

REMEDIES ON ACCIDENTS AND SAFETY IN INDUSTRY

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ABSTRACT

The success of industrial health and safety programs requires the co-operative effort of management, engineering, production and purchase organization as well as of supervisor and individual employees. Working health and safety hazards may mean condition that because legally remediable illness or any condition in workplace that impair the health of employees enough to make them lost time from work or to work at less than full efficiency. Both are preventable and their correction is properly a concern of management.

In this paper, a study is carried out in industry within changed working sections i.e. safety and environment management section and electro deposition section. The main aim function of safety and environmental management section is to assess the level of airborne concentration of carbon black, metal fumes, sodium cyanide, sulphuric acid, mist etc. in various working industries. Also for these various working

failure several references, suggestions are provided along with that need and importance of safety is suggested within it.

INTRODUCTION

Safety always is to be a part of any industry. Accident involves loss of life, property and causes human sufferings. it also causes production loss to the employer and of time. Accident are likely to cause personal injury or property damage, fire, explosion, sabotage, noise pollution, damage to facilities, equipments or material and hence represent a great deal to human(employees/employer)industrial and social loss much of which can be prevented. The following are the loss of employees/employer.

For employees-accident causes are

- 1) Creates a fear which may prevent him from enjoying his work
- 2) Recognizes him as a labeled accident-prone employee.
- 3) Loss of earning capacity in future.

safety by setting goals, monitoring progress, formulating decisions and listening to people of all levels.

Industrial health and safety hazards may mean condition that cause legally compassable illness or any condition in workplace that impair health of employees enough to make them lose time form work or or to work at less than full efficiency.

For employer cause of accident

- 1) A waste/downtime and loss of production
- 2) Increases insurance cause

OBJECTIVES:

This is the program that containing” a plan ”which is a tool to implement and improve

Both are preventable and their correction is properly a responsibility of management OSHA(occupational health and safety association) and NIOSH(national institute of occupational safety and health administration) view a hazardous material from a standpoint of potential hazards. They rate condition that may cause injury or rate as they are found in working environment, whether they are obvious or not.

NEED AND IMPORTANCE OF SAFETY:-

(A) Need for safety

- loss of earning capacity
- suffering and emotional loss of families
- industrial accident-various types of accident
(electrical,mechanical,chemical,radiation)
- economic costs
- to management direct cost like medical expenses, compensation and other indirect costs.
- social loss-(pain, suffering)
- to society-economic costs in terms of loss of productive capacity and cost of maintenance of injured and their family through social security schemes.

Importance of safety

- 1) for applying following policies-An unsafe act, an unsafe condition and an accident are symptoms of something wrong in the management system.
- 2) certain sets of circumstances can be predicted to produce several injuries. this circumstances can be identified and controlled.
- 3) safety should be managed like any other company function.
- 4)The key to effective line safety performance is management procedures that fix accountability.
- 5) The function of safety is to locate and define the operational error that allow accident to occur.

VARIOUS INDUSTRIAL HEALTH RELATED SAFETY FACTORS-

There are various types of factors and element which are responsible for affecting the industrial health in some extent.

Different factors like-

- 1) Working action
- 2) Type of work
- 3) Machines and equipment
- 4) Material used
- 5) Environment factor
- 6) Condition of work
- 7) Unsafe use of safety devices and equipment

WORKING ACTION-

This process includes various acts of working, handling of work machine and equipments by workman, unsafe act, unsafe implementation of methods and techniques of working.

UNSAFE

PHYSICAL/MECHANICAL CONDITIONS OF WORKING

Generally classified as

- Inadequate guarded
 - unguarded
 - defective condition, rough. sharp, corroded, frayed slippery etc
 - unsafe design /construction
 - hazardous arrangement, process
- Unsafe condition, may be eliminated by;-
- engineering revisions
 - plant inspection
 - recording data
 - analyzing data and taking corrective actions

TYPES OF WORK;-

This is important type of work mainly related to type of work either it is a simple mechanism or complex construction machineries like machines made of subassemblies also different working methods heating ,moulding, pouring,cutting, chemical process,electrical process, various

complicated process, undesired and unplanned way of working on such activities of work may cause to affect workers health badly

MACHINES AND EQUIPMENTS;-

This is a basic factors of affecting the industrial health adversaly.machines used in different industries like small scale and large scale industries are of different types along there dimensions and there working techniques.

In manual way of working, there is direct contact of man and machines and equipment also. It can be seen along with semiautomatic methods. Various mechanical condition causes for industrial for affecting industrial workers/machineries health are as follows

---inadequately guarded

---unguarded

MATERIAL:

This factor also get adversely causes normal condition of working and workman if provided and use in improper way like-

---improper handling and use in manufacturing process

---improper quality

---improper dimensions

ENVIRONMENTAL FACTORS;-

The various type of factors of stresses that may cause sickness ,impaired health, or significance discomfort or insufficiency in workers may be classified as chemical,physical,biological etc.

Chemical hazards arise from excessive exposure to airborne concentration of mists,vapours,gases that are in the form of dust or fumes.

In the addition to the hazards of inhabitation many of these material act as skin irritant or may be toxic when absorbed through the skin .

Physical hazards includes excessive level of radiation or noise and extremes of temperature and pressure. Biological hazards includes contamination of food

drinking water, or sanitary facilities by insects molds, fungi and bacteria and improper removal of industrial waste and sewage.

Ergonomic hazards includes improperly designed tools are work area, improper lifting are reaching, poor visual condition or repeated motion in an awkward position. careful designing of both tools and the

CONDITION OF WORKING;-

Exposure to many of these hazards may produce an immediate acute response, due to intensity of exposure, or a chronic response resulting from larger exposure at lower intensity. In normal circumstances, an employee rarely experience exposure to single environmental stresses, but rather to an inter play of multiple stresses.

This factor consist of-

---temperature variation

---ventilation

---working position and workman

---illumination condition

---sound noise and vibration pollution

---hours of working

UNSAFE USE OF SAFETY DEVICES AND EQUIPMENTS;-

Within this factor, improper and inadequate use of safety devices and equipment such as guards and protection devices causes to affect industrial workmen's health adversely.

Different reasons are

---improper use of guards and protection devices may create a risk.

---unawareness about use of such safety devices.

---ignorance of workman or operator towards the work.

VARIOUS EFFECTS OF ACCIDENTS AND THEIR SAFETY METHODS

Effects of accident

An accident is defined as an event suddenly originating from external sources,detrimental to health of an employee

of the worker or operator should be associated with the performance of paid job and which results an injury or disability or in certain causes death also.

The effect of the accident are numerous and explained as given below;-

1. to pay the compensate to the worker as to to the workman ,compasation act(1923),insurance etc
2. cost of medical care and hospitalization
3. cost of damage to equipment,material(inventory in process) and the plant.
4. loss of well trained and efficient employee and cost to replace the worker by providing training to the worker.
5. daily in production as the space has to be cleared only after an inquiry by factory inspections and loss of production for the above period.
6. if the person is injured that will hamper in the operating efficiency and the enterprise will suffer for low production.
7. downtime of machines specially in the product layout

TO THE WORKER;-

- If the worker dies in accident, in the family losses the bread earner.
- no amount can compensate the loss of life
- if the workers get injured, he loose his efficiency and the workman ship and the rating get lowered due to handicap. he losses the incentive due to not performing at higher level.
- after the accident the worker psychologically hesitate to work at the same place and even reluctance to exerts himself in the job

TO THE SOCIETY;-

- the society suffer due to loss of life. his family needs compensation to look after the family member till they get stalled in life
- loss of production hours cause less product in market

---if the worker is involved in social activities than his replacement is very difficult to achieve

VARIOUS SAFETY MEASURES;-

A Comprehensive approach to safety includes the following elements;-

- an effective safety policies to reduce work place injuries or accident
- managements commitments and involvement in conducting periodical meeting on safety matters and safety training to all employees
- review of performance of safety committees and strict enforcement of safety rules followed by incentives for safe work behavior
- implementing proper engineering procedure like material handling system, use of safety devices ,maintenance of machines and parts of equipments etc to prevent accident
- safeguarding employees from any foreseeable hazard to health and safety in existing processes and working systems
- training employees to be aware of their own responsibilities in respect of safety matters. maintaining proper measures for fire prevention, fire protecting and fire fighting and systems of evacuation in case of emergency
- monitoring of safety performance
- maintaining informative service on legislation, codes of practice and technical developments in relation to safety policies
- involvement of all employees by joint consultation for attaining health and safety objectives of the organization

VARIOUS REGULATORY LAWS, ARTICALS, RULES, SECTIONS, PROVISIONS AND ITS IMPLEMENTATION:-

The policy on safety ,health and environment is a statutory requirement under section 7A(3),41B(2) and 112 of the factories act,1948 and also under the rules 73(L) of Maharashtra factory rules,1963

It should be formulated in all the factors except:

---The factories running with power and employing less than 50 workers and not covered under section 2(CB) and/or section 87 of factories act

---The factories running without power and employing less than 100 workers and also not covered under section 2(CB) and /or section 87m of the factory act.

---The health and safety policies should be signed by the occupier and presented to the inspector on demand

---it is required to updated while:

- When change in manufacturing process
- when new process or substance is added
- When major changes have taken place

---Employee state insurance act,1948

---factories act 1948

SCALES PRESCRIBED FOR SOME SAFETY ,HEALTH AND WELFARE MEASURES IN THE FACTORIS ACT 1948 AND THE MAHARASHTRA FACTORY RULES 1963

Sr.No.	Statute(order) ref.	Safety, health and welfare measures	Minimum employment or scale prescribed										
01	FA 1948 Sec 40B	Safety:	<p>i)One thousand or more workers ordinarily employed ii)smaller units in which the processes involve risk of body injury, or health hazard and are notified by the state government For i) above,</p> <table> <thead> <tr> <th>Employment of no. officers</th> <th>The scale Safety</th> </tr> </thead> <tbody> <tr> <td>100 to 2000</td> <td>1</td> </tr> <tr> <td>2001 to 3000</td> <td>2</td> </tr> <tr> <td>5001 to 10000</td> <td>3</td> </tr> <tr> <td>Above 10000</td> <td>4</td> </tr> </tbody> </table>	Employment of no. officers	The scale Safety	100 to 2000	1	2001 to 3000	2	5001 to 10000	3	Above 10000	4
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02	FA 1948 Sec 8(3) and MFR 44	Health: Cooled drinking water during hot weather	More than 250 workers ordinarily employed(one water centre for every 150 workers or part thereof upto the first 450 and one for every 450 workers or part thereof										

			thereafter)
03	FA 1948 Sec 42 and MFR74(4)	Washing facilities,i.e.shower controlled by tap(for person whose work involves contact with any injuries or obnoxious substances or who are emploted in dusty processes)	1(or every 10 workers at a time(enclosed ones for female worker to be provided separately.) 1 for every 20 upto 200 workers and 1 for every 50 thereafter(enclosed ones for female workers)
04	FA 1948 Sec 45(1) and MFR76	First aid boxes or cupboards(equipped with contents prescribed in a state factories rules)	1 for every 150 workers ordinarily employed
05	FA 1948 Sec 47(1) and MFR86	Adequpte and suitable shelters or rest rooms and a suitable lunch room with provision for drinking water	More than 150 workers ordinarily employed

VARIOUS SAFETY DATA SHEETS AND COST SHEETS;-

IDENTITY (as used on label and list)	Note: Blank are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.
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Section I

Manufacturer's Name	Emergency Telephone Number
Address (Number, Street, City, State and ZIP Code)	Telephone Number for Information
	Date Prepared
	Signature of Preparer (optional)

Section II – Hazardous Ingredients/Identity Information

Hazardous Components(Specific chemical identity common name(s)	OSHA PEL	ACGIH TLV	Other limits Recommended	% (OPTIONAL)
None, other than nuisance dust	15 mg/m ³	10 mg/m ³ (total dust)	None	None

Section III – Physical/Chemical Characteristics

Boiling Point	Non-volatile	Specific (H ₂ O =1)	941-965
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Vapor Pressure (mm Hg.)	Non-volatile	Melting Point	Non-volatile
Vapor Density (AIR =1)	Non-volatile	Evaporation Rate (Butyl Acetate=1)	Non-volatile
Solubility in Water-Insoluble.			
Appearance and Odor Translucent, odorless,			

Section IV – Fire and Explosion Hazard Data

Flash Point (Method Used) N/A	Flammable Limits Non-volatile	LEL	LEL
Extinguishing Media Carbon dioxide, water spray, foam or dry chemical.			
Special Fire Fighting Procedures N/A			
Unusual Fire and Explosion Hazards Refer to National Fire Protection Association Bulletin 654, “Dust Explosion Prevention . Plastic Industry 1975”, for safe handling procedures.			

Section V – Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	N/A
Incompatibility (Materials to Avoid) Attacked by oxidizing agents such as nitric or perchloric acid and free halogens. Also softened by hydrocarbons such as benzene, gasoline, lubricating Oils, petroleum ether and by chlorinated hydrocarbons.			
Hazardous Decomposition or Byproducts Burning yields CO and CO ² .			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	N/A

Section VI – Health Hazard Data

Route(s) of Entry Ingestion?	Inhalation N/A	Skin? N/A
N/A		
Health Hazards (Acute and Chronic) No acute hazard.		
Carcinogenicity: OSHA Regulated?	NTP? N/A	IARC Monographs? N/A

N/A
Signs and Symptoms of Exposure
N/A
Medical Conditions Generally Aggravated by exposure
N/A
Emergency and First Aid Procedures
No acute hazard.

Section VII – Precautions for Safe Handling and Use

Steps to be taken in case material is released or spoiled
Sweep up and collect as essentially harmless organic wastes
Waste disposal method
Dispose of in accordance with local ,state and federal regulation
Precaution to be taken in handling and storing
No specific requirement
Other precautions
Self contained breathing apparatus for fire fighting personal is recommended

Section-VIII-Control Measures

Respiratory Protection(specific type)		
Not generally required		
ventilation	Local exhaust N/A	special N/A
	Mechanical N/A	other normal working environment
Protective gloves		eye protection
Not generally		safety glasses recommended
Other protective clothing & equipment		
not generally required		
Work/hygiene practices	N/A	

CASE STUDY REPORT:

ELECTRO DEPOSITIONS SECTION

During Study Work we have visited at Ordnance Factory, Ambajhari, Nagpur.

The Ordnance Factory Govt. of India, Ministry of Defense, Ambajhari, Nagpur is in the production of shells, metallic fuses, propellant, cartridge cases of different shapes and dimension which are required as defense material used with explosive for Rockets, guns, bofors tank etc.

The production includes operations like forging, nuzzling, heat treatment, electroplating, painting, die pressing, version nozzling, lacquering, degreasing, tool handling, casting, pressure die casting & melting of metal.

In Ordnance Factory we have visited to the two sections

1. Safety & environmental Section
2. EDS (electro Deposition Section).

The main objective function of safety & Environmental Management section is to evaluate the level of airborne concentration of carbon, metal fumes, sodium cyanide, sulphuric acid mist, sodium hydroxide mist during forging and prospecting, cyanide and acid alkali mist in painting, solvent vapors during painting operation in various shops.

In Electro Deposition section the function of electroplating, lacquering, painting can be taken out.

A) Electroplating:

In the Electroplating shop both picking & electroplating bath are arranged in two rows. There are 2 baths of sodium Hydroxide (8gm/lit of NaOH at 53° temperature), 2 baths of Sulfuric Acid 15% v/v at 26°

temperature and two baths of cadmium cyanide bath (20 gm/lit Cd+8gm/lit at room temperature).

According to laid down specification, materials of different sizes are picked and placed in different baths. 118 workers are employed in the shop.

Hazards Observed:-

Sulphuric acid-It is extremely corrosive. Mist or vapor can cause severe damage to nose, throat and lungs. Symptoms include: tickling in nose and throat, coughing, difficulty in breathing and tooth erosion. At high concentration fluid accumulates in the lungs and can be fatal. On injection it would cause severe burn of mouth and intestinal tract. On skin contact, liquid causes severe painful burn. Liquid on eye contact causes severe damages.

Safety Majors:-

It was observed that lateral exhaust system provided to the plating tank was kept in working condition. Top ceiling exhaust fans were under renovation. It was also seen that on the sidewalls, the exhaust fans were provided.

It was observed that workers working near sulphuric acid bath were not using personal protective equipments such as acid gas cartridge respirator, safety gloves, safety shoes and safety clothing etc. made of standard quality materials.

B) Lacquering

Within this section, lacquering and painting is carried out with the help of 6 nos. of workers in each shift. Around 200 pieces of TPF are painted in a shift.

This operation is carried out using liquid spray containing turmeric(100 g/lit) and shellac in alcohol(50 g/lit),each operation requires 2 to 4 minutes. Two walls mounted exhaust fans are provided on the front wall of the place of operation.

It was observed that workers were not using any personal protective equipment such as organic solvent cartridge respirator, safety goggles or safety hand gloves.

C) Cartridge:-

There are total 60 workers employed in the cartridge case shop. Bath of zinc cyanide(32gm/lit)+sodium hydroxide(75gm/lit) are used in electrode position section of cartridge case shop for zinc plating of various component of cartridges cases. The cartridge cases are of different size such as 30mm, 125mm, 76.2mm & 73mm etc. Around 100-110 minutes are required for zinc plating of each component of at room temperature.

Before zinc plating, degreasing operation is carried out in alkali bath of 2000litres capacity at 60°C.Operation like cold pickling, degreasing and plating are carried out in this room

Hazards observed:-

1) Sodium hydroxide-

Moderately toxic injection. it is corrosive irritant to skin, eyes and mucous membrane. This material both solid and in solution has a remarkably corrosive action upon all body tissue causing burn and frequently deep ulceration, with ultimate scarring. Mist, vapours and dust of this compound causes small burn and contact with the eyes rapidly cause severe damage to delicate tissue. Injection causes very serious damage to the mucous membranes or other tissue with which contact is made. It can cause

perforation and scarring. Inhalation of dust of of the concentrated mist can cause damage to upper respiratory tract and to lungs tissue depending upon the severity of the exposure.

2) Cyanide:-

Symptoms of cyanide poisoning are caused by chemical asphyxia that is inhabitation of iron dependent enzymes, which takes part in cellular oxidation process. Acute and sub acute symptoms include headache, nausea, vomiting, shortening of breath, irritation of throat, convulsions, respiratory paralysis, coma and death.

Safety majors:-

It was observed that total exposure period of operator was 4 hrs. In a shift. It was seen that practice of manual handling of job cyanide treatment was stopped and the job was taken in and out from the cyanide bath by a crane system. It was also observed that lateral exhaust system was provided to all the cyanide tanks. All the worker should have to provide safety equipment such as hand gloves, safety gobbles proper uniform, gumboot etc.

Various Acts, Rules, Sections:-

The following Acts, Rules And sections are strictly applicable and followed in the O.F., Nagpur

1. The factories Act. 1948 as amended in 1976 and 1987.
2. The Maharashtra Factories Rules 1963 as amended upto 1989.
3. The petroleum Act 1034.
4. The Petroleum Rules 1976.
5. The Gas Cylinder Rules 1981.
6. The Static and Mobile Pressure Vessels (Unfired) Rules 1981.
7. The Indian Explosive act 1884 as amended in 1983.

8. The Explosive Rules 1983.

RECOMMENDATIONS, CONCLUSION & SUGGETIONS

Recommendation:-

(A) DOs and Don'ts in handling acids for safety of the workers.

Do's:

1. Use of rubber hand gloves and gum boots while handling.
2. Use face mask to avoids inhaling of acid vapor as these are highly toxic.
3. Use safety goggle / face guard to protect eyes and face from splashing of acid.
4. Use of correct acid after checking the level.
5. Use HDPE container for handling acid, do not use meal container.
6. Keep acid in to water, not wear in to acid
7. Add acid in water, not water in to acid
8. Empty carboys should thoroughly washed with water before sending out.
9. Spilled acid should be cleaned immediatly with plenty of water.
10. Wash hands thoroughly before taking any edible items.

Don'ts :

1. Do not smoke while handling acid.
2. Do not keep acid container on uneven floor / stand.
3. Do not put water directly on acid.
4. Do not carry carboys on shoulder.
5. Avoid rough handling of acid drum or container.
6. No food, drink, tobacco, pan of any edible items shall be stored or heated or consumed near any part of the acid plants or equipment.

(B) Practice of carne system for dipping job should be maintained while handling cyanide solution, at zinc planting operation in E.D.S. of cartridge case shop.

(C) Lateral exhaust system provided to the tank in electroplating section should be efficiently maintained.

(D) Acid gas cartridge respirator should be provided to operators engaged in carrying out Sulphuric Acid treatment in Electro deposition in shell.

(E) Effective exhaust system should be provided to shot blasting operation in shell.

(F) Polishing job should be segregated at one place under exhaust system.

(G) Standard quality of safety must be used while carrying out forging & nozziling operation for leg protection.

(H) All the workers should be educated & trained regarding the use & maintenance of personal protective equipment. A specially designed training programme may be conducted for supervisor and workers on safe work practices and use of personal protective equipment.³³

Conclusion & Suggestions

1. All the factory Act, Rule, section are applied in strictly manner but even though accidents were happened incidentally in the factory.
2. The reason of the accident happened will be probably due to ignorance of the workman handling the work or involved in the work
3. Some of the times unavailability of some useful safety devices and good such as hand gloves, Goggles, Aprons, gumboot or soap for washing hand after completion of work.
4. Worker can adopted to the environment and they are unable to find out the effects of various poisons gases on their body.
5. Office In charge should strictly inform to check all the components

- of the work and also all necessary safety equipment and devices.
6. Worker should have to follow 5's policies till starting from their work upto completion.
 7. Medical checkup of workers should be carried out at regular interval of time.
 8. Housekeeping near paint booth of spray painting operation of shell machine shop should be improved.
 9. Safety goggles should be used while charring out shell forging and nuzzling operation.
 10. Ear plugs should be provided where noise pollution is higher.

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