

Development Of Mechanized Loom For Rural Khadi Industries To Increase Clothe Productivity

Dinesh Dekate¹

¹Assistant Professor, Department of Mechanical Engineering, Datta Meghe Institute of Engineering, Technology & Research, Wardha (MS) India

Mobile: 7798758821 dineshdekate@gmail.com

ABSTRACT

In Khadi industries, cloth is produced by time consuming manual driven loom affecting the cost of production of Khadi. A survey was conducted to the nearest khadi wavers workstations in central India region to study existing manual driven loom emphasizing on rate of production of Khadi. By observation and interview with the wavers, it is revealed to develop new Mechanized Loom in order to improve the productivity of Khadi. It is observed that the looms used by weavers are conventional. About 35% of the handlooms are in the range between 30 to 40 years old, and 15.83% units are more than 50 years old. The different motions and the strokes in mechanism of loom machine were studied. The loom is redesigned based on the input and output parameters required to increase the productivity of khadi. The Pro-E software is used for modeling and simulation purpose. The new mechanized loom was fabricated based on the designed dimensions and trials were conducted at the workstations. It is observed that the production rate of Khadi cloth waving of Manual Loom for 1 day is 8 meter with 60 rpm, while new mechanized loom with 120 RPM produces 12 meter cloth per day. The production is observed to be significantly increased by 50%.

Keyword: Khadi manufacturing¹, Hand Loom Wavers², Productivity³, Modeling & Simulation⁴.

1. INTRODUCTION

The fabric formation from the yarn is known as weaving. It is the interlacement of warp and weft. Warp is length-wise or longitudinal yarn (taana) and weft is breadth-wise or horizontal yarn (baana). The process of weaving is done on manually operated looms to produce Khadi fabric. In practice, the basic purpose of the loom is to hold the warp threads under tension to facilitate the interweaving of the weft threads. The first step in weaving is to stretch the warp yarns, which must be very strong. The process is called beaming. The weft or woof filling crosses the warp, binding the warp threads at either side to form the selvage. The three essential steps after the warp is stretched are: shedding, or raising every alternate warp yarn or set of yarns to receive the weft; picking, or inserting the weft; and battening, or pressing home the weft to make the fabric compact. In Khadi weaving all these operations are performed by hand. According to Mahatma Gandhi- The crying need of India is production by masses through rural entrepreneurship and not mass production by heavy industries. Rural population was accommodating in Village and cottage industries and agriculture sector, which have been losing ground to service and industrial sector.

In recent years, rural markets have acquired significance, as the overall demand of Khadi. In this context, mechanized loom is produced for the fulfillment of Khadi demand. The main objective is to improve the socio-economic conditions for the poor handloom weavers using solar loom. To improve the production rate of Khadi, we need to apply a mechanized system which can be operated with the utilization of renewable energy source (like solar) to produce the Khadi cloth.



Fig.1.1 “Existing Hand Operated Loom”

With the help of this project we will be able to maximize the Production Rate of Khadi Industries, The main objectives of this Project to provide mechanized Loom to Khadi Industries to get more profit.

1.1 Survey of Industry

We also visit the Main center of Maharashtra Khadi Udyog, Sewagram, & Gram Sewa Mandal Gopuri, Wardha, Nivedita Nilam Ashram Satoda, Magan Sangrahalaya Samiti-Khadi Works-Seloo, Handloom Wavers Work Nalwadi, Wardha, which was developed by the father of nation Mahatma Gandhi, for study & analysis of Khadi manufacturing as well as various process of Hand Loom in order to find out various quality requirements of Loom & its specification.



Fig.1.1.1 “Nivedita Nilam Ashram Satoda”



Fig.1.1.2 “Handloom Wavers Works Nalwadi”

The above images shows how the poor village wavers are wave the Khadi cloths for Production of Khadi at different organizations of Khadi manufacturing Industries.

2. PROBLEM STATEMENT

- In recent years, rural markets have acquired significance, as the overall demand of Khadi. In this context, Mechanized loom is produced for the fulfillment of Khadi demand. The main objective is to improve the socio-economic conditions for the poor handloom weavers using Mechanized loom.
- The looms used by weavers are old and out dated. About 35% of the handlooms range between 30 to 40 years old, and 15.83% units are of more than 50 years old.
- The handloom weavers working are not involved in pre-loom activity of preparing warp, as they are supplied with ready warp beam, but the Khadi weavers have to invest lot of time and energy in pre-loom

activity. In total there is less or no modernization and mechanization in manufacturing processes in Khadi cloth weaving than in others.

- The production capacity of handloom units is less. Per year production capacity of handloom units varies between 600 meters to 2160 meters, where as the production capacity of power loom units varies between 3840 meters to 5760 meters.

3. MOTIONS OF COMPONENTS EVOLVED IN WAVING

In handloom machine there are three motions required to run the setup.

- Shuttle stroke
- Up and down motion
- Forward backward motion



Fig.3.1 “Shuttle Stroke”



Fig.3.2 “Upward & Downward Stroke of Harness”



Fig.3.3 “Horizontal Motion of Reed”

The figures show the different motions required to run the Loom, These motions are helps to create different strokes to operate Shuttle Harness and Reed, with the help of these different strokes Loom converts a set of yarn into a cloth generally called as Khadi cloth.

3.1 Modified CAD Model of Proposed Mechanized Loom

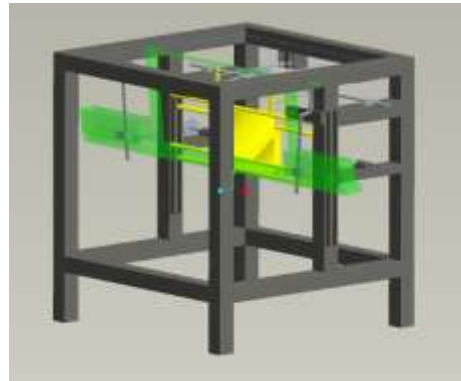


Fig.3.1.1“CAD Model using Pro-E”

After studying the different motions and the strokes required running the loom we develop & design a Model using a software Pro-E which helps us while fabricating the loom.

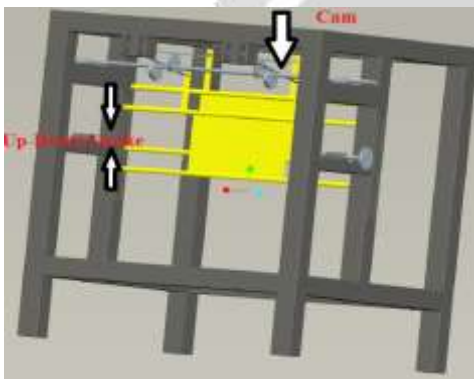


Fig. 3.1.2 “Upward & Downward Stroke of Harness Using CAM”

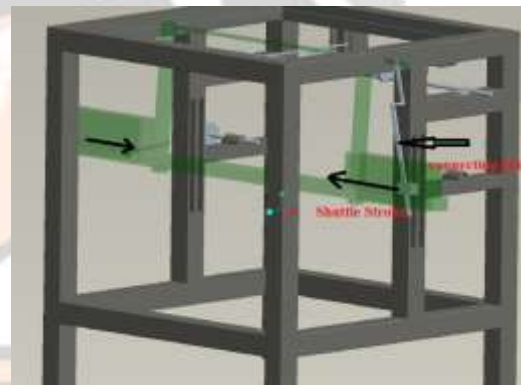


Fig. 3.1.3“Shuttle Stroke Using Connecting Link”

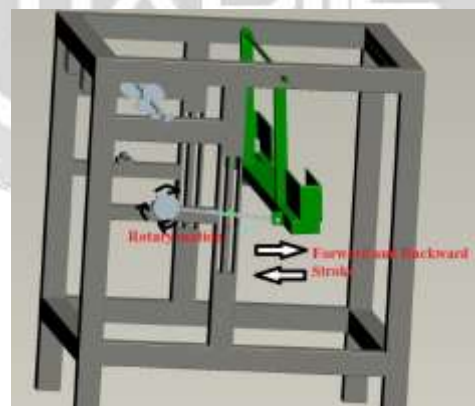


Fig. 3.1.4 “Horizontal Motion of Reed Using Wheel & Connecting Link”

The various strokes are identified by simulation in the software to get exact dimensions for fabrication work of the Loom. Above figures shows the different motions of Loom to operate it.

The following figures shows the different parts of the Mechanized loom, after fabrication & assembling these various parts A mechanized loom can be utilized for waving the cloth.

3.2 Proposed Mechanized Loom Dimensions and Parts

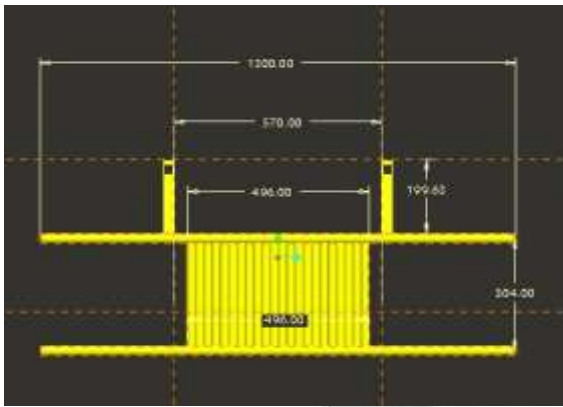


Fig.3.2.1 "Harness"

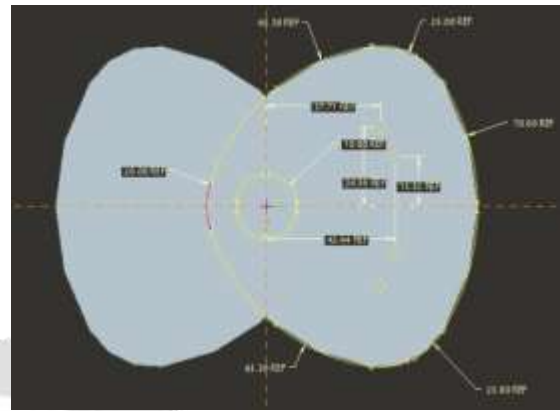


Fig.3.2.2 "Cam"



Fig.3.2.3 "Rib of the Loom"

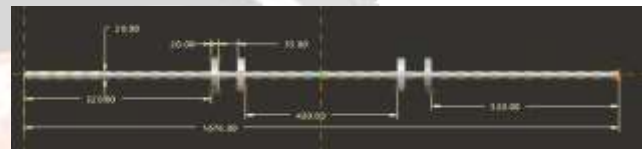


Fig.3.2.4 "Shaft of the Loom"



Fig 3.2.5 "Reed"

4. FABRICATED MODEL



Fig.8.1“Fabrication Work”

The Different Components and its Specification is given in the table which is utilized for the complete fabrication of the Loom.

Following Table Shows the different components used to fabricate the Loom as per design specifications

| Sr. No. | Component | Specification |
|---------|-----------|--|
| 1 | Shaft | Φ20 mm, length- 1600 mm |
| 2 | Cam | Outward stroke 1350 mm Return Stroke 1350 mm Dwell 1200 mm |
| 3 | Pulley | Larger dia.=180 mm, Width=20 mm, thickness= 8.03 mm |
| 4 | Belt | Length=951 mm B1089 & B 678 |
| 5 | Bearing | 62 /04 |

Table.4.1 “Components and its Specifications”

5. COMPARATIVE STUDY BETWEEN MANUAL & MECHANIZED LOOM

The Production Rate of Khadi cloth waving of Hand operated Loom for 1 day is 8m, while the machine is running at approximate 60 revolutions per minute. And the modified Mechanized Loom can be able to produce more than that of Hand operated loom as it running at more speed i.e. 120 revolutions per minute, hence we can obtained the higher production rate on Mechanized Loom.

If we considered the idle time of machine and the effort required to run & waving the cloth on Hand operated Loom is much more as compare to the Mechanized Loom.

| Sr. No. | Specification | Handloom | Mechanized Loom |
|---------|--------------------|--|--|
| 1 | Speed | 60 RPM | 120RPM |
| 2 | Productivity | 2m/Hr | 4m/Hr |
| 3 | Effort | Required maximum effort as all the stroke are run manually | Required minimum efforts as all the strokes are mechanized |
| 4 | Machine Ideal time | More | Less |

Table.5.1 comparative study

6. CONCLUSIONS

It is observed that the various strokes which are required to run the loom are Horizontal stroke, Vertical stroke and Shuttle stroke completed successfully.

The speed of Manuel handloom is 60 rpm to run the loom and fabricated mechanized loom gives the speed more than 100 rpm which ultimately gives higher production rate of Khadi cloth.

The objective to reduce the human effort and to increase the production rate of Khadi has been successfully completed.

6. REFERENCES

1. Mr.MaheshS.Gorde, Prof.Gajendra R. Potey , Prof. NishantG.Jogi, "Productivity Improvement of Sliver Manufacturing In Khadi Industries Though Development of Mechanized System" Journal of Research in Electrical and Electronics Engineering (ISTP-JREEE) ISSN: 2321-2667 Volume 2, Issue 3, May 2013.
2. Prof.S.P.Mishra , L.K.Das ,Leenabansod ,Ujwalagujar ,Sujata P. Bhalshankar ,P.B.Kale "The khadi and Handloom sector do seem to continue providing an additional source of incoming village",International Journal Of Scientific And Research Publication ISSN 2250-3153.,volume 3,issues 7,july 2013.
3. Dr.D.Nabirasool, "Poor infrastructural families in rural segment has been one of the factor holding back rural industrialization in India" International Journal Of Advance Research In Computer Science And Management Studies On Issues And Strategies For Rural Industrialization" ISSN 2321-7782 volume 2, issue 1,jan 2014.
4. P.B.Khope, J.P.Modak "Development and Performance Evaluation of a Human Powered Flywheel Motor Operated Forge Cutter". International Journal Of Scientific & Technology Research" Volume 2, Issue 3, March 2013 ISSN 2277-8616 pp 146-149.
5. Harpeet Kaur Sandhu, "Earning sources in rural areas and scope of rural marketing", International Journal Of Marketing ,Financial, Services And Management Research ,ISSN 2227-3622,volume 1,no.4,apr 2012.
6. Ram Krishna Mandal, "Khadi and Village Industries in North East India with Special Reference to Arunachal Pradesh: Retrospect and Prospect" Journal of Global Economy, Volume 3 No 2, April, 2007, pp 87-105.

7. Venkateswaran A, "A Socio Economic Conditions of Handloom Weaving In Kallidaikurichi of Tirunelveli District" International Journal of Social Science and humanities Research, ISSN 2348-3156 Vol. 2, Issue 2, pp: (38-49), Month: April 2014 - June 2014.
8. P. Gopinath, "Wages, Working Conditions and Socio-Economic Mobility of Spinners and Weavers in the Unorganized Khadi Industry: Findings from a Survey in India" The Indian Journal of Labor Economics, Vol. 53, No. 2, 2010.
9. "Report on Technology Transfer of Solar Charkha in Khadi Sector" International Journal of Modern Engineering Research (IJMER) Vol. 3, Issue. 4, Jul - Aug. 2013 pp-1965-1979 ISSN: 2249-6645.
10. A thesis By Muhammad Asif ,Umar Javed Jarral. "To study how to improve the productivity of yarn and fabric production in a production mill", Thesis report Number: 2010.9.10
11. Book: "HAND-LOOM WEAVING" By MATTIK Pmrrs TODD, the Motley School, Minneapolis, Minn. By ALICE W. COO.EY Formerly Supervisor of Primary Scaols, Minneapolis, Minn.Chicago, EDUCATIONAL PUBLISHERS New York London.
12. Book: John Becker with the collaboration of Donald B. Wagner, "A practical study of the development of weaving Techniques in China, Western Asia and Europe" Second edition published in 1986 by Rhodos International Publishers.

BIOGRAPHIES



Dinesh Dekate

Assistant Professor, Department of Mechanical Engineering, Datta Meghe Institute of Engineering, Technology & Research, Wardha (MS) India

Mobile: 7798758821 dineshdekate@gmail.com