

Solar Textile Machinery

Textile on Renewable Wheel

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Rev -0

Introduction

Poverty and climate risk are the two most important issues that are increasing social unsustainability and leading to more disparities across geographies. Both are man-made and solvable using sustainable energy as a catalyst. Replicable eco-system processes, banking on sustainable energy that encourages various income generating activities for the marginalized populations can help solve the poverty and climate crisis.



Today many of the people live under poverty or extreme poverty level lack access to reliable energy that could have enabled them to explore options of increased incomes. The relationship between energy gap and livelihood opportunity gap is very visible. There are ways these gaps or problems can be solved.

In Textile Industry Revolution in seeds, farm practices, advanced ginning and never-ending developments by the Indian and global spinning machinery sector have been making the entire

cotton value chain believe that India can take the global lead in cotton in near future.

However, large-scale mills with large scale machinery, hybrid long staple cotton and private players now dominate the sector which was earlier a decentralized hand spun sector whose history is embedded in the freedom struggle in India.

Being a skill-based, labour-intensive industry even today, handlooms is the second largest employer provider after agriculture, providing livelihood opportunities. Most weavers belong to poor and marginalized communities who are at the verge of being wiped out due to large scale mills and powered machinery- machineries made for centralization of manufacturing processes.

Considering this it may be concluded that there is a need for decentralized machinery powered by renewable energy to resuscitate the sector by developing innovative technology.

Solarization of the textile machinery used in decentralized manner at village level in textile industries is one of the steps to increase the productivity and quality in turn improve the financial status of the village worker.

A. Textile (Cotton Industry)

1. Solar Charka

Charkha, a symbol of resistance during the freedom struggle has been used to spin cotton fibers into yarn for centuries. However, there have not been any technological improvements in the design. Year of manufacture of the most commonly used Solar Charka in 1965. Using the charkha involves hard labour work and is very challenging for the spinners, as most spinners in the country are elderly women.

This has been observed that 300 rotations of hand for every 1000 m of cotton spun are required.



Solar Charka

1.1 Technology Solution

Invention of Solar Charka with 6-8 Spindle with a DC Motor and Solar system.

1.2 Technical Specification

Function	Yarn Production
No. of Spindle	6-8
Backup Power	8 Hrs
Production	32 Hunk (1.25 kG)
Motor	
Type	DC
Capacity	60 W
System Controller	1 set
DC Adopter	1 No.
Power Source	Dual Supply (Solar PV and Grid)
Solar PV System	
PV Module	75Wp
Battery with 80% discharge	75Ah at C/10
Dual Charge controller (AC and DC)	15A

*1 Hunk =1000m

1.3 Impact

1. With the speed controller, varying speeds will be available allowing the spinners to use different types of cotton
2. With ease in usage, this can be adopted by many women as a home-based livelihood opportunity creating more employment.
3. Percentage increase in production quantity is about 80%
4. Increase in total income earned by a spinner per day is about 150 % (by using two Charka)

2. Solar Looms

Weaving is one of the most wide spread home-based livelihood practices in India across almost every state with weaving clusters steeped in textile traditions. There is a wide variety in the raw materials used, method of weaving, type of looms used, designs on the fabrics etc.

Woven fabrics are an intricate study in warp and weft. Although the end product is a masterful craft creation, making each hand-woven piece a physically arduous process that is repetitive and unyielding. Other factors also include low wages, imported cotton goods, increased price of yarn and insufficient supply of quality raw cotton.

Cotton weavers are mainly limited to Government run societies, due to lack of availability of a supply chain and highly centralized pre-weaving processes, which has led to a decline in number of individual cotton weavers in recent years.

2.1 Challenges in Manual Loom

Extreme drudgery in the form of heavy stress and strain experienced by the skilled weavers and due to the monotonous repetitive movements causing early fatigue. The weavers suffer in knee issues shoulder issues and back pain. [About 18000 limb movements for weaving 25 kms of thread]

In case of the hand loom there is low efficiency coupled with intensive physical intervention, resulting in low productivity and lower income levels [Production per day manually is about 1 m]. The number of skilled weavers in the country is diminishing rapidly due to them resorting to unskilled labour work as it pays more. The current generation is also not interested in adopting the skill due to its tedious physical involvement and disproportional lower incomes.



Solar Loom

To address these challenges Solarization of Looms may be the best option for un-electrified or poorly electrified hamlets

2.2 Technology Solution

Invention of Solar Loom with a DC Motor and Solar system may cater the challenges of manual swing machine through renewable rout.

2.3 Features of Solar Looms

- Backup Power with solar energy
- Fly wheel integrated with the loom which provides energy in the working stroke and absorbs energy in the idle stroke conserving energy on a whole expended by the weaver.
- Instead of four motions, one motion is done for one pick

- A DC motor is connected to the flywheel through a flat belt drive due to which the weavers do not need to apply any force.
- Speed controller is integrated with the system to give the weaver flexibility to adjust the speed according to the type of fabric woven.
- It is of iron body which makes it sturdier and easier to maintain.
- It comes in different sizes based on the requirement of the weaver and the size of the cloth.

2.4 Technical Specification

Function	Loom Production
Backup Power	8 Hrs
Production	2 metre /hour
Motor	
Type	DC
Capacity	150 W
Speed Controller	1 set
DC Adopter	1 No.
Power Source	Dual Supply (Solar PV and Grid)
Solar PV System	
PV Module	200 Wp
Battery with 80% discharge	180 Ah at C/10
Dual Charge controller (AC and DC)	25 A

3. Solar Sewing Machines

Tailoring is one of the most important livelihoods in India. Traditional tailors who generally serve local customers in small cities and villages use a manual sewing machine. The scale of tailoring operations can vary depending on the demand generated in the market for their service. Local tailors also serve institutional demands like that of schools and other peak season demands. Local tailors also serve institutional demands like that of schools and other peak season demands.

3.1 Challenges in Manual Sewing Machines

It takes a lot of time to stitch one product when stitching in a manual machine which leads to low productivity and lesser income or fewer orders. As work moves very slowly, it is difficult to engage in alternate business activities [Time taken to stitch one shirt is about 2 Hrs.]



Solar Swing Machine

Physical drudgery is involved in using of manual sewing machines and it affects the health of the user [More than 1000 no. of repetitive leg movements per meter of straight stitch]

3.2 Typologies of Tailoring Industries

a) Home based Tailoring Industries

Type of Stitching:	Normal tailoring with straight stitching
Type of Materials:	Cotton, silk, synthetic, nylon, polyester
Products Manufactured:	Clothes, Alteration of clothes
Market Linkage:	Individual orders and orders from shops

b) Shop based Tailoring Industries

Type of Stitching	Normal tailoring with straight stitching
Type of Materials:	Plastic, cloth
Products Manufactured	Clothes, Bags
Market Linkage	Individual orders and bulk orders from centres which is passed on to home based tailors.

3.3 Technology Solution

Invention of Solar Swing Machine with a DC Motor and Solar system may cater the challenges of manual swing machine through renewable route

3.4 Technical Specification

Function	Cloth and Bag stitching
No. of user	1
Backup Power	8 Hrs
Motor	
Type	DC
Capacity	60 W
Speed Controller	1 set
DC Adopter	1 No.
Power Source	Dual Supply (Solar PV and Grid)
Solar PV System	
PV Module	75Wp
Battery with 80% discharge	75Ah at C/10
Dual Charge controller (AC and DC)	15A

B. Textile (Silk Industry)

India is the second largest producer of silk in the world. It produces four types of silk- Mulberry, Tasar, Eri and Muga Silk processing is one of the most widely performed activities by the people of India, across all geographies. The entire silk production chain is a livelihood opportunity for millions owing to high employment oriented, low capital intensive and remunerative nature of its production.

The very nature of this industry with its rural based on-farm and off-farm activities and enormous employment generation potential has attracted the attention of the planners and policy makers to recognize the industry among one of the most appropriate avenues for socio-economic

development of a largely agrarian economy like India.

4. Silk Reeling Machine / Silk Spinning and Twisting



Silk Reeling Machine



Muga Silk Reeling Machine

4.1 Technical Specification

Function	Reeling /Spinning and Twisting
No of End	Single/ Double
Backup Power	8 Hrs
Production	200 – 300g / 300 – 500g
Motor	
Type	DC
Capacity	20-30 W
System Controller	1 set
DC Adopter	1 No.
Supply source	Dual Supply (Solar PV and Grid)
Solar PV System	
PV Module	40Wp
Battery with 80% discharge	40Ah at C/10
Dual Charge controller (AC and DC)	15A



Silk Spinning Machine

5. Silk Reeling Charka



Silk Reeling Charka

5.1 Technical Specification

Function	Reeling & Twisting
No of End	4/6/10
Backup Power	8 Hrs
Production	400 -100g
Motor	
Type	DC
Capacity	90 W
System Controller	1 set
DC Adopter	1 No.
Supply source	Dual Supply (Solar PV and Grid)
Solar PV System	
PV Module	100Wp
Battery with 80% discharge	100Ah at C/10
Dual Charge controller (AC and DC)	20A

6. Silk Weaving Loom

6.1 Technical Specification

Function	Weaving
Category	50"/60"
Backup Power	8 Hrs
Production	2m / hr
Motor	
Type	DC
Capacity	150 W
System Controller	1 set
DC Adopter	1 No.
Supply source	Dual Supply (Solar PV and Grid)
Solar PV System	
PV Module	200Wp
Battery with 80% discharge	180 Ah at C/10
Dual Charge controller (AC and DC)	25A

General Impact on Textile Cottage Industries

By solarisation of Cottage Textile Machineries following general impact in society may be followed:

1. **Improved Well Being** with the reduction in drudgery, poor impact on health has drastically reduced. With increase in efficiency, there has been a lot of time saved which has reduced the amount of stress and fatigue allowing the beneficiary to focus on other aspects of life as well without it affecting the income levels.
2. **Increase reliability** on uninterrupted power supply at un-electrified or poorly electrified area.
3. **Increase Productivity and Income** may be expected two-fold for ease in operations.

Indicative Cost:

Textile Machinery	Type of Motor	Motor Wattage (W)	Backup Power (Hr)	PV Module (Wp)	Battery Capacity at C/10 Ah	Indicative cost (Rs.) *
Textile (Cotton)						
Solar Charka	DC	60	8	75	75	1,06,500.00
Solar Loom	DC	150	8	200	180	2,12,500.00
Solar Sewing Machines	DC	60	8	75	75	33,500.00
Textile (Silk)						
Silk Reeling Machine	DC	30	8	40	40	27,300.00
Silk Spinning and Twisting Machine	DC	30	8	40	40	27,300.00
Silk Reeling Charka	DC	90	8	100	100	91,900.00
Silk Weaving Loom	DC	150	8	200	180	1,97,500.00

*The indicative cost is excluding GST, Transportation and Installation

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