Fabrication of a Silk Hammering Machine Suitable for the Small-Scale Industry

Subha Das[1], Monidipa Sarkar[2], Dr. Sumanta Bhattacharya[3], Dr. Sparsha Moni Chatterjee[4]
[1]M.Tech (Textile Technology), Govt. College of Engineering & Textile Technology, Serampore
[2]MBA (Textile Management), Sardar Vallabhbhai Patel International School of Textile Management
M.Tech (Chemical Processing in Textiles), Govt. College of Engineering & Textile Technology, Serampore
[3]PhD (3), M.Tech, MA, LLB, DIA&D, DG&GS, PGCPP&A, MPI (Oxford University) Research fellow and policy analyst, Department of Science and Biotechnology (MAKAUT)
[4]Ex. Vice Chancellor of IIST Shibpur, Member of Executive Council AICTE, Former Director of Technical Education, Chairman of BOAA, IIHT, Ministry of Textiles (Govt. of India), Member of Development Commission (Govt. of India)

Abstract **- Silk is the queen of fiber and is manufactured mostly by the small-scale industries across India. After the dry and processing of the fabric, finishes are applied to enhance its sheen, lustre, crease-recovery. Among all the most common type of finishing applied is the hammering of the fabric using a manual hammer (kudi), to increase the brightness. The process is still carried out manually, engaging a lot more time and efficiency. This paper studies the ways to design a machine-driven hammering system that would serve the purpose in a more confined way, saving the time.**

Index Terms **- silk, hammer, finishing, kudi, small-scale industry, beating machine.**

INTRODUCTION

Silk is known to be the most elegant and luxurious fibre. The principle of raising silkworms is by removing of the silk filaments from the cocoons, which are further used to weave the silk fabric. The process-flow of silk manufacturing involves reeling, throwing, degumming, weaving, dyeing, and sometimes weighting. Silk fabrics are noted for their soft hand, lustre, warmth, resilience, and crease recovery, tenacity and excellent drape or fall of the fabric. A wide range silk fabrics range from sheer chiffon to firmer dress and suiting material, to heavy brocades to the rich pile of velvet. Silk fabric is mainly manufactured in the various small-scale industries across India.

NEED OF THE STUDY

The finish applied to the silk fabric in the small-scale industry is mainly hammering, done manually involving two persons alternatively doing the work. The main drawback of the system is that it is time consuming which resulting in low production and the conscious engagement of manpower. Hence, the fabrication of an automatic motor driven hammering system would satisfy the unmet needs and result in high production efficiency.

AIM OF THE STUDY

- To make a cost-effective system.
- To increase the production efficiency.
- To result in more precise operation.

OBJECTIVE OF THE STUDY

- To fabricate an automatic motor-driven hammering system for silk finishing.
- To find out the optimum machine setting for optimum effects.
- To study the effect of hammering on fabric.
- Testing the geometrical values, effects and analyzing the result.
- To compare the fabric finishing machine effects with the previous model.

ACTION PLAN

Study the existing process

1. Hammer specification
2. Time study
3. Pressure study
4. Force
5. Costing

Fabrication of automatic hammering system & update

1. Engineering drawing
2. Capacity calculation
3. Fabrication

Application of automatic hammering machine

- All parts are movable

RESEARCH METHODOLOGY

Silk fibres mainly consists of Sericin and Fibroin, where Sericin is the coating of the Silk which is actually a gum. So, it has to be removed before any chemical processing, this process is termed as Degumming of Silk. The process flow followed by the small-scale industries in manufacturing silk is given below:

Degumming →Dyeing →Printing →Steaming →Washing →Starching →Kudi (hammering) →Polishing(ironing) →Pressing

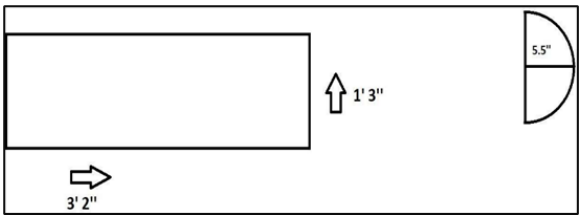
After printing, the Silk has to go through steaming to fix all the dyestuffs, before washing. After that the silk fabric is made stiff by the starching process. Later, the hammering (Kudi) process is done i.e., beating by means of hammer. This is done manually, but here we are going to discuss about the fully automatic hammering system.

Process of Hammer Beating: After starching of silk fabric, the fabric looks very dull, so to enhance its brightness and lustre it must go through some process. Thus, the hammer beating process is done by placing the silk fabric on a piece of half cylindrical shape of wood. This actually force the filament yarns to burst out which actuate the glossiness of the silk fabric.

DESIGNING OF THE AUTOMATIC SILK HAMMERING MACHINE (KUDI)

For making the automated hammer beating machine we need to keep in mind some of the conditions. Force of beating has to be kept constant at approximately 14kgf with standard speed. The capacity of motor has to be enough to keep all the systems active with two hammer weighing approximately 7kg each.

MACHINE DETAILS



Hammer perimeter = 28inch Hammer Handle = 12inch
Hammer Height = 6 inch
Half Cylindrical wood width = 20inch Wood length = 35 inch
Height = 4 inch
Production rate = 200 Sarees/ 14 hrs
Costing of Kudi Process per Saree = Rs. 10/-.
Hammer weight =5 kg

OPERATING PARAMETERS

1. FORCE OF BEATING: It may be defined as the force by which the hammer will hit the Silk Fabric which is to be placed on the half cylindrical shape of wood.
2. SPEED OF HAMMERING: It is defined as the speed by the help of which the hammer will hit Silk Fabric which has to be proportionate with movement of the Silk Fabric.
3. CAPACITY OF MOTOR: It refers to the working ability of the motor for the Hammer beating action.
4. HAMMER WEIGHT: The hammer beating action as well as the frequency of Hammer beating will depend on Hammer Weight.

EFFECT OF HAMMERING ON THE SILK FABRIC

- LUSTRE: It is property by the virtue of which any material would reflect the amount of light per unit area. The hammering operation enhances the lustre by making the surface flat.

- BRIGHTNESS: It is the property by the virtue of which it will look glossy and shiny. The hammering is seen to have increase the brightness of the fabric.
- AIR PERMEABILITY: It is property by the virtue of the air will pass between the yarns of the Silk Fabric. The beating effect on the fabric increases the air-permeability of the fabric.
- COVER FATOR: It is referred to as the numerical value indicating the extent of area of the fabric covered by the yarn components. The beating action results in better cover factor than before.
- STIFFNESS: It is defined as the property by which it will resist the deformation of the original shape of the Silk Fabric. The hammering process reduces the fabric stiffness which was caused due to starching.

ADVANTAGES OF THE NEW SYSTEM

- Time saving process.
- More efficient, precise and convenient method of silk finishing.
- Does not involve manpower.
- Cost-effective system.
- High rate of production.
- A step towards automation.

CONCLUSION

At the bottom-line it can be said that the automation of the manual hammering system is far convenient with lots of advantages. This area gives scope for research and development.

REFERENCES

[1] www.google.com
[2] www.onlineclothingstudy.com
[3] www.nptel.com
[4] www.youtube.com