	Formation of flammable gas air mixtures	1	3	4	Store the cylinders vertically.
		Insulation damage of electrical equipment	Fire hazards	1	4	5	Periodically maintenance the insulation of wirings
		keeping the combustible materials in flammable gas cylinder area	Increase pressure on cylinders in case of combustible materials Catch fire	1	4	5	Keep the combustible materials away from the gas cylinder storage area
26	<i>CO₂ welding</i>	Forget the earthing of the welding machine	Electric shock	2	3	5	Provide double insulation for the welding machine. Follow safe operating position before welding work
		Leakage of co2 in workplace	Oxygen deficiency	1	3	4	Before performing welding work confirm the co2 cylinder free from leakage defects
		Air contamination of welding in case of deficiency in CO2 gas supply	Failure welding work /re work	2	3	5	Confirm the volume of Co2 gas cylinder to avoid damage of welding
		Handling the sharp tools and materials with bare hands	Cut injuries	1	3	4	Wear leather safety gloves
		Touch the hot objects	burn injuries	1	3	4	keep caution boards to avoid touching of hot objects
		Temporary wirings and insulation damage of wire of welding machine	Short circuit	1	3	4	Avoid the temporary wirings for current transmission
		flame back to the acetylene cylinder	Explosion hazards	2	3	5	Confirm the condition of flash back arrester before carryout welding
48	<i>Ergonomical hazards</i>	Working more than 2 hours above shoulder level	Increase stress and strain	2	3	5	Provide the platforms to reduce the strain of workers
		Repetition Work by hand	Carpal tunnel syndrome	2	3	5	Use the hand tools and reduce the stress on carpal tunnel
		Excessive Force	Pain on tendons, muscles and joints	1	3	4	Keep the all the parts near the work place
		Awkward Postures	Muscular skeletal disorder	3	3	6	Provide the facility to reduce awkward posture based on job
		Static Posture		1	3	4	Take the break 15 hr for every 5 hr work

	Vibration	White finger dieses	3	3	6	Wear anti resistance gloves/ Avoid the hand tools which produce vibration more than 4 m/s ²
	Temperature Extremes	Heat cramps	2	3	5	Provide the artificial humidification

V. RESULT

S. No	ACTIVITIES	AVARAGE RISK RATING
26	CO2 welding	5.6
41	Grinding Machine	5.4
32	cleaning with acid	5.3
46	Electrical wiring	5.3
28	Metal cutting by abrasive wheels	5.3
47	Diesel Generators	5.2
37	HSD yard	5.2
44	Motors	5.2
31	Skid cleaning with chemicals	5.2
24	SPOT welding	5.1
43	Transformers	5
34	Boiler Room	5
35	Compressor room	5
17	Dolly	5
45	Electrical Panels	5
48	Ergonomical hazards	5
30	Flat Deck inspection	5
38	Lathe machine	5
29	Ovens and driers	5
16	Water dispenser	5
39	Drilling machine	4.8
25	Gas cylinder storage area	4.8
40	Milling Machine	4.7
27	ARC welding	4.7
36	ETP and water treatment plant	4.7
14	Hoist	4.7
8	Assembling of auto parts	4.5
23	Conveyors	4.5
33	Recycle Center ((Paper, thermos Coal, plastic storage area)	4.4
42	DIE unloading	4.3
22	fork lifts	4.3
20	Air supply fans	4.2
19	Electrical bulbs	4
18	Glass mirrors installation	4
11	Movement between workstations	4
10	Nuts and screws tightness by pneumatic gun	4
3	Staking of object	4
13	Tool and bin holders	4

21	Tow truck for carrying materials	4
15	Installation of hoist	3.8
9	Nuts and screws tightness by the battery guns	3.7
7	Attaching the cab incoming skid to next level skid	3.6
6	Cab incoming by electrical chain hoist	3
2	Cutting strap to unpack	3
1	Import and unload of auto parts	3
5	Pushing and pulling of dollies	3
4	Carrying the load by manual handling	2
12	Carrying the cables and insulate sheets	2



VI. DISCUSSION AND CONCLUSION

The industry involves various major activities like Assembling, Welding, pressing, painting and material handling by manually or mechanical. The risk assessment was conducted to identify the hazards in the above said major and their sub activities and the ergonomical hazard existing and their significant level like tolerable or intolerable. In this assessment, the above said major activities are sub divided into sub activities and analyzed each sub activity to find the hazards and subsequent risk level.

The results indicated that the risk rating levels for the all the activities are from value 3 to 6. This values shows that the hazards arise from the activities carried out in this Assembly shop are all in the tolerable limit or the below significant level

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