Health and safety in Micro-business – traditional textile production, Ghana

iosh.com

Institution of Occupational Safety & Health

Report by: Duncan Spencer CFIOSH, Head of Advice & Practice, IOSH

Ably assisted by:

- Jude Collins Crankson, Committee Member, Publicity and Media engagement, IOSH Ghana.
- Matilda Mantey, Volunteer, IOSH Ghana.
- Helena Naayd Abotiwine, Local Expert

Introduction

This report was commissioned in response to the interest shown by the International Labour Organisation and Investment Banks in economic investment that improves safety, health, and local lives. Workers in northern Ghana, mostly women, are employed on a piece-meal basis for subsistence pay to weave traditional fabrics. The conditions of work are hard.

In July 2023 the Institution of Occupational Safety and Health (IOSH) commissioned members to visit the industry on location and gather information. The purpose of this report is to highlight the significant risks identified during that visit and offer ideas for investment that will transform the lives of those employed in this industry.

Discussion of issues encountered

- The operation is described in Appendix A.

- All stages of the process are labour intensive and conducted by women between the ages of 15 and 35. The working day lasts for 12 hours and requires workers to complete repetitive tasks or hold static postures for long periods of time without a break. Workers complain of fatigue. The most significant risk is therefore musculo-skeletal injuries that could lead to chronic conditions.

    a. During heddling and denting workers sit, stoop and stand for up to two hours.
    b. When weaving, workers sit perched on a stool with no back rest for hours at a time.
    c. Weavers repetitively use the treadle, pass the shuttle and beat the yarn.

- The warping mill and loom are constructed from iron tube and angle which provides durability. Workers complained of cuts and lacerations from the equipment which is more likely to be due to burrs left during the manufacturing process. Metal can get hot in the sun and cause minor burns when handled.

- The warping mill weighs approximately 8 kilograms and the loom around 15 kilograms. Both are kept in stores over night and then carried out into the open

during the working day. Pushing, pulling, and lifting is used in the movement of this equipment. Both loads are imbalanced.

- Hands and fingers can be trapped or nipped in exposed parts of the loom during operation i.e., gears, rollers and shuttles.

- The treadle on the loom is very narrow requiring uneven force to be applied through the toes and sole of the foot. This could lead to foot conditions being generated e.g., flat feet, ankle instability, high arches, bunions, heel pain, shin splints, big toe pain, achilles tendonitis and plantar fasciitis.

- Noise readings taken at the loom. NIOSH SLM reading taken at the workstation was LC Peak 83.5Db. Anything over 70 dBA is loud enough over a 12-hour working day to cause permanent hearing loss.

Possible Control Strategies

To help these workers the following considerations need to be made:

a. They live a life earning barely enough to feed themselves and their families. Their employers do not invest to improve their working conditions. External funding from investment or charitable donation will be necessary if change is to be achieved.
b. In general, the workers have not had a good education. They may well struggle with explanations regarding the biology of the human body, i.e., adopting appropriate manual handling techniques or neutral postures to avoid injury.
c. Expertise will need to visit the locations to carry out any building projects, provide alternative equipment, train and educate.
d. Some hazards cannot be avoided (e.g., local fauna hazards).
e. Any equipment modification must be able to withstand the rugged environment and easily fixed using local resources if possible.

Ergonomics

The photographs indicate that the workers do not understand poor posture and how that can give rise to musculo-skeletal issues. Chronic pain developed over time can be easily avoided by designing good workstations. In addition, workers need to understand how poor posture can be harmful, how to avoid it and why. A programme of training would greatly benefit the community, especially if it was done in a way in which they could pass on the knowledge to future generations. Perhaps through the creation of pictorial story boards that can be used on site. Training must also ensure that the workers understand the relevance and benefits of accepting new technologies in their occupation.

Once the workers are educated in the importance of good posture and how to adopt it, the next step is to identify where breaks from static posture or repetitive actions can be made. That is not to say that they need to do nothing and rest, but they could do

another task. Frequent job rotation during the day would help to mitigate ergonomic risk.

Mechanical Hazards

Design modifications could be completed on the looms.

a. The narrow treadle could be widened to enable the whole foot to be placed flat. Better still widened to enable both feet to be used. Force can then be more evenly applied through the whole of the base of the feet.
b. Wheels could be fitted to ease movement of the loom to and from the store, but the design would also need a means to lock them off during loom operation to stop it from moving. Alternatively, a modified sack barrow could be used to take the weight.
c. A seat with a back rest should be provided for the loom workstation.

During purchase the warping mills and looms should be checked for any burrs or sharp edges. These should be removed with a file to give a smooth rounded surface. Alternatively, they could be replaced with wooden versions.

Noise

It may not be possible to reduce the noise from the looms. Oiling parts could contaminate the cloth being woven. Therefore, reducing the amount of time exposed to the noise (through job rotation) and the wearing of ear defence would mitigate this risk. The provision of full ear defenders (not plugs) may have greater durability in this environment. Again, the education of the workers in hearing and its loss will be necessary.

Environmental & Welfare

Workers spend all day in the hot sun in temperatures ranging from 28 to 35 degrees Celsius. This can cause dehydration and add to fatigue. The provision of a shelter with open sides to shield the work from the sun would mitigate this risk.

Toilets, washing facilities, and somewhere sheltered to rest, should be provided.

Conclusions

Significant improvement can be made for relatively small investment e.g., provision of full ear defence, filing smooth any sharp metal edges or burrs, widening the treadle on the looms, using sack barrows to move equipment, and providing loom seats with back rests.

Other provisions would require greater investment. The building of a work shed and provision of welfare facilities would significantly improve working conditions.

Educating the workers on the hazards, how they cause harm and how this can be avoided is of great importance. This should be completed in a way that the knowledge can easily be passed on to new workers by those more experienced.

Of greatest importance is enabling these communities to get the very best price for their labours. Legal advice and investment to support the development of cooperatives of a sufficient size to sell to the main dealers directly, cutting out the middleman, would greatly benefit these communities. With sales knowledge or support, they would potentially be able to sell at the best price for their product.

Appendices

Appendix A: Description of the Weaving Process
Appendix B: Hazards

Appendix A: Description of the Weaving Process

Assessment Date: 5th July 2023

The stages of the weaving process are:

1. Production of yarn from spinning.
2. Doubling and twisting
3. Winding
4. Creeling
5. Warping
6. Heddling
7. Denting
8. Weaving
9. Packaging

In the past, hand spun yards made from cotton and the traditional process of dyeing yarns were employed, however non availability of cotton in the Northern parts of Ghana, scarcity, closure of cotton factories in the northern Ghana have made weavers resort to the use of factory produced yarns imported largely from China. These yarns are in cones and hanks and are mostly polyester and rayon.

Due to these factors the ***spinning of yarn section, doubling and twisting, winding, creeling*** stages of the production process were not carried out on site.

Warping

During the initial stages of warping, the weavers lay the yarns in longitudinal pattern around a rotating mill called the ***warping mill.*** This helps the weavers determine the length, width and arrangement of the colours that will make up the design of the strip fabric as shown in *Figure 1a.*

The weavers then rotate or spin the warping mill making chained warps with a variation of colours as illustrated in *Figure 1b.*

Image 1a. A weaver laying yarns around a warping mill

Image 1b. A weaver rotating the warping mill.

Heddling

In this stage, the weavers painstakingly pick the threads of the warp one by one through a frame called a heddle as illustrated in Figures 2a and 2b. Heddling is done to achieve the desired design. It usually takes about 2hrs to get it done depending on the complexity of the design.

The heddle is a component of the weaving machine called the Loom.

Image 2a. Weavers picking the threads of a warp through a heddle.

Image 2b. Weavers picking the threads of a warp through a heddle.

Denting

During this stage the threads of the warp are picked thread by thread through another frame called a reed, which is a component of the loom. This enables the weavers to achieve a fabric with expected size, colour pattern and design. Denting is illustrated in figure 3a. It takes about 2hrs to complete depending on the complexity of the design.

Image 3a. A weaver picks the threads through a reed.

Weaving

With the warp firmly in place in the loom set up, the weaver holding a shuttle with a yarn in the right-hand steps on the right treadle. This opens up the warp between the heddle and reed slides. The shuttle is inserted through the gap and is received in the left hand. The beater is then used to beat the yarn tight. The weaver then carries out the same operation in reverse by stepping on the left treadle to open the warp again. Sliding the shuttle through the gap and receiving the shuttle with the right hand. Again the beater is used to beat the yarn. This process continues until a desired fabric strip is realized.

Image 4a. A weaver steps on a treadle while weaving.

Image 4b. A weaver beats the yarn with the beater in the left hand.

Image 4c. A weaver receives the shuttle in the left hand after sliding it through the open warp between the reed and heddle.

Image 4d. A weaver in action

Packaging

The risk assessment revealed that weavers didn't have available market or buyers for the finished product due to this factor weavers only made fabric strips ordered in advance by customers.

Image 5a. Traditional strip fabric

Image 5b. A traditional strip fabric in a rubber package ready for sale

Appendix B: Hazards

Stage 1: Warping

Hazard present	Who might be harmed and how?	Existing Controls
Ergonomic Women stand in awkward position to lay yarn around a warping mill in a repetitive manner for a considerable period of time. Women either sit or stand and rotate the warping mill repeatedly to make chained warps for a considerable amount of time	**Who:** Weavers **How:** Risk of musculoskeletal injuries such as back pain, strains, sprains and work-related upper limb disorder Risk of musculoskeletal injuries such as back pain, strains, sprains, work related upper limb disorder and repetitive strain injuries such as joint and tendon inflammation, pinched nerves, and spinal disk degeneration	No controls present
Mechanical Women rotating the warping mill	**Who:** Weavers **How:** Risk of bodily injuries such as cutting, shearing, punching	No controls present

Environmental Women work outdoor and are exposed to hot temperatures be- tween 28.4˚C – 35.2˚C	**Who:** Weavers **How:** Risk heat related illnesses such as de- hydration, fainting, heat rush, heat cramps, heat exhaustion and heat stroke	No controls present

Stage 2: Heddling

Hazard present	Who might be harmed and how?	Existing Controls
Ergonomic Women either sit or stand be- tween 1hr to 2hrs to repetitively pick threads through the heddle. Prolonged use of hand tool	**Who:** Weavers **How:** Risk of musculoskeletal injuries such as back pain, strains, sprains, and work-related upper limb disorder Risk of musculoskeletal injuries such as back pain, strains, sprains, work related upper limb disorder and repetitive strain injuries such as joint and tendon inflammation, pinched nerves, and spinal disc degeneration. Risk of soreness, fatigue, and musculoskeletal injuries such as aches, pains, and work-related upper limb disorder	No controls present
Mechanical Use of a sharp needle-like hand tool to pick threads through the heddle	**Who:** Weavers **How:** Risk of injuries to the hand such as bruises, puncture, laceration, cuts.	No controls present

Stage 3: Denting

Hazard present	Who might be harmed and how?	Existing Controls
Ergonomic Women either sit or stand between 1hr to 2hrs to repetitively pick threads from the heddle through the reed Prolonged use of hand tool	**Who:** Weavers **How:** Risk of musculoskeletal injuries such as back pain, strains, sprains and work-related upper limb disorder Risk of musculoskeletal injuries such as back pain, strains, sprains, work related upper limb disorder and repetitive strain injuries such as joint and tendon inflammation, pinched nerves and spinal disc degeneration. Risk of soreness, fatigue and musculoskeletal injuries such as aches, pains and work-related upper limb disorder	No controls present
Mechanical Use of a sharp needle-like hand tool to pick threads through the reed	**Who:** Weavers **How:** Risk of injuries to the hand such as bruises, puncture, laceration, cuts.	No controls present

Stage 4: Weaving

Hazard present	Who might be harmed and how?	Existing Controls
Ergonomic Women sit behind the loom to weave with no back support for prolonged periods of time Women repetitively use both feet on the treadle, slide shuttle through the open warp from one had to another while beating the yarn with one hand during weaving for prolonged period of time	**Who:** Weavers **How:** Risk of musculoskeletal injuries such as back pain, neck pain and spinal disc de- generation Risk of musculoskeletal disorders of the feet such as Rheumatoid arthritis, degenerative joint diseases such as osteoarthritis, Morton's neuroma, metatarsalgia, flat feet, ankle instability, high arches, bunions, heel pain, shin splints, big toe pain, Achilles tendonitis and plantar fasciitis. Other musculoskeletal disorders such as strains, sprains and work-related upper limb disorder	No controls present
Mechanical Women weaving strip fabrics with metallic loom	**Who:** Weavers **How:** Risk of injury due to entanglement of loose clothing, jewelry, long hair with moving parts of the loom Risk of injury such as pinching and crushing due to contact with moving parts of the loom such as gears, rollers and shuttles Risk of injury due to contact with sharp and rough edges of the metallic loom Risk of long-term hearing damage due to significant noise and vibration generated during weaving operation	No controls present

Stage 5: Packing

Hazard present	Who might be harmed and how?	Existing Controls
Ergonomic Women either sit on chairs with no back support or bend to package finished fabric	**Who:** Weaver **How:** Risk of musculoskeletal injuries such as back pain, strains, sprains and work-related upper limb disorder	No controls present

Recommended control measures:

See the International Labour Organization (ILO)'s Code of Practice on Safety and Health in Agriculture, 2010, found at:

https://www.ilo.org/safework/info/standards-and-instruments/codes/WCMS_161135/lang--en/index.htm#:~:text=This%20code%20of%20practice%20is,governments%2C%20employers%2C%20workers%20and%20other

IOSH is the Chartered body for health and safety professionals. With over 49,000 members in more than 130 countries, we're the world's largest professional health and safety organisation.

We set standards and support, develop and connect our members with resources, guidance, events and training. We're the voice of the profession and campaign on issues that affect millions of working people.

IOSH was founded in 1945 and is a registered charity with international NGO status.

IOSH
The Grange
Highfield Drive
Wigston
Leicestershire
LE18 1NN
UK
+44 (0)116 350 0700

twitter.com/IOSH_tweets
facebook.com/IOSHofficial
tinyurl.com/IOSH-linkedin
youtube.com/IOSHchannel
instagram.com/ioshofficial
tiktok.com/@ioshofficial