

# Hazards and Safety Prevention Techniques in Footwear Manufacturing Sectors –A Special Review

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## Abstract

Footwear are one of the consumer materials and an engineering product, Globally China is the largest footwear production country, and India is the second largest footwear production after China for approximately 9% of the global annual production of 22 million pairs. The footwear production industry having many more working process and machinery utilization that sector is fragmented and close to 75% footwear production in unorganized sector including small scale and medium enterprises. To make the footwear comfortable, durable, to be to protect from injuries or to make it look very attractive different materials are to be used. i.e., leather, fabric, plastic, Rubber, Foam materials, metallic, chemicals, wood. During this production activity at different sections, various Hazards exists which may harm to employee and surrounding if adequate measure not ensured. In this review article in footwear industry with control measure are monitored and required to avoid any untoward incident, thoroughly discussed.

**Keywords:** Leather; Rubber sole; chemical; Hazards safety; Fire; Electrical; Machineries; Training; SOP

## Introduction

Footwear industries plays a major role in the country economy The knowledge and practice of footwear manufacturing involves general processing of closing the upper like skiving edge treatment reinforcement of upper and lining components perforation Gimping sewing and full shoe production activity. Footwear production mostly unorganized small scale and medium scale industry and multinational branded MNC footwear industry also involved for this bulk production process. It require many of the manpower and materials chemical other synthetic materials many other machineries also involved for making one pair of shoe due to this production base it will meet many more technical issues employee hazardous incident production problems and quality issues factors also so this article mainly focused the employer and surrounding Hazardous problems and it will recommended the accident prevention techniques to avoid such type of up normal problems in footwear industry [1]. Robust manufacturing set up and good manufacturing practices is the strength for the quality product and high productivity. It takes time in month years to ensure good manufac

turing practices to build the up a safe working environment and maintain organization reputation. But un incident may destroy all efforts, reputation of the organization including damage of life. Properly and environment at large. Footwear manufacturing process is not easy activity due to different machinery activities and it involves different hazards. Appropriate safety measure may lead to a serious incident may be cause harm to human being as well as to environment due to use of different hazardous chemical. It is moral responsibility of an employer to ensure identification of different hazards and take adequate steps to minimize the risk due to identified in this special review article. It will help to improve the safety prevention control measure in at all levels of workplace and ensure Zero incident in all process activity areas. Hence a review of Hazards and Prevention safety measures required in Footwear industry is essential to control unwanted Hazards.

## Different Workplace Introduction

In Footwear Industry generally different work process department and sections exists for Production plant operations

- a) Raw Material Handling Plant.
- b) Logistics.
- c) Quality control (QIP) implementation.
- d) R and D Research.
- e) Rubber outsole production plant.
- f) Computer stitching section.
- g) Leather store.
- h) Upper Sewing section.
- i) Assembly section.
- j) Full shoe production plant.
- k) Engineering (Boiler, Electrical maintenance, Mechanical maintenance, Water Treatment plant).
- l) Packing and Handling of finished product.
- m) HR and Admin (security, IT, Legal).
- n) Industry worker health centre.

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## 5. Hazards and Safety Measure

There are different Hazards exists in the Footwear production sectors due to different activities is too

- a) Physical Hazards.

- b) Chemical Hazards.
- c) Electrical hazards.
- d) Leather Cutting section Hazards.
- e) Mechanical Hazards.
- f) Fire and explosion Hazards.
- g) Occupational Health Hazards.
- h) Footwear industry all workplace process wise briefly identified hazards and recommended safety and prevention measure techniques explained [3].

### Material Storage Area and Its Hazards Effect

#### Associated Hazards

- a) Collision of vehicles during movement and placement for leather and materials loading, unloading of store materials may cause serious injury to human being and damage to property.
- b) Leather inspection and fall person during inspection of store materials and chemical on lorry or tanker may cause serious injury.
- c) Footwear leather cutting section and upper productivity conveyor power cable or transmission lines may cause shock, electrocution, sometimes cause worst electric fire accident it will lead to human death.
- d) Contact with chemical raw materials may lead to serious human injury.

#### Control and Safety Measure

- a) Parking of vehicle in its designated place under supervision, wheel chokes, Hand break removal of vehicle key must be properly ensured.
- b) Display of warning sign and SOP (Standard operating procedure) provision of Traffic barriers location.
- c) All electrical line installation must have adequate earthing and proper insulation.
- d) Proper traffic routing for vehicle movement.
- e) Chemical transfer hose pipeline must be tied properly to avoid sudden fire accident due to failure of hose.
- f) Organized platform with protective railing and approach must be provided to take sample of chemicals before unloading activity, Ensuring use of safety Helmet and hand gloves.
- g) Adequate illumination must be ensured near the unloading point during night hours [4].
- h) All rotating parts of conveyor must be well guarded, and emergency stop switch must be provided at both ends of production conveyors.

### Goods Logistics Hazards and its Effect in Footwear Industry

- a) Slip and fall of people during inspection of vehicle.
- b) Contact with overhead power transmission cable may be shocked, and electric fire accident.
- c) Collision of vehicles during movement may cause serious injury of human body and it will damage to the industry property.

### Control and Safety Measure

- a) Ensure vehicle in good condition, Driver with valid license and good behavior working condition.
- b) Following all traffic rules and regulations.
- c) Avoid rush and drunken driving by Driver.
- d) Provision of suitable vehicle as per need basis of raw materials.
- e) Inspection vehicle time to time to avoid failure.

### R& D AND QUALITY CONTROL SECTION

#### Hazards and its Damage

- a) Fire and explosion in case of reaction between chemicals.
- b) Busting of autoclave due to over pressurization.
- c) Slip and fall of labour from tanker, truck top during sampling of raw materials.
- d) Skin infection, burn injury, inhalation of toxic gas in laboratory during testing of different raw materials quality.
- e) Electric shock and electrocution due to contact with high voltage electricity [5].

#### 6.5.2.Safety and Prevention Measure

- a) All workplace display of warning sign and SOP.
- b) Chemicals should be handled by trained chemist.
- c) All chemicals should be identified with their name and MSDS sheet.
- d) All gas item of materials should be handled carefully, broken glass items must be removed suddenly.
- e) Use of PPE equipment must be ensured.
- f) Ensure to wash hand before taking food.
- g) Do not take food inside of the laboratory.
- h) Do not switch on or off any electrical equipment with bare hand
- i) Be careful about contact with hot surface and hot water.

j) Compressed gas cylinder should be kept inside the lab. Same should be kept with chain lock under shell. All PRV should be ensured in good operational condition to avoid failure. Autoclave must be examined through competent person in every one-year interval is better.

- k) Do not use any damaged electrical associate materials.
- l) Ensuring adequate earthing and insulation materials in electricity lines.
- m) Switch off electrical supply when not in use.
- n) Do not operate any equipment if you are not trained.
- o) Ensure calibration of all measuring system to avoid work failure and Hazards [6].

### Rubber Outsole Preparation Unit Hazards

- a) Burn injury due to contact with rubber and other chemicals.
- b) Slip fall of person in shop floor may cause serious incident like injury to person.
- c) Shock, electrocution, due to conduct with electricity lines.
- d) Cut, Amputation injury due to contact with rotating parts of outsole making machines.
- e) Slip and fall and collision with structure due to poor illumination.
- f) Noise and vibration due to poor maintenance of machines.
- g) Exposure of rubber dust in workplace areas.
- h) Fire due to Failure of equipment.
- i) Accident during maintenance activity in case of SOP is not followed.
- j) Topping of forklift.
- k) Musculoskeletal injuries due to repetitive movement of body or sitting in a single location for long time.
- l) Fall of rubber materials on body.
- m) Fall of person in Banbury machine and contact with roller of roller machines and cutting machines.
- n) Fire or explosion due to improper handling of sulphur chemicals.
- o) Fall of band formation machine roller on leg while during maintenance or shifting.
- p) Contract with hot surface of the outsole melding machine, Steam [7].
- q) Contact with sharp edge of the trolley.

### Safety and Prevention Techniques

- a) Use of PPE equipment must be ensured.
- b) Be careful about contact with machinery hot surface, display of warning sign at all level of work place.
- c) Compressed gas cylinders should not be kept inside the laboratory kept with chain lock under shed.
- d) All PRV should be ensured in good operational condition to avoid accident and failure.
- e) All chemicals should be identified with their specific name along with MSDS sheet.
- f) Sulphur should be handled with care and ensure display off warning signs.
- g) Ensure of flame proof equipment in sulphur handling area, and safety precaution should be followed to avoid fire accident.
- h) Do not switch on or off any electrical equipments with bare hand location.
- i) Do not use any damaged electrical associate materials, switch off supply not in use.
- j) Ensure proper earthings and insulation.
- k) Don't operate any equipment or any machines if you are not trained.
- l) Ensure calibration of all measuring systems to avoid work failure.
- m) Use right tools and equipment for different process, ensure use of non-sparking tools.
- n) All low, high-level alarms in the machine must be maintained in good functional condition.
- o) Display of SOP indication all workplaces.
- p) Trained housekeeping, fire prevention and protection measures must be ensured.
- q) Inspection machines, Trolleys, pallet and Forklift must be ensured with proper maintenance.
- r) Ensure PPE, Nose Mask and provision of dust extraction systems.
- s) Regular health check of workforce working near rubber dust generation area.
- t) Trained work supervisor and safety engineer should be ensured in the outsole unit [8].

### Leather Cutting Section Hazards in Footwear Production

- a) Slip falls of person in leather store and it will cause serious injury like fracture, dislocation, sprain, Fatal.

- b) Burn injury due to conduct hot surface and steam, electric shock in leather cutting machines.
- c) Cut, amputation injury from leather splitting machine.
- d) Slip and fall collision with structure due to poor illuminations.
- e) Noise and vibration from poor maintained of cutting machines.
- f) Exposure to leather dust.
- g) Fire due to overheating of equipments.
- h) Accident during maintenance activity in case of SOP not followed.
- i) Toppling of Forklift.
- j) Musculoskeletal injuries due to repetitive movements of body or sitting in a single location for long time.
- k) Suffocation due to lack of ventilation in cutting section.
- l) Fall of leather materials on body and conduct with cutting machines.
- m) Conduct with sharp edge of the hand trolley.

### Safety And Prevention Measures

- a) Use of PPE must be ensured.
- b) Be careful about contact with hot surface and display warning signs.
- c) Do not switch on or off any electrical equipments with bare hand.
- d) Ensure proper earth and insulation in cutting machines.
- e) Do not operate any machine without trained cutting operator.
- f) No open flame source, no spark, no mobile, no photography in the area of operation must be maintained in good condition.
- g) Ensure trained housekeeping person in leather cutting section.
- h) Fire prevention, protection measure, proper inspection machines, trolley, pallet Forklift must be ensured to avoid any mishap.
- i) Cutting section workplace properly designed.
- j) Display of all SOPs related to plant operation, shutdown and emergency shutdown must ensure and communicated to all relevant persons in the section engaged for plant operation.
- k) Ensure PPE equipment and nose mask and provision of dust extraction systems.

### Upper Closing and Stitching Section Hazards

- a) Burn injury due to upper cut component burning machines.
- b) Slip fall of operator in shop floor may cause serious incident like fracture, dislocation, Fatal, sprain etc.
- c) Electricity shocking, noise vibration due to poor machine maintenance.
- d) Exposure to rubber and leather dust.
- e) Accident during maintenance activity in case of SOPs not followed.
- f) Failure of lifting tools, tackles, lifting machines may cause serious injury loss to property.
- g) Toppling for Forklift and suffocation due to lack of ventilation.
- h) Without needle guard sewing machine it will cause serious injury to the stitcher.
- i) Conduct sharp edges of the hand trolley.
- j) Exposure to different chemicals like adhesives, toluene.
- k) Skiving machine, Embossing machines, upper component fusing machines, will lead to serious incident in upper section.

### Safety and Prevention Measures

#### Use of PPEs Must be ensured

- a) Display of SOPs and warnings signs at all levels of assembly section.
- b) Do not switch on or off any electrical equipments with bare hand.
- c) Ensure safety sewing machine needle guard for necessary machines.
- d) Do not used any damaged electrical equipment's.
- e) Switch off electrical supply when not in use.
- f) Do not operate any machine if you are not trained.
- g) Ensure calibration of all measuring systems to avoid failure.
- h) Use right tools and equipments for different activity.
- i) Alarm systems and fire prevention and protective measure must be ensured.
- j) Inspection machines, Trolleys, must be ensured frequently avoid any mishap.
- k) Safe handling adhesives and toluene, precaution to avoid eye injuries by wearing safety glass.
- l) Display of MSDS, Safety signs for creating awareness in upper closing section.

### Engineering Hazards

- a) Shock, electrocution, Fatal due to conduct with electricity.
- b) Burn injury due to contact hot water, steam, chemicals.
- c) Slip fall of person in floor may be serious incident due to poor illumination.
- d) Amputation injury due to contact with rotating parts of machinery.
- e) Incident in case of failure to strict work permit system requirements during maintenance work.

#### Accident Preventing Measure

- a) Use PPEs equipments must be ensured (Safety shoe, Helmet, Cotton hand gloves, leather apron, safety goggles etc).
- b) Be careful about contact with hot surface and hot water.
- c) Do not use damaged electrical materials.
- d) Switch off electrical supply when not in use.
- e) Do not operate any machine if you are not trained.
- f) Use right tools and equipments for different activity.
- g) Ensure work permit and adequate isolation before start of any critical routine and non -routine maintenance job.
- h) Replacement of damaged /defective equipments.
- i) Calibration of all measuring systems.
- j) Ensuring proper housekeeping to avoid fall hazards.
- k) Do maintain of any work after releasing load or stored energy.
- l) Proper keeping compressed gas cylinder.
- m) Diversion of smoke to atmosphere through stack.
- n) Examination of PRV, Pressure vessel, lifting tools, tackles through competent person.
- o) Proper colour coding of pipelines.
- p) Participation in onsite emergency plan and mock drill.
- q) Ensure monitoring of oxygen level and other toxic gas if any in confined space.

#### Packing Department or Finished Goods Section Hazards

- a) Slip fall of person in floor may cause serious hazards.
- b) Shock, electrocution, Fatal due to contact with electric transmission lines.
- c) Packing machinery rotating parts machines injury.
- d) Fall of finished materials, hitting trolley, cut injury due to conduct with sharp of different packing materials.

- e) Exposure to leather and rubber dust while finishing of shoe.
- f) Topping of forklift may cause injury.
- g) Improper keeping items may cause injury during movement of workforce.
- h) Exposure to different chemicals and polish.
- i) Suffocation due to poor ventilations in shop floor may cause occupational health issues.

#### Control And Preventing Techniques

- a) Use of PPEs equipments must be ensured at all levels of packing areas.
- b) Do not switch on or off any electrical equipments with bare hand.
- c) Ensure work permit and adequate isolation before start of any critical routine and non –routine maintenance job.
- d) Training to workforce, display of safety instruction boards.
- e) Proper housekeeping and hygiene practices.
- f) Ensure fire production, provision of smoke detectors and alarms in packing division.
- g) All packing machines must be properly maintained in well condition with safety systems.
- h) SOPs for different machine operation to be displayed and communicate to all relevant workers.
- i) Smoke detector must be installed, and immediate waste disposal system must be en.
- j) Emergency power supply must be provided in all packing sections.
- k) Do not operate any machine if found in over heating condition.
- l) All machines safety system must be checked regularly to avoid worst incident.
- m) Adequate seating arrangements and designing work sequences to reduce the musculoskeletal issues.
- n) Health check-up of employees and ensure emergency exit way [9].
- o) Provision of adequate illumination to avoid eye strain.
- p) Marking movements areas on floor and fixing of emergency route direction lights.

#### Administration Areas Hazards

- a) Slip fall of person in shop floor may cause falling injuries.

- b) Electric shock, cut injury due to contract with broken glass.
- c) Fire due to overheating of electrical systems, AC Machines, printer, xerox, micro woven in office cabinet.
- d) Fire in LPG facility inside the canteen area.
- e) Insect bite during Gardening regular activity.
- f) Injury due to public unrest.

#### Control Measures

- a) Safety instruction to workforce.
- b) Proper housekeeping.
- c) No work to be carried out without valid work permit.
- d) Display of SOPs, road safety signs and safety poster.
- e) Ensuring electrical safety measures.
- f) Fire protection systems, proper maintenance, adequate illumination, proper electrical installation ensured.
- g) Switching of AC Machines, xerox machines, printers' lights when not required.
- h) Trained official employees, provision of PPE gardening activity must be ensured.
- i) Proper official maintenance of fire protection systems.

#### Environmental, Health, Safety and Fire Issues

- a) Hand /finger cut, amputation, blunt injury.
- b) Collision of vehicles, road accidents.
- c) Slip fall hazards, busting of fire extinguishers during hydrotest.
- d) Exposure to smoke and fire during firefighting.
- e) Exposure to ammonia and corrosive chemicals during handling emergency in case of leakage.
- f) Exposure of Hazards waste.

#### Control Technical Measures

### Conclusion

Safety is basic need due to moral, legal and economical aspects in any industry productivity. It is the moral responsibility of employer to safe guard their favorable asset. To ensure successful footwear plant operation involvement of different well-trained technical staffs, equipments, machinery, proper maintenance with broadly formulated and important procedure should be adopted. Industry hazards identification and control measure techniques is a valuable tool for avoid incident in footwear industry.

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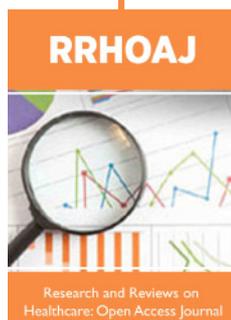
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