Introduction
One of the key industries in Zimbabwe is agriculture and, in particular, cotton production and processing play a major role in the country’s economic development. In fact, Zimbabwe is one of the largest producers of cotton in Africa. Cotton has been grown in Zimbabwe on a commercial basis since around 1920. At present, the cotton industry in Zimbabwe continues to expand. More than ten ginneries and about seven cotton textile spinning factories are now in operation.

Expansion of the cotton industry has made it necessary to carry out health hazard evaluations with special focus on the ergonomic problems associated with cotton processing in the cotton-spinning industry. The cotton-spinning industry in Zimbabwe has equipment ranging from modern to relatively old. The cotton-spinning processes in all of the factories visited were similar, and the ergonomic assessments carried out focused on bale breaking, waste press, ring frame and winding processes. The ergonomic hazards identified focused on these areas, and possible solutions have been suggested.

Ergonomics aims to find the best fit between worker and working conditions. Ergonomics examines the physical capabilities of the human body and the limitations of the human body in relation to a person’s work tasks, the tools used and the job environment (1). Thus ergonomic programmes aim to ensure that workers are protected against occupational injuries and that the environment in which they operate is comfortable.

Operational areas and ergonomic hazards identified

Bale breaking process

Manual handling
In the bale breaking area, the operator uses a sack trolley to collect bales and lines them up for breaking. Each bale weighs about 200 kg. There is a great deal of manual handling of the bales in order to get them aligned, resulting in considerable bending, turning and twisting of the operator’s body. This task has been observed to require considerable muscular effort in addition to the force required to wield an axe to break the wires holding the bale together. Such work activity was noted to cause mechanical stress in the worker’s upper arms and lower back muscles.

Posture
The operators work in a bent position for long periods when breaking the bale with an axe or cutting the wires with a wire cutter (clippers). The operator is further exposed to injury from the wires which hold a cotton bale together; upon being cut the wires can swing back swiftly with great force, possibly causing injuries to the face and upper body.

Recommendations
It was noted that the tasks performed during bale breaking required that workers receive periodic training on the proper and safe ways of manual handling of heavy lint bales in order to prevent problems of back injuries and other musculoskeletal disorders. Although useful equipment – such as roller conveyors, mobile raising platforms or barrows – were available in some cases, these were noted not to be fully utilized. These equipment should be utilized in order to minimize exposure to the ergonomic hazards which may lead to musculoskeletal disorders.

Since the bale breaking process re-
quires standing postures, ergonomically designed seats which are padded with back rests should be provided. Operators should be allowed to sit for short periods in order to rest the muscles of the legs and to reduce strain, autostatic collapse and development of varicose veins.

The poor postures noted during wire cutting of the cotton bales should be avoided, as this leads to local mechanical stress on the muscles, ligaments and joints, resulting in complaints of the neck, back, shoulder, wrist and other parts of the musculoskeletal system (2). Full-face shields or visors should also be provided for the task of cutting wires, as these would protect workers' faces against injury from the tension wires holding the bales together.

Waste-press process
The different cotton-spinning factories have different types of presses in the waste-press process areas. Waste cotton collected from the machines during cleaning is baled and either is sold to furniture manufacturers for stuffing, or is recycled.

It has been noted that operators gather large armfuls of dirty cotton off the floor and feed the press unit manually. In some cases, the machines feeding point is above chest height, and the operator has to reach up (work with arms above shoulder height), while other machines have feeding points at about waist height (see Photo 2). This, however, then requires someone to jump into the feeding hole and compress the cotton with the feet (see Photo 3).

The main musculoskeletal risk is injury to the back arising in removing the heavy bales from the waste press and moving them into the storage area. Waste is usually brought and dumped on the floors in large heaps; this makes housekeeping difficult, as the cotton dust tends to fly all over the work environment. There is also the risk of back injury, which can result from repeated bending down to pick up the cotton and feed the waste-press units.

Mechanical loading of waste in the press is a possible solution which would help avoid the manual loading that can lead to musculoskeletal disorders. Waste cotton should be kept in containers, or skips, rather than dumping it onto the floor; then operators would not have to bend down continuously to pick up the cotton waste on the floor. Since waste cotton bales from the press weigh up to 200 kgs, removal of these bales should be by some lifting equipment. This would prevent the back injuries that can arise as a result of pushing, pulling and moving the bales of cotton to storage areas.

The ring frame and winding processes
The operators in these areas work in standing postures for long periods, and this can cause back injuries and leg problems. The working height is not adjustable, especially in the winding process; tall workers are thus forced to work with bent backs and necks, leading to back and neck strain.

There is considerable manual handling where workers pull and push knee height trolleys containing tubes onto which yarn is spun. In some spinning factories, the trolleys were wheeled, but in others the trolleys had no wheels, making them more difficult to push and pull. The fact that in some factories the trolleys are knee height forces workers to bend most of the time when pushing and pulling.

Workers should be allowed to sit for short periods in order to rest their legs. Trolleys should have wheels so that they are easier to pull and push. In order to ensure that the trolleys can be handled in an upright position, they should have handles at waist height.

Conclusion
Ergonomic assessment in the cotton-spinning industry has shown that there is a need to improve engineering designs as well as work methods and processes in order to avoid musculoskeletal injuries among workers. Management should consider action plans that aim at eliminating musculoskeletal disorders, in particular back injuries associated with manual lifting and poor handling practices (3). Such an action plan (3) should
- identify all manual handling operations and risks which may give rise to musculoskeletal disorders
- examine current sickness absence records associated with manual handling, e.g. days lost through back strain, fatigue, handling injuries as well as calculation of the cost to the organization
- examine the nature of the loads han-
A two-day meeting was convened in Arusha, Tanzania, on 15–16 December 2004 to discuss occupational safety and health in Kenya, Tanzania and Uganda. The main organizers of the Workshop were Mr. Ali Ibrahim, Director of the ILO Office in Dar es Salaam and Mr. Franklin Muchiri of the ILO Office in Addis Ababa. The ILO Headquarters was represented by Dr. Shengli Niu and Mr. Konstantin Novikov. WHO was represented by Mr. Thebe Pule of the WHO Regional Office for Africa in Brazzaville, Congo. Also WHO representatives from the three countries attended. The three countries were represented on a tripartite basis, i.e. governments, employers’ and workers’ organizations, and they contributed actively to the discussion and the overall success of the Workshop. The Finnish Institute of Occupational Health had the privilege to attend the meeting in the role of observer.

The aim was to survey the possibilities for further harmonization of occupational health and safety regulations and practices in the Region. The discussions of the Workshop were based on the long-term collaboration in occupational health and safety among the three countries.

Areas of common interest

Working conditions are similar everywhere in the world, especially in regions where the cultures and languages are so close to one another as in East Africa. The three participating countries had prepared an OS&H country profile according to the format of the ILO. These profiles were briefly introduced, and they were discussed and used as a basis for group work.

The first group work was conducted per country (government, employers, workers). The task was to define the strengths, weaknesses, and challenges in OS&H in each country. Also, each group identified their national priorities for action.

The second group work dealt with the regional harmonization of OS&H policy and legislation. A proposal for a plan of action was also requested from the groups. The groups were now formed as a combination of countries and reference groups. The second day of the Workshop was long – still after 12 hours of work everybody was eager and enthusiastic to edit, improve and polish the wording of the recommendations of the Workshop. The atmosphere of the Meeting was one of development, understanding, appreciation and learning.

It became clear during the two-day discussions that the countries share common topics of interest, such as renewal and harmonization of OS&H legislation, increasing awareness of OS&H, capacity building in OS&H, prevention of HIV/AIDS at workplaces, and elimination of child labour, just to mention a few.

The countries are preparing their own development plans to promote health and safety at work. The ILO and WHO collaboration will be targeted to support these development plans. In addition, it will be cleared up whether the Finnish Institute of Occupational Health could contribute to the development by a special follow-up programme. This should be a part of the development programmes of the Finnish Ministry for Foreign Affairs. These plans are now being monitored.

References


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