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ERGONOMICS - AN AID TO SAFETY, HEALTH AND PRODUCTIVITY AT WORK

DR.S.K.SENSARMA

INTRODUCTION

The study of Ergonomics dates back to the beginning of the current century when F.W. Taylor, a Mechanical Engineer made the first application of the subject on the design of shovels in order to improve productivity. He, however, did not take into account the human factor which was involved in the productivity. Although the approach was not quite scientific, it nevertheless created some vague ideas about Ergonomics and the related management development.

In 1910, Gilbreths (Mr. Gilbreth, an Engineer and his wife, a Psychologist) carried out some systematic observations of work, time and motion. They are regarded the 'parents' of Ergonomics.

What is ergonomics?

Ergonomics may be defined as the science of 'man at work'- fitting the job to the man. It is concerned with the knowledge from basic sciences such as 'Physiology', 'Anatomy' and 'Psychology' about limitations and capabilities of human-beings and integrating this knowledge with information from applied studies such as engineering and management studies in the interest of matching task demands with human limitations. The word "Ergonomics" has been coined from the Greek roots - ERGON (work) and NOMOS (law, rule) and is a corpus of scientific and technical knowledge related to man and his work and also environment. This knowledge can be applied in the work sites to achieve a higher standard of reciprocal adaptation between man and his work -both humanitarian and economic ends.

In 1961, the International Labour Review defined ergonomics as "the application of the human biological sciences in conjunction with the engineering sciences to achieve the optimum mutual adjustment of man and his work, the benefits being measured in terms of human efficiency and well being". This mutual adaptation reduces stress, lightens the workload and increases safety; equipment and plant are used more efficiently and their reliability is improved.

Ergonomics - a multi-disciplinary approach :

Ergonomics may be considered as the meeting point of variety of disciplines such as 'Anthropometry and Biomechanics', 'Occupational Physiology' (Work Physiology and Environmental Physiology), 'Occupational Health', 'Work Planning', 'Operational Research', 'Engineering Psychology' and 'Cybernetics'.

The study of individual problems and the overall analysis of specific situations contributed to the enlargement of knowledge in each discipline; however, it is primarily in the design of improved work posts, methods and equipment that ergonomics makes itself felt as an independent and integrated discipline. This necessitates collaboration between the 'Research Worker' and the Technician, and specialist use of observation, measurement, recording and testing equipment. Thus, the Ergonomist forms part of a multi-disciplinary Ergonomic - team.

The disciplines which feed information directly to Ergonomics are cited below :

Anthropometry and Bio-mechanics :

Anthropometry and bio-mechanics are the disciplines that establish the principles and standards for the design of equipment, workspace and motion pattern for different operations to bring them into harmony with the size, shape, mobility and structure of the human body. The aim is to enable a man to exert the greatest force with highest precision speed and safety and with the least-effort.

Work Physiology :

Work Physiology is the discipline that analyses the responses of the human organism to physical activity and to the different stresses occurring during work. It measures the physiological cost of different work methods to determine how work should be performed with the least energy expenditure and with least fatigue.

Environmental Physiology :

Environmental Physiology is the study of interaction of the living organism with physical factors of the environment, such as climate, noise and vibration, light, gaseous composition of air, etc.

Engineering Psychology :

Engineering Psychology is the discipline that studies the sensory and mental capacities of man in order to establish the conditions under which a man-machine system can most efficiently and safely operate. It also deals with the behavioural factors of performance and fatigue- such as motivation, vigilance, information proceeding, decision making and learning. Other important areas are the interaction between physical and mental work and the effect of environmental factors on human proficiency. The expression "environmental factor" is used here in the broadest sense, and environment refers to both physical and psycho-social environments.

Time and Motion Study :

Time and motion study has been developed from the combination of method developed by Taylor and the Gilbreths for improving efficiency and human work. In British usage this discipline is called "work study" and is subdivided into method study and time study.

Application of Ergonomics :

Ergonomics can be applied to any activity where human effort is involved - at home, in offices, factories and work-houses - on the seas, in the air, and even in spaces. Thus it has been successfully applied in (1) Design of furniture, seats, rests and steps for operators; (2) design of jigs and fixtures; (3) improvement in working conditions and environments; (4) selection, training and placement of personnel; (5) motivation of workers; (6) fatigue reduction; (7) betterment of health and safety standards; (8) composition of "relaxation allowances" for workers, etc.

Anthropometric data - height, length of arms and of legs and many others - are needed to fit the machine to the man. A study of loads - physical, perceptual and mental - static and dynamic posture, pauses of rest - tend to better understanding of problems of performance and contribute more comfort, less fatigue and better productivity. Similarly, hours of work, temperature, humidity, illumination, noise, altitude - each plays its role and better understanding of their role leads to more ease, more comfort and more work. Contrary to popular beliefs, more hours at work do not mean more overall production. A reduction in the number of hours worked per week has been found to produce an increase in the rate of production. In heavy manual work, reducing the hours of work per week from 66.7 to 55.5 had resulted in an increase of 37 per cent in the rate of output, and an increase of 19 per cent in the volume of output. The effect however, is not so pronounced in the case of light work.

The Ergonomics Programme :

This comprises four steps : 1)'Diagnosis', 2) 'Experimentation', 3)'Application' and 4) 'Validation'.

Diagnosis :

It is first necessary to identify the problem and define the variables by analysing the jobs and the tools and materials employed. The problem situation under study may be found to be merely the symptoms of a more fundamental condition, e.g. a study on absenteeism, or labour turnover may bring to light an excessive workload in certain jobs or faulty work organisation and difficulties encountered in worker training may be attributable to the poor design of the tools or the method of working. In many cases, the

very fact that the Ergonomist has defined the problem will make it possible for the remedial action to be taken (e.g. installation of remote-control equipment).

Experimentation :

In this stage, the chosen parameters are studied experimentally; by constructing analogical or statistical models, it may be possible to formulate general laws, simulate new working conditions and suggest new approaches in personnel training.

Application :

In the third stage, the result of the experiments are applied in block or in successive tests, to produce a prototype, improve the existing situation or arrange for the necessary preparations.

Validation :

Here a check is made on the effectiveness of the Ergonomist's solution, either by behavioural studies, or by the evaluation of improvements in productivity, product quality, process reliability, worker safety and health and labour turnover.

Magnitude of the Problem :

Although mechanization and automation affected the processing industry, they are now being rapidly introduced into other fields such as agriculture and administration. While they reduce exposure to hazards, they bypass certain problems and even introduce new ones. One group of problems concerns local stresses (energy expenditure in heavy or repetitive manual handling at the infeed and outfeed ends of processes; work rates in certain intermediate jobs). Second group relates to maintenance and repair work which has to be carried out on operating equipment where there is a timed production line or multi-shift working; maintenance and repair work may often entail arduous postural stresses and exposure to undesirable environmental conditions.

The concern of third group is the physical and mental health effects of special stresses related to the worker's responsibility and age- such as work tempo, physical stress, nervous

tension, reduction in the individual's ability to regulate his own work tempo, the repercussions of shift work, the feeling of isolation and responsibility in persons working on control panels of automated production units, the increasing monotony and repetition of work which has been broken down into limited operations, the need to digest excessive quantities of information, or the loss of vigilance which occurs when signals and signal responses occur only rarely.

In addition, there is the stress imposed by environmental conditions such as noise, dust, heat, ionizing radiations and immobility.

The fourth and final group relates to the problems of industrialization in the developing countries where workers migrate from agriculture into industry, may be inadequately fed and have reduced work capacity, and where technological growth may have profound human, economic and social repercussions.

Although there is virtually unlimited scope for mechanization and automation in industry, process safety and profitability are paradoxically dependent on human capability and human and social behaviour.

Ergonomics helps mitigate many problems in the following ways :

Work-Stress and Environmental Stress

Ergonomics can be used to reduce energy cost and stress, Evaluation of the energy cost of work by using physiological criteria makes it possible to recommend modifications for the adaptation of workload and environmental stress to human capacities.

The main objective is to ensure the worker's health without compromising on productivity and safety . In evaluating work capacity and work cost, consideration should be given to physical activity (intensity, tempo, hours of work and rest breaks), the effect of environmental conditions (humidity, air speed, noise, lighting, colours, dust), biological data (modification of food intakes, recovery

during rest and sleep, age-related changes in work capacity) and special features of the work (e.g. vibrations, night work, shift work). In addition, it is necessary to give consideration to certain local conditions such as climate and nutrition, in hot or mountainous regions, polar zones, deserts, at higher altitudes or underground and in survival conditions. In most developing countries, the prevailing climate presents specific problems and malnutrition is widespread, with the result that labour standards and conditions require specific adaptation.

Ergonomics and Biomechanics :

An important field for the ergonomist is locomotion and posture that involve both energy expenditure and the sensorimotor features which are dealt with below. Here he can have recourse to biomechanics. When dealing with the fit worker he must ensure that the postural stresses are reduced, training is given in kinetic methods and manual handling, seats in the plant and on vehicles are comfortable, levers, pedals and other controls are accessible and that the worker receives adequate physical training either in his work or by some sporting activity; in the case of the handicapped, thought should be given to rehabilitation, the supply of prostheses and specialized equipment.

Ergonomics and Sensorimotor Tasks :

An important aspect of many jobs is in the perception and interpretation of signals which requires a decision and a reaction. The ergonomist can help facilitate information reception and decision making or increase the efficiency of the response; he can help reduce mental strain, fatigue, impaired vigilance, physiological disorders and finally, errors and accidents; this improves the level of safety and increase output.

The prime factors in information reception are sensation thresholds, vigilance, discrimination and interpretation, and the ergonomist can improve the environmental conditions and provide methods of display that will minimize signal ambiguity. The first step is a study of the shape and layout of dials and indicators, the presentation of quantities (figures, scales, etc.) and the specific characteristics of optical, acoustical and tactile signals. The second stage is a study of the quality and quantity of the information provided and its complexity in relation to the worker's ability to interpret and memorize it. It may be necessary to employ mechanical and electronic data coding, logging and processing equipment which will provide the operator with information in a more readily assimilable form; this may be achieved by selection or analysis, and by immediate, delayed, extrapolated or comparative presentation.

In response to an incoming signal, an operator is required to make a number of movements, and his task will be simplified, if the controls and layout are well designed and lay-out with regard to reach, direction of movement and necessary operating force. This involves study of stereotypes, function compatibility and operational picture.

Ergonomics of the man-production system complex :

Ergonomics also studies the relationship between a man and the system of which he forms part, and the communication and cybernetic problems this system poses . By defining the operations involved, the ergonomist can decide which tasks should be entrusted to humans and which tasks should be handed over to machines.

Adapting man to his work :

Although it is essential to adapt the work to the man, ergonomics can also help adapt man to his job. The psychologist and industrial sociologist have gone into these matters thoroughly. The ergonomist can help here by his knowledge of training problems and suggesting teaching moods; this he will do in the light of cybernetic theory, his proposals relating to such things as apprenticeship programmes, programming and teaching aids. Clearly, the undertaking as well as the worker will derive benefit from this. Applied Psychology will be used to assist in the choice and training of persons whose jobs necessitate an ability to handle large amount of information, reach quickly or

cope with an emergency. A study of social factors and their effects on worker's outlook is also of value and should cover attitudes, motives and human relations and communications between workers and with other people.

Ergonomic Checklist: *

- Is the work space adequate?
- Is the worker able to sit down?
- Can the speed of the machine be adjusted to the skill of the operator?
- Is there any visual glare?
- Is colour discrimination needed?
- Controls, displays and equipment adequately lit? Does the noise level permit adequate verbal communication?
- Are the most frequently used displays grouped together in the normal visual field?
- Do dial pointers in their correct working positions point in the same direction?
- Does the controlling hand obstruct vision of the dial?
- Can displacement of the centre of gravity or rotation of the body be avoided?
- Is there sufficient accurate feedback to the operator about work-flow and output?
- Will the signals from different sources overlap and overload the operator?

* Selected from a check list developed by the International Association

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ENVIRONMENTAL STUDY IN A PESTICIDE FORMULATION UNIT

Pesticide Industry makes use of a number of hazardous chemicals, many of which are highly flammable, toxic, corrosive and carcinogenic. Many of the operations and processes employed in the industry have inherent hazards due to severity of operating conditions, energy release during processing and other factors. Realising the extent of problem, the Directorate General Factory Advice Service & Labour Institutes, Mumbai undertook a National Project to study the Process Safety, Work Environment and Medical aspects of the working conditions in pesticide manufacturing and formulation units in all the regions of the country. This study was conducted by Regional Labour Institute, Chennai as a Consultancy-cum-National Study .

OBJECTIVE

The objectives of the study were:

1. To study the manufacturing process in detail in order to evaluate the safety and health aspects.

2. To study the operating conditions that could lead to accidents causing loss to property, human life and environment; and

3. To suggest remedial control measures to improve the overall safety performance of the plant and safeguard the health and safety of the workers.

METHODOLOGY

The following methodology was applied to collect the information for a critical review of safety and health aspects of the Plant. A preliminary visit was made to the Plant to collect the information relating to safety and health. Literature survey was made prior to field work to collect available safety and health related information. This information was used to prepare checklist/questionnaire for use in the Process Safety Study. Work areas and the activities in the factory were physically inspected and observations were made and information pertaining to safety, fire fighting, first aid, work practices etc.was collected.

Observations were made on storage and handling of hazardous substances, safety and health management system and maintenance and the various safety measures being adopted to control the hazards of chemicals.

FINDINGS

The factory had three Process Plants for manufacture of Ethion, Acephate, Dimethoate, Carbendazim and Cyper-methrin. In addition, the factory had two Formulation Plants for Dusting Powder, Granulation and Emulsifiable Concentrate. The factory had 80 employees including management staff and workers.

Manufacture of Carbendazim technical involved three stages i.e. Methylation of Thiourea, Methoxy Carbonization and Condensation with OPDA. Methyl Mercaptan was evolved during condensation which was burnt in the incinerator.

Acephate manufacture also involved three stages i.e. Isomerization, Acetylation and Hydrolysis. DM PAT was isomerized by adding Di-methyl sulphate to get Methomidaphos which was acetylated with acetic anhydride. Acetylated product was hydrolised with Ammonia and organic aqueous layers were separated. Organic layer was distilled and Acephate technical was obtained after crystalisation and drying.

Manufacture of Cypermethrin involved three stages i.e. Premix, Cyano Esterification and Distillation. MPBD and DV Acid Chloride were mixed to get Premix. Sodium Cyanide was mixed with the premix to get crude Cypermethrin.

The mass was dissolved in solvent. Organic layer was distilled for recovery of solvent and to obtain the finished product. Formulation of Emulsifiable Concentrate, Dusting Powder and Granulated Phorate were carried out in two plants. Technical Pesticide and the filler material along with dispersing agent were fed into the feeder of the micronizer. Micronised material was discharged into the ribbon blender and mixed for two hours and then packed in bulk packing as dusting powder. Required quantity of solvent, liquid technical pesticide and emulsifiers were pumped into the vessel. Stirring was continued for two hours and the emulsifiable concentrate was discharged into the storage vessel. Bentonite granules were spread over the Phorate technical coating agent in booth mixer. Granulated product after approval from Quality Control Department was packed in small laminated HDPE bags.

RECOMMENDATIONS

There were two Plants for formulation and packing of different pesticides. Number of deficiencies were observed in formulation areas. Various remedial measures have been suggested to improve the conditions in the formulation area which included providing an exhaust chamber for keeping the drum while transferring liquid technical pesticide into formulation vessel, providing bag filters with the pre-blender for dust control, maintaining Phorate scrubber in working order etc.

Various remedial measures have been suggested to improve and maintain safe working conditions. Some of which include providing high temperature alarm with the reactors involving exothermic reaction, providing gas monitors with alarm system for gases like H_2S, HCN etc., maintaining of scrubbing systems in good working order, improvement of Ammonia feeding system, provision of vacuum gauge with the distillation vessels, periodic testing and examination of vessels maintained under vacuum etc.

Deficiencies were observed in the storage area and the remedial safety measures have been suggested for improvement which include providing proper dyke walls, provision of proper level indicators with the storage tanks, shifting of pumps, valves etc. outside the dyke walls, provision of drainage with the dyke, emergency shower/eye wash fountain near the storage area, provision of proper overflow pipe with the storage tanks etc.

Safety Management aspects and various records pertaining to Safety were studied in detail. Various deficiencies were observed in the Safety Management System and remedial measures have been suggested to improve the Safety Management System which include framing Occupational Safety and Health Policy, Constitution of Safety Committee, Development of Safe Operating Procedures, Introduction of Accident Investigation, Analysis and Reporting System, Work Permit System, Preparation of P & I Diagram, Start-up and Shut-down procedures, etc.

TRAINING PROGRAMME ON EVALUATION AND CONTROL OF HAZARDS IN CHEMICAL INDUSTRY

Chemical industry occupies very important position in meeting the basic human needs and desires. The growth of chemical industry will continue to be faster, year after year, in view of the recent industrial policy of liberalisation and globalisation in the country. In the last decade, there has been a vast increase in the use of chemicals and this trend will continue, as chemicals have a direct impact on the improved quality and standard of human life. The increasing sophistication of modern industry may generate inherent hazards associated with hazardous chemical processes. Besides, certain chemical operations such as degreasing, painting, surface treatment etc. also involve health hazards at workplace. Today virtually in every workplace, workers are exposed to chemical and physical hazards like heat, noise, etc. The chemical exposure needs to be evaluated and controlled by using varieties of monitoring equipment. This needs knowledge, skills, competence on chemical safety and Industrial Hygiene. The Factories (Amendment) Act, 1987, under Schedule II, Section 41-F, emphasizes the responsibility on the part of the management to monitor the chemicals exposure in workplace environment. This needs a policy, planning, development of programmes and implementation through monitoring and improvement of safety, health and environmental system.

OBJECTIVES

- To disseminate information and create awareness on the chemical hazards.
- To impart training on the techniques of identification, evaluation and control of chemical exposure and risk of chemicals.
- To train industrial personnel on the practices and procedures to be followed for the safe use of chemicals.

TOPICS

- Safety and Environment Protection-related legal provisions and the statutes.
- Siting and layout of chemical plants - Environment and safety concerns.
- Chemical process hazards.
- Hazards in chemical operations
- Techniques of monitoring work place environment.
- Principles and applications of analytical instruments for assessment of the level of airborne contaminants.
- Practical and Laboratory exercises on Evaluation Techniques of Industrial Pollutants.
- Industrial Waste Treatment and Disposals.
- Operational Control Measures.
- Environment Management System - ISO 14000.

PARTICIPANTS

This programme is designed for the middle management personnel such as Supervisors, Analytical Chemists, Technical Officers and Safety Officers.

DURATION- 5 Days

Conducted by:

Industrial Hygiene Division
Central Labour Institute
Mumbai.

- During the day shift, a vessel was preparing to sail from a berth in a Port. When the mooring ropes were being removed, the steel wire rope parted and accidently hit a mazdoor.He suffered serious injuries and succumbed to his injuries later. Investigations revealed that the accident had taken place because of improper operation of the winch, breaching 32(1) of the Dock Workers (Safety, Health and Welfare) Regulations, 1990. Further, the accident was not reported within four hours nor the notice of the death was communicated, breaching Regulation 91(1) and 91(3) of the said Regulations. The Port authorities were warned for beach of Regulations 91(1) and 91(3). The Master of the vessel was also warned for breach of Regulation 32(1).

- In a Port, while crossing a railway line to his work spot through a container yard, a mazdoor was run over by a train and killed. Investigations into the accident proved that the accident had taken place due to the negligence on the part of the deceased who took a short cut instead of using the designated approach road. The employer of the worker and the Dock Labour Board were advised to issue a circular to all the workers not to take such short cuts and to use the safe routes to reach their work spots.

- A worker was connecting the hose with fresh water point to receive fresh water for a ship at a Port. While tightening the hose, his hand came into contact with an M.S.bracket. He experienced heavy shock and died on the way to the hospital.

  Investigations revealed that the accident was not as result of dock work and the same was classified as a non-reportable accident.

- In the third shift, an official of a vessel berthed in a Port had gone to check the draft of the ship and

  appeared to have fallen into the dock basin. The body was recovered later. Investigations revealed that the accident was not as a result of carrying out any dock work and was classified as a non-reportable fatal accident.

- A mazdoor was filling up the radiator of a 100 KVA DG Set at a Port. The shawl he was wearing around his neck caught into the revolving fan and received a horizontal cut on his forehead which later proved fatal.

  Investigations revealed that the accident was not as a result of carrying out any dock work and was classifed as a non-reportable fatal accident

- During the first shift, lorries were being loaded with cargo which was unloaded from a vessel, in a Port . After parking the lorry, the cleaner jumped out on the left hand side and was run over by another lorry which was overtaking from the left side.

  Investigations revealed that the accident had taken place due to over-speeding of the second lorry and also because of the improper supervision of the employer, breaching Regulation 66(6). Further, the accident was also not reported by the employer in Form-XII breaching Regulation 91(6).

  The employer was warned for contravention of Regulations 66(6) and 91(6) of the Dock Workers (Safety,Health & Welfare) Regulations, 1990.

- In the second shift, a tindal (senior mazdoor) was run over by a train while attempting to cross the container-yard of CONCOR in a Port.

Investigations revealed that the accident had taken place due to the negligence of the deceased who attempted to take short-cut to reach his work spot.

The employer of the tindal was advised to issue a circular to all the workers advising them not to take such short-cuts and use only the normal safe routes their work spot.

INTERNATIONAL OCCUPATIONAL SAFETY AND HEALTH INFORMATION CENTRE (CIS)

CIS (from the French name, Centre international d'Information de securite et d'hygiene du travail) i.e. International Occupational Safety and Health Information Centre, is a part of the International Labour Office, Geneva, Switzerland. The mission of CIS is to collect world literature that can contribute to the prevention of occupational hazards and to disseminate this information at an international level. CIS imparts to its users the most comprehensive and up-to-date information in the field of Occupational safety and health. The work of CIS is supported by a worldwide Safety and Health information exchange network which includes over 91 affiliated National Centres and 38 CIS collaborating Centres. Central Labour Institute, Mumbai has been designated as the CIS National Centre of India.

CIS can offer you rapid access to comprehensive information on occupational safety and health through:

- Microfiches on original documents abstracted in CIS DOC (CISILO)
- ILO CIS Bulletin "Safety and Health at Work"
- Annual and 5-year indexes
- The CIS Thesaurus
- The list of periodicals abstracted by CIS

EXCERPT FROM CIS DOC

Title:Variability of geometric and mechanical measurements on wheelchair users.

CIS ACCESSION NUMBER :
CIS 00- 567

ABSTRACT :

A measurement method was developed to describe and quantify the handicapped user's 3D position in his wheelchair. Pre-defined landmarks are digitized with an articulated mechanical arm. To quantify the pressure distribution, a system composed of sensors is used on the seat and the back of the wheelchair. In this method, different types of errors contribute to modify the geometric and mechanical measurements. The purpose of this study is to evaluate these errors and their impact on the precision of the various parameters on a sample group of five non-handicapped subjects. The variability of most of the geometric parameters was $<2^{o}$ where the sagittal rotation of the pelvis (3.8^{o}) showed the highest variability and the thigh angle (0.5^{o}) the lowest. The lowest variability of the mechanical parameters was obtained for the average pressure and pressure gradient measurements. It was confirmed that the geometric and mechanical measurement method presented in this paper is a non-invasive, simple and accurate procedure for seating evaluation. (74624).

Note: For details write to CIS National Centre for India, Central Labour Institute, Sion, Mumbai 400 022.

The Library & Information Centre of Central Labour Institute has unique collection of Material Safety Data Sheet of about 1,20,000 chemicals/materials taken from Canadian Centre for Occupational Health & Safety. MSDS provides extensive coverage over safety perspective with detailed evaluation of health, fire and reactivity hazards. It also provides precaution as well as recommendation on handling, storage, personal protective equipment, accidental release etc.

IDENTIFICATION:

Product Name **: HEXANE**

HAZARDS IDENTIFICATION

Route of entry:
Skin contact: Causes mild irritation, redness, cracking and drying.
Skin absorption: No evidence of adverse effects from available information.
Eye contact: May cause irritation, experienced as stinging with excess blinking and tear production. Redness.
Inhalation: Slightly toxic.Nose and throat irritation.Exposure to high concentrations of vapour may cause central nervous system depression resulting in signs and symptoms of toxicity as described for "ingestion".These high levels may also cause cardiac arrhythmias (irregular heartbeats).
Ingestion:Low toxicity. May cause gastrointestinal irritation. May cause headache,nausea,vomiting and weakness. Aspiration hazard - this material can enter lungs during swallowing or vomiting and cause lung inflammation and damage.
Effects of acute exposure: Dizziness, intoxication,stupor, lightheadedness, loss of appetite, nausea. Refer to route of entry.Effects of chronic exposure: Prolonged overexposure to solvents has been associated with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling this product may be harmful or fatal. May aggravate asthma and inflammatory or fibrotic pulmonary disease. May aggravate an existing dermatitis.Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs, and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexaneare potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone. Medical conditions aggravated By overexposure: Preexisting respiratory disease including asthma and emphysema.Peripheral nerve disorders. Skin disorders and allergies. Rhythym disorders of the heart.

First aid measures
Instructions: Remove from contaminated atmosphere.Flush eyes with large amounts of running water for at least 15 minutes. Hold eyelids apart to ensure rinsing of the entire surface of the eye and lids with water.If the symptoms persist, consult a physician. In case of skin contact: Remove any contaminated clothing and wash affected area with plenty of soap and water. If irritation develops, consult a physician. Wash clothing and decontaminate shoes before reuse.In case of inhalation, remove to fresh air. Seek medical attention if respiratory irritation develops or if breathing becomes difficult. If breathing has stopped, administer artificial respiration and seek medical attention.If ingested, do not induce vomiting: Lung aspiration hazard. Consult a physician.Place victim in a stable side position and keep warm.
Notes to physician: Cardiac arrythmias have been reported with solvent exposure. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to this material. Other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs

are administered, observe for the development of cardiac arrhythmias.

Fire fighting measures:

Flammability:Extremely flammable.If yes, under which conditions?: Excessive heat, sparks and open flame.Extinguishing media: Carbon dioxide, dry chemical, foam. Halon. Special procedures: Wear full protective equipment including a self-contained breathing apparatus. Prevent human exposure to fire, smoke and fumes, and evacuate non-essential personnel from area.Keep personnel removed and upwind of fire. Use water-spray to keep containers cool. Disperse vapour with water spray. Water may be ineffective in fighting fire as burning liquid may float. Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Closed containers may explode when exposed to extreme heat.

Unusual fire and explosion:Escaping vapours may ignite which can hazards result in a flash fire.Vapours formed from the product may travel or be moved by air currents and be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges, or other ignition sources at locations distant from product handling point.Vapours may settle in low or confined areas, or travel a long distance to an ignition source and flash back explosively.Closed containers may rupture (due to build up of pressure) when exposed to extreme heat. Water spray may be used to cool the container. Hazardous combustion products: Carbon dioxide. Carbon monoxide.

Accidental release measures

Leak/spill: Ventilate. Eliminate all sources of ignition. Use non-sparking, non-static generating implements. Follow all applicable fire and explosion precautions during the spill response procedure. Try to work up wind of spill. Isolate hazard area and restrict access. Stop leak only if safe to do so. Wear NIOSH/MSHA approved respirator (self-contained breathing apparatus preferred) and appropriate protective equipment. Prevent runoff into drains, sewers, and other waterways.Dike area to prevent spreading.Soak up with an absorbant material. Put in a closed container.Notify fire and environmental authorities.

Handling and storage

Handling procedures and equipment: Avoid contact with eyes, skin, and clothing.Avoid breathing vapours.Do not swallow. Keep away from heat, sparks, and open flame.Keep container closed.Relieve possible internal pressure in container before opening by partially unscrewing bung.Bond and ground transfer containers and equipment to avoid static accumulation.A considerable static electrical charge can be built up during mechanical handling which may become a hazard in atmospheres containing flammable vapours.Do not apply to hot surfaces or use in areas where exposed to electric sparks.Do not enter areas where vapours of this product are suspected unless special breathing apparatus is used and an observer is present for assistance.Ventilate adequately, otherwise wear an appropriate breathing apparatus.Wash contaminated clothing before re-use.Empty containers are hazardous. May contain flammable/explosive dusts, liquid residue or vapours.Do not cut, drill, grind, or weld on or near this container.Do not pressurize, cut, heat or weld empty containers.Use only non-sparking tools. Improper disposal or reuse of this container may be dangerous and/or illegal. Follow labeled warnings even after container is emptied. Wash thoroughly after handling. Maintain a good personal hygiene.

<u>NOTE</u>: The above details constitute part information of MSDS taken from Canadian Centre for Occupational Health and Safety. For complete MSDS write to MIS division, Central Labour Institute, Sion, Mumbai.400022. MSDS on about 1,00,000 chemicals/materials are available with Central Labour Institute. Computer printout will be supplied on nominal charge basis.

LIBRARY AND INFORMATION CENTRE

The Library and Information Centre of Central Labour Institute has unique and rare collection of different kinds of publications in the field of Occupational Safety, Health, Management and allied subjects. It also has a good collection of different standards, codes, regulations on these matters. In the current year the centre is subscribing to 28 Indian & foreign journals, besides receiving complimentary copies of different periodicals from all over the world. The centre provides facilities for study and research and at the same time supplies authentic and up-to-date information on Occupational Safety, Health and Management. It also extends reading facilities to students & scholars attending different training programmes & courses conducted by CLI. From July 2000 till date a number of publications in the field of OS&H have been added to Library. Some of them are :

DATABASE ON HEALTHCARE & CHEMKNOWLEDGE

The databases received under the WHO project supports clinical decision making as it provides drug information on the following:

1. Drug Information
2. Toxicology Information
3. Acute Care & Emergency Medicine
4. Complementary & Alternative Medicine
5. Reproductive Risk
6. Abstracts
7. References

The Chemknowledge TM System Plus LOLI includes the TOMES Plus System which comprises a computerized library of proprietary and government databases providing rapid, easy access to chemical, hazard, environmental and medical information needed for safe management of chemicals.

Chemknowledge TM System Plus LOLI includes:
Meditext: Medical management contains information to assist in evaluating and treating acute exposure to industrial chemicals, adverse health effects and treatment for the same.

1. Hazardtext: Hazard management provides information needed for the initial response to incidents involving hazardous materials.
2. Infotext: Documents offer general health and safety data on non-chemical specific topics such as ergonomics.
3. CHRIS: Chemical Hazard Response Information System presents information useful for initial response to aquatic incidents involving hazardous materials.
4. Reprorisk System: It evaluates reproductive risks of drugs and chemicals.

HEALTH AND FAMILY WELFARE
Public Policy and People's Participation in India.
Author: M.M.Krishna Reddy
Publisher: Kanishka Publishers, Distributors, New Delhi.110002

This book describes the evolution of the National Family Welfare Programme in India right from its inception till to this day in its different dimensions. The book highlights the different approaches or techniques adopted by the government of India in promoting and popularizing the family welfare programme at different times and to make it a peoples programme among the different sections of Indian society. It explains the historical sketch of the family welfare movement in India stressing the philosophy and essence of target free approach of the programme as announced by the government of India from 1st April 1996 onwards. The recently evolved innovative target free approach is aimed to improve the quality content of the Family Welfare Programme among the Indian masses. It brings out the need to involve the voluntary sector (NGOs) in addition to the governmental efforts to boost up the programme implementation under the target free approach in India.

28 PSU EMPLOYEES SELECTED FOR PM'S SHRAM AWARDS

Altogether 28 employees of Central and State Public Sector Undertakings were selected for the Prime Minister's Shram Awards for 2000 in recognition of their distinguished performances.

An official release said Shram Ratna, the highest among the Shram Awards, carrying Rs. two lakhs, had been awarded to Raghavan Pillai Parameswaran Nair of National Thermal Power Corporation's Korba Super Thermal Power Station.

While two entries were selected for Shram Bhushan, six were chosen for Shram Vir and eight for Shram Shri or Shram Devi awards.

Though the total number of Shram Awards is 17, the number of persons who received the awards was 28, including three women, for their innovative abilities, outstanding cosntribution in the field of productivity and exhibition of exceptional courage and presence of mind.

Two Shram Bhushan Awards, each with a cash money of Rs.1 lakh, went to the team of Bharat Heavy Electricals Limited (Bangalore), employees comprising A.Ramesh Babu, N.Monappa, K. Shivadas and T. Ramachandra; and to Asis Bhattacharyya of Rifle Factory, Ichapur, West Bengal.

Six Shram Vir Awards were given to a team consisting of Chajju Ram, Anchal Singh, Rattan Lal, Nidhia Ram and Bhagwan Das of Power Grid Corporation of India; Nisar Ahmed, Mommed Siddique Shaikh of Bhabha Atomic Research Centre; Ananta Kumar Nath of Rifle Factory, Ichapur; J.S.William of Bhilai Steel Plant, Pankaj Kumar Sen of Chittaranjan Locomotive Works and Satya Pal Singh of Bharat Heavy Electricals Limited (Hardwar).

Eight Shram Shri and Shram Devi Awards carrying Rs.40,000 each were also announced.

Three women - Deveeramma of HMT (Bangalore), Mdhuri Singh of ITI, Manakpur(Gonda) and Potluri Rajani of Defence Research and Development Laboratory (Hyderabad) were selected for the Shram Devi Awards.

Besides, five entries were selected for Shram Shri Awards.They were a team comprising Kunchunni Achari Viswanathan, Karuppa Samy Selvakumar, Thandavarayan Ramalingam,Parameswaran Sasidharan Nair and Hellappan Pillai (jointly) of CVRDE, Avadi; A.K. Vijayaraghavan of Hindustan Aeronautics Ltd, Bangalore; Dineshwar Upadhyay of Chittaranjan Locomotive Works; Ashok Kumar Atri of 505, Army Base Workshop, Delhi Cantt. and Ramesh Prasad Singh of Indian Oil Corporation, Barauni Oil Refinery, Begusarai (Bihar).

The Hindustan Times

TRAINING PROGRAMMES
JANUARY-MARCH 2001
CENTRAL LABOUR INSTITUTE , SION, MUMBAI - 400 022

Programme Title	Period	Contact Person
Diploma in Industrial Safety	**15 June 2000 -31 March 2001**	Director (Safety)& Incharge Indl. Safety Division
Associate Fellowship of Industrial Health	01 Feb-30 April 2001	Director (Medical) & Incharge Indl.Medicine Division
Safety,Health for Trade Union Officer	01-05 January, 2001	Director (Safety) & Incharge Indl.Safety Division
Team Building for Health	01-05 January, 2001	Director (Staff Trg.) & Incharge Staff Training Division
Training programme for CIS	08-12 January, 2001	Director (Safety) & Incharge Indl.Safety Division
Evaluation & Control of Hazards in Chemical Industry	08-12 January, 2001	Director (Indl.Hygiene)&Incharge Indl.Hygiene Division
Occupational Back pains-Evaluation,Control & Management	15-19 January, 2001	Director (Physiology) & Incharge Indl.Physiology Division
Basic Course for Inspectors of Factories	05-23 February,2001	Director (Safety) & Incharge Indl.Safety Division
Participated Approach for Safety & Health	06-09 February, 2001	Director (Psychology) & Incharge Indl. Psychology Division
Training programme on Techniques of Hazards	26 Feb.-02 March, 2001	Director(Indl.Hygiene) & Incharge MAHCA Division
Wage & Salary Administration	12-16 February, 2001	Director (Productvity) & Incharge Productivity Division
Occupational Physiology-its application in industry for promotion of safety, health & productivity at work.	19-23 February, 2001	Director (Physiology) & Incharge Indl.Ergonomics Division

Programme Title	Period	Contact Person
Evaluation & Control of Hazards in Pesticide Industry	12-16 March,2001	Director (Indl.Hygiene) & Incharge Indl.Hygiene Division
Training Methodology for Trainers	12-16 March, 2001	Director (Staff Trg.) & Incharge Staff Training Division
Safety in Material Handling	26-28 March, 2001	Director(Safety)& Incharge Indl. Safety Division
Occupational Back pain - Evaluation, control and Management	26-30 March, 2001	Director (Physiology) & Incharge Indl.Physiology Division

INDOSHNET

Ministry of Labour, Government of India, is developing a National Network on Occupational Safety and Health information system known as INDOSHNET. Directorate General Factory Advice Service & Labour Institutes (DGFASLI), an attached office of the Ministry of Labour will act as a facilitator of the network system. The objective of the network is reinforcement and sharing of national occupational safety and health (OS &H) information on no-profit no-loss basis with a view to pooling our information resources for mutual benefit. The sharing of information will not only confine to the national level but also includes international sources. The communication of information will be through E-mail as well as postal/courier service. DGFASLI invites industrial organisations, institutions, industry associations, trade unions, professional bodies and non-governmental organisations having information on OS&H and willing to share the same with others at the national and international level to participate as members in the network. Interested agencies may please write for proforma of organisational profile to Director General, DGFASLI, Central Labour Institute Bldg., N.S. Mankikar Marg, Sion, Mumbai 400 022.

Note: Those who have responded to our earlier communication and sent organisation profile in the prescribed format need not write again.

NATIONAL REFERRAL DIAGNOSTIC CENTRE

Early detection and diagnosis of occupational health disorders and occupational diseases is one of the most important factors in the prevention and control of adverse health effects on workers due to various factors - physical, chemical, biological and psycho-social. The Industrial Medicine Division of Central Labour Institute, Mumbai runs a National Referral Diagnostic Centre (N.R.D.C.) for early detection and diagnosis of occupational diseases and recommends necessary measures for prevention/control of occupational health problems/occupational diseases. The diagnostic centre is well equipped for medical examination of the exposed workers and facilities are available for carrying out special investigation, e.g. Pulmonary function tests, Audiometry, ECG, Titmus vision test, Biological monitoring, etc. Medical professionals including Factory Medical Officers, ESI Doctors, Medical Inspectors of Factories and Certifying Surgeons, Doctors from Medical Colleges and Hospitals can refer suspected cases of occupational diseases to N.R.D.C. for diagnosis and advice. The communication should be addressed to the Director General, DGFASLI, Central Labour Institute Bldg., N.S. Mankikar Marg, Sion, Mumbai 400 022 for further details.

REGIONAL REFERAL DIAGNOSTIC CENTRE

For early detection of "Occupational Diseases", Regional Referral Diagnostic Centres have also been established at the Regional Labour Institutes of Chennai, Kolkata & Kanpur for the benefit of the Industries located in the Southern, Eastern & Northern Regions of the country .

Medical professionals from the Factories, Factory Inspectorates, ESI, Railways, Medical Institutions and Hospitals, Ports & Docks can refer suspected cases of Occupational Diseases for diagnosis and advice. This facility is available free of cost in the interest of the affected worker.

Person to be contacted in different regions:

1. Director Incharge
   Regional Labour Institute
   Sarvodaya nagar
   Kanpur.208005
   Uttar Pradesh

2. Director Incharge
   Regional Labour Institute
   TTTI Post, Taramani
   P.O Adyar
   Chennai. 600113
   Tamil Nadu

3. Director Incharge
   Regional Labour Institute
   Lake Town, Patipukur
   Kolkata.700089
   West Bengal

GOVERNMENT OF INDIA, MINISTRY OF LABOUR
DIRECTORATE GENERAL FACTORY ADVICE SERVICE & LABOUR INSTITUTES

The Directorate General Factory Advice Service & Labour Institutes (DGFASLI) is an attached office of the Ministry of Labour, Government of India. DGFASLI organisation was set up in 1945 under the Ministry of Labour, Government of India to serve as a technical arm to assist the Ministry in formulating national policies on occupational safety and health in factories and docks and to advise State Governments and factories on matters concerning safety, health, efficiency and well-being of the persons at workplace. It also enforces safety and health statutes in major ports of the country.

The Directorate General Factory Advice Service & Labour Institutes (DGFASLI) comprises:

* Headquarters situated in Mumbai
* Central Labour Institute in Mumbai
* Regional Labour Institutes in Calcutta, Chennai, Faridabad and Kanpur

The Central Labour Institute in Mumbai functions as a socio-economic laboratory and is a national institute dealing with the scientific study of all aspects of industrial development relating to the human factors.

Over the past 33 years the Central Labour Institute has constantly grown not only in size but also in stature and has earned national and international recognition. It has been recognised by the International Labour Organisation as a Centre of Excellence in training on Occupational Safety and Health in the Asian and Pacific Region. It also functions as a National Centre for CIS (International Occupational Safety and Health Information Centre) and the Centre for National Safety and Health Hazard Alert System. At the national level, apart from providing research and training support to the Government and functioning as a technical arm of the Ministry of Labour, the institute provides comprehensive and multi-disciplinary services to the Industrial Port sector through studies, technical advice, training and dissemination of information. It also runs National Referral Diagnostic Centre for early detection of occupational disorders and thereby controls and prevents them. It has a modern Audio Visual Studio fully equipped with sophisticated video production equipment to produce quality U-matic video films on Safety and Health. The Regional Labour Institutes are a scaled-down version of the Central Labour Institute and cater to the needs of their respective regions.

The organisation is poised to grow further, and meet the increased demands on it. In a developing country with a large number of industries having diverse and complex nature, the task of protecting safety and health of workers is an uphill task. Armed with the technology, good-will of the industrial society and the strength of the dedicated staff, the organisation is well prepared to meet the challenges of tomorrow. It is committed to the goal of making the workplace safer.

Visit us at : www.dgfasli.nic.in