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THE STUDY OF GENERAL MAINTENANCE AND SAFETY PRACTICES IN INDUSTRIES OF KERALA

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Abstract

Lots of accidents occur in industries mainly due to lack of safety awareness. Accidents also occurs due to unsafe operation practices, lack of supervision etc. Maintenance practices as prescribed should be strictly imparted otherwise safety may be imparted. Safety effort helps in improving production costs and quality. Compensation and medical payment, damaged equipment and products, and production delays resulting from accidents all subtract directly from profits. The gains resulting from good safety effort are good community relations, lower employee turnover and absenteeism, better employee morale and steadier work. There are many methods by which safety of the industries can be improved. Safety rules have to be enforced, safe working conditions should be developed and workers should be trained for preventing accidents and improving safety.

Keywords: Safety, Hazard, Maintenance, Training, Safety Rules.

1. INTRODUCTION

Maintenance practices should be strictly compiled with otherwise safety may be impaired. There are lots of accidents occurring in industries due to lack of safety awareness. Men fall from ladder, operates their machines without a guard, drop objects on their toes, cuts their hands because of misuse of tools. These are the results of unsafe acts due to lack of knowledge about safety practices.

The supervisor has to understand that safety is a practice of good management, the safety effort help in improving production costs and quality.

Compensation and medical payment, damaged equipment and products, and production delay resulting from accidents all subtract directly from profits. The gains resulting from good safety effort are good community relations, lower employee turnover and absenteeism, better employee morale and steadier work.

Good results in accident prevention can be achieved by following some points in their safety program namely (I) Development of safe working condition, (ii) Creation of safe work habits on a personalized basis, (iii) promotion of employees participation in safety, (iv) Corrective action when safety rules are ignored, (v) Carry out maintenance when it is due and (vi) Maintain charts near each machine indicating when actions like lubrication, greasing, checking and testing are due and whether these have been actually carried out.

To prevent accidents, safety rules have to be enforced, safe working conditions should be developed and worker should be given necessary training to do the job safely.

Any safety program will be ineffective if any attempts are made to control accidents without first creating a proper safety philosophy, teaching safety principles, and eliminating misconceptions about the cause of accidents.

Safety Engineers, Supervisors and workers must believe that accidents are caused and they can be prevented.

2. LITERATURE REVIEW

Every organization or group of people requires a set of rules for the proper regulation, safety and protection of the individual who make up the group. The rule should be according to the need and should not cause any inconvenience to the employees.

The supervisor has to understand that safety is a practice of good management, the safety effort help in improving production costs and quality.

Maintenance and safety awareness can be developed by having meetings, posters, safety booklets, films, special classrooms sessions and lectures by experts or safety specialists. It requires great need for personalized safety training which permits the conversion of safety generalities into specific safe practices that apply to a specific job and to the individual doing the job.

Compensation and medical payment, damaged equipment and products, and production delay resulting from accidents all subtract directly from profits. The gains resulting from good safety effort are good community relations, lower employee turnover and absenteeism, better employee morale and steadier work.

Safety Engineers, Supervisors and workers must believe that accidents are caused and they can be prevented.

3. OBJECTIVE OF STUDY

The present study is aimed to
(a).To understand Present Status of Safety
(b).Improve safety of Industries

4. METHODOLOGY OF STUDY

In the present study, an extensive use of secondary data was made. The study was made descriptive.

5. MAJOR FINDINGS OF THE STUDY

An intensive study is conducted to overcome accidents and improve safety in industries. Some of the methods which will reduce accidents and improves safety are:

i) Maintenance and Safety Training: Maintenance and safety awareness can be developed by having meetings, posters, safety booklets, films, special classrooms sessions and lectures by experts or safety specialists. It requires great need for personalized safety training which permits the conversion of safety generalities into specific safe practices that apply to a specific job and to the individual doing the job. Personalized safety training permits consideration of the workers rate of learning, his interest, his natural ability and his limitations. In launching a personalized safety training program, the first step is preparation of job- methods improvement, elimination of bottle necks and improved plant layouts. In making job-hazard analysis the following should be considered namely job descriptions, job allocations, key job steps, tools used, potential health and injury hazards, safe practices, apparel and equipment. Personalized safety training helps in workers attitude towards their jobs. This approach stresses work habits required for safe job performance.

(ii) Hazard Check: In a machine shop the main hazard checks are as follows

(a). Housekeeping: Stocks should be properly piled, floor should not be slippery and work area should be orderly.

(b). Machine hazards: Guard should be provided to machines. This should include gears, sprockets, chains, bolts, shafting etc.

(c). Fire hazards: Firefighting appliances and fire exits should be ready for immediate use. Inflammable material should be properly handled and stored.

(d). Protective equipment: The protective equipment's like goggles, respirators, safety caps and other safety equipment's should be worn as required. Jewellery rings and wrist watches are a source of danger around moving machinery.

(e) Electrical equipment's: The condition of electrical switches, outlets, light chords and ground wires should be proper.

(f). Tools: The required tools for each job should be properly placed and it should not be defective.

(g). General conditions: Equipment's required for repair like ladders, stairs, guards and other equipment's should be readily available. There should not be any sharp objects like nails on the floor. Fluids should not be spilled on the floor.

(ii) General Safety Rules: Every organization or group of people requires a set of rules for the proper regulation, safety and protection of the individual who make up the group. The rule should be according to the need and should not cause any inconvenience to the employees. The rule should keep pace with changing condition and there should not be too many safety rules. Smoking should be strictly prohibited. Personnel protective equipment such as safety glasses, respirators gloves etc. should be used. Safety devices and guards should be used. Maintain good housekeeping. Prompt first-aid attention should be obtained for any injury, no matter how slight, in order to prevent the infection from developing. Proper dress should be worn and employees should never operate any equipment, unless authorized.

(iii) Human factors in machine maintenance: High percentage of accidents result from a combination of unsafe acts and unsafe conditions. Many operator errors leading to accidents have been triggered by faulty design or machine tools being handled, poor house-keeping, operating practices that created hazards, or lack of standardization and identification which so confuses the operator that he is literally trapped into making mistakes. Safe operation of any machine tool requires that the operator learns about any hazards that exist so that he can protect himself from them. Operator should be alert when working on the machine. Being tired, sick, or emotionally upset is dangerous when operating machine. The safety engineers should consider the following safety points namely.

(a). Factors creating unsafe conditions in operation.

(b). Possibilities of eliminating or isolating hazards with a guard, shield, ventilation equipment.

(c). Identify the hazard area by using warning signs or barriers etc.

(d).To overcome danger to operator provide emergency electrical controls, foot switches, exhaust fans, spray guns etc. should be used.

(e). Operator should be trained about unsafe conditions that would be created if the proper operating sequence were not followed. The operators should look for opportunities to suggest design changes, re-arrangement of equipment, or other steps that might be taken to assure proper sequence of operation.

(f).Standardization has an important bearing in the development of safe working conditions and safe work habits.

(g).Job training should be intensified.

(iv). Industrial Noise: The increased use of power and high speed equipment has increased noise levels in recent years. High noise levels have annoying and unpleasing effects and many account for some accidents through inference with hearing instructions and warning signals. The need for reducing noise to assure worker's safety, comfort and attention, is catching the attention of employers due to competition for the better employees and the financial liability associated with hearing loss claims.

In order to tackle the noise problem, there are three possible steps that can be taken

(a) Reduce noise level

(b) If reduction is not possible then isolate noise source

(c) If both mentioned above are not possible then use personal protective equipment such as ear plugs or muffs.

(v). Fire protection: For preventing fires and keeping them small, it is essential to have knowledge of the various classes of fires and the various fire-fighting equipment's suitable for each class. A volunteer fire-fighting team should be trained on the use of firefighting extinguishers. The success of the fire prevention program depends much on good house- keeping, maintenance of fire-fighting equipment, the enforcement of rules like "No Smoking" and the segregation and reduction of combustible materials. In order to keep the ignition sources at a minimum, it is essential to have the proper teaming of maintenance program and the use of equipment of a safer design. A productive approach to fire prevention is to keep the accumulation of combustible materials at a minimum, so that once the fire starts, the loss will be minimized because it will be easy to get the fire. It is very important to follow the practices of good house- keeping like avoiding oil deposits on machines, rubbish and waste under benches and corners, inflammable packing materials, open containers or inflammable solvents etc. For all practical purposes the basic type of fires can be grouped into four classes namely.

(a). Class A fires: Fires involving combustible materials of organic nature such as wood, paper, rubber and many plastics etc., where cooling effect of water is essential for extinction of fire. Water expelling type of extinguishers is recommended.

(b). Class B fires: Fires involving flammable liquids, petroleum products etc where blanking effect is necessary. Foam, dry powder, vaporizing liquid carbon dioxide, extinguishers is recommended.

(c). Class C fires: Fires involving flammable gases under pressure including liquefied bases, where it is necessary to inhibit the burning gas at fast rate with an inert gas, powder or vaporizing liquid for extinguishment. Extinguishers designed for expelling special dry chemical powder are recommended.

(d). Fires involving combustible metals such as magnesium, aluminum, zinc, sodium, potassium when burning metals are reactive to water and water-containing agents and in certain cases to carbon dioxide, halogenated hydrocarbons and ordinary dry powders. These fires require special media and techniques to extinguish.

Where energized electrical equipment is involved in fire, the non-conductivity of the fire extinguishing media is of utmost importance and only extinguisher expelling dry powder or carbon dioxide (without metal horn) or halogen should be used. Once the electrical equipment is de-energized extinguisher suitable for class A, B and C fires may also be used safely. Where the cleanliness and contamination of sensitive electrical equipment are of importance, only carbon dioxide type and halogen type should be used. Use of foam type is not suitable for alcohol and other water miscible flammable liquids. Dry powder type should be used for dealing with such fires.

(vi). Inspection and testing of all extinguishers in respect of mechanical parts, extinguishing media and expelling means should be carried out by trained personnel at frequent intervals but at least once in a month, to make sure that these are in proper conditions and have not been accidently discharged or have lost pressure or suffered damage. At least once in a year, a thorough inspection and maintenance of extinguisher, including chemical charge inside and expellant should be carried out by trained personnel. Any extinguisher showing corrosion or damage and corroded parts should be replaced by correct components. Illegible labels should be replaced.

(v). Accident Prevention: Industrial safety is the situation which is free from danger or risk. With the rapid advances in industrial processes newer types of dangers to life, limb and health are being increasingly introduced. In industry exposure to risk involves either man, material or machine or any combination of these three and is reflected as unexpected or unforeseen occurrence that interrupts an activity. The loss due to accidents is colloidal in the form of pain, loss of life, earning capacity. The pain and suffering of the injured as well as the emotional loss to the victim of the fatalities and accidents causing disfigurement or disabilities are impossible to be summed up or evaluated. Accident prevention must be taken seriously in industry either on money loss basis or on humanitarian ground. Job safety analysis, Plant safety inspection and analysis of accidents should be done.

(vi). Guarding of machines: No safety procedure is complete or satisfactory if does not provide for the guarding of machines, the provision of safe tools, adequate light ventilation and sanitation, and for the correction or elimination of other mechanical and physical hazards. In machines, the hazards to the operators arise from the unguarded points of operation such as punch and die of press, cutting edge of shear press, and from belts and pulleys, gears, projecting parts, shaft ends, clutches and other moving parts. The machine should therefore preferably be designed so as to facilitate guarding and the guards should be incorporated as an integral part of the entire unit. The basic objective of machine safeguarding is to prevent personnel from coming in contact with any revolving or moving machine parts such as belts, chains, pulleys, gears, flywheels, shafts and spindles and any working part of the machine which creates a shearing or crushing action or may tangle the worker. The purpose of guarding point of operation is to prevent injury to the operator at the part of machine where the work of shaping, forming, shearing, squeezing, drawing etc. or manipulating of stock in any other way, is actually done.

(vii). Safe machine design: The following are the principles of safe machine design

(a). Dangerous moving parts should be enclosed.

(b). Parts subject to wear, adjustment and hand lubrication should be conveniently accessible.

(c). Lubrication should be automatic and continuous when machine is in operation.

(d). Consideration should be given to individual drives so that hazards due to driving mechanism may be minimized.
(e). Sharp contrast between light and shadow and glare in the vicinity of the point of operation should be avoided.
(f). wherever possible, materials should be conveyed mechanically.
(g). Provision should be made for automatically conveying dusts and gases away from the machine.
(h). Noise should be eliminated or reduced to the minimum.
(i). Vibration should be minimized.
(j). Exterior shapes of any parts of the machines that require frequent handling or contacting should be such as to facilitate convenience in handling and corners generally rounded.
(k). Point of operation should be guarded.
(l). Consideration should be given to safe location or isolation of machines that can't be made safe otherwise.
(m). Where ever possible individual motor drive should be employed.
(n). Prime mover and transmission mechanism should be guarded properly.
(o). Screen of substantial fireproof material should be installed where hot chips are likely to fall as in the case of shaper.
(viii). General Precautions for safety on powered machines:
(a). A full understanding of the nature of all risks involved in the operation of a particular machine is essential.
(b). The correct setting up of machine and securing of all nuts, fixing bolts and clamps necessary for the safe operation of the machine and the firm holding of the work are also essential.
(c). The use and correct adjustment of all guards is necessary for safe operation of the machine. Defects and omission if noticed should be reported immediately. No attempts should be made to work a machine unless all guards are correctly positioned and functioning properly.
(d). No loose or flapping clothes, finger rings or gloves should be worn in close proximity to moving machinery.
(e). No tools should be left on the way of movement of slides, rams, carriage etc.
(f). Work holding methods should be reviewed before making cut. Fastening of the vise to the work table should be checked properly.
(ix). Precautions to be taken by operators for safe working:
(a). Drilling machine: The spindle, chucks and as much of tools as possible should be guarded. It should be ensured that all set-screws are recessed. No neck ties, loose or flapping clothes, long hair style or finger rings should be allowed. Spindles or chucks should be stopped by hand only after machine is switched off. The work should be properly clamped. One should never attempt to hold work by hand while drilling. If work slips from clamp, the machine should be stopped. Properly sharpened drills should be used and it should be ensured that they are running true to avoid broken or splintered drills. Correct speed should be selected and drill should be never forced or fed too fast. If drill stops in work, machine should be stopped and drill started by hand.
(b). Power presses: In order to avoid trap between tool and die, fencing should be secured and access to the danger zone should be out of reach of personnel. Guards should be kept in position whenever the press is under power, whether it is for production or for after setting up. In order to avoid trap between ram and part guard, care should be taken that guards are not so constructed that a trap exists between the ram or any projections on it and the guard itself. Improper functioning of the interlocks should be immediately reported.
(c). Grinding Machines: In order to avoid chattering of the wheel it should be tested correctly, mounted at the right tension and run at prescribed speed. If wheel chatters or vibrates, it should be stopped. The face of the wheel should be flat and under grooved. The face should be dressed with proper tool. Even pressure should be applied as the tool is moved smoothly across the face of the wheel. To avoid contact with the wheel or trapping between the wheel and the machine casting, the tool rest should be correctly set. Wheel should never be allowed to run when not in use nor left unattended during the run down period after switching. Eye protection that is fixed vision type guard rigidly attached above the wheel itself and goggles/ spectacles should always be used.
(d). Milling Machines: It should be ensured that the cutter is sharp and in good condition. Guard should also be in good condition and correctly adjusted. Setting of work should not be done in close proximity to cutter. The chips of metal should be removed by brush.
(e). Lathes: Machine power should not be used for putting on or removing the chuck or face plate. Work should be properly clamped. No attempts should be made to adjust the tools or for measurement when the machine is running. Gear should never be changed when the machine is running. Strips of sand should not be used for polishing work in lathes. Wrench or the other tool from the chuck should be removed before switching on the machine. Adequate clearance should be checked for and ways kept clear of materials and tools.
(f). Shaping Machines: Properly secure in position the ram, tool head, vice, work and table support, clamping screws before starting machine; always check that the adjusting nuts are tight after setting the stroke length and position. Do not reach over or cross a machine whilst it is under power. Do not attempt to remove metal shearing or chips while the machine is moving and stand to the side of the ram, not in front of it.
(x). Precautions in maintenance work: Maintenance work sometimes has to be done in confined spaces such as chambers, tanks, vats, flues etc., where there is a risk of workmen being confronted by fumes or by lack of oxygen for respiration. In such conditions following precautions should be taken namely adequate means of moving out through bigger manholes, provision of breathing apparatus for persons entering unsafe spaces with a safety belt and line held by a person keeping watch outside, deposits likely to give off fumes should be removed if

space has been blocked off from the surface of fume and no work in the furnace or flues be allowed until the space is sufficiently cool to work safely. Effective measures have to be taken to prevent the crane from approaching the area where men are working. Another frequent source of accidents is explosion during hot repairs of the fuel tanks. No welding should be allowed on tanks that have carried inflammable liquid or gas until all substance and fumes are removed to make it non-explosive. Workers who work in welding, cutting, turning, casting, grinding machines etc. should be provided goggles or screens.

(xi). Safety in material handling and storage: Material handling is the preparation, placing and positioning of materials to facilitate their movement or storage. In most industries, the handling of materials, articles and equipment is one of the main sources of injuries. Every type of material and article handled in a factory must be studied in detail and consideration given to factors such as the weights handled, character of materials or articles, size weight, rate of handling, distance moved, the purpose of moving or handling etc., and suitable methods of handling decided upon. Most commonly used material handling equipment's in industries are hoisting apparatus, overhead traveling cranes, mechanical shoves, conveyors, elevators & escalators, chutes, rollers & sliders, hand trucks etc. Unsafe manual handling should be avoided. Use suitable lifting equipment for specific job. Materials should be stored in proper place.

(xii).Mechanical handling: Cranes, Hoists and lifting tackles: The factory deals with the safety requirements in respect of hoists, lifts, lifting machines, chains, ropes and lifting tackles and requires that these should be of good construction, sound material and of adequate strength. These are to be properly maintained and thoroughly examined by a competent person at least once in every period of six months, in the case of hoists and lifts and 12months in the case of the others.

(a). Hoists and lifts: Every hoist or lift shall have the safe working load plainly marked on it and no load far greater that such load should be carried on it. The cage of every hoists or lift used for carrying persons should be fitted with a gate on each side from which access is afforded to a landing and such gates should be fitted with inter-locking or other efficient devices to ensure that they cannot be opened except when the cage is at the landing and the cage cannot be moved unless all the gates are closed. Whenever the cage is supported by rope or chain there shall be at least two ropes or chains separately connected with the cage and balance weight and each rope or chain with its attachment should be capable of carrying the whole weight of the cage together with the maximum load. Further, efficient devices should be provided and maintained capable of supporting the cage together with its maximum load in the event of breakage of the ropes, chains or attachments. There should be efficient automatic devices to prevent the cage from over-running.

(b). overhead traveling cranes: In the use of overhead cranes, great care be given to the provision of safe and adequate means of access. It is necessary that all ladders and stops should be provided with secure hand-holds and foot-holds. Stairways are preferable to ladders. Proper landing or stages should be provided at the point of transfer from ladder to the driver's cabin. While any person is employed or is working on or near the wheel track of a traveling crane in any place where he would be liable to be struck of the crane, effective measures shall be taken to ensure that the crane does not approach within 6 meters of that place. In some factories, no action is taken to eliminate the possibilities of injury to any person on or near this wheel track of an overhead crane. And in some factories steps taken are totally inadequate. Effective means should be arranged to prevent a crane from traveling into the dangerous zone, should the driver suffer from a lapse of memory.

(c). Jib Cranes: It is stationary or mobile crane in which suspension rope is supported by a projecting, horizontal or inclined member known as jib. It is important that capacity marking for jib cranes clearly showing the maximum safe working load for the various inclinations of the jibs or various positions of the trolley on a horizontal jib should be marked on the sides of the jib or on the mast or on the pillars. A number of accidents have occurred due to overloading of jib cranes particularly with the mobile type resulting into overturning of the cranes. It is recommended that the jib cranes should be fitting with automatic indicators which will give sufficient sound signal whenever the load being moved is in excess of the safe working hand.

(d). Lifting tackles: According to the factories act rules, no lifting machines, chains, ropes and lift tackles should be taken into use unless it has been tested and all parts have been thoroughly examined by a competent person and a certificate of such test and examination specifying the safe working load or loads is kept. Also no lifting machines, chains, ropes and lifting tackles should be, except for the purpose of testing, loaded beyond the safe working load. The safe working load shall be plainly marked on each such gear together with an identification mark and corresponding entries made in a register. Wherever these cannot be marked, a table showing the safe working loads of every kind and size of lifting machines, chain rope or lifting tackle in use should be displayed in prominent positions. Many accidents have occurred in the factories through failure of lifting tackles and some of these accidents could have been avoided if the users had possessed more intimate knowledge of the strength of the lifting tackles and the proper method of using them By lifting tackles we mean, fiber rope slings, wire rope slings, chain sling, books, rings, shackles.

(e). Power Trucks: Power trucks usually operate on storage batteries or internal combustion engines and are extensively used in factories for handling of materials to and from machines and on through to ware-house or loading platforms. These trucks are of many types, such as fixed platforms, elevating type of platform is inserted under the skid elevated to lift it from the floor and the truck carries it to some other point. The forklift truck makes the lift by means of a two prong form instead of a

platform and lifts the load up from the floor permitted in high piling to conserve space. They could also be fitted with special attachments for handling barrels, paper reels etc. The capacity of truck should be marked and never over load it. Avoid jerking and guard should be provided so that object does not fall on the operator.

(f). Conveyers: Various types of conveyers and monorail systems are used in many industries to eliminate manual labor to expedite the movement of materials and also to facilitate the processing or assembling. Belt Conveyors are widely used and they are of flat or troughed type and can be horizontal or inclined. They are used for handling almost all the materials of modern industry including coal, coke, grains and building materials such as sand and gravel. Conveyors shall be so constructed and installed to avoid hazardous points between moving and stationary parts or objects. Where workers have to cross over conveyers, regular crossing facilities affording safe passage and adequate lighting shall be provided. Conveyers shall be provided with automatic and continuous lubrication system or with lubricating facilities so arranged that oiling and greasing can be performed without the oiler coming into dangerous proximity of the moving parts. When two or more conveyers are operated together, the controlling device shall be so designed that no conveyor can feed on to a stopped conveyor. Workers should not ride on conveyors.

(xii).Handling of dangerous substance: Dangerous substance should be handled and stored under the supervision of competent person who is familiar with the risk. In case of doubt as to the nature of the risk or the precautions to be taken, the necessary instructions should be obtained from the competent person. Workers who handle dangerous substance should be given adequate information concerning the risk involved and special precautions to be observed in handling them. When highly flammable material is being handled, special measures should be taken to ensure that an incipient fire can be controlled immediately. Where necessary, non-sparking tools should be provided and used in explosive atmosphere. Where corrosive substance are handled or stored, special precautions should be taken to prevent damage to the containers and to render any spillage harmless. Workers handling harmful substance should thoroughly wash the hand and face with soap before taking any food or drink.

Other factors to be considered are condition of floor, color of floor, lighting, obstructions and ladders.

(xiii): Safety in Electrical works: Use gloves while handling live lines. All voltages should be handled properly and safely. Adequate protective equipment must be used when working on live circuit. Fuses of proper amperage should be used. Only non- conductive ladders should be used by electrical workers. Keep the area around the electrical equipment dry to minimize possibility of shock. All electrical equipment should be properly earthed. Be sure the circuit breaker is open before attempting to remove draw out type circuit breaker from their voltage. Ground should be clamped to pole ground wires. Inspect all electrical extensions before placing in service. Ground all electrical power tools. Use only 24V for hand lamps. Do not make loose connections. While working with portable tools, check for worn out wires, loose connections or broken plug.

6. CONCLUSION

Maintenance practices should be strictly compiled with otherwise safety may be impaired. There are lots of accidents occurring in industries due to lack of safety awareness. The supervisor has to understand that safety is a practice of good management, the safety effort help in improving production costs and quality. To prevent accidents, safety rules have to be enforced, safe working conditions should be developed and worker should be given necessary training to do the job safely. Any safety program will be ineffective if any attempts are made to control accidents without first creating a proper safety philosophy, teaching safety principles, and eliminating misconceptions about the cause of accidents.

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