Ergonomics

Introduction: Ergonomics is the scientific study of designing and arranging objects, systems, and environments to fit the needs, capabilities, and limitations of the human body. It seeks to optimize the interaction between people and their workspaces, tools, and tasks. Ergonomics aims to enhance both safety and efficiency in various settings, from offices to industrial workplaces.

Definition: Ergonomics, also known as human factors engineering or human-centered design, focuses on creating workspaces and systems that promote well-being, productivity, and comfort for individuals. It involves designing products and work environments that consider the physical, cognitive, and emotional

capabilities of people. The goal is to prevent injuries, reduce physical strain, and improve overall performance by adapting tasks and environments to suit human characteristics.

Application: Ergonomics has a wide range of applications, including but not limited to:

- Office ergonomics: Designing workstations, chairs, and computer setups to prevent musculoskeletal disorders and enhance productivity.
- Industrial ergonomics: Optimizing manufacturing processes and equipment to reduce physical strain on workers and improve product quality.
- Healthcare ergonomics: Designing medical devices and healthcare environments to enhance patient care and reduce the risk of injury to healthcare professionals.
- Automotive ergonomics: Designing vehicle interiors to improve driver comfort and safety.
- Consumer product design: Creating everyday products like kitchen appliances, furniture, and tools with user-friendly and ergonomic features.

Health Effects of Poor Ergonomic Design and Practices: Poor ergonomic design and practices can lead to a range of health issues, including:

- Musculoskeletal disorders (e.g., carpal tunnel syndrome, back pain, tendonitis).
- Repetitive strain injuries (RSIs) caused by repetitive tasks with awkward postures.
- Eye strain and discomfort from improper computer workstation setup.
- Reduced productivity due to discomfort and fatigue.
- Increased risk of accidents and injuries in poorly designed work environments.

Ergonomic Risk Factors and Mitigation Methods: Identifying ergonomic risk factors and implementing mitigation methods is essential for preventing workplace injuries and discomfort. Common risk factors include repetitive motions, awkward postures, heavy lifting, and prolonged sitting. Mitigation methods may involve:

- Redesigning workstations and tools to promote proper posture.
- Providing training on ergonomic best practices.
- Offering adjustable furniture and equipment.
- Rotating tasks to reduce repetitive motions.
- Encouraging short, frequent breaks to reduce sedentary behavior.
- Conducting ergonomic assessments to identify and address risks.

Designing Working Environment: Designing a conducive working environment involves creating a space that supports ergonomic principles and enhances overall well-being. Key considerations include:

- Adjustable furniture and equipment to accommodate different body sizes and preferences.
- Proper lighting to reduce eye strain and glare.
- Adequate ventilation and temperature control for comfort.
- Organized and clutter-free workspaces to reduce stress.
- Access to natural elements, such as plants, to improve mental well-being.

- Flexibility in workspace layout to accommodate changing needs and tasks.

Incorporating ergonomic principles into the design of workplaces and products can lead to healthier, more productive, and safer environments for individuals and organizations alike.

What are work-related musculoskeletal disorders (MSDs)?

Musculoskeletal disorders include a group of conditions that involve the nerves, tendons, muscles, and supporting structures such as intervertebral discs. They represent a wide range of disorders, which can differ in severity from mild periodic symptoms to severe chronic and debilitating conditions. Examples include carpal tunnel syndrome, tenosynovitis, tension neck syndrome, and low back pain.

Work-related Musculoskeletal Disorders are caused or made worse by the work environment.

MSDs can cause severe and debilitating symptoms such as:

• pain, numbness, and tingling

• reduced worker productivity

• lost time from work

• temporary or permanent disability

• inability to perform job tasks, and

• an increase in workers compensation costs

MSDs are often confused with ergonomics. Ergonomics is the science of fitting workplace conditions and job demands to the capabilities of workers. In other words, MSDs are the problem and ergonomics is a solution.

What are the risk factors for MSDs?

Risk factors for MSDs include:

• repetitive, forceful, or prolonged exertions of the hands

• frequent or heavy lifting, pushing, pulling, or carrying of heavy objects

• prolonged awkward postures, and

• vibration contribute to MSDs

Essential considerations

•Ergonomics issues are identified and resolved in the planning process. In addition, general ergonomic knowledge, learned from an ongoing ergonomics program, can be used to build a more prevention-oriented approach.

•Management commitment and employee involvement in the planning activity are essential. For example, management can set policies to require ergonomic considerations for any equipment to be purchased and

production employees can offer ideas on the basis of their past experiences for alleviating potential problems.

•Planners of new work processes involved in the design of job tasks, equipment, and workplace layout, must become more aware of ergonomic factors and principles. Designers must have appropriate information and guidelines about risk factors for MSDs and ways to control them.

•Studying past designs of jobs in terms of risk factors can offer useful input into their design strategies. Expressions of management commitment Management commitment is a key and perhaps the most important controlling factor in determining whether any worksite hazard control effort will be successful. •Management commitment is more than just "support." Support is merely talk, but real commitment is expressed by actually backing up that talk with action which takes time and money. Remember, support = talk and commitment = action!

Policy statements are issued to:

• Treat ergonomic efforts as furthering the company's strategic goals

• Expect full cooperation of the total workforce in working together toward realizing ergonomic improvements

• Assign lead roles to designated persons who are known to "make things happen"

• Give ergonomic efforts priority with other cost reduction, productivity, and quality assurance activities

• Have the support of the local union or other worker representatives

• Allow full discussion of the policy and the plans for implementation

• Set concrete goals that address specific operations and give priority to the jobs posing the greatest risk

Employee involvement

Promoting employee involvement in efforts to improve workplace ergonomic conditions has

several benefits. They include:

• enhanced worker motivation and job satisfaction,

• added problem-solving capabilities,

• greater acceptance of change, and

• greater knowledge of the work and organization.

Worker involvement in safety and health issues means obtaining worker input on several issues.

• The first input is defining real or suspected job hazards.

• Another is suggesting ways to control suspected hazards.

• A third involves working with management in deciding how best to put controls into place.

Increasing worker involvement

To increase worker involvement in identifying and solving ergonomics-related issues in the workplace, management must show commitment by doing the following:

1. Making sure ergonomics is a formal (written) part of the safety and health management system by developing ergonomics policies, programs, process, procedures and safe practices.

2. Sharing information about ergonomics and the results of inspections and workplace analysis.

3. Training both in ergonomic hazard recognition and control through active participation and group problem solving.

4. Positive recognition for those who participate in ergonomics as well as other safety activities.

Who should participate?

Ergonomic problems typically require a response that cuts across a number of organizational units. Hazard identification through job task analyses and review of injury records or symptom surveys, as well as the development and implementation of control measures, can require input from:

• safety and hygiene personnel

• health care providers

• human resource personnel

• engineering personnel

• maintenance personnel

• ergonomics specialists

Gathering and Examining Evidence of MSDs

Once a decision has been made to initiate an ergonomics program, a necessary step is to gather information to determine the scope and characteristics of the problem or potential problem. A variety of techniques and tools have been used; many provide the basis for developing solutions to identified problems.

• Following up of worker reports

• Conducting symptom surveys

• Using periodic medical examinations

• Identifying Risk Factors in Jobs

o Screening jobs for risk factors

o Performing job analyses

o Setting priorities

Conditions and Symptoms

What are some of the clues that MSDs are a real or possible workplace problem? Some signs are obvious while others are more subtle.

• OSHA Form 300 logs or workers compensation claims show cases of MSDs such as carpal tunnel syndrome, tendonitis, tenosynovitis, epicondylitis, and low back pain. Sometimes these records contain nonspecific entries like "hand pain," which may be an indicator of a significant health problem if severe or persistent.

• Certain jobs or work conditions cause worker complaints of undue strain, localized fatigue, discomfort, or pain that does not go away after overnight rest.

• Workers visiting the clinic make frequent references to physical aches and pains related to certain types of work exercises.

• Job tasks involve at risk activities such as repetitive and forceful exertions, frequent, heavy, or overhead lifts, awkward work positions, or use of vibrating equipment.

Here are some other examples of symptoms that should trigger evaluations.

If you uncover signs like these in your workplace, it might be a good idea to request a confidential evaluation by OSHA or insurer ergonomics consultant. Ergonomic evaluations may uncover significant problems and be very helpful in correcting them.

Other sources that could alert employers to potential problems include the following:

• Trade publications, insurer newsletters, or references in popular literature indicating risks of MSDs

• Cases of MSDs found among competitors or in similar businesses

• Proposals for increasing line speed, retooling, or modifying jobs to increase individual worker output and overall productivity

Identifying Risk Factors

Screening jobs for physical and psychological risk factors is very proactive and should involve one or more of the following:

• Walk-through observational surveys of the work facilities to detect obvious risk factors

• Interviews with workers and supervisors to obtain the above information and other data not apparent in walk-through observations such as; time and workload pressures, length of rest breaks, etc.

• Checklists for scoring job features against a list of risk factors

Physical Risk factors

Awkward postures

Body postures determine which joints and muscles are used in an activity and the amount of force or stresses that are generated or tolerated. For example, more stress is placed on the spinal discs when lifting, lowering, or handling objects with the back bent or twisted, compared with when the back is straight.

Manipulative or other tasks requiring repeated or sustained bending or twisting of the wrists, knees, hips, or shoulders also impose increased stresses on these joints. Activities requiring frequent or prolonged work over shoulder height can be particularly stressful.

Forceful exertions (including lifting, pushing, and pulling)

Tasks that require forceful exertions place higher loads on the muscles, tendons, ligaments, and joints. Increasing force means increasing body demands such as greater muscle exertion along with other physiological changes necessary to sustain an increased effort. Prolonged or recurrent experiences of this type can give rise to not only feelings of fatigue but may also lead to musculoskeletal problems when there is inadequate time for rest or recovery. Force requirements may increase with:

• Increased weight of a load handled or lifted

• Increased bulkiness of the load handled or lifted

• Use of an awkward posture

• The speeding up of movements

• Increased slipperiness of the objects handled (requiring increased grip force)

• The presence of vibration (e.g., localized vibration from power hand tools leads to use of an increased grip force)

• Use of the index finger and thumb to forcefully grip an object (i.e., a pinch grip compared with gripping the object with your whole hand)

• Use of small or narrow tool handles that lessen grip capacity

Repetitive motions

If motions are repeated frequently (e.g., every few seconds) and for prolonged periods such as an 8-hour shift, fatigue and muscle-tendon strain can accumulate. Tendons and muscles can often recover from the effects of stretching or forceful exertions if sufficient time is allotted between exertions. Effects of repetitive motions from performing the same work activities are increased when awkward postures and forceful exertions are involved. Repetitive actions as a risk factor can also depend on the body area and specific act being performed.

Duration

Duration refers to the amount of time a person is continually exposed to a risk factor. Job tasks that require use of the same muscles or motions for long durations increase the likelihood of both localized and general fatigue. In general, the longer the period of continuous work (e.g., tasks requiring sustained muscle contraction), the longer the recovery or rest time required.

Frequency

Frequency refers to how many times a person repeats a given exertion within a given period of time. Of course, the more often the exertion is repeated, the greater the speed of movement of the body part being

exerted. Also, recovery time decreases the more frequently an exertion is completed. And, as with duration, this increases the likelihood of both localized and general fatigue.

Contact stresses

Repeated or continuous contact with hard or sharp objects such as non-rounded desk edges or unpadded, narrow tool handles may create pressure over one area of the body (e.g., the forearm or sides of the fingers) that can inhibit nerve function and blood flow.

Vibration

Exposure to local vibration occurs when a specific part of the body comes in contact with a vibrating object, such as a power hand tool. Exposure to whole-body vibration can occur while standing or sitting in vibrating environments or objects, such as when operating heavy-duty vehicles or large machinery.

Controlling Risk Factors

Rid the job of risk factors

Analyzing jobs to identify factors associated with risks for MSDs lays the groundwork for developing ways to reduce or eliminate ergonomic risk factors for MSDs.

The Hierarchy of Hazard Control Strategies

Controlling exposures to occupational hazards is the fundamental method of protecting workers. Traditionally, a hierarchy of controls has been used as a means of determining how to implement feasible and effective controls. ANSI Z10-2005, Occupational Health and Safety Management Systems, encourages employer employ the following hierarchy of hazard control strategies:

1. Elimination

2. Substitution

3. Engineering controls

4. Warnings

5. Administrative controls

6. Personal protective equipment

The idea behind this hierarchy is that the control methods at the top of the list are potentially more effective and protective than those at the bottom. Following the hierarchy normally leads to the implementation of inherently safer systems, ones where the risk of illness or injury has been substantially reduced. Let's take a closer look at the hierarchy of control strategies.

Controlling MSDs through elimination and substitution

Elimination and substitution, while most effective at reducing hazards, also tend to be the most difficult to implement in an existing process. If the process is still at the design or development stage, elimination and substitution of hazards may be inexpensive and simple to implement. For an existing process, major changes in equipment and procedures may be required to eliminate or substitute for an ergonomics

hazard. Some obvious examples of elimination include eliminating the need to carry heavy containers by replacing them with smaller containers. You can substitute that old office chair with a new ergonomically designed chair.

These strategies are considered first because they have the potential of completely eliminate the hazard, thus greatly reducing the probability of an accident. Redesigning or replacing equipment or machinery may be expensive, but remember that, according to the National Safety Council, the average direct and indirect cost of a lost work time injury more than $38,000 and most injuries in the workplace are ergonomics-related.

Controlling MSDs through engineering controls

The preferred approach to prevent and control MSDs is to design the job including:

• the workstation layout

• selection and use of tools

• work methods to take account of the capabilities and limitations of the work force

A good match, meaning the job demands pose no undue stress and strain to the person doing the job, helps ensure a safe work situation.

Engineering controls are preferred because they may completely eliminate the hazard. No hazard: No injury! They also do not rely on human behavior nor do they require continual oversight to work. Finally, engineering controls may save the company far more than the initial investment.

Engineering control strategies to reduce ergonomic risk factors include the following:

• Changing the way materials, parts, and products can be transported. For example, using mechanical assist devices to relieve heavy load lifting and carrying tasks or using handles or slotted hand holes in packages requiring manual handling.

• Changing the process or product to reduce worker exposures to risk factors. Examples include maintaining the fit of plastic molds to reduce the need for manual removal of flashing or using easy-connect electrical terminals to reduce manual forces Modifying containers and parts presentation, such as height-adjustable material bins.

• Changing workstation layout. Examples might include using height-adjustable workbenches or locating tools and materials within short reaching distances.

• Changing the way parts, tools, machinery and materials are to be manipulated.

Examples include using fixtures (clamps, vise-grips, etc.) to hold work pieces to relieve the need for awkward hand and arm positions or suspending tools to reduce weight and allow easier access.

• Changing tool designs. For example, pistol handle grips can be used for knives to reduce wrist bending postures required by straight-handle knives or squeeze-grip-actuated screwdrivers to replace finger-trigger-actuated screwdrivers.

• Changes in materials and fasteners. For example, lighter-weight packaging materials to reduce lifting loads.

• Changing assembly access and sequence. For example, removing physical and visual obstructions when assembling components to reduce awkward postures or static exertions.

Controlling MSDs through work-practice and administrative controls

Work practice and administrative controls are closely related attempts to change behaviors. They are management-dictated work practices and policies to reduce or prevent exposures to ergonomic risk factors. Work practice and administrative control strategies include:

• Changes in job rules and procedures such as scheduling more rest breaks

• Rotating workers through jobs that are physically tiring

• Training workers to recognize ergonomic risk factors and to learn techniques for reducing the stress and strain while performing their work tasks

Common examples of administrative control strategies for reducing the risk of MSDs are as follows:

• Reducing shift length or curtailing the amount of overtime

• Rotating workers through several jobs with different physical demands to reduce the stress on limbs and body regions

• Scheduling more breaks to allow for rest and recovery

• Broadening or varying the job content to offset certain risk factors (e.g., repetitive motions, static and awkward postures)

• Adjusting the work pace to relieve repetitive motion risks and give the worker more control of the work process

• Training in the recognition of risk factors for MSDs and instruction in work practices that can ease the task demands or burden.

Personal protective equipment

One of the most controversial questions in the preventing MSDs is whether using PPE (such as wrist supports, back belts, or vibration attenuation gloves) is effective.

Ergonomics PPE devices may, in some situations, reduce the duration, frequency, or intensity of exposure, but evidence of their effectiveness in injury reduction is inconclusive. In some instances, they may decrease one exposure but increase another because the worker has to "fight" the device to perform his or her work. An example is the use of wrist splints while engaged in work that requires wrist bending.

Back belts are sometimes provided as PPE, but they are controversial. Back belts have been studied extensively, and experts have concluded that they are not effective in preventing back injuries. Some believe that, in fact, they may cause injury by encouraging workers to lift heavier objects or by making

muscles weaker. Most importantly, they do not make workers stronger or more able to perform a lift that is awkward or too heavy.

The National Institute for Occupational Safety and Health (NIOSH) recommends that employers not rely on back belts to protect workers. Instead, it recommends that employers implement a comprehensive ergonomics program that includes workplace assessment, hazard reduction, and worker training.

Less controversial types of personal equipment include:

• clothing that accommodates extreme temperatures This worker would benefit from using vibration attenuation gloves.

• hand, wrist, elbow, knee, and ankle support

• vibration attenuation gloves, and

• knee pads for carpet layers

Employer responsibilities

The employer can create an environment that encourages early evaluation by a health care provider by:

• Providing education and training to employees regarding the recognition of the symptoms and signs of MSDs and the employers procedures for reporting MSDs

• Encouraging employees to report symptoms early so prompt evaluation by an appropriate health care provider can be provided

• Giving health care providers the opportunity to become familiar with jobs and job tasks

• Modifying jobs or accommodating employees who have functional limitations secondary to MSDs as determined by a health care provider

• Ensuring, to the extent permitted by law, employee privacy and confidentiality regarding medical conditions identified during an assessment

Employee responsibilities

Employees should participate in the health care management process by:

• following applicable workplace safety and health rules

• following work practice procedures related to their jobs

• reporting early signs and symptoms of MSD

Employees may be faced with conflicting job demands or requirements. Safe work practices or rules may conflict with pressures or incentives to be more productive.

Healthcare Provider Responsibilities

The healthcare provider can support the employer's ergonomics program by:

• Acquiring experience and training in the evaluation and treatment of MSDs

• Seeking information and review materials regarding employee job activities

• Ensuring employee privacy and confidentiality to the fullest extent permitted by law

• Evaluating symptomatic employees including:

o Medical histories with a complete description of symptoms

o Descriptions of work activities as reported by the employees

o Physical examinations appropriate to the presenting symptoms and histories

o Initial assessments or diagnoses

o Opinions as to whether occupational risk factors caused, contributed to, or

exacerbated the conditions

o Examinations to follow up symptomatic employees and document symptom improvements or resolutions

Ergonomics and human factors at work

To assess the fit between a person and their work, you have to consider a range of factors, including:

The job/task being done:

■ The demands on the worker (activities, workload, work pacing, shiftwork and fatigue). ■ The equipment used (its design in terms of size, shape, controls, displays, and how appropriate it is for the task).

■ The information used (how it is presented, accessed, and changed).

■ The physical environment (temperature, humidity, lighting, noise, vibration).

The individual's physical and psychological characteristics:

■ Body size and shape.

■ Fitness and strength.

■ Posture.

■ The senses, especially vision, hearing and touch.

■ Mental abilities.

■ Personality.

■ Knowledge.

■ Training.

■ Experience.

The organisation and social environment:

■ Teamwork and team structure.

■ Supervision and leadership.

■ Supportive management.

■ Communications.

■ Resources.

How can ergonomics and human factors improve health and safety?

-Applying ergonomics to the workplace can:

■ reduce the potential for accidents;

■ reduce the potential for injury and ill health;

■ improve performance and productivity.

Taking account of ergonomics and human factors can reduce the likelihood of an accident. For example, in the design of control panels, consider:

■ the location of switches and buttons – switches that could be accidentally knocked on or off might start the wrong sequence of events that could lead to an accident;

■ expectations of signals and controls – most people interpret green to indicate a safe condition. If a green light is used to indicate a 'warning or dangerous state' it may be ignored or overlooked;

■ information overload – if a worker is given too much information they may become confused, make mistakes, or panic. In hazardous industries, incorrect decisions or mistaken actions have had catastrophic results.

What kind of workplace problems can ergonomics and human factors solve?

Ergonomics is typically known for solving physical problems. For example, ensuring that emergency stop buttons are positioned so that people can reach them readily when they need to. But ergonomics also deals with psychological and social aspects of the person and their work. For example, a workload that is too high or Health and Safety Executive Ergonomics and human factors at work:. The following examples highlight some 'typical' ergonomic problems found in the workplace:

Design of tasks

■ Work demands are too high or too low.

■ The employee has little say in how they organise their work.

■ Badly designed machinery guards (awkward to use or requiring additional effort) slow down the work.

■ Conflicting demands, eg high productivity and quality.

■ These problems can lead to employees failing to follow procedures or removing guards, causing accidents, injury and ill health.

Manual handling

■ The load is too heavy and/or bulky, placing unreasonable demands on the person.

■ The load has to be lifted from the floor and/or above the shoulders.

■ The job involves frequent repetitive lifting.

■ The job requires awkward postures, such as bending or twisting

■ The load can't be gripped properly.

■ The job is performed on uneven, wet, or sloping floor surfaces.

■ The job is performed under time pressures and doesn't include enough rest breaks. These problems may lead to physical injuries, such as low back pain or injury to the arms, hands, or fingers. They may also contribute to the risk of slips, trips, and falls.

Workstation layout

■ Items that are used frequently are out of convenient reach.

■ Inadequate space under work surface for legs.

■ Work surface height inappropriate for the tasks causing awkward and uncomfortable postures.

■ Lighting inadequate causing eyestrain when inspecting detail on work items.

■ Chair not properly adjusted to fit the person and workstation. Managing the working day

■ Not enough recovery time between shifts.

■ Poor scheduling of shifts.

■ Juggling shifts with domestic responsibilities.

■ Employees working excessive overtime.

These problems may lead to tiredness or exhaustion, which can increase the likelihood of accidents and ill health

How can I check if there are ergonomics problems?

Checking for human factors problems is part of your normal risk assessment process. The first step in a risk assessment is to identify the hazards. This can be done by talking to employees and seeking their views, walking around your workplace to see if you can spot any hazards, and reviewing any accidents or reports of ill health you have had in the past..

Talking to employees

Workplaces where employees are involved in taking decisions about health and safety are safer and healthier. Collaboration with your employees helps you to manage health and safety in a practical way by:

■ helping you spot workplace risks;

■ making sure health and safety controls are practical;

■ increasing the level of commitment to working in a safe and healthy way.

Hazard spotting

While you walk around your workplace, look for signs of poor or inadequate equipment design such as:

■ improvised tools;

■ handwritten reminders, or handwritten labels on machinery controls;

■ plasters on workers' fingers or 'home-made' protective pads made of tissue or foam.

Review

Review information you may already have about accidents and ill health which may result from human factors problems:

■ Look at the circumstances that lead to frequent errors or incidents. Try to identify the root causes of people's mistakes. Use accident reports to identify details of incidents and their possible causes

■ Record and look at sickness absence and staff turnover levels. High numbers may be because of the problems listed earlier and/or dissatisfaction at work.

What can I do if I think I have identified an ergonomics problem?

■ Talk to employees and get them to suggest ideas and discuss possible solutions. Involve employees from the start of the process – this will help them to adopt changes.

■ Look for likely causes and consider possible solutions. A minor alteration may be all that is needed to make a task easier and safer to perform. For example:

— arrange items stored on shelving so those used most frequently and those that are the heaviest are between waist and shoulder height;

— raise platforms to help operators reach badly located controls (or alternatively relocate the controls);

— remove obstacles from under desks so there is enough leg room;

— provide height-adjustable chairs, so individual operators can work at their preferred work height;

— change shift work patterns;

— introduce job rotation between different tasks to reduce physical and mental fatigue.

■ Always make sure any alterations are properly evaluated by the people doing the job. Be careful that a change introduced to solve one problem doesn't create difficulties somewhere else.

■ You should be able to identify straightforward, inexpensive changes yourself. But you may need to ask a qualified ergonomist if you can't find a straightforward solution or if a problem is complex.

■ Adopting an ergonomics and human factors approach can save money in the long term by avoiding costly accidents, reducing injuries, reducing sickness absence, and improving quality and productivity.

■ There is a list of relevant HSE guidance at the end of this leaflet, including practical evaluation checklists and advice. Health and Safety Executive Ergonomics and human factors at work:

Case study 1

Eddie works on an engine assembly line. He uses a handheld impact wrench to fit a component to an engine. The assembly line makes up to 2400 engines a day and it takes approximately 3 seconds to tighten each component. As well as the risk from using a vibrating tool, Eddie often had to adopt poor postures to reach some parts of the engine. He had to repeatedly stretch out his arm and constrain his posture while tightening the adapter. After a few weeks Eddie found that he was leaving work with shoulder and neck pain. One tea break, Eddie's line manager saw him rubbing his neck and shoulder and recognised that the pain could be due to the type of work Eddie was doing. The line manager spoke with Eddie and then told the company health and safety officer about what she had seen. The company assessed the work by considering ergonomics principles and, after getting ideas from the workforce, came up with the following modifications:

■ They replaced the impact wrench with one with minimal reaction force so that little shock was transmitted to the hand. They also suspended the wrench so Eddie didn't have to support its weight.

■ They modified the workplace layout so workers had better access to all sides of the engine, avoiding the need to adopt poor working postures.

■ They implemented a job rotation scheme so the five workers on the line were moved around a number of different tasks.

Some of these tasks still required the use of vibrating tools, but the overall personal exposure was halved. As a result of the modifications there was:

■ a reduction in vibration exposure;

■ no need to adopt poor and constrained postures;

■ reduced boredom and fatigue for Eddie's team;

■ improved productivity.

Case study 2

Julie is a receptionist at a bank. Much of her work involves using a telephone to take messages and redirect calls to other departments. Julie regularly uses a computer to make appointments, record messages and respond to emails. After working at reception for eight months, Julie found she was leaving work with an aching shoulder and neck, and with sore eyes and a headache. Julie talked about the problems with her manager, who decided to review how computers were used in reception. Her manager carried out a DSE assessment, and also looked at the work Julie was doing at reception.

■ The DSE assessment identified that Julie's computer screen was difficult to read because of glare and reflections from light through the window. This meant that she would repeatedly adjust her posture to view the screen.

■ In addition, her manager also identified that Julie would often hold the telephone between her shoulder and ear while talking on the phone and typing a message on the computer. She regularly adopted this awkward posture during her working day. The assessment led to the introduction of simple, cost-effective measures to reduce the risks:

■ With the help of her manager, Julie rearranged her workstation so that the screen no longer faced the window, to remove the glare.

■ An eye test to establish if Julie had any problems with her vision.

■ A hands-free telephone headset was provided, which helped eliminate Julie's neck and shoulder problems. As a result, Julie's health problems diminished, and her productivity increased.

Case study 3

An operative's hand was amputated after he became trapped in packaging machinery while trying to clear a blockage. The machine was part of a production line. Workers were protected by a fence that enclosed several production lines. Access to the machines was through a door in the fence which was arranged so that all production lines were switched off when it opened. Managers regularly visited the shop floor to talk about production targets. The workers had obtained an override key, so they could open the door and enter the enclosure without stopping production. But this meant the machinery was not isolated. Following the accident, these measures were identified to help prevent a recurrence:

■ Consulting workers about how and why the maintenance procedures were difficult to follow;

■ installing local guards so workers could isolate individual machines without stopping the other production lines;

■ holding toolbox talks with the workforce to better communicate management's commitment to safe working. As a result of these changes, employees were less likely to take short cuts when clearing blockages. There was also less down time on the production lines which improved productivity.