

Ergonomic hazards Associated with Steel Manufacturing Industry: The case of a steel making company in Redcliff, Zimbabwe

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Abstract

The aim of this study was to examine the ergonomic hazards that are associated with steel manufacturing at a plant in Redcliff, Harare. The objectives of the study were to identify the ergonomic hazards, analysis of their effects and an assessment of the effectiveness of measures that are in place to combat the impacts of the hazards on employees. The research encompassed both qualitative and quantitative research paradigms and the use of primary and secondary methods of collecting data pertaining to ergonomic hazards associated with steel manufacturing. Primary data was gathered through questionnaires, field observations and interviews while secondary data was obtained from the company health and safety records, clinic records, national health and safety policies and journals. Results from the study indicated that the level of knowledge and appreciation of ergonomics amongst the employees was still low due to inadequate training and lack of management commitment. There is need to consider ergonomic interventions in the day to day operations of the company in order to reduce work related ergonomic hazards, risk factors and ergonomic injuries.

Keywords: Ergonomics, Musculoskeletal disorders, ergonomic risk factors, ergonomic hazards, Steelmaking.

Introduction

According to Scott and James (2009), ergonomics has a relatively short history on the African continent. Most countries in the region have not fully adopted the science compared to most developed countries. However, there is a growing awareness of the need for ergonomics and the international community and local enthusiasts have been actively involved in establishing the discipline in North, West, Central and Southern Africa (Ali 2008; Bhattachanya and McGlothlin 2012; Collins et al. 2011; Dekker et al 2013; ILO 2013; Yisa 2005). In South Africa, Ergonomics was first recognized in the early 1960s where investigations were carried out examining the effects of thermal stress on the miners. It took the country probably 20 years around the 1980s to establish a society and the Ergonomics Society of South Africa (ESSA) was finally accepted as a member of the International Ergonomics Association (IEA) in 1994 (Scott and James 2009). It can be noted that the field of ergonomics is an integral part

of day to day life at work yet its application in Africa is still very low. There is need to investigate occupational ergonomic hazards and implement control measures in order to improve the health and safety of workers around Africa.

In Zimbabwe, the field of ergonomics falls under Occupational Health and Safety and the National Social Security Authority (NSSA) is the custodian of safety and health issues and falls under the Ministry of Labour and Social Welfare. In 2001, the Zimbabwe Congress of Trade Union (ZCTU) health and safety department divided occupational safety and health hazards into six categories namely physical, chemical, mechanical, biological, psychological and ergonomic (ZCTU 2001). Katsuro (2001) elude that all these six have a negative impact on employees. In his manual for occupational hygiene, Hirst (2010) pointed out some of the ergonomic hazards found at work places which are manual handling of loads, repetitive actions and use of display equipment such as computer screens. Kadiri and Niesing (2012) also noted some of the hazards as forceful movements, vibration, temperature extremes and awkward postures. These cause cumulative trauma disorders (CTD) also known as work related musculoskeletal disorders (WMSD)(Mannuele 2013; Mile and Perrew 2011; OSHA 2015; Pheasant 2015. Examples of muscular-skeletal disorders include carpal tunnel syndrome, cellulitis, osteo-othritis and tendonitis. Hirst (2010) pointed out that many manual handling injuries tend to be cumulative in nature with far reaching repercussions for both employers and employees with therefore leaving the best strategy for preventing injuries being preventative rather than reactive.

Steelmaking in Zimbabwe generally involves heavy duty work and employees are exposed to ergonomic hazards such as repetitive and forceful movements, vibration, temperature extremes, manual handling and awkward postures. The industry requires higher production rates and as a result the duties involve frequent lifting, carrying, and pushing or pulling of loads with limited help from other employees or devices. The above factors when coupled with poor machine/equipment and workplace design create a physical stress on workers' bodies. Generally, ergonomic hazards are known to cause MSDs but in this case they mainly accounted for instant cuts, bruises, burns and sprains known as ergonomic injuries. An ergonomic injury is one that occurs as a direct or indirect consequence of the nature and demands of the person's working task and they may occur as discrete events which take place at a particular point in time due to a single episode of over-exertion (Hilgert 2013; Scott 2009; Zinh and Fischer 2012). Jerie (2013) describes ergonomics studies as the study of complex relationship between people, physical and psychological aspects of the work environment and aims at optimizing the comfort, health, safety and efficiency of workers yet this is not the case in mining enterprises of Southern Africa.

The steel manufacturing company in Redcliff, just like the bulk of manufacturing companies in Zimbabwe, incorporates manual heavy duty work where awkward postures, bending and other ergonomic hazards are experienced. There have been recorded and unrecorded complaints of backaches, pain of the wrist, cuts, thermal injuries, sprains and strains at the

company. Some employees already have permanent disabilities due to poor ergonomics. The year 2014 accounted for 361 accidents for both Units 1 and 2, of these 38 had a lost time injury and were reported to the National Social Security Authority (NSSA). Of these accidents, 161 were due to unsuitable protective clothing which falls under wrong equipment and 111 were due to unsafe conditions which included poor work design and equipment hence many cuts, burns, bruises, sprains and strains were recorded. Other ergonomic injuries accumulate over time and it is because of this nature that some of the ergonomic injuries develop unnoticed and some employees lack adequate knowledge hence they opt to continue working without paying attention to these in order to earn a living. In addition to these, there is no clear policy addressing the issue of ergonomics alone within the company hence no attention to this area in particular. Moreover, the plant was manufactured around 1927 long before the discipline had gained momentum and it is now outdated together with most of the equipment used at the company. When taken seriously, an ergonomic program leads to increased productivity, job satisfaction, lowered workers' compensation claims and absenteeism. However, despite these advantages many workers each year still suffer ergonomic injuries and cumulative trauma disorders. Given the current conflict between production and worker's safety in the area of study, this study endeavours to assess the impacts of ergonomic hazards and come up with recommendations on how basic ergonomic principles can be applied to control the ergonomic hazards.

Previous studies on ergonomics have greatly contributed to the pool of knowledge available. Many studies have been carried out in the United States and the European Union identifying ergonomic hazards, risk factors, the burden of musculoskeletal disorders and how ergonomic principles can be applied to attain better results. In South Africa, much work on ergonomics covers the mining industry and health facilities (Bhattachanya and MvGlottlin 2012; Pew and Mavor 2007; Vaidogas 2011; Hilgert 2013; Scott 2009). There has been a gap in the information and knowledge available on ergonomics in Zimbabwe specifically the steel manufacturing industry. Different industries and workplaces present different hazards therefore different prescriptions should be given accordingly, but firstly there is need to know what is happening on the ground so that recommendations can be drawn from that. Henceforth, this study aims to bridge the knowledge gap between other developed countries and the Zimbabwean Steel manufacturing industry.

Methodology

The target population for the study comprised employers and employees at the steelmaking company. The organization currently has an establishment of around 200 employees. The inclusion of both employers and employees is to be done since ergonomics involve the workstation/equipment/machinery design and human errors which has to do with employers acquiring them while these are designed for workers who are mostly exposed to the physical and mental strain these pose. Given the number of workers under the target population which was around 180 at the time of the study, one third of the population was sampled that is 60.

The sampling purposively involved the various business units of the company. These included Production, Clinic and Human Resources. The representation basis can be further divided into two that is probability and non-probability sampling while the element selection technique relies on restricted and unrestricted sampling. This study adopts the probability restricted sampling design.

Primary data methods adopted include questionnaire surveys, interviews and observations. Secondary data was used to compliment the data obtained from primary data. Literary data from journals, reports and books was used in this study. The questionnaire captured demographic data, time on the job, type of tasks carried out, ergonomic hazards associated with the jobs, their suspected effects, the effectiveness of measures that are in place to control these hazards if any and the questionnaire also gave the respondents a chance to add their views and recommendations towards the subject under study. The main objective under this method was to be able to quantify and qualify data obtained and be able to analyse it both quantitatively and qualitatively. This method was both cost-effective and non-time consuming and the questionnaires were self-administered. Structured interviews were adopted as a guide to obtain information pertaining to organisation of ergonomics in the company (Table 1).

Table 1 Interviewees and rationale for choosing them

Interviewee	Rational for choosing them
Chief safety officer	<ul style="list-style-type: none"> ➤ Is responsible for company SHE policy, manuals and procedures implementation. ➤ Is responsible for training employees on safe operating procedures. ➤ Carries out daily plant inspections, monitors working behaviors and proposes recommendations hence is in the best position to assess the ergonomic hazards encountered by employees and keeps records of all the injured employees.
Human resources personnel	<ul style="list-style-type: none"> ➤ Responsible for enrolling employees, keeps all employee records and is also responsible for training.
Nurse in charge	<ul style="list-style-type: none"> ➤ Attends to all occupational injuries and keeps all clinical records of the employees.
NSSA inspector/Ergonomist	<ul style="list-style-type: none"> ➤ Have information on the occupational, health and safety legislation in relation to ergonomics. ➤ Carries out OHS inspections in organisations including Steelmakers.

The safety and health department also keeps records of all accident statistics, investigations and reported injuries. The department also has safe operating procedures (SOPs), a manual

and a she policy in use. In addition to these there are copies of all the legislation governing occupational health and safety. Information of any use in relation to ergonomic hazards associated with the production of steel at the company was also drawn from these secondary sources. Accident statistics for the past five years were accessed for the analysis of trends, major causes of accidents and nature of injuries. Standard Operating Procedures, manuals and SHE policy were analysed by the student and helped come to a conclusion whether the policies address the issue of ergonomics, to what extent and what needs to be done to improve the already set structures. On the other hand, the clinic keeps mainly two types of registers that is one for injuries on duty and the other for sick cases. There was need to identify to what extent does the clinic recognize ergonomic injuries and if there are any measures in place towards minimizing the exposure of employees to ergonomic hazards. Data from the questionnaires was mainly analysed through SPSS and Microsoft excel while interviews and field observations' results were used for the qualitative discussion. The information was then presented through tables, bar graphs, pie charts and test of significance were also carried out (Chi-Square tests).

Results and Discussion

Organisational SHE structure at the steelmaking company

The steelmaking company is made up of five main plants namely the smelting, foundry, rolling mills, crusher and oxygas plant. All these departments or plants have one central Safety Health Environment and Quality manager who reports directly to the Group General Manager and one Chief safety officer who works with other safety officers, SHE representatives and attachees. The SHEQ manager controls all safety, health, environment and quality issues at the company. The manager works with the safety department and quality department. In the safety department, she advises the company management on legal and statutory instruments related to SHE issues and enforcement of Occupational Health and Safety (OHS) legislation. Some of the manager's duties include carrying out major accident investigations, planning committee meetings and workshops. The chief safety officer induct and train new employees, visitors and contractors on Safety Health and Environmental (SHE) issues, enforces safety legislation and policies, ensure that all employees adhere to safe work procedures through daily plant tours, carries out all accident investigations, monitor enforcement of recommendations, process and send claims to NSSA and carry out SHE trainings with employees. Safety officers and attachees carry almost the same duties, doing accident investigations, safety audits, and hazard identifications and monitoring safe work behavior. Plant supervisors on the other hand work hand in hand with employees ensuring that safety talks are held daily, monitoring employee behavior and identifying risks and hazards as they arise. Safety representatives include supervisors, employees and contractors. These sit in the SHE executive meetings supposedly done every month, they raise SHE concerns of employees and help the SHE department with recommendations and monitoring. The clinic mainly helps injured employees with immediate medical attention, carries out awareness campaigns and doing medical examinations.

Types of ergonomic hazards

Manual material handling accounts for 69.4% of the hazards, uncomfortable chairs/confined workspace; repetitive work, and poor workstation design, layout and equipment accounts for 8.3%, 8.3% and 13.9% respectively. This is so because most of the work done at the company involves manual handling such work as packing material, tonging during rolling and pushing and pulling of scrap material. The Chief Safety Officer also indicated that,

“the absence of forklifts and other lifting aids increase the risk of injuries from manual material handling, and the shortage of transport and other resources result in employees doing the work manually that should be done with the aid of trucks such as moving scrap material from one point to the other, they end up pulling or pushing carts around which requires excessive force.”

The ILO (2005) has noted that manual handling of large, bulk objects is common in iron and steel industries despite the high degree of mechanization and aid devices. The Tongs men work in groups of ten, two per rolling stand. Their work involves inserting hot steel bars from one pass to the other. Their work involves repetition, pulling and pushing steel bars using the tongs. This work is performed four hours to five hours per day having one hour breaks in between. Jerie (2012) noted that most manual material handling tasks constitute risk or injury and the factors under consideration being the task, load, work environment and individual capacity. In terms of individual capacity, the tongs men are limited because their work is paced by the mill and they have to adapt to that speed which most of them highlighted that it is difficult to keep up with the pace. Confined spaces or uncomfortable chairs accounted only for 8.3% because only a few people work in confined spaces and those with uncomfortable chairs were mainly crane operators and machine operators. Some employees spend the whole day operating the cold shear machine while on an uncomfortable steel chair. This increases the risk of lower back pains and at times their feet will be suspended while they operate. Scott *et al* (2010) noted the following for seating work stations:

“No one posture is suitable all of the time or for all people. Regular changes in sitting postures are necessary to reduce the effects of straining the same muscle groups and fatigue. Tasks should be organised so that people can take breaks periodically. If people are seated for most of the working day they need well-designed seating including adjustments and padding. No chair will seat people comfortably for more than about an hour at a time. Even the best designs become uncomfortable over time. Work seating should be adjustable at least in seat height and backrest angle. Adequate lumbar support at the base of the spine is important for comfort and back care.”

Although confined workplaces and uncomfortable chairs accounted for only 8.3%, employees at these workstations are at the risk of developing MSDs taking into consideration what Scott *et al* (2010) observed.

Nature of injuries

A number of injuries arising from poor ergonomics were gathered through the survey. Figure 1 shows the injuries that were identified by respondents. Twenty-two percent of the respondents indicated that they experience burns due to poor ergonomics while 19.44% indicated they experience both cuts and burns. Others indicated they experience cuts alone (8.3%); cuts and back aches (8.3%), others just minor injuries (5.6%), burns and back aches (13.89%) and so on. Poor ergonomics at the steelmaking plant mainly accounts for instant injuries.

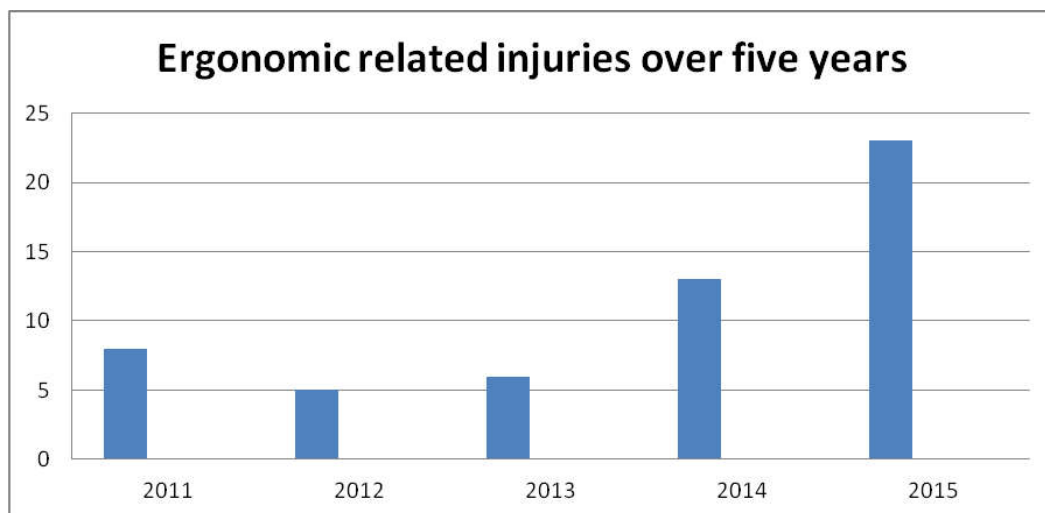


Figure 1 Injuries related to ergonomics over five years

Figure 1 shows a trend in the ergonomic related injuries at the company. According to the accident register these injuries were due to improper PPE, poor workstation layout, forceful movements and heavy lifting of loads. The injuries also varied from back aches, cuts, muscle strains and burns. An interview with the clinic's sister in charge indicated that some of the main ergonomic injuries such as back aches, pains of the shoulders and wrists sometimes go unnoticed due to lack of knowledge of ergonomics.

Knowledge of ergonomics amongst employees

Sixty-six percent of the respondents indicated that they are not familiar with the term ergonomics while 39% indicated that they are familiar with the term. Those who are familiar with the term indicated the following as consequences of poor ergonomics: "workplace injuries, backaches, weak joints and straining muscle, absenteeism and low production." A Chi-Square test was undertaken to determine whether there is any association between the respondents' level of education and the knowledge of ergonomics (Table 2).

Table 2: Chi-Square Test for level of education and knowledge of ergonomics

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.134 ^a	3	.545
Likelihood Ratio	3.176	3	.365
N of Valid Cases	36		

As noted above the Pearson Chi-Square value is above 0.05 therefore we reject H_1 and accept H_0 meaning that there is no association between the level of education and knowledge of ergonomics. Ergonomics is relatively a new field in Zimbabwe and it has not been fully incorporated in other studies except for those students doing medicine or occupational health and safety. It might have been the case that those who had knowledge of ergonomics would have been trained at work. Scott *et al* (2010) is also of the view that most developing countries have very limited knowledge concerning ergonomics and that they have very few qualified ergonomists. This is true for Zimbabwe, the country's organisation that deals with OHS issues NSSA only have one ergonomist at the moment, whereas it is even advisable to have an ergonomists in industrial firms to boost productivity and safety.

Workload of employees

During the survey, 55.6% of the respondents noted that the workload was too much. When asked of the effect the workload had on them, the respondents gave different responses. Eleven respondents indicated that they would end up not having any rest while fifteen indicated too much workload leads to fatigue and mental stress. Another respondent who is a machine operator indicated that too much workload leads to stress and development of back pains. One other worker noted that "it may cause ergonomic problems like pulling of muscles and pain of the back." This might be as a result of the work posture and repetition of work all day long. The responses signaled that workload can also be a cause of ergonomic hazards as it increases the number of working hours minimising breaks. Five of the responses from packers highlighted that their work conditions pose the risk of injury to their musculoskeletal system and further indicated the body parts mostly affected are the back and the hands.

Packers normally work in groups of fours. The employees who work at the packing section indicated that they sometimes work for more than nine hours up to twelve at times depending on the available material. They only rest when there is a breakdown or when material is unavailable for packing. Most of them indicated that they have too much workload and their work involves repetitive motions, continuous bending and manual handling of material, for instance the stopper used is heavy. As a result most of them highlighted that they end up

experiencing back and shoulder pains. They also indicated they do not normally report these pains except for instant injuries and excessive muscle strains.

A Pearson's Chi-Square test was taken to determine if there is any association between number of working hours and workload of the worker.

Table 3 Chi-Square Tests for the number of working hours and overall workload of respondents

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.191 ^a	6	.058
Likelihood Ratio	12.637	6	.049
N of Valid Cases	36		

The Chi-Square value is 0.058 which is slightly above the critical value, therefore H_1 is accepted and H_0 rejected meaning that there is a slight association between the number of working hours and overall workload of respondents. As noted from the questionnaire responses, as the workload increases, the number of working hours also increases limiting the amount of rest time for employees. Therefore too much workload increases the risk of the burden for musculoskeletal disorders.

At the steel-making company, 86% of the employees indicated that they do not take their leave days while only 19% indicated that they take all their leave days. While employees indicated that the importance for taking vacation leave is mainly for resting many of them are not going because of the following reasons obtained from questionnaire responses:

- Some indicated they only take a few days off in case of emergencies
- Some sell their leave days due to demanding production rate
- Some indicated that they cannot go for leave since they are only contract workers.
- Others mentioned shortage of manpower

The Labour Act (14:08, 2005) states that employees are entitled to an annual leave of thirty calendar days at the end of each year with an employer. This gives them time for renewal; however, most employees at Steelmakers do not take time for leave putting them at the risk of developing cumulative trauma disorders taking into account the identified ergonomic hazards.

Ergonomic control measures

The third objective was to assess the effectiveness of measures in place to combat the impacts of ergonomic hazards. The Human resources manager who also used to be the SHE manager noted the following ergonomic control measures,

“Awareness campaigns and in-house training, mechanical audits and other safety audits national policies and legislation, accident investigations and remedial actions.”

The Chief Safety and health officer noted the following current control measures;

“We have Safe Operating Procedures (SOPs) and there are SOPs for every department and machinery that requires extra safety precautions. These procedures mainly state hazards and risks found in a department and how employees are supposed to carry out their duties in that department, we also train employees every quarter but sometimes when need arises for instance, a department with many injuries for that month. We train employees on lifting techniques e.g. use of legs and not the back. Moreover, there are fans and one hour breaks for the tongs men who work in an extremely hot environment and at some point they were given refreshments to cover for the water lost through diaphoresis (sweating). The safety department also carries out monthly safety audits in which we assess housekeeping, state of machinery, and electrical appliances.”

These were the words of the Chief Safety Officer when asked on the ergonomic control measures they have. She, however, noted that the machinery is now old which limits the success for the safety audits they carry. She also noted that NSSA carry out inspections and pass recommendations which sometimes are not fully implemented because of the current economic environment. In as much as training is concerned she noted that NSSA also carries out trainings but they are limited by resources as the trainings are not done freely.

Employees’ responses from the questionnaire survey were also used to assess the effectiveness of measures in place to control ergonomic hazards.

The responses show that fourteen of the thirty-six respondents strongly agreed that control measures by management lacked clear strategies for action while eleven just agreed, ten moderately agreed while just one strongly disagreed. A Pearson’s Chi-Square test was also carried out to determine whether there is any association between the clarity of control strategies by management and effectiveness of control measures.

Table 4: Chi-Square test for the measures’ lack of clarity on strategies for action and effectiveness of these measures.

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.099 ^a	12	.049
Likelihood Ratio	22.107	12	.036
N of Valid Cases	36		

As noted in Table 4, the Chi-Square value for the test is 0.049 and it is slightly less than 0.05 therefore we accept H_1 and reject H_0 meaning there is any association between the measures lacking clear strategies for action and the effectiveness of control measures. This means that if control measures lack clear strategies for action they consequently become ineffective in controlling the hazards. There is also a possibility that employees were not adequately trained in relation to ergonomics.

Of the respondents, 12 strongly agreed that training in relation to ergonomics at work was inadequate, 17 just agreed, 1 was moderate, 2 disagreed while 4 strongly disagreed. A larger percentage (80.6%) did not receive adequate training on ergonomics that perhaps explains why the control measures were ineffective and lacked clarity because they did not understand them.

Below is a list of factors that were raised from questionnaires that hinder the effectiveness of occupational health and safety regulations:

- Lack of/inadequate/inconsistent training and provision of safety clothing
- Individual safety culture aspects
- Current economic situation which is ailing at the moment
- Long working hours
- Lack of implementation from the management and proper follow ups by the safety department and NSSA inspectors
- Lack of respect for workers' rights
- Consideration of production over safety issues
- Noncompliance of safety regulations by the company
- Employees lack of interest in training
- Use of old model technology which is largely manually operated.

These were the top factors hindering the effectiveness of OHS mentioned by employees during the questionnaire survey.

The Chief SHE officer also noted some factors hindering the effectiveness of OHS. She noted that changing the whole plant would be one of the most viable ergonomic control measures; however she noted that it is too expensive and considering the current economic environment it is almost impossible. She went on to note cultural differences in the sense that it is an Indian organisation based in Zimbabwe henceforth the way Indians perceive safety issues might differ from the way Zimbabweans perceive them. An interview with the NSSA OHS inspector raised the following as some of the factors hindering the effectiveness of OSH regulation on ergonomics,

“There is a conflict of interest between employers and inspectors whereby employers are mostly concerned with production while inspectors are concerned with safety of employees. The extent of reporting is poor-musculoskeletal disorders (MSDs) may be ignored as they are gradual. There is also a weakness on the law that does not fully recognize ergonomic injuries due

to their gradual nature. There is lack of in-house expertise per company on ergonomics; at least a company should have an ergonomist. There is poor level of appreciation of ergonomics in companies and even at national level since this is relatively a new field in Zimbabwe and thus the extent of the damage of MSDs cannot be ascertained here. People may not report because they do not get anything or any specific help.”

These are some of the major hindrances mentioned by the NSSA inspector on the effectiveness of ergonomic control measures in Zimbabwe. The International Labour Office (2013) also noted that the current global economic recession which leads to reduced production and downsizing of companies amongst others is also responsible for depreciating OHS standards in industries.

Personal Protective Equipment

Personal protective clothing is the last line control measure in the event engineering controls are not feasible. Responses from questionnaires revealed that only 17% of the respondents are provided with protective clothing while 83% indicated they are not provided.

Table 5: Chi-Square Test for the type of PPE provided and frequency for provision

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	74.951 ^a	35	.000
Likelihood Ratio	66.799	35	.001
N of Valid Cases	36		

The Chi-Square value in Table 5 is 0.00 and it is less than 0.05 therefore we accept H_1 and reject H_0 meaning that there is significant association between the type of personal protective equipment provided and the frequency for provision. Respondents from the questionnaire survey highlighted that gloves are the only PPE type they are provided with in most cases. There is no specific time interval for provision of different types of protective clothing. Other types of PPE such as work suits and safety shoes are provided to employees sometimes once a year or twice and other indicated they buy their own personal protective equipment. Most employees also noted that the gloves provided are not that comfortable to use during performing their tasks while some tongs men also noted that they are not provided with leggings frequently. Plate 4.3 shows how some tongs men had dealt with the problem of lack of leggings. They continue using the old torn legging tying them around but they are not comfortable.

Workplace ergonomics and the legal framework

The steelmaking is required by law to follow certain Occupational Health and Safety Legislation throughout its entire operations. Throughout the interviews and field observations, it was noted that the company is aware of some of the legislation governing OHS for instance their commitment to the Factories and Works Act (14:08), Statutory Instrument 68 of 1990 and others. These other pieces of legislation only imply the issue of ergonomics. The company is required by law to establish a SHE policy which read;

“ As management we acknowledge that it is our solemn obligation to harmonize our operations with our surrounding environment as well as creating a safe working culture within our work environment. In order to continue to implement our drive towards this goal, our health and environmental strategy includes the following elements;

- Compliance with statutory instruments aimed at promoting health, safety and environmental management*
- Ensure that all employees, contractors and business partners are inducted on occupational safety, health and environmental matters and understand their obligations with respect to this policy*
- Conduct regular safety audits for compliance by trained inspectors*
- Commitment to continual improvement and prevention of occupational accidents and illnesses*
- Involve the workforce in the development and implementation of management systems and standards that minimize adverse safety, health and environmental impacts resulting from its operations, products and services.”*

As noted above, the company policy does not clearly state the issue of ergonomics. In an interview it was brought to light that the policy was drafted as per NSSA requirements and that they are supposed to state five or six things as required by NSSA as a result ergonomics is enshrined in other issues on the policy.

On a national scale, the issue of ergonomics is stated in the Zimbabwe National Occupational Safety and Health Policy of 2014. According to the policy, ergonomics is “the adaptation or matching of work to the capabilities of employees in light of their physical and mental health” while a hazard is defined as a “source or situation with potential to cause harm in terms of human injury or ill health, damage to property, damage to the work environment or any combination of these.” The policy appreciates that occupational injuries and accidents rise as a result of uncontrolled worker factors, environmental conditions and the state of the equipment and machinery in use hence the fifth Policy objective states that, “To provide for ergonomics, prevention of occupational accidents and for emergency preparedness”

Policy Principle number 12 states that,

“all lost time injuries preventing or likely to prevent a worker from attending duty for 3 or more shifts, all fatalities immediate or delayed and all injuries to persons not

employed in the workplace where the accident occurs such as customers, clients and members of the public shall be reported to the nearest Inspector of workplaces as soon as possible and certainly within 24 hours of occurrence”

The above principle indicates that the Policy mostly recognizes instant injuries with instant impacts noticeable; however ergonomic injuries are in most cases cumulative in nature that they take time to manifest into a noticeable problem. This is a weakness in the reporting structure as required by law consequently cumulative trauma disorders will progress unreported. This is also the case for Steelmakers; the Chief Safety Officer even noted that it is difficult to classify MSDs as occupational injuries. The industrial nurse however also indicated that sometimes workers report back aches as sick cases that’s when they notice that they are in fact occupational injuries.

On the Strategic Areas of Focus part 6.6 “Hazards identification and risk assessment” of the national policy, it is stated that the employers should effect OSH programmes. Programmes are to be implemented in this hierarchy:

- Elimination of hazard or risk,
- Control of the hazard or risk at source through engineering controls or organisational measures,
- Minimising the hazard or risk by designing safe work systems which include administrative control measures,
- Providing personal protective equipment and
- Maintaining a hazard and risk register with all identified and profiled hazards and risks to inform mitigatory programmes.

The last section of the Policy which is OSH in the economic sector part 7.4 speaks on the manufacturing industries. It clearly states that organisations involved in manufacturing should pay attention and monitor occupational safety and health issues which amongst them are the issues of ergonomics.

Conclusion

Ergonomics is a relatively new field in Zimbabwe indicated by the above results. The ergonomic hazards at the steelmaking constitute heavy loads, heat, uncomfortable work spaces and repetitive work. Employees are faced with risk factors such as manual material handling of the heavy loads, over exertion, awkward posture and repetitive motions also implying the risk of musculoskeletal disorders. Accident registers show injury statistics are on the rise from the period 2012 to 2015 signifying the growing concern for ergonomic interventions. It was established during the study that over 60% of the respondents are not aware of the issue of ergonomics and some even suffer ergonomic injuries unaware and they do not report.

The study also established other factors that expose the employees at the risk of suffering musculoskeletal disorders such as leave conditions. It was noted that despite the importance of taking all annual leave days, employees sell their days due to economic hardships and

shortage of labour. Lack of training on ergonomics also contributed to the employees' lack of ergonomics awareness and probably leaving them susceptible to hazards caused by poor ergonomics. Other respondents from other sections also noted that long working hours led to them getting fatigue and losing concentration on their work. The time factor was raised by employees who assume awkward work postures such as bending the lower back, neck and head. These are at a greater risk of suffering work related musculoskeletal disorders with time.

It was also established that the company had set control measures to control ergonomic hazards. Most of these are administrative such as breaks for the tongs men and some fans. It should be noted that these measures are ineffective as they mainly cater for the tongs men only. There is need to vary tasks across the whole plant and wherever possible introduce some engineering controls which are best fit for ergonomics. In a nutshell, more still needs to be done to fully incorporate the principles of ergonomics at Steelmakers in order to prevent work related musculoskeletal disorders and other injuries resulting from poor ergonomics

Recommendations

In order to reduce hazards emanating from improper ergonomics at the steelmaking company the following recommendations are made:

- There is need to form an ergonomics facilitation team which may comprise of workers, supervisors, engineering team and SHE department to oversee ergonomics implementation throughout the whole plant. In addition to this, there is need for a written policy document specifically on ergonomics clearly outlining how they intend to eliminate ergonomic hazards and should show commitment to continual improvement.
- The company's safety and health department needs to undertake regular workplace risk assessments on individual workers to identify their capabilities, shortfalls and tasks that put the risk of causing harm because different individuals have different anthropogenic variations hence one workplace may be safe to one but not safe to the other so there is need to continually assess these variations.
- The company should consider engineering controls, that is, automation where possible, offer comfortable ergonomic chairs to machine operators and crane drivers and improve the state of equipment such as tongs and stoppers at packing section in order to minimize or prevent the risk of developing work related MSDs or ergonomic injuries.
- The company should get certified with the safety management system OHSAS 18001 as it assist to improve compliance by providing a structure for establishing, monitoring and complying with all legal and regulatory requirements that relate to the operations of the company. Getting certified not only improves workers health and safety but ensures quality and increases production and savings.

- There is need for provision of adequate fans in the plant for cooling purposes as the plant is very hot due to hot steel bars and furnaces and the company should also embrace provision of refreshments to cover for the body fluids lost through perspiration.
- Employees need to adopt dynamic and varied work postures and movements, rotating jobs and taking adequate breaks so that they do not end up putting localized pressure on the same muscles which may lead to cumulative trauma disorders or MSDs but rather they get time to rest, renew their strength and use varied muscles.
- There is need for continuous training and education of employees and supervisors on the issue of ergonomics in order to increase knowledge and raise awareness thereby reducing the burden of suffering musculoskeletal disorders/ergonomic injuries.
- The National Social Security Authority should adopt strict measures in terms of inspection and fines to companies in order to help them comply with regulations so that company top management prioritises safety issues, ergonomics in particular and adopt ergonomic principles to avoid fines and increase savings.
- The country should come up with a separate instrument or policy specifically on ergonomics as it is one of the pillars for sound occupational health, safety and production.

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