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A REVIEW ON YARN PRODUCTION USING SOLAR CHARKHA

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ABSTRACT

The Khadi Industry statistics indicates there is lot of drudgery and the low wages for the workers operating charkhas and these has attracted the use of electric and solar energy for operating charkhas. Charkhas are mostly operated in villages where electricity is not available for twenty four hours a day, use of solar energy is the best available source and it is the cleanest available non-renewable source of energy. About 3,50,000 manually 0operated charkhas are use throughout the country particularly in remote villages. If the solar panels are made available at the subsidized rates from the Ministry of Non-conventional Energy, the cost of the solar charkha can be reduced substantially and can become a commercially viable proposition. The major components of the system are Charkha, Solar panel, Motor, Battery and Charge controller.

Keywords: Ambar Charkha, KVIC, Roller, Solar Panel

I. INTRODUCTION

With the solar electrical energy, storage the charkha can run during the day time when sun is available. The only thing is that the spinner has to intervene when there is a breakage in the yarn during spinning. The khadi statistics indicates that due to the hand spinning of charkha youth is not luring to it and also due to the lower income through it. The present breakthrough can usher in a new era of khadi spinning-of course if the necessary policy changes take place at the level of KVIC. The has been resistance to power operated Charkha due to the reason that electricity is not available in the remote villages besides the impact of power operated Charkha on employment in rural India The invention of Major cost component in the solar charkha is the cost of the solar panels and the motor needed for the operation of the charkha.. Therefore at the present stage it will be difficult to calculate the exact price of the solar system to be attached. The solar charkha name itself suggest that it can directly run with help of solar energy but due to fluctuations in solar energy during the day it result in varying the speed of charkha during its working. So runningthe charkha at constant speed it is therefore essential to store the solar electrical energy. The solar charge controller is essential for the continuous performance of the system**.** The charkha performs three basic operations: First operation is drafting for the input fibreup to the fixed period of necessary thickness is accomplish. Second operation in which twisting of the obtained yarn form first step is done to gain the required strength. Third operation after the twisting we required the wrapping of produced yarn; this process is known as winding.

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II. TWO-SPINDLE CHARKHA

Figure: Two Spindle AMBAR Charkha [2]

The two spindle existing amber charkha is shown in above figure. These two spindle charkhaconsist of various gear arrangement to perform the operation of yarn production. The research has been done to developed solar charkha by KVIC in association with Flexitron, Bangalore enables a spinner, living in the rural area of the country, to spin yarn and also generate enough power to light up her home and listen to transistor. Such e-charkha is available in all spindle-age i.e. single, 2 spindle, 8 spindle and 10 spindle models. [2]

III. WORKING PRINCIPLE OF TWO SPINDLE AMBER CHARKHA

The input material to the charkha is roving/sliver which contains large number of fibbers in its cross section. The numbers must be reduced to about 100 in the yarn cross section. The reduction of fibbers in the cross section is effected through drafting. In charkha 3-line single-apron drafting system is used.The rubber rollerswhich are present at the top of the system are affixed in pendulum. When the process of drafting started, fibbers are trapped in the rubber roller which is fitted on the lever arm. On the lever arm the force is applied to hold the yarn through spring fitted in the system. Various rollers which are present on the arm revolve at a speed for the pulling of the fibre entrapped between the rollers.

The specified pulling operation performed in two steps in the first step fibre should be provided through the roller & in second step yarn can be produced at required length. After that the next task is the twisting of the yarn. It can be done with the help of the ring & traveller. Traveller is affixed with the ring so that it can take a rotary motion to wound the yarn.This rotary motion of traveller also helps in wounding the obtained yarn in pack form.

The required power input in this device is at three places:

- The operation of the rollers which draw the sliver,
- The rotation of the spindle which twists and winds the sliver into usable yarn and
- The CAM which bobs the spindle mounted bobbin up and down while winding the twisted yarn around it. [3]

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IV. DETAILED PART STUDY OF AMBAR CHARKHA

1. To provide supplementary and remunerative employment to more and needier people especially women, there was a need to improve design of the Charkha which will be more productive. One such Charkha was proposed, designed and further improved by Mr. Ekambaranath from south India. Thus this Charkha is called as Ambar Charkha. Ambar Charkha's use standard parts used in the mills for spinning yarn (ring frame, set of rollers with pressure arm, cam etc). A modular unit with 1, 2 or more spindles is assembled and driven by hand to produce cotton yarn. Spinning with Ambar Charkha is a much faster process. There were various other types of charkhas in use, however owing to simplicity in design and operation along-with speed of production Ambar Charkha became popular. (Please refer Fig overleaf)
2. The raw material for the Ambar Charkha is called as Roving. These can be manufactured with Ambar Charkha, however due to increased demand these are manufactured in private or co-operative spinning mills managed by KVIC (Khadi and Village Industries Commission).
3. When the handle is rotated its movement is transferred to various parts through Gears, belts and Pulleys. The function of major parts is given below.
4. R1 Feed Roller Pair, it decides the rate of feeding the roving
5. R2 Extender Roller Pair; It opens, stretches and aligns the fibres in the roving
6. R3 Throw Roller Pair; It decides the speed of formation of the yarn
7. Yarn Guide Hook; it facilitates the free rotation and linear movement of the yarn
8. Traveller; It facilitates the twisting and winding of the yarn on the bobbin.
9. Ring Frame; It holds and guides the Traveller and helps in winding the Yarn on Bobbin.
10. Cam; It facilitates the follower lever to move up and down which in turn wind the yarn on the Bobbin , uniformly.
11. G1, G2 and G3 gears which decide the rate of production of Yarn
12. Generally 1 meter of roving is converted in to 20 meters of yarn. This 1:20 is called as the throw of the Charkha.

The count of the yarn is decided by the throw, revolutions of the spindle in 1 revolution of the handle and the count of the roving. The required throw can be adjusted by using the appropriate set of gears. [4]

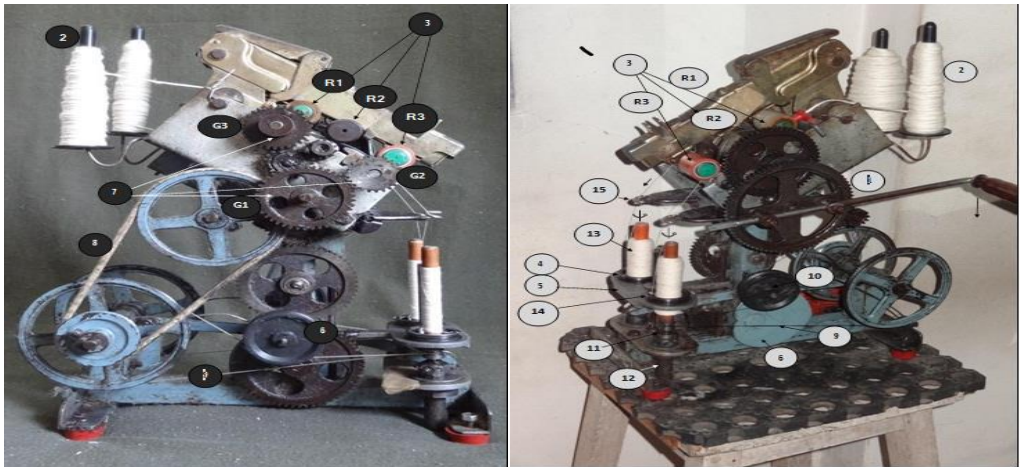

Figure: Detail parts of Ambar charkha

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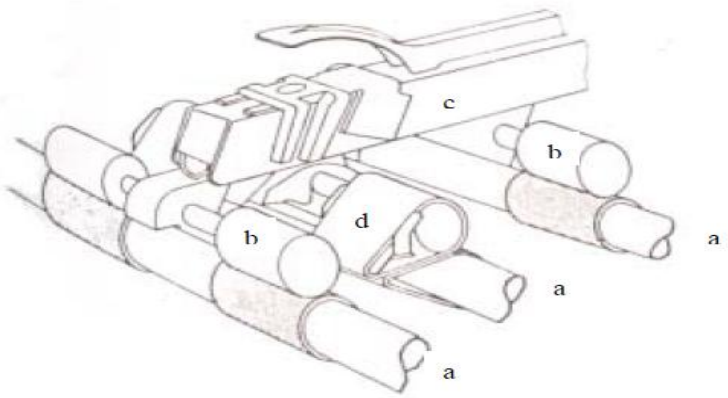
V. OPERATIONS PERFORMED BY CHARKHA:

5.1. Drafting

The bottom drafting rollers made of steel are mounted on an inclined roller stand having fixed brackets. The rubber rollers which are present at the upper side of the charkha are affixed in pendulumlever arm which is pivoted in the machine frame. The lever can be able to move up the entire roller present on the lever to upper side for inserting the yarn or for maintenance. The roller present on the upper side of the arm is pressed against the bottom steel rollers by spring pressure. The roller on the lower side is run positively with the help of motor or through hand & the roller present on the upper side of the arm issurface driven.Certain tractability in deciding the parameter of drafting able to spin yarns of different fineness.



A: Bottom fluted roller, b: Top roller, c: Pendulum lever arm, d: Apron

Figure3: Drafting arrangement of charkha [1]

5.2 Twisting

Twist is imparted to the yarn by the rotating traveller (Fig. 2). Each revolution of the traveller imparts one turn of twist to the strand. The traveller rotates on the surface of the ring. The traveller does not have its own drive. It is dragged by the yarn that passes through the bobbin which is affixed with the spindle. The yarn is pulled by the rotating spindle. [1]

5.3 Package Formation

For the bundle of yarn it required the wounding of yarn around the package and laid uniformly .over the desired length. When both the Traveller & spindle rotate in the same direction, the difference in the peripheral speeds of the traveller and the spindle causes the yarn to be wound on to the package. The speed difference is due to the dawdling of the traveller relative to the spindle due to continuous delivery of yarn from front roller and traveller ring frictional drag. Since the traveller also acts as a guide for the yarn it is oscillated back and forth across the entire length. This motion is imparted to the ring rail which holds the ring on which the traveller runs. [1]

5.4 Roller Setting

An adjustment in the distances between the drafting rollers is essential to suit the fibre length being processed. There is every likelihood that the fibre length may vary in season such rainy seasons, winter season & in summer also. It may vary across different area depending on the temperatures & humidity aspects. For spinning yarns of different fineness different fibreare utilized.

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However this flexibility does not exist in the design. Limited flexibility achieved by affixing the lower roller a slot in which it can move. The rubber roller which are present at the upper side of the charkha are affixed in pendulumcan be moved little bit to accommodate small changes in fibre length. However for bringing a larger change, apron length, nose bar and cradle length all need to be changed. This can be evaluated in mill. The KVIChas designed charkhas that suit a given count range i.e. a given length of fibres with appropriate twist imparting capability. [1]

VI. ERGONOMIC CONSIDERATIONS

The charkha was commonly floor affixed. Because of this manipulator require to lie down on floor with enfolding his legs for running the charkha by hand. In the charkha which is affixed on table in this case the manipulator can sit on the chair which is in front of the table at some height to possibly operate the charkha with some effort. Another extension of charkha in which it can be operated by means of foot pedal so the hand of manipulator is free & his feet will be agitated to do work. So in this case if we used better bearing then the work can be done more efficiently. In pedal run charkha there is also a provision to run the charkha by hand. So that if the manipulator feels tired by working through feet so it can use its hand to run the charkha. [5]

VII. COMPARISMBETWEEN KHADI & OTHER FABRIC [6]

Khadi	Other fabric
Hand spun & hand Oven	Machine spun & oven
Eco Friendly fabric	Use of harmful chemical
Breathing & versatile Fabric suited for all season & climate change	Suited for certain season & climate change
It improve with every wash	It decay with every wash
Individual fabric strength is high in a khadi	Individual fabric strength is less
3 litters of water used in production of 1m of khadi	42 liters of water used in production of 1m of fabric
It is hygienic, antimicrobial fabric harmless to skin	It may be allergic to skin in some cases

VIII. ADVANTAGES AND LIMITATIONS

8.1. Advantages

- The hard work involved in manual operation of charkha will be totally eliminated.
- One operator can supervise the operation of minimum three charkhas and thus increase in wages.
- The yarn quality will be improved because of constant speed of rotation which is not possible in manual operation.
- As a solar energy is cleanest form of renewable energy available in plenty will lead to complete elimination of electrical energy.

8.2. Limitations

- In cloudy weather, there is low possibility of electricity generation.
- For good quality of yarn, sufficient amount of moisture should be present in atmosphere.

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IX. CONCLUSION

Using solar energy for the production of yarn reduces the drudgery and due to increase in the production rate it leads to increase in the wages of the worker. Solar energy is the cleanest source of energy and available in plenty which adds to the advantages of the use of solar energy.

REFERENCE

[1] Overview of Development in Yarn C. A. Lawrence, University of Leeds, UK.

[2] KHADI -Release of e – Charkha

[3] Report on Technology Transfer of Solar Charkha in Khadi Sector, Mr. Ravi Kandasamy1, Mr. Deep Varma2, Mr. Sachin Raut3, Mr. Ganesh There4, International Journal of Modern Engineering Research Vol. 3, and Issue. 4, Jul - Aug. 2013 pp-1965-1979 ISSN: 2249-664

[4] Khadi & Village Industries Commission (KVIC).”

[5] . “Assessment of factors affecting the productivity of amber charkha Ergonomics Evolution of workers.” G. V. Thakre et al. / International Journal of Engineering Science and Technology (IJEST), ISSN: 0975-5462, Vol. 3 No.11 November 2011 7871.

[6] Revival of Khadi – An Analysis ofthe State Of Khadi in India withSupply And Demand Side Problems Nitish Goel1. Kshitij Jain2 1Department of Chemical Engineering, Indian Institute of Technology Delhi, New Delhi, India 110016 Innovative Journal of Business and Management 4:5, September – October (2015) 100 – 103.

[7] “Skills Re-Adaptation for Value additional Experiment with Khadi Designer Handbags” | By Shashi Prakash Mishra, Senior Scientific Officer (Craft & Engineering),

[8] Mahatma Gandhi Institute of Rural Industrialization, Ujwala Gujar, Designer, District Rural Development Agency. National Institute for Rural Industrialization. Project Sponsored by khadi and village industries commission

[9] Charkha Sangh ka Nav-Sanskaran (Re-orientation of the Spinners Association), in Hindi, Scvagram:

[10] All India Spinners Association. 1945, p. 32, translated into English by the author.

[11] "Hook Worm and Charkha", Young 1ndia.