PROJECT REPORT

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CONTENTS

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ABSTRACT

The Jute Textile Industry occupies an important place in the Indian economy. Jute meets all the standards for 'safe' packaging in view of being a natural, renewable, biodegradable and eco-friendly product. Jute as a packaging material is facing stiff competition from synthetic materials such as LDPE, HDPE and PP. Several attempts have been made by researchers to enhance the properties of jute so that it could face the competition from synthetics.

Polypropylene (PP) and Polyethylene (PE) “carry bags” are well accepted because they are cheap, light weight and can bear the desired load. Further, they can be decorated and made attractive by colouring (Dyeing and Printing). They are also used as a means of advertising by printing the company’s logo etc.

Though PP/PE “carry bags” are popular, “jute carry bags” are also available in the market but in small number. The “jute carry bags” are not popular because they are heavy weight, costlier due to the cost of raw material and additional process of typical stitching etc. If designed properly, “Jute carry bags” can provide desirable degree of air porosity so that the material (fruits, vegetables etc.) can be stored for longer periods unlike in synthetic bags.

Most of these properties can be developed by:

- Choosing such constructions & designs which consume less jute yarn. This not only reduces weight

of the carry bag but also reduces raw material cost which affects cost of product.

- Use of dyed / printed jute yarns which gives the carry bag an attractive look and increases profit margins.
- Providing proper space for advertisement of product / company
- Producing seamless jute carry bags on conventional powerlooms with slight modifications in place of circular looms. This reduces cost of production by eliminating typical jute stitching process and reducing wastage of fabric during cutting into shapes and sizes.
- Introducing double plush loom for jute weaving to increase productivity which considerably reduces cost of production.

Thus this project is an effort to promote use of jute by developing weaver friendly technology and to create awareness amongst people for using jute products in their day-to-day activities.

CHAPTER - 1
INTRODUCTION

Jute is a long, soft, shiny *vegetable fibre* that can be spun into coarse, strong threads. It is produced from plants in the genus *Corchorus,* which has been classified in the family *Tiliaceae,* or more recently in *Malvaceae.* However, it has been reclassified within the family *Sparrmanniaceae*.

Jute is one of the most affordable *natural fibres* and is second only to *cotton* in amount produced and variety of uses of vegetable fibres. Jute$_2$fibres are composed primarily of the plant materials *cellulose* (major component of plant fibre) and *lignin* (major components of wood fibre). It is thus a ligno-cellulosic fibre that is partially a textile fibre and partially wood. It falls into the *bast fibre* category (fibre collected from bast or skin of the plant) along with *kenaf, industrial hemp*, *flax (linen), ramie*, etc. The industrial term for jute fibre is *raw jute*. The fibres are off-white to brown, and 1–4 metres (3–12 feet) long.

Jute needs a plain *alluvial* soil and standing water. The suitable climate for growing jute (warm and wet climate) is offered by the *monsoon* climate during the monsoon season. Temperatures from 20˚C to 40˚C and relative humidity of 70%–80% are favourable for successful cultivation. Jute requires 5–8 cm of rainfall weekly and more during the sowing period.

Fig : 01 Extraction of Jute fibre

Jute is a rain-fed crop with little need for fertilizer or pesticides. The production is concentrated in *India* and some in *Bangladesh*, mainly Bengal. The jute fibre comes from the stem and ribbon (outer skin) of the jute plant. The fibres are first extracted by *retting*. The retting process consists of bundling jute stems together and immersing them in slow running water. There are two types of retting: stem and ribbon. After the retting process, stripping begins. Women and children usually do this job. In the stripping process, non-fibrous matter is scrapped off and grabbed. *India, Pakistan, Chinas* are the large buyers of local jute while *Britain, Spain, Ivory Coast, Germany* and *Brazil* also import raw jute from *Bangladesh.* India is the world's largest jute growing country.

USES

Jute Fibre

Jute fibre is extracted from retted stem of jute plants. Jute is the second most important vegetable fibre after cotton. Jute is used mainly to make cloth for wrapping bales of raw cotton, and to make sacks and coarse cloth. The fibres are

also woven into *curtains, chair coverings, carpets, area rugs, hessian cloth, and backing for linoleum*.

Jute Fabric

Jute matting being used to prevent flood erosion while natural vegetation becomes established. For this purpose, a natural and biodegradable fibre is essential.

Fig : 02 Use of Jute Matting

While jute is being replaced by synthetic materials in many of these uses, some uses take advantage of Jute's *biodegradable* nature, where synthetics would be unsuitable. Examples of such uses include *containers* for planting young trees, which can be planted directly with the container without disturbing the roots, and *land restoration* where jute cloth prevents erosion occurring while natural vegetation becomes established.

The fibres are used alone or blended with other fibres to make various types of *twines* and *ropes for different uses*. Jute rope has long been popular in *Japan* for use in *bondage*. Jute butts, the coarse ends of the plants, are used to make inexpensive cloth. Conversely, very fine threads of jute can be separated out and made into *imitation silk*. As jute fibres are also being used to make pulp and paper, and with increasing concern over forest destruction for

the *wood pulp* used to make mostly paper, the importance of jute for this purpose may increase. Jute has a long history of use in the *sackings, carpets, wrapping fabrics (cotton bale)*, and *construction fabric* manufacturing industry.

Traditionally jute was used in textile machineries as textile fibres having cellulose (vegetable fibre content) and *lignin* (wood fibre content). But, the major breakthrough came when the automobile, pulp and paper, and the furniture and bedding industries started to use jute and its allied fibres with their non-woven and composite technology to manufacture nonwovens, *technical textiles*, and composites. Therefore, jute has changed its textile fibre outlook and steadily heading towards its newer identity, i.e., wood fibre.

Jute is used in the manufacture of a number of fabrics such as *Hessian cloth*, *sacking*, *scrim*, *carpet backing cloth* (CBC), and *canvas*. Hessian, lighter than sacking, is used for *bags, wrappers, wall-coverings, upholstery* and *home furnishings*. Sacking, a fabric made of heavy jute fibres, has its use in the name. CBC made of jute comes in two types. Primary CBC provides a tufting surface, while secondary CBC is bonded onto the primary backing for an overlay. Jute packaging is used as an eco-friendly substitute.

Diversified jute products are becoming more and more valuable to the consumer today. Among these are *espadrill*, *soft sweaters* and *cardigans*, *floor coverings, home textiles, high performance technical textiles, Geotextiles, composites* and more.

Jute floor coverings consist of woven and tufted or piled carpets. Jute Mats and mattings with 5 / 6 mts width and of continuous length are easily being woven in Southern parts of India, in solid and fancy shades, and in different weaves like, Boucle, Panama, Herringbone, etc. Jute Mats & Rugs are made both through Powerloom & Handloom, in large volume from Kerala. The traditional *Satranji mat* is becoming very popular in home décor. Jute non-wovens and composites can be used for underlay, linoleum substrate, and more.

Jute has many advantages as a home textile, either replacing cotton or blending with it. It is a strong, durable, color and light-fast fibre. Its UV protection, sound and heat insulation, low thermal conduction and anti-static properties make it a wise choice in home décor. Also, fabrics made of jute fibres are carbon-dioxide neutral and naturally decomposable. These properties are also why jute can be used in high performance technical textiles.

Moreover, jute can be grown in 4-6 months with a huge amount of cellulose being produced from the jute hurd (inner woody core or *parenchyma* of the jute stem) that can meet most of the wood needs of the world. Jute is the major crop among others that is able to protect deforestation by industrialization.

Thus, jute is the most environment-friendly fibre starting from the seed to expired fibre, as the expired fibres can be recycled more than once.

Jute is also used to make *ghillie suits*, which are used as camouflage and resemble grasses or brush.

Another diversified jute product is *Geotextiles*, which made this agricultural commodity more popular in the agricultural sector. It is a lightly woven fabric made from natural fibres that is used for soil erosion control, seed protection, weed control, and many other agricultural and *landscaping* uses. The Geotextiles can be used more than a year and the bio-degradable jute Geotextile left to rot on the ground keeps the ground cool and is able to make the land more fertile. Methods such as this could be used to transfer the fertility of the Ganges Delta to the deserts of *Sahara* or *Australia*.

Jute bags

Jute has gained an advantage as being an eco-friendly option instead of poly and paper bags as polybag are made from petroleum and are non-biodegradable and manufacturing paper bags requires large quantities of wood. Jute has none of these problems and is therefore being used widely for these purposes although higher cost does place jute at a disadvantage. Jute is also used for making fashion & promotional bags.

Other Uses

Jute stalks are being dehydrated under the sun, later they are used as *fuel*.

Fig 03 : Use of Jute Stalks

Diversified byproducts from jute can be used in *cosmetics, medicine, paints*, and other products.

The lower part is hard fibre, which is called *jute cuttings* in Bangladesh and India (commonly called *jute butts* or *jute tops* elsewhere). Jute cuttings are lower in quality, but have commercial value for the paper, carded yarn, and other fibre processing industries.

Fig 03 : cutting lower part of jute fibre

Jute fibres are kept in bundles in the background in a warehouse in Bangladesh.

Features of Jute Fibre

- Jute fibre is 100% bio-degradable and recyclable and thus environmentally friendly.
- It is a natural fibre with golden and silky shine and hence called *The Golden Fibre*.

- It is the cheapest vegetable fibre procured from the bast or skin of the plant's stem.
- It is the second most important vegetable fibre after cotton, in terms of usage, global consumption, production, and availability.
- It has high tensile strength, low *extensibility,* and ensures better *breathability* of fabrics. Therefore, jute is very suitable in agricultural commodity bulk packaging.
- It helps to make best quality industrial yarn, fabric, net, and sacks. It is one of the most versatile natural fibres that has been used in raw materials for packaging, textiles, non-textile, construction, and agricultural sectors. Bulking of jute yarn results in a reduced breaking tenacity and an increased breaking extensibility when blended as a ternary blend.
- The best source of jute in the world is the Bengal Delta Plain in the Ganges Delta, most of which is occupied by Bangladesh.
- Advantages of jute include good insulating and antistatic properties, as well as having low thermal conductivity and moderate moisture regain. Other advantages of jute include acoustic insulating properties and manufacture with no skin irritations.
- Jute has the ability to be blended with other fibres, both synthetic and natural, and accepts cellulosic dye classes natural, basic, vat, sulfur, reactive and pigment dyes. As the demand for natural comfort fibres increases, the demand for jute and other natural fibres

that can be blended with cotton will increase. To meet this demand, some manufactures in the natural fibre industry plan to modernize processing with the Rieter's Elitex system. The resulting jute/cotton yarns will produce fabrics with a reduced cost of wet processing treatments.

- Jute can also be blended with wool. By treating jute with caustic soda, crimp, softness, pliability, and appearance is improved, aiding in its ability to be spun with wool. Liquid ammonia has a similar effect on jute, as well as the added characteristic of improving flame resistance when treated with flame-proofing agents.
- Some noted disadvantages include poor drapability and crease resistance, brittleness, fibre shedding, and yellowing in sunlight. However, preparation of fabrics with castor oil lubricants result in less yellowing and less fabric weight loss, as well as increased dyeing brilliance. Jute has a decreased strength when wet, and also becomes subject to microbial attack in humid climates.
- Jute can be processed with an enzyme in order to reduce some of its brittleness and stiffness. Once treated with an enzyme, jute shows an affinity to readily accept natural dyes, which can be made from marigold flower extract. In one attempt to dye jute fabric with this extract, bleached fabric was mordanted with ferrous sulphate, increasing the fabric's dye uptake value. Jute also responds well to reactive

dyeing. This process is used for bright and fast coloured value-added diversified products made from jute.

SUMMARY – JUTE FIBRE

Jute fibre's inherent characteristics of strength, versatility, being eco-friendly, etc can directly cater to technical and industrial requirements through its appropriate functional end uses. The Indian jute industry had been at the forefront of industrialization of the Indian economy. The first jute mill In India was established in the year 1855. Today the Jute Industry is one of the major industries in the eastern region, particularly in West Bengal. The area under jute in the country is around 8 lakh ha producing about 85 lakh bale of jute. It supports nearly 40 lakh farm families, provides direct employment to about 2.6 lakh industrial workers besides livelihood to another 1.4 lakh persons in the tertiary sector and allied activities and thus generating huge employment opportunities to the tune of about 25 crore man days.

The production process in the jute industry goes through a variety of activities, which include cultivation of raw jute, processing of jute fibers, spinning, weaving, bleaching, dyeing, finishing and marketing of jute products. The jute industry produces goods worth Rs 6500 crore p.a. and contributes to export earnings to the tune of nearly Rs. 1200 crores p.a. The jute

industry is labour intensive, thus requiring large number of people in the value chain. The industry at present faces stiff competition from its cheaper substitutes and is plagued with many problems ranging from obsolete technology, labour unrest, etc.

The following issues concerning the industry emerged:

I. Jute is a natural and eco friendly vegetable bast fibre extracted from plants whose stems are used as renewable energy resource and for other diversified uses. Its products are re-usable, sustainable and bio-degradable and deserve policy support towards environmental commitments.

II. The jute sector is subjected to demand constraint.

- The current demand for jute is mainly dominated by domestic consumption and comprises approximately 87% of the total production of jute goods in quantity terms.
- A consistent rate of domestic consumption of jute goods in India could reflect the industry's satisfaction with an assured demand from their large consumers in the protected market.
- Traditional products like Sacking and Hessian constitute the bulk of the product-mix (over 80%) which creates low value addition and are manufactured with age old machinery.

- In an unprotected market the traditional products would suffer from poor price competitiveness compared to alternative products. The Export Market expansion will also depend on the ability reduce cost to attain price competitiveness.
- Despite India's potential for positioning jute goods in export market, jute goods confined mostly towards domestic consumption and the export remained almost stagnant.
- Raw jute production has remained stagnant and acreage has also declined.
- Jute growers have been unable to obtain remunerative returns for raw jute.
- Fluctuations in raw jute prices around the year.
- Surplus production of raw jute as compared to demand for raw jute can deflate prices of raw jute, thus leading jute growers to distress selling.
- The gaps between production of raw jute and production and consumption of finished jute or jute goods creates a vicious cycle between jute growers and jute mills further leading to a demand inconsistency and uncertainty for jute.
- Shortage of certified seeds in proximity of jute growing areas.
- Non-determination of Jute grades through scientific grading systems and absence of proper jute quality

mapping leads to price variation in accordance with the decisions of the buyers.

- Lack of or minimal availability of appropriate storage and warehousing facilities affect the consistent availability and quality of jute.
- Jute mills in India are characterized with high conversion costs.
- Jute industry in general suffers from technological obsolescence, as there have been only lukewarm response in adoption of new technology developed by international machinery manufacturers and GOI sponsored projects.
- Poor industrial practices like in the field of Material Handling, Training & labour, Maintenance, Quality Management, Energy Management, IT application & ERP etc. caused the industry dearly in terms of profitability and cost competitiveness.
- Assured market of over 50% of jute products through the JPM Act and cost plus administered pricing of over one third of total production acted as dampener in the real time modernization efforts of the industry.
- Jute mills have not been able to generate desired level of profitable returns.
- Shortage in availability of skilled labour.
- Lack of compliance of welfare measures for growers and workers.

- Lack of collaborations within and between the institutions, jute growers, traders, jute mills, entrepreneurs of JDP.
- Compatibility of Jute fibres for blending with other fibres.

III. The policy aims at sustained growth and improved competitiveness of jute fibre, by taking appropriate measures:

- Compatibility of Jute to create demand for jute fibre and its products
- to produce good quality fibre and products to meet the domestic and international demand
- to create more value addition by shifting the focus to product diversification with help from Intensive R&D and market research
- to make a concerted effort by all concerned e.g., the industry, R&D institutions, machinery manufacturers etc which is to be supported and facilitated by the Government for rapid development of upgraded technology and their adoption in large scale.
- to ensure remunerative prices to the jute farmers in the country
- to increasingly contribute to sustainable employment and the economic growth of the nation
- to compete with confidence for an increasing share of the global market

- to develop transparent information mechanism regarding jute, across the value-chain
- to encourage self-initiatives from stakeholders for overall development and self-sufficiency of the jute sector
- to position jute as a positive prospering eco-friendly commodity with potential for diverse applications and make it the preferred choice of all the users

IV. The Policy envisages a road map for the jute industry for short term (5 years hence), medium term (10 years hence) and long term (15 years)

JUTE INDUSTRY AT A GLANCE

- There are 78 composite jute mills in the country, of which 61 are located in West Bengal. These mills have 48 thousand looms with 7.5 lakh spindles.
- The total production of jute goods was 16.34 lakh tonnes in 2008-09, out of which 2.80 lakh tonnes was accounted for by Hessian, 10.71 lakh tonnes by Sacking, 1.76 lakh tonnes by Yarns and Twines, 0.05 lakh tonnes by Carpet Backing Cloth (CBC), and 1.02 lakh tonnes by other diversified products.
- The value of the total production of jute goods is approximately Rs. 6000 crores. The product mix of the jute industry is highly distorted in favour of low-valued jute sacks (nearly 66% of the total).

- The jute industry provides direct employment to about 2.6 lakh workers.
- 1900 Small and Medium Sector enterprises providing employment to around 1.35 lakh artisans / workers are engaged in production of diversified jute products.
- In addition, around 1.4 lakh people are engaged in the tertiary sector and allied activities, supporting the jute economy.
- The jute industry also contributes to exports to tune of nearly Rs 1200 crores per annum.
- The Jute sector contributes Rs. 110 crores to the National exchequer by way of Income Tax, Fringe Benefit Tax and Cess.

CHAPTER - 2
OBJECTIVES

The objective of the project is to promote jute fibre as a substitute of synthetic packaging material and develop a technology which help poor jute weavers to earn more using the existing machinery as given below:

- To modify powerloom to produce seam less jute carry bags
- To modify powerloom to double plush loom for producing jute carry bags.
- To popularize jute carry bags by organizing workshops/seminars.
- To help jute industry by providing them technological support.

CHAPTER - 3

LITERATURE SURVEY REPORT

No such literature could be traced out which covers production of seamless jute carry bags (with double layer leno weave). We have developed a purely new technology to produce double layer leno jute fabric having its bottom closed automatically during weaving.

Further, running two shuttles (one over the other) in two different sheds to produce two fabrics (one over the other) is also a new invention for which no literature could be traced out.

CHAPTER – 4

NEED ASSESSMENT REPORT (as submitted earlier)

Introduction

Packaging fulfils the diverse role in protecting products, preventing spoilage, contamination, extending shelf life, ensuring safe storage thereby helping to make them readily available to consumers

India is the second largest producer of fruits and vegetables in the world. But our national loss of fruits and vegetables is staggering as high as 35%. Shortage of cold storages, improper packaging and abusive handling of farm produce are major reason of losses. Horticulture produces are transported to various *Mandis* by trucks either without any packaging or in wooden boxes, paper cartons, jute bags and crates, etc. Vegetables and fruits, in godowns and in *mandis*, are packed mostly in Polypropylene (PP) bags. Application of synthetic bags has increased in manifold and has surpassed jute bags popularity because they are inexpensive, light weight, can bear the desired load, and easily available. Further, they can be made attractive by colouring (Dyeing and Printing). The major disadvantage of synthetic bags is that they are non-biodegradable and hence non-environment friendly. This causes severe harm to the environment and increases pollution level.

The fundamental advantage associated with jute bags is that they are eco-friendly because they are biodegradable. On the other hand, jute bags have various disadvantages in comparison to synthetic bags. Manufacturing of jute fabric for making carry bags (extraction of jute fibre to weaving of bags) is a tedious process. Besides, jute bags are heavier in weight, costlier and require additional process of stitching.

Jute bags, if designed properly, can provide desirable degree of air porosity so that the product like fruits, vegetables etc. can be stored afresh for longer periods unlike in synthetic bags. Jute, dubbed as the` ***golden fiber*`** of India, meets all the standards for '***safe***' packaging in view of being a natural, renewable, biodegradable and eco-friendly product. Jute as a packaging material is facing stiff competition from synthetic materials such as Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE) and Polypropylene (PP). Several attempts have been made by researchers to enhance the properties of jute so that it could face the competition from synthetics.

By responding to the urgent need of reducing plastic carry bags and packaging bags usage, it would be worthwhile to introduce renewable natural fibers like jute, ramie, hemp, kenaf and PLF (Pineapple leaf fiber) as an alternative. The advantage of employing these renewal and bio- degradable fibers is that they are available in abundance; like in Siliguri PLF is available free of cost and in abundance throughout the year, Pineapple being the cash crop of the state. Jute,

and hemp are available abundantly in West Bengal. Also, by putting these unconventional fibers into some profitable use the farmers engaged in cultivation and processing of crop will be directly benefited, by the exploration and diversification of surplus and residual fibers. Thereby, the poor and the less advantaged population would get benefited.

While, based on the damage caused to the environment, synthetic bags cannot be solely banned. Therefore, the present project aims at reducing consumer dependence on synthetic bags, in lieu of the numerous critical hazards it renders to our environment. The project proposes, `*golden fiber*` as an alternative to the unlimited and overextended synthetic bags consumption. Raw jute crop is an important cash crop to the farmers of West Bengal, Bihar, Assam, Orissa, Andhra Pradesh, Tripura and Meghalaya. Cultivation of raw jute crop provides not only fiber, which has industrial and other substantial usage, but also the jute stick which is used as fuel by the farming community.

While PP leno bags have some of the advantages over jute leno bags, which cannot be replicated. Jute leno bags can be used as a substitute to PP leno bags in certain cases like packing/carrying vegetables and fruits etc.

The report proposes to improve the usage level of Jute leno bags over PP leno bags. Detailed benefits of using Jute leno bags over PP leno bags have been discussed in detail in the forth coming paragraphs.

Disadvantages of Poly Bags

Almost every market that we go today, we can see people carrying their shopping items in plastic bags. Right from food items to clothes and shoes etc., there is hardly any item that we do not use a plastic bag to carry. However, before stuffing our home with different styles, colors and shapes of plastic bags, had we ever considered the dangers that are inherent in using them.

Plastic bags are very popular with both retailers as well as consumers because they are cheap, strong, lightweight, functional, as well as a hygienic means of carrying food and other items. Even though they are one of the modern conveniences that we seem to be unable to do without, they are responsible for causing pollution, killing wildlife, and using up the precious resources of the earth. Poly bags pollute the environment from the time they get manufactured. When one considers the huge economies and populations of India, China, Europe, and other parts of the world, the destruction caused to the environment in numbers can be staggering. The problem is further exacerbated by the developed countries shipping off their plastic waste to developing countries like India.

Some of the harmful effects of plastic bags on the environment have been discussed in detail in the following parts:

A. Plastic bags litter the landscape:

Once they are used, most plastic bags go into landfill, or rubbish pits. Each year more and more plastic bags are ending up littering the environment. Once they become litter, plastic bags find their way into our waterways, parks, beaches, and streets. And, if they are burnt, they infuse the air with toxic fumes.

B. Plastic bags kill animals:

About 100,000 animals such as dolphins, turtles whales, penguins are killed every year due to plastic bags. Many animals ingest plastic bags, mistaking them for food, and therefore die. And worse, the ingested plastic bag remains intact even after the death and decomposition of the animal. Thus, it lies around in the landscape where another victim may ingest it.

C. Plastic bags are non-biodegradable:

One of the worst environmental effects of plastic bags is that they are non-biodegradable. The decomposition of plastic bags takes about 1000 years.

D. Petroleum is required to produce plastic bags:

As it is, petroleum products are diminishing and getting more expensive day by day, since we have been using this non renewable resource increasingly. Petroleum is vital for our modern way

of life. It is necessary for our energy requirements - for our factories, transport, heating, lighting, and so on. Without viable alternative sources of energy yet on the horizon, if the supply of petroleum were to be turned off, it would lead to practically the whole world grinding to a halt. Surely, this precious resource should not be wasted on producing plastic bags.

E. Dangers to Sea Life:

Animals and sea creatures are hurt and killed every day by discarded plastic bags, a dead turtle with a plastic bag hanging from its mouth is not a pleasant sight but mistaking plastic bags for food is commonplace amongst marine animals. Plastic clogs their intestines and leads to slow starvation. Others become entangled in plastic bags and drown.

Because plastic bags take hundreds of years to break down, every year our seas become home to more and more bags through our sewers and waterways. Every bag that is washed down a drain during rainfall, down a toilet, blown into a river will end up in the sea.

The effects of plastic bags on the environment are really quite devastating. While there are many objections to the banning of plastic bags based solely on their convenience, the damage to the environment needs to be controlled. The

biggest problem with this is that once they have been soiled they end up in the trash, which then ends up in the landfill or burnt. Either solution is very detrimental for the environment. Burning emits toxic gases that causes harm to the atmosphere and increase the level of VOCs (Volatile Organic Compounds) in the air while landfills hold them indefinitely as part of the plastic waste.

Recycling Plastic Bags

While it's a noble thought to place the plastic bags in the recycling bin every week, studies have proven that there are very few plants that actually recycle them. Most of the municipalities either burn them or send them off to the landfill after sorting. This is because it can be expensive to recycle them. It doesn't melt down easily and is often not realistically able to be reused from its original form without considerable overhaul to the facility.

The premise of recycling these bags is nice. Yet, funding for the upgrades just has not happened and thus less than 1% of all bags sent to recycling plants. The result is worldwide end up in the recycling project. Most are left to become a pollution problem in one way or another.

Alternatives to Plastic Bags

There are various alternatives to plastic bags and the search for more alternatives continues.

a) **Paper bags**: Paper bags are a possible option but they also take their toll on the environment. The use of trees to increase the production of paper products combined with the increased energy that is required to make paper bags will also have a negative environmental effect.

b) **Reusable plastic bags**: are being introduced to regions that want to outlaw the plastic bag altogether. These are stronger and more durable and can be used for three to five trips to the store. But, similar to non-reusable plastic bags, these also end up in trash pits.

c) **Reusable fabric bags**: are fast becoming a favorite among environmental supporters. But cotton bags require extensive additional treatments and cotton being a water intensive crop increases the cost of using reusable cotton bags.

d) **Reusable Jute bags:** are the best alternatives to be used instead of plastic bags. Jute being bio-degradable, durable, easily available and cheap is seen as the future of carry bags.

Advantages of Natural Fiber bags over Poly bags

Reusable grocery bags are environment friendly bags, made out a variety of materials, such as cotton, hemp etc. These reusable bags are designed to be reused for grocery and

household shopping and reduce the impact of single-use plastic or paper bags on the environment.

Most people are not aware of the hazards on our environment when certain materials are produced for certain products. One of those products is plastic. As it is well known that the petroleum products are detrimental to the earth.

Plastics are of no exception. They are non-biodegradable and perpetuate damage to our eco-system. On the other hand JUTE is a natural fiber. Jute is a rain fed crop which means it doesn't need harmful pesticides and fertilizers to grow. The great thing about JUTE is that it's bio-degradable, reusable and durable. That’s why we are supporting the need of using JUTE as a supplement to PLASTIC.

Jute bags are environment friendly product and a natural alternative with inherent advantages. Jute bags are completely biodegradable, where the toxic effects of synthetics are serious that several western countries have banned it for use in food products. Jute is an agricultural product while synthetic bags are manufactured from polyester granules as a byproducts of naphtha, which poses a number of hazards.

Advantages of jute fiber bags

Jute bags have a number of advantages over widely used Poly bags (used as carry bags) by consumers on a frequent rate. Jute is a natural bast fiber and environment friendly,

non pollutant and produces non toxic gases or harmful gases as byproduct. Jute, when discarded, totally decomposes putting valuable nutrients back into the soil. Jute is available abundantly being a renewable resource. Jute is a fast growing crop with a much higher carbon dioxide assimilation rate than trees. Also, it benefits the poor as jute production creates much needed employment in poorer regions of the world. Jute is a durable material. It has the life span of over a thousand plastic carry bags. Jute is one of the strongest natural fibers and has high tensile strength. Jute fiber can be made attractive by dyeing with Basic, Vat, Sulphur and Reactive dyes. So, jute bags can be attractive along with being functional.

Jute Leno Bags

Leno Bags, are widely used for packing of various agricultural products such as onion, garlic, potato, pineapple, etc. At present, Leno bags made out of PP (Polyethylene) are very famous among consumers for carrying vegetables, fruits and groceries. But, PP being non-biodegradable and non-renewable has to be replaced by a renewable and sustainable resource like jute.

Leno weave improves the stability in “open” fabrics. This form of woven fabrics is constructed by twisting two adjacent warp threads around consecutive weft thread to form a spiral pair effectively ‘locking’ each weft in place.

Jute leno bags offer following advantages to consumers:

- ***Flexibility and Rigidity:*** The jute leno bags are rigid in use and have high tensile strength.

- ***Zero toxicity and chemical inertness:*** Jute leno bags are non- toxic and non-reactive to packed product and to the environment as well. These bags do not transmit any odour to the packed product.

- ***Anti fungal:*** No fungal growth takes place in leno woven jute bags.

- ***Excellent Air Permeability:*** Due to leno woven structure the packed product remains fresh for longer time and the energy cost in cold storage systems reduces.

- ***Stable performance:*** It has stable performance over large temperature range.

Although there are no reliable figures for poly bags usage but according to environmental census, more than 10 million poly bags are used in Delhi and NCR everyday. Similar census depicts that each year the world goes through some 500 billion plastic bags.

Production of jute fiber fluctuates, influenced by weather conditions and prices. India produces 60% of the world's jute, with Bangladesh accounting for most of the rest. As per a census given in FY 2009-2010, India exports only 200,000

tonnes of Jute products, the remainder being consumed domestically.

Jute fiber is used to manufacture coarser yarns for sacking, food grade agro bags, grocery bags, shopping bags, floor mats, ropes, twines etc. Jute occupies an important place in Indian economy. Currently the production of the fibre in India is around 100 lakh bales. Besides, there are several small scale industries in the decentralized sector producing handicrafts, decoratives, twines, pulp & paper from jute and allied fibers and particle board from jute stick. It is a labour intensive industry. There are 76 jute mills in India with around 4 million families are dependent on cultivation of Jute and around 2 lakh workers get direct employment in the Jute industry. Thousands of other people are engaged in several jute related diversified items. Around 16 lakh MT raw jute was produced in India in the financial year 2009- 2010. During 2010-11 (April-March), the total domestic consumption of jute items was 1315.5 thousand MT as against 1205.2 thousand MT in the corresponding period of 2009- 10, recording an increase of 12.15%.

Jute constitutes about 50% of the total global production of bast and hard fibres. So, by diversifying the use of jute fiber, farmers producing jute fiber and other bast fibers like hemp, kenaf, ramie, will find it to their assistance. New avenues of product diversification will be opened for the labour engaged in working with fibers like hemp and kenaf and thereby increasing their overall livelihood.

The Jute Packaging Material (Compulsory Use in Packaging Commodities) Act, 1987 has been enacted to provide for the compulsory use of jute packaging material in the supply and distribution of certain commodities in the interests of production of raw jute and jute packaging material, and of persons engaged in jute production and other stakeholders.

The above discussion clearly indicates that there is an immediate need of exploring an alternative source for making packaging bags, which are eco- friendly and at the same time sustainable too. The usage of PP bags poses inevitable hazards on our environment, from the day it gets manufactured. Henceforth, there is an urgent obligation to introduce natural fibers to lessen the overextended usage of synthetic bags, thereby reducing the burden on earth deterred by littered synthetic bags. Jute bags have been into market for long time, but have not been able to co- exist as per the expectations. An elaborate research is required to be undertaken, in order to introduce jute bags as strong, attractive, renewable and inexpensive packaging material to the native consumers of PP leno bags.

The proposed project is an attempt to produce seamless low cost jute carry bags using modified power loom. These would primarily be used for storage of vegetables and fruits etc.which, in current scenario, constitutes one of the major uses for PP leno bags. Eventually, it would reduce the usage of PP leno bags and hence, contribute towards an eco-friendly green environment.

CHAPTER – 5

DETAILED REPORT ON METHODOLOGY OF R & D PART OF PROJECT

The whole process was carried out in following nine steps:

1. Modify powerloom with suitable attachments for jute weaving
2. Modify powerloom to double plush loom with suitable attachments
3. Proper weave selection for the products
4. Synchronize different mechanisms of loom
5. Gait jute warp beam on the looms and run for trial
6. Fine tune the mechanisms
7. Run the loom and produce various jute bags
8. Conduct workshops and seminars to popularize seamless jute carry bags
9. Prepare final report of the project.

STEP - 1: Modification of powerloom for Jute weaving and fitting required attachments:

A. Single Shuttle Leno Loom:

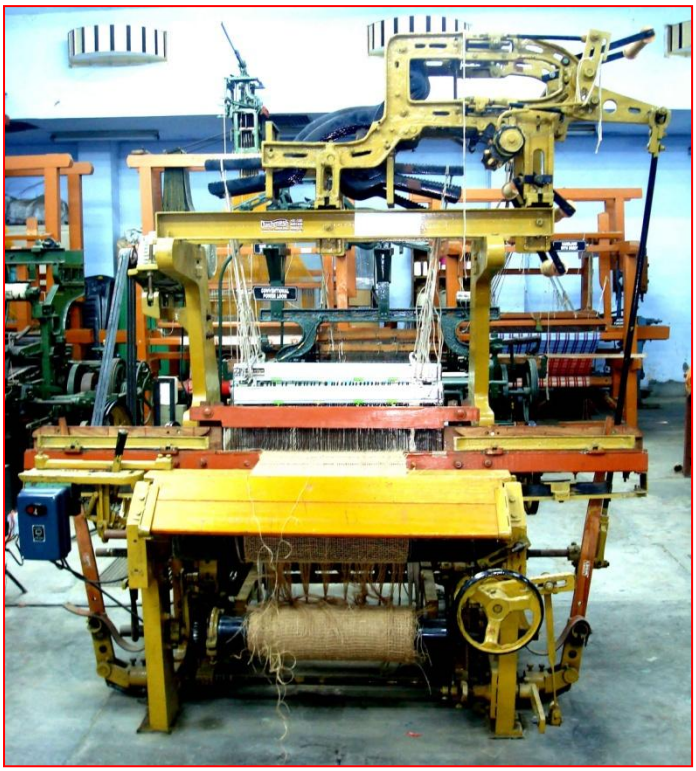


Fig A: Single Shuttle Leno Loom

Under this step various motions of a conventional power loom were re-designed and fitted. The major modifications are as briefed below:

a) **Emery Roller:** Jute leno fabric is a thin woven fabric with very low weft density. Further the fabric was having two layers in pipe shape. Therefore to avoid slippage of any layer, conventional emery surface was converted into spiked surface (fig 1-a and 1-b).

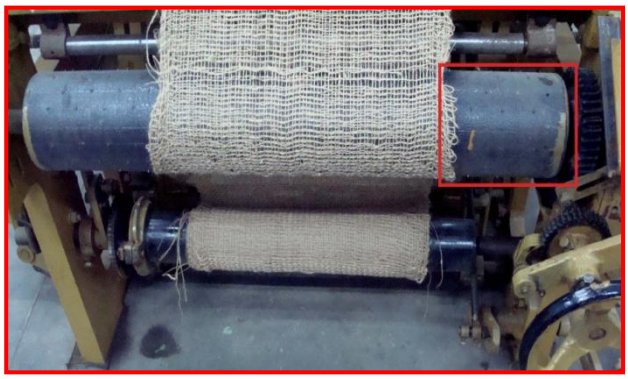


Fig 1-a

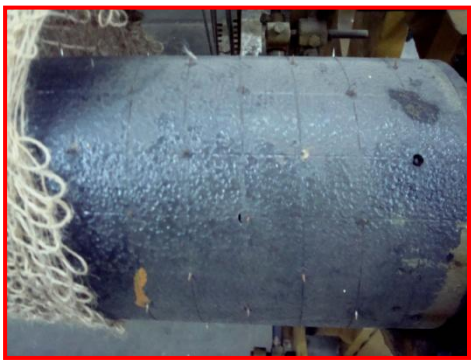


Fig 1-b Enlarged view

b) Take-up motion: As the weft density (PPI) of Jute leno fabric is considerably low, conventional 7-wheel take-up motion was redesigned and a worm & worm wheel system was developed (fig 2).

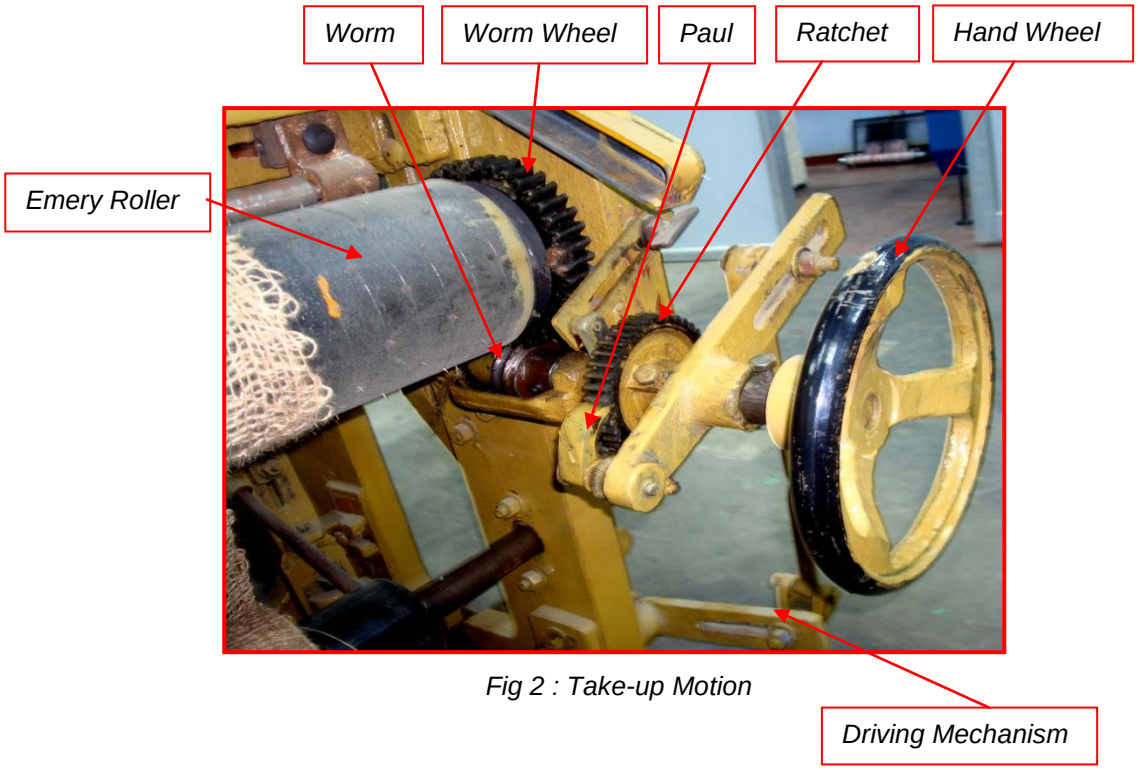


Fig 2 : Take-up Motion

c) Let-off Motion: The conventional let-off system of powerloom was modified and fitted to fulfill requirements of modified take-up motion (fig 3).

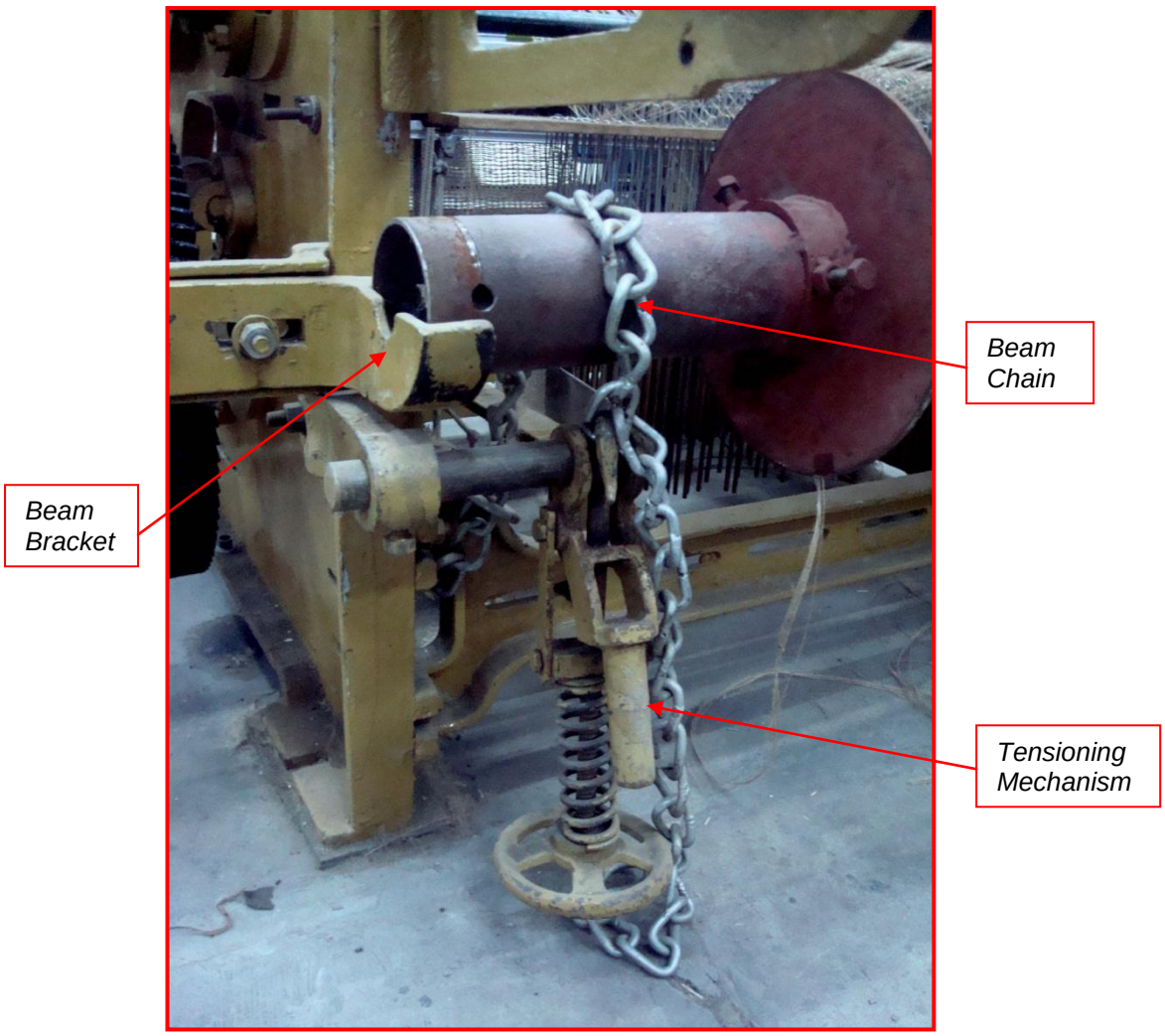


Fig 3 : Let-off Motion

d) Picking motion: To ascertain consistency of picking, an under-picking system with suitable modifications was designed and fitted (fig 4).

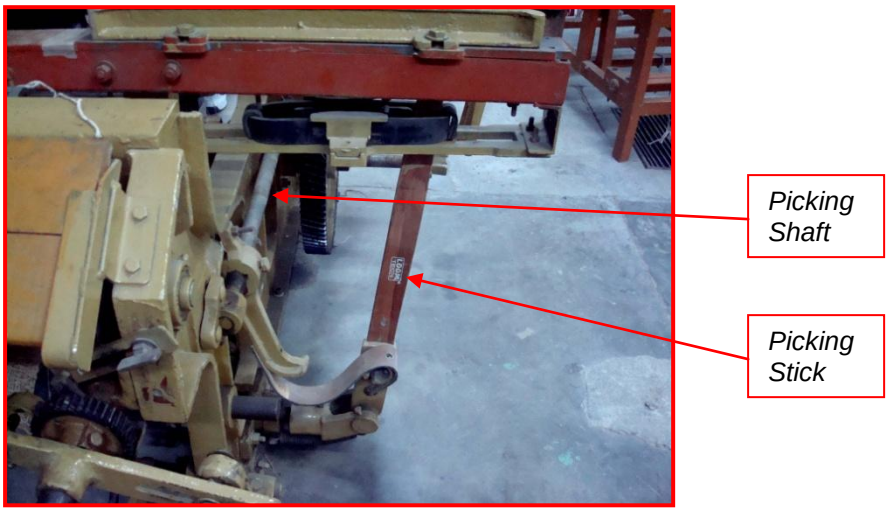


Fig 4 : Picking Motion

e) Yarn Tensioning Attachment: In leno weave structure, one warp thread crosses over its neighboring thread every time to lock the inserted weft yarn. This creates tension variation. The problem becomes more serious while double layer leno is woven, especially while processing bast fibre yarns. To overcome this problem and to keep the yarn tension as per requirements of weaving, a special type of yarn tensioning attachment is developed and fitted (fig 5-a and 5-b).

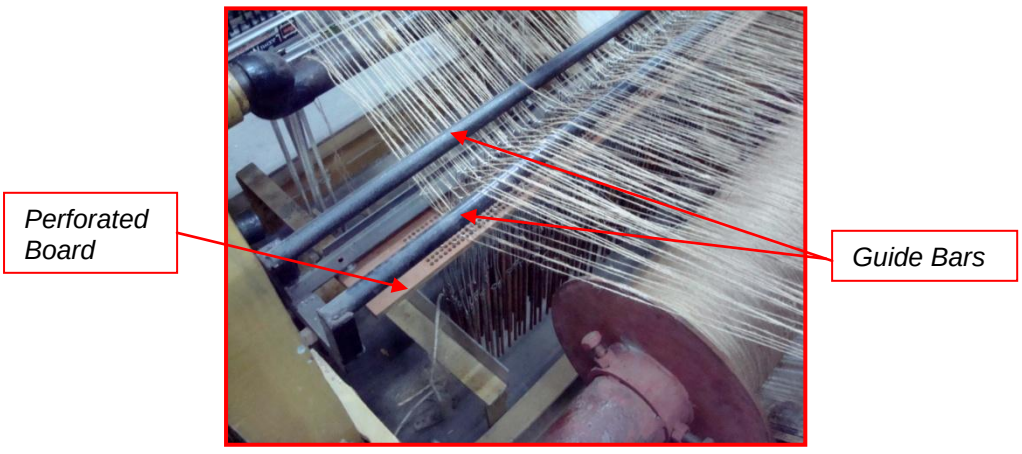


Fig 5-a : Yarn Tensioning Attachment

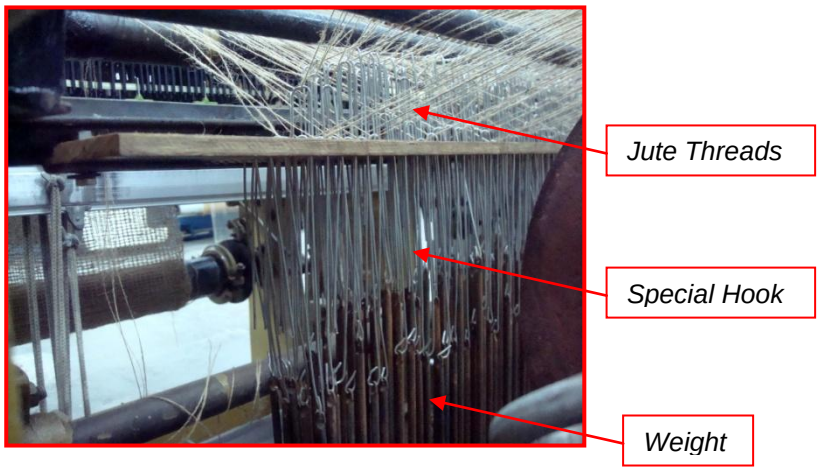


Fig 5-b : Yarn Tensioning Attachment

f) Cloth Roller: Conventional cloth roller and its driving system are modified and a new ratchet and friction clutch driven cloth roller system is developed and fitted on the loom (fig 6).

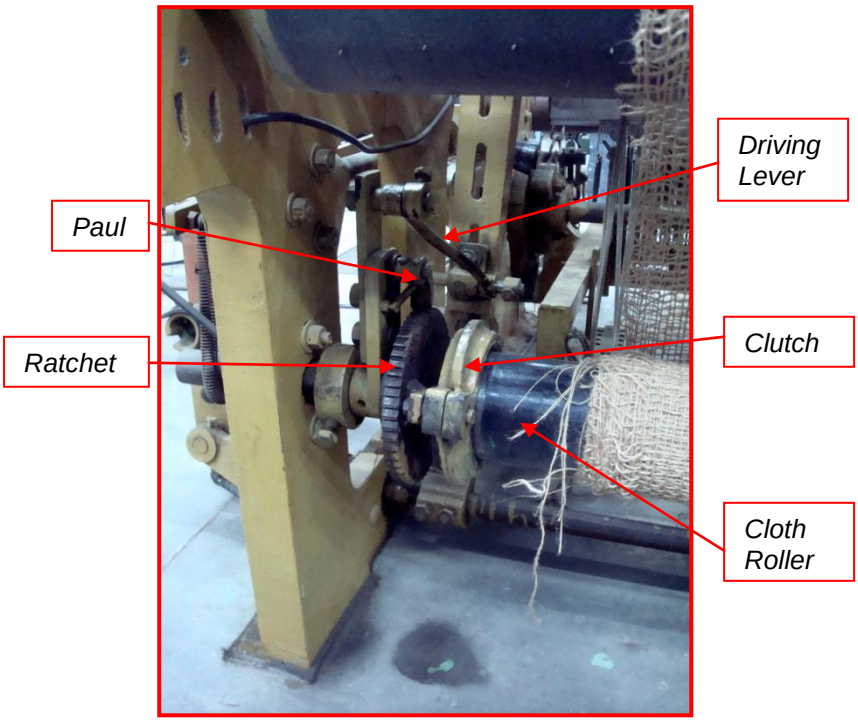


Fig 6 :Cloth Roller Drive

g) Braking Mechanism: For quick and effective braking action, conventional dead weight type braking mechanism is modified and spring loaded system is developed and fitted on the loom (fig 7).

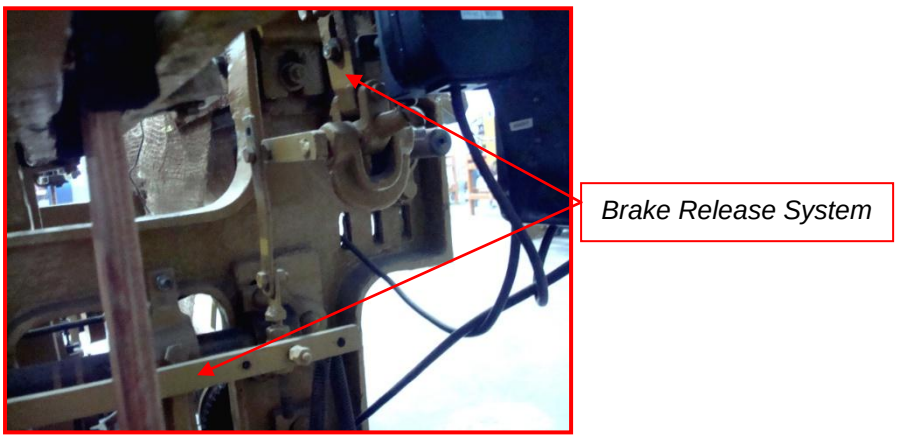


Fig 7 :Braking Mechanism

B. Double Plush Loom:

Fig B : Double Plush Loom

a) **Sley:** Sley is modified to accommodate two shuttle boxes each side (fig 8).

Fig 8 : Modified Sley

b) **Shuttle Box:** Shuttle box, as used in drop box looms, is fitted in place of conventional shuttle box. Two boxes, one over other, fitted in such a way so that both shuttles can be propelled simultaneously (fig 9-a and 9-b).

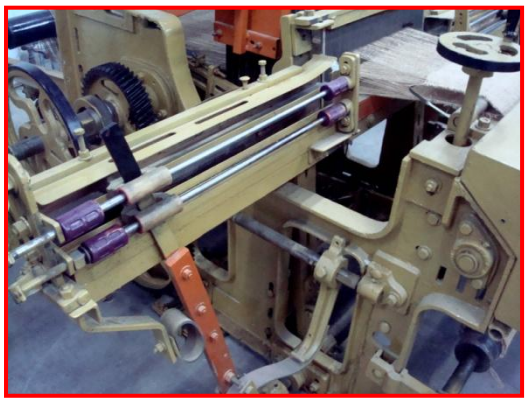


Fig 9-a : Shuttle Box (Left)

Fig 9-b : Shuttle Box (Right)

c) **Reed & Reed Cap:** In double plush (double shuttle) loom two sheds are formed to facilitate double

picking. Therefore width of reed is increased. Further reed cap is also modified to suit the angle of warp yarns in both sheds (fig 10).

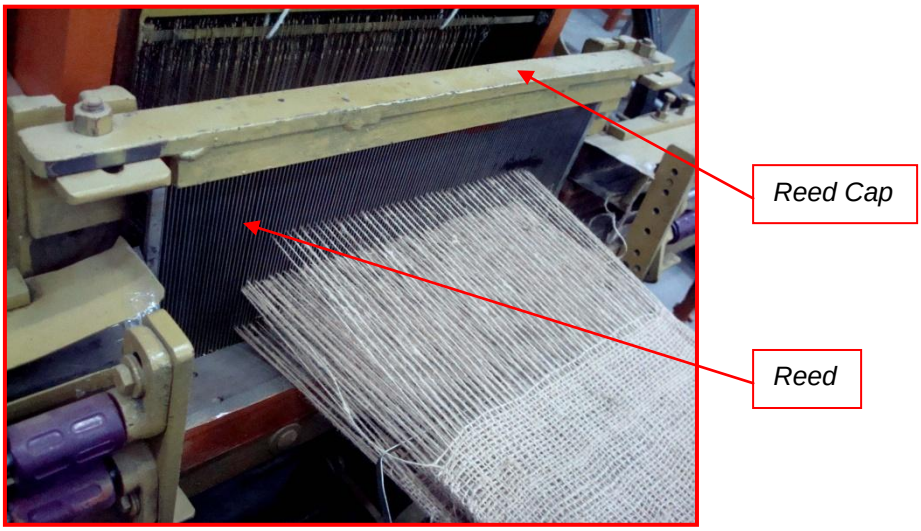


Fig 10 : Reed & Reed Cap

d) Picking stick & Pickers: Normal picking stick used in underpick drop box looms is extended to meet the requirements of double shuttle box system. The conventional underpick pickers are also changed to suit the picking system fitted in the loom (fig 11).

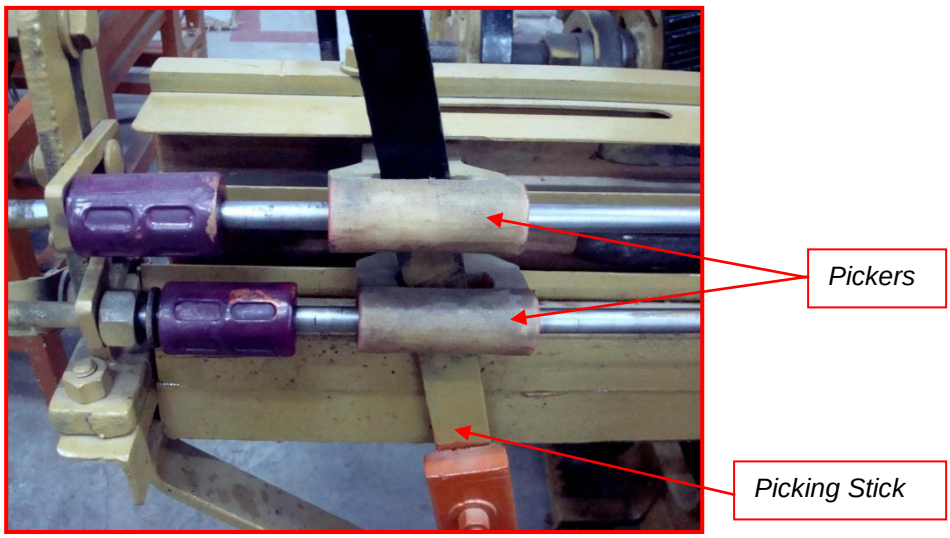


Fig 11 : Picking Stick & Pickers

e) Take-up motion: Conventional 7-wheel take-up motion was redesigned and a worm & worm wheel system was developed (fig 12-a & 12-b).

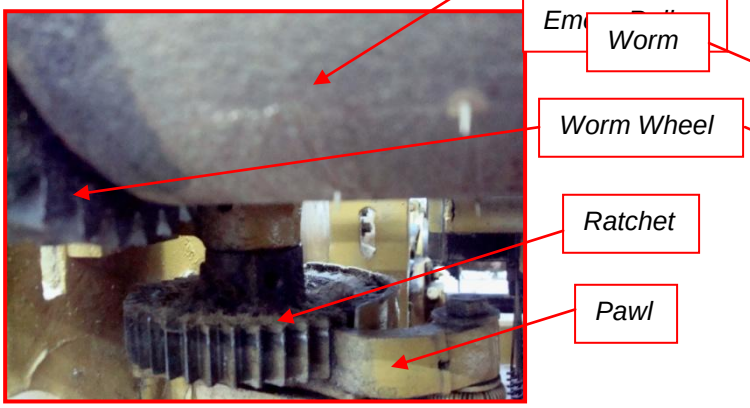


Fig 12-a : Take-up motion

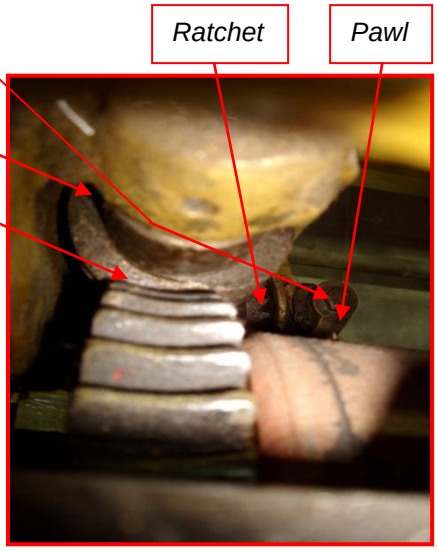


Fig 12-b : Take-up motion

f) Let-off Motion: The conventional let-off system of powerloom was modified and fitted to fulfill requirements of modified take-up motion (fig13-a & 13-b).

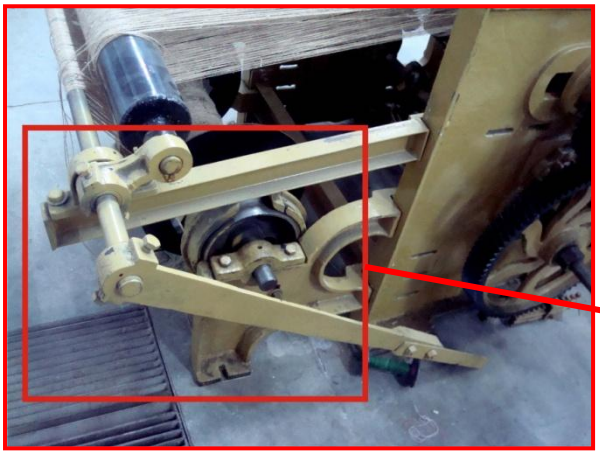


Fig 13-a : Let-off motion

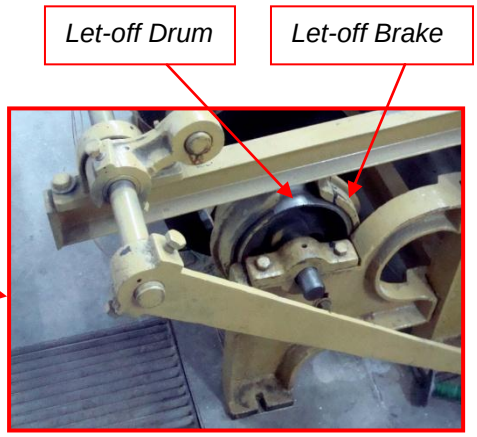


Fig 13-b : Let-off motion (Enlarged)

g) **Weft Hammer Lever:** Weft hammer lever is also modified according to the requirements of the loom and fitted (fig 14).

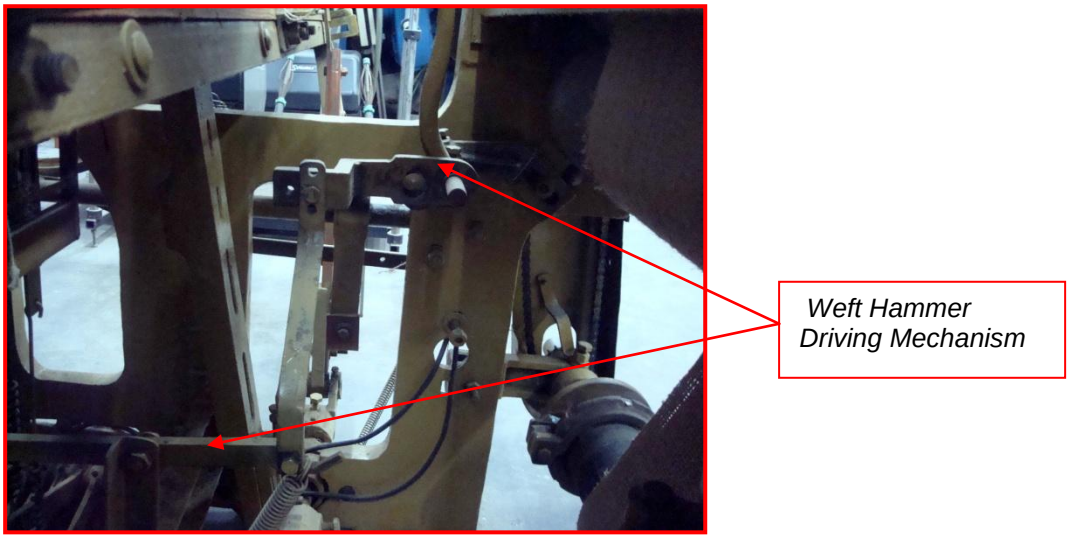


Fig 14 : Weft Hammer Drive

h) **Dobby Shedding Motion**: Considering heavy loading on shedding mechanism, conventional dobby is modified into heavy duty dobby and fitted on the loom. Other parts of its driving motion are also modified to suit the requirements (fig 15).

Fig 15 : Dobby Shedding Motion

i) **Dobby Under motion:** To support heavy duty dobby, heavy duty under motion is also developed and fitted on the loom (fig 16).

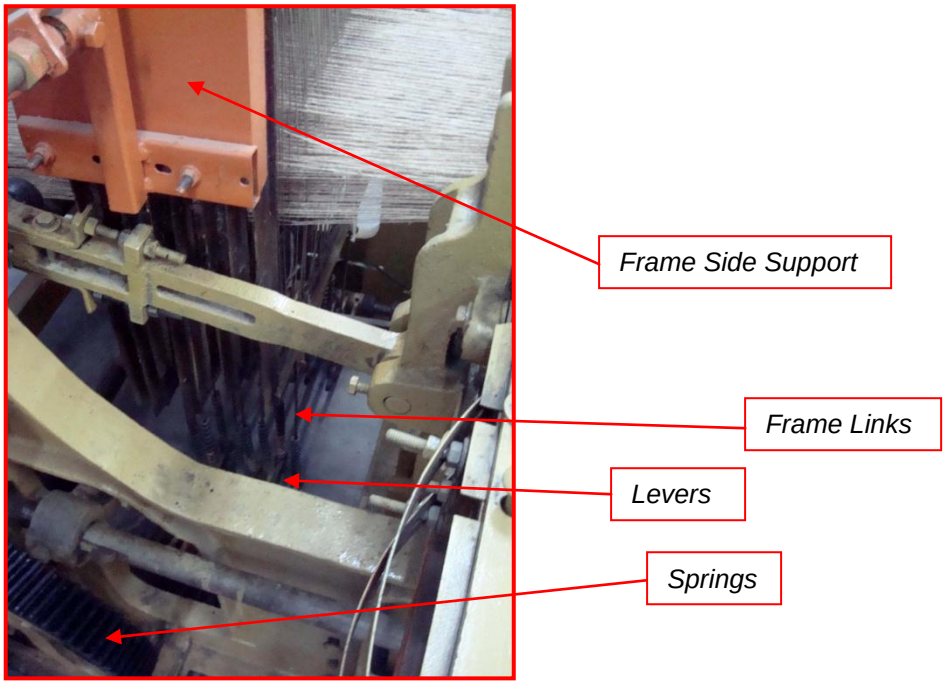


Fig 16 : Dobby Under Motion

j) **Emery Roller:** Jute fabric, woven on double shuttle loom, is having 04 layers. Hence to avoid slippage of any layer, conventional emery surface was converted into spiked surface (fig 17).

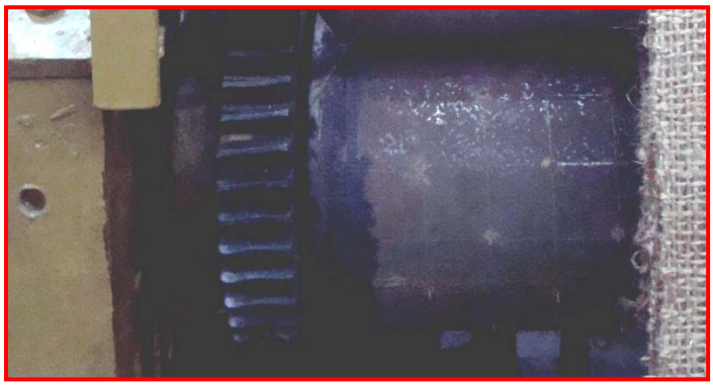


Fig 17 : Emery Roller

k) **Guide Rollers:** The design of fabric guide rollers, fitted with take-up motion is also changed and two new rollers are developed and fitted as per requirement of the system (fig 18-a and 18-b).

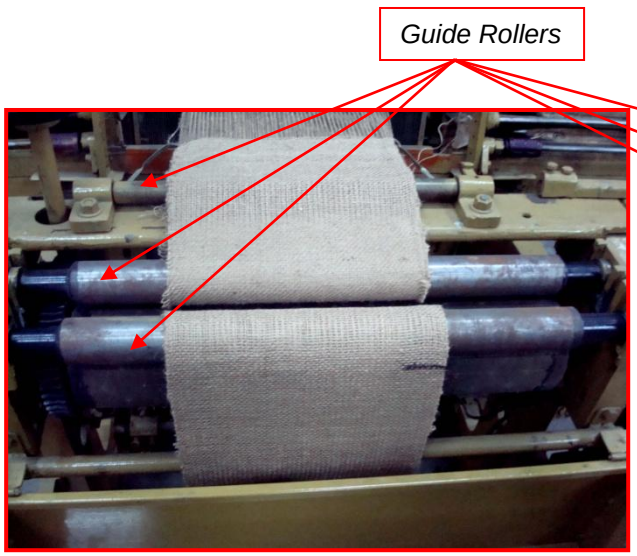


Fig 18-a : Guide Roller (Top View)

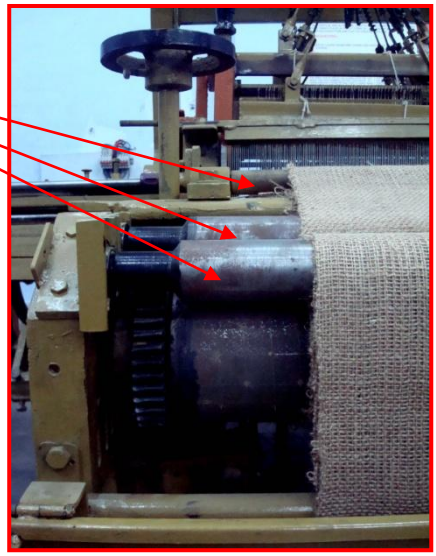


Fig 18-b : Guide Roller (Front View)

l) **Cloth Roller:** Conventional cloth roller and its driving system are modified and a new clutch driven cloth roller system for better winding of woven fabric is developed and fitted on the loom (fig 19).

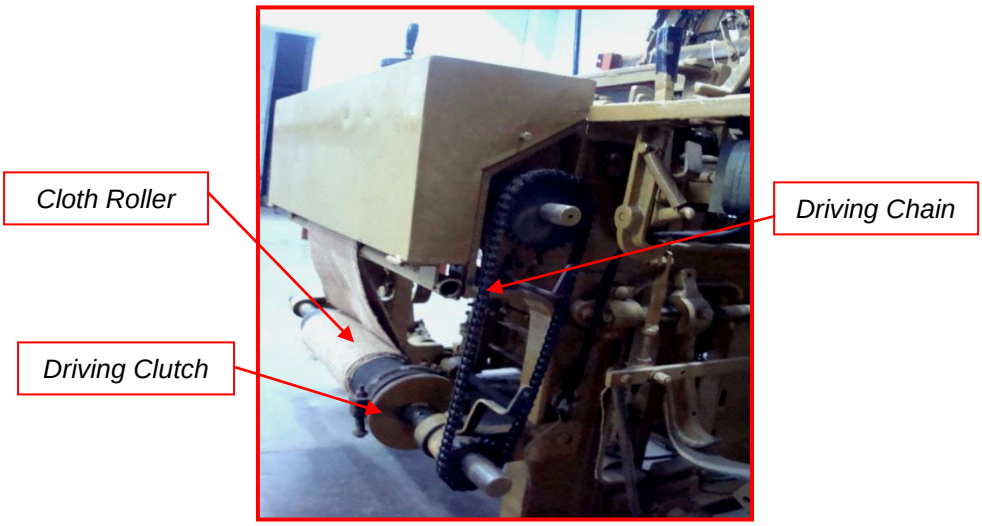


Fig 19 : Cloth Roller Drive

m) Shuttles: In double plush loom two sheds are formed and hence the back angle of the bottom shed shuttle is different from the conventional one. We have modified the shuttle, being run in the bottom shed and fitted on the loom (fig 20-a and 20-b).

Fig 20-a : Top Shed Shuttle

Fig 20-b : Bottom Shed Shuttle

n) Brake Release System: For quick and effective braking action, conventional dead weight type brake release mechanism is modified and spring loaded system is developed and fitted on the loom (fig 21).

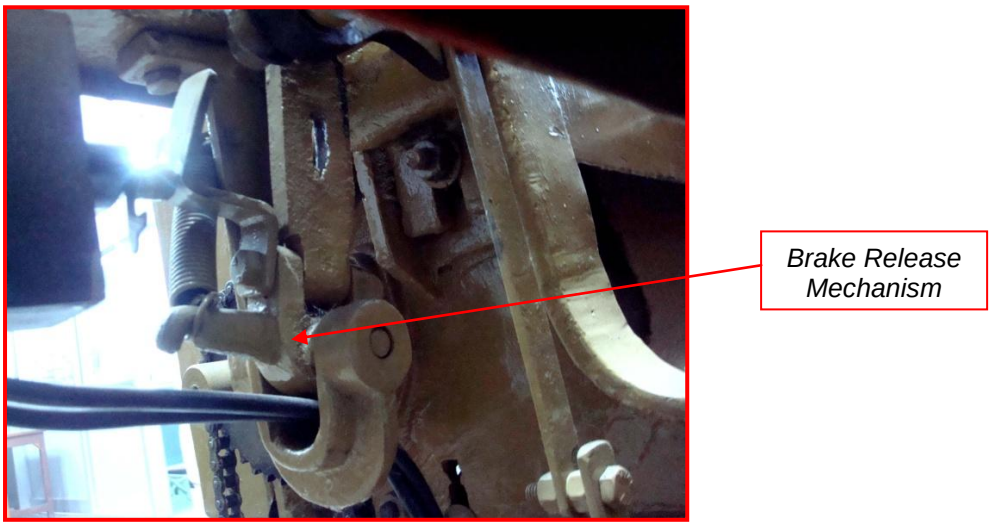


Fig 21 : Brake Release System

o) **Attachment for Layer Separation:** During weaving of seamless bags (one over other)it was observed that bottom layer of top bag and top layer of bottom bag were inter-weaving. To keep them separate a special attachment was developed and fitted with the guide roller brackets (fig 22-a and 22-b).

Fig 22-a : Layer Separator (Top View)

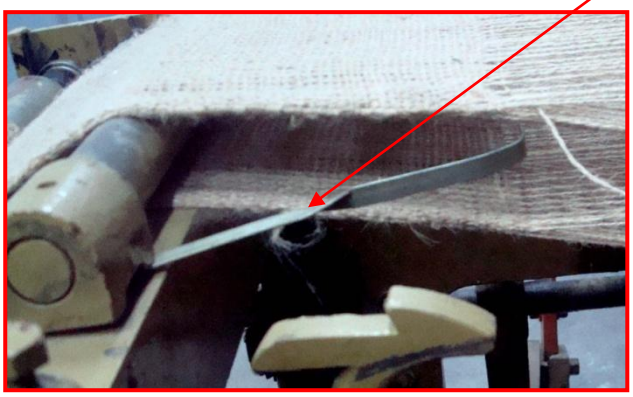


Fig 22-b : Layer Separator (Side View)

STEP - 2: Gaiting of jute warp beam and trial run:

A. Single Shuttle Leno loom:

a) Fitting of Heald Frames and fastening: Generally in leno weave one set of two heald frames is used. In this project we have to weave double layer leno fabric and hence two sets of two heald frames each set, thus total 04 heald frames, are used. 50 leno healds (to accommodate 200 threads) were inserted in each set of two heald frames (fig 23).

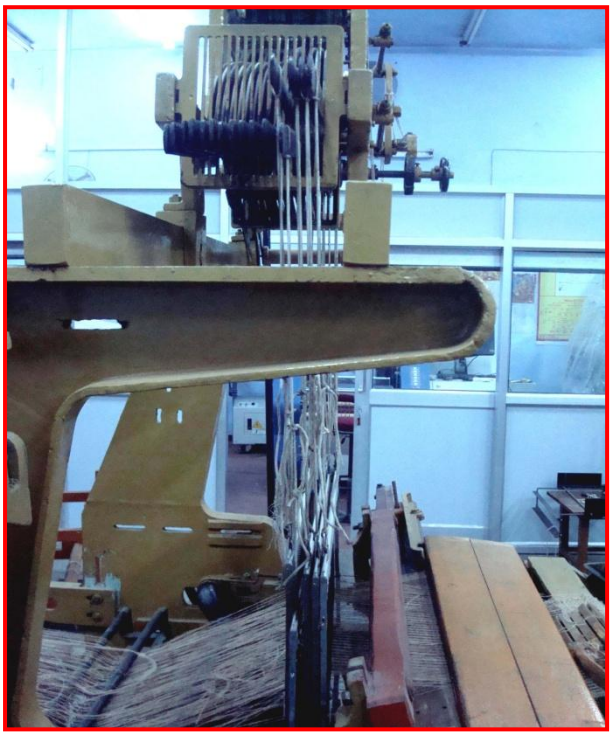


Fig 23 : Fitting of heald frames

All four heald frames were hanged in the dobby shaft no. 2,3,4 & 5. In shaft no 1 one ordinary heald shaft with 04 healds was hanged. This is required to control breakage of selvedge ends. All heald shafts were tightly secured on dobby levers at their

upper side while elastic cords were tightened at their bottom side.

b) **Selection of weave:** The concept of the project is to produce seamless carry bag. To achieve this it is necessary to weave a pipe in leno structure and then to seal it at the bottom. For this purpose during pipe weaving the lifting plan is kept as 1,2/2,3,4/1,3/2,3,5. For sealing at bottom side the lifting plan is kept as 1,2/3/1,4/5. This sealing weave is run for about 2 inches length.

c) **Preparing pattern chain and fitting on the loom:** A pattern chain (lattice) having required number of wooden strips (as per the length of the bag to be produced) is taken and pegs are inserted according to lifting plans as described above (fig 24-a & 24-b).

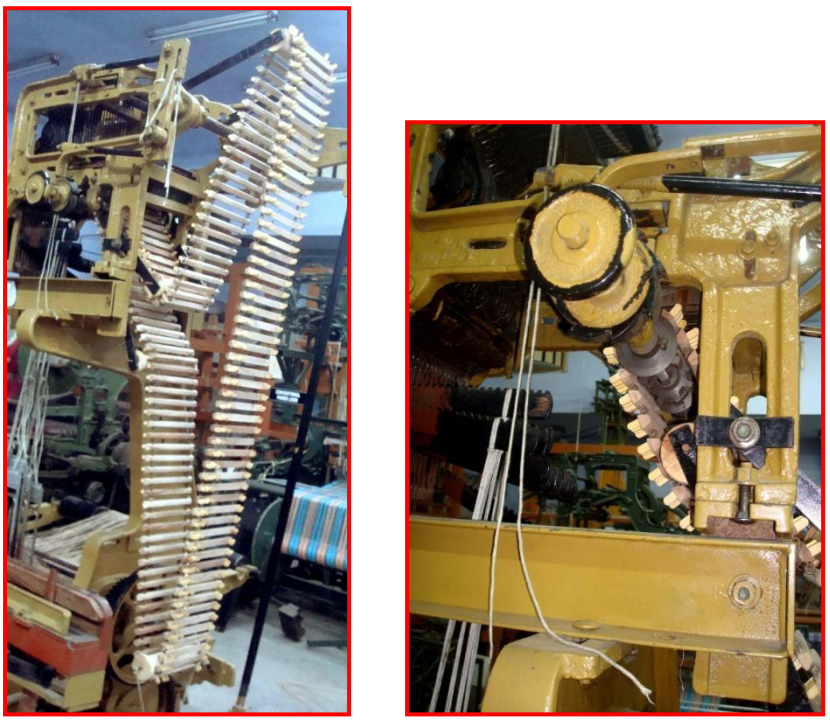
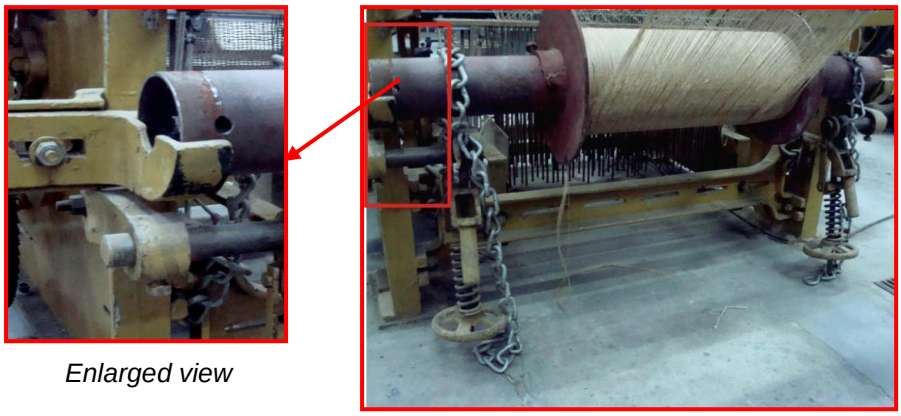


Fig 24-a & 24-b :Fitting of Pattern Chain

d) **Placing jute warp beam on brackets:** Jute warp beam consisting of 200 ends was prepared (approx. 30 mtrs) and all ends were leased to avoid crossing of ends. The beam was carefully loaded on beam brackets of the loom (fig 25-a & 25-b).



Enlarged view

Fig 25-a & 25-b : Fitting of Beam on brackets

e) **Gaiting of beam:** Leno healds are fitted in a set of two heald frames for each layer and in this project we have two layers one over the other. Hence two sets of two frames are to be loaded. It is, therefore suggested to draw the warp on loom and avoid loading drawn beams which may cause excessive thread breakage and/or pins coming out of their housing.

Jute warp sheet is taken forward over the back rest (fig 26) and drawn through the wires of tensioning device (fig 27). Then jute threads are drawn through leno healds – one thread through pin while the other in between the casing of the same pin thus making a set of two threads (fig 28).

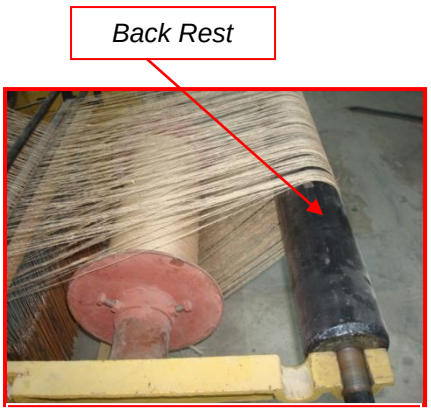


Fig 26 : Gaiting of beam

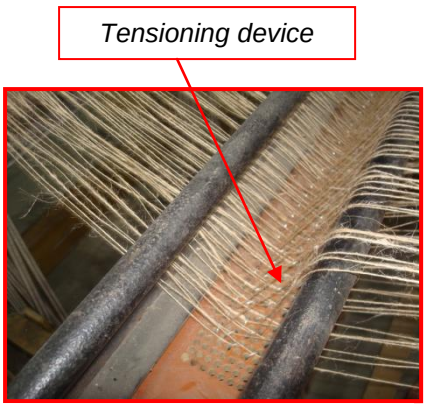


Fig 27 : Gaiting of beam

Fig 28 : Gaiting of beam

These two threads are then drawn together through one reed dent. Thus draw all warp threads through healds and reed. A piece of fabric is threaded through emery roller, guide roller and finally to the cloth roller as in conventional powerlooms. The drawn warp threads are tied with the piece of fabric (fig 29). After that pick density and beam tension are adjusted to run the loom for production.

Fig 29 : Gaiting of beam

Double Shuttle Loom:

a) **Fitting of Heald Frames and fastening:** The requirement of the project is to reduce the manufacturing cost of carry bags for which there are two factors, namely the raw material cost and the conversion cost, who constitute major part of the cost of product. In single shuttle loom, reduction of raw material cost was done by adopting leno weave construction whereas the concept of reducing conversion cost has been taken in designing double shuttle loom. For this the conventional powerloom is modified to run two shuttles simultaneously.

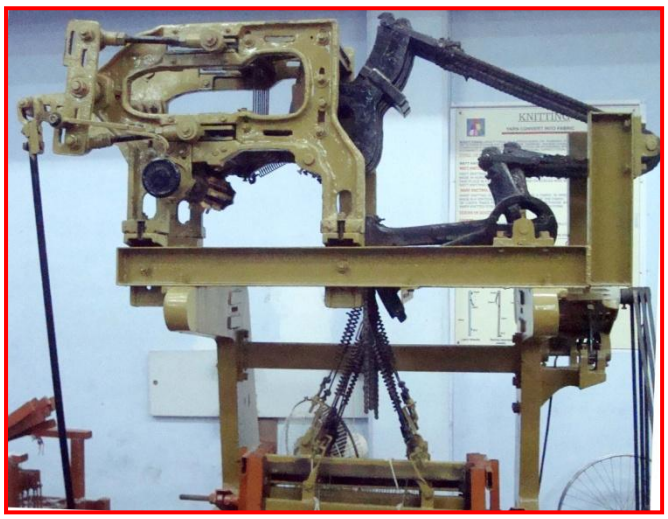


Fig 30 : Modified Heavy Duty Dobby

In this concept plain weave structure was taken and two carry bags (one over other) were woven. For this eight heald shafts (four for each carry bag) were taken with 50 healds in each shaft. All eight heald shafts were hanged and fastened with

specially designed chain and link system of dobby (fig 31-a & 31-b) and under-motion (fig 32). Then frame side supports are fitted at left and right sides (fig 33-a & 33-b) and set for smooth running of heald frames. The dobby is also modified to bear heavy loads (fig 30).

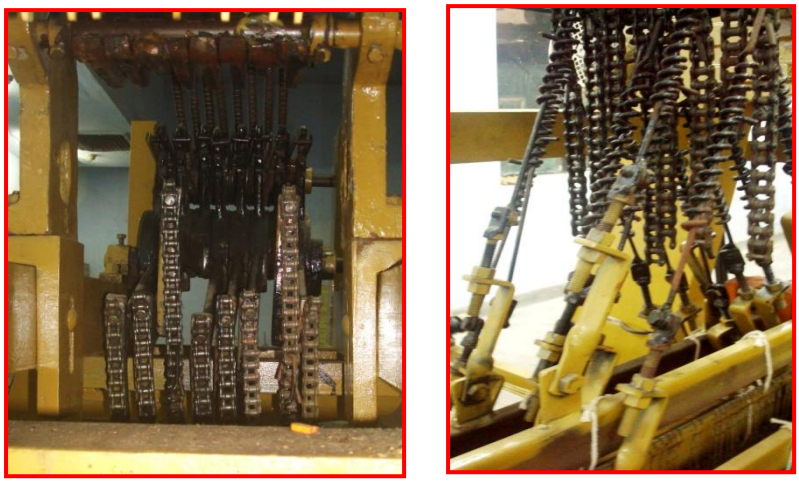


Fig 31-a & 31-b : Fitting of Heald Frames

Fig 32 : Under-motion with links

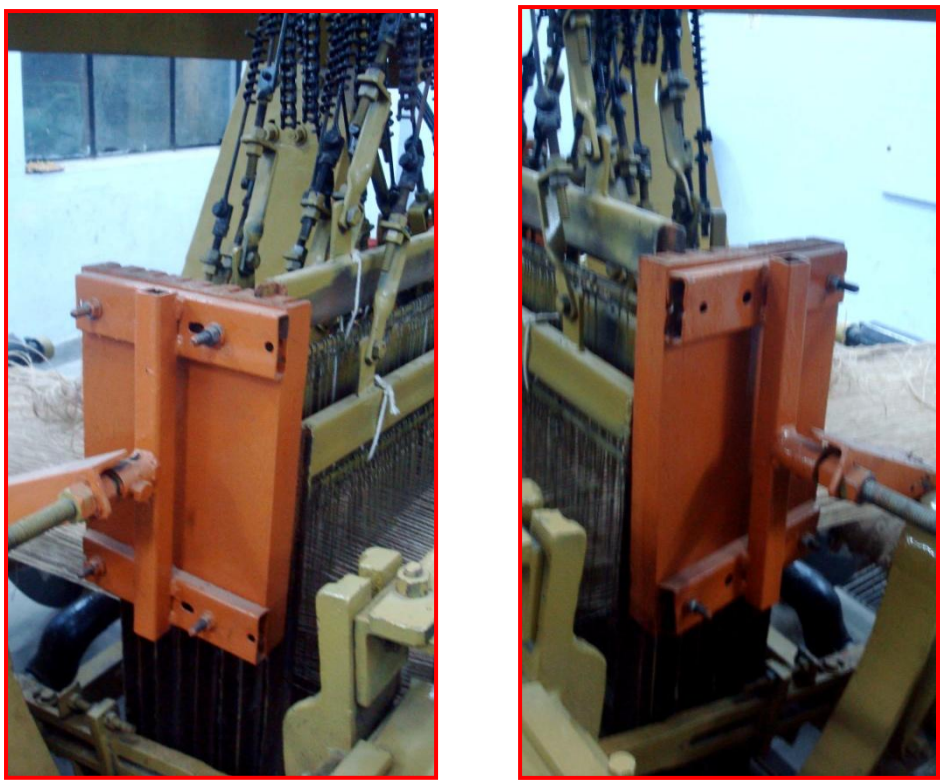


Fig 33-a & 33-b : Fitting of Frame Side Support

b) Selection of weave: The concept of the project is to produce seamless carry bags. To achieve this it is necessary to weave a pipe in plain structure and then to seal it at the bottom. For this purpose during pipe weaving the lifting plan is kept as 1/1,2,3/2/1,2,4/for upper bag and 5/5,6,7/6/5,6,8 for lower bag. This sealing weave is run for about 2 inches length.

c) Selection of Heald and Reed: The purpose of the job is to weave two fabrics simultaneously, one over the other, so that the productivity of the modified loom is increased and conversion cost goes down, which the main object of the project. For this purpose two warp sheds are to be formed,

one over the other, called the Top Shed and the Bottom Shed.

There are three ways to do so. One way is to use double eye healds, specially designed for the purpose. Second way is to use normal type of longer (15”) heald wires with the eye placed at the centre of the heald. While fitting these heald frames in loom with all dobby jacks down, the height of one set of 4 frames (for top shed) is to be kept higher to match with the level of top shuttle box while the other set of 4 frames (for bottom shed) is kept matching with the race board.

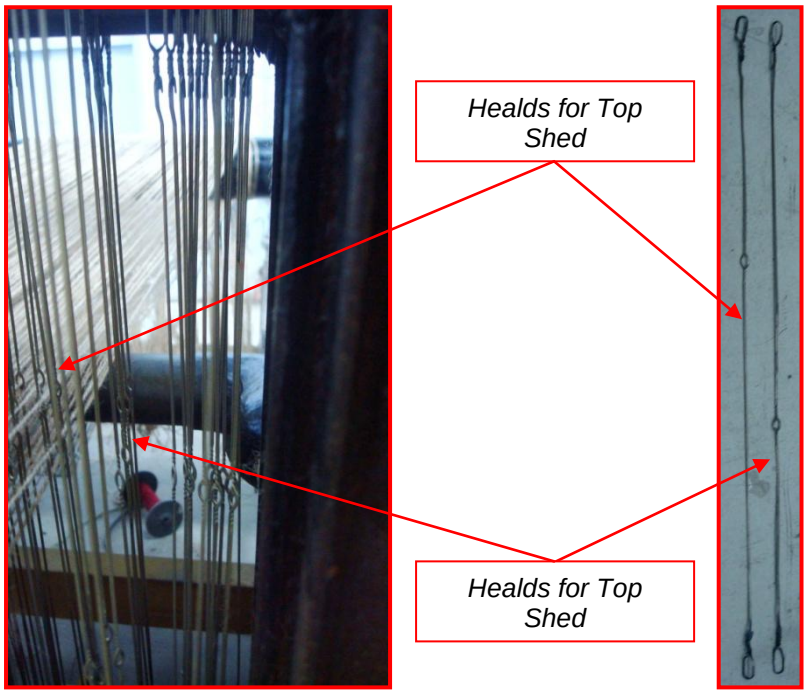


Fig 34-a & 34-b : Off-centre Healds

The second method is an unconventional system as adjusting frame height is such a way is not easy. Hence, as third option, we used specially designed

15” size healds. In these healds the eye is placed off- centre (fig 34-b) to suit the requirements of forming two sheds, one over other. For this we put one set of frames with eyes at bottom side while other set with eyes at top side (fig 34-a). The frame height and other adjustments are easier in this system.

d) **Preparing pattern chain and fitting on the loom:** A pattern chain (lattice) having required number of wooden strips (as per the length of the bag to be produced) is taken and pegs are inserted according to lifting plans as described above (fig 35).

Fig 35 : Fitting of Pattern Chain

e) **Placing jute warp beam on brackets:** Jute warp beam consisting of 400 ends was prepared (approx. 30 mtrs) and all ends were leased to avoid crossing of ends. The beam was carefully loaded on beam brackets of the loom (fig 36-a & 36-b).

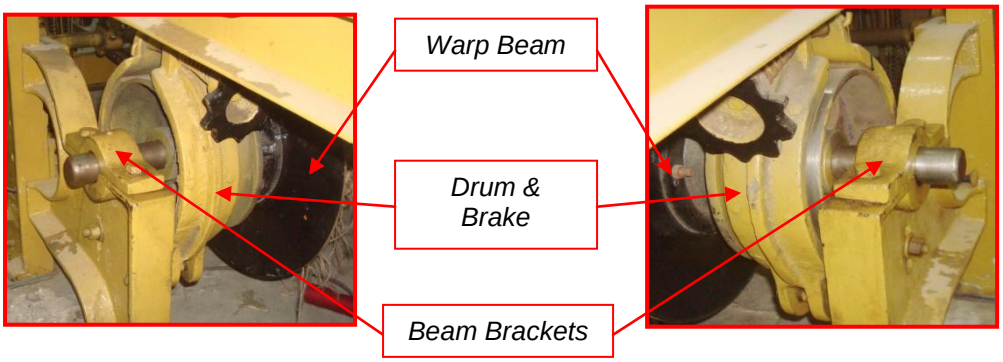


Fig 36-a & 36-b : Fitting of Jute Warp Beam on Brackets

f) **Gaiting of beam:** Jute warp drawn through heald and reed is taken forward, reed fitted at its place properly and fastened. Considering bast fibre properties it is suggested to draw the warp on loom to avoid excessive breakage of yarn during loading eight shafts on loom.

Fig 37-a : Gaiting of warp for bottom fabric

Fig 37-b : Gaiting of warp for Top fabric

Two pieces of fabric are taken and threaded through emery roller, guide roller and finally to the cloth roller. Care should be taken that the bottom fabric should run below the guide roller, fitted on front rest while the top fabric should run over the said guide roller. The drawn warp threads are tied with the pieces of fabric i.e. threads of bottom shed with the bottom fabric and that of top shed with the top fabric. Now pick density and beam tension is adjusted and the loom is run.

STEP - 3: Trial run of looms and production of carry bags:

a) Single Shuttle Leno loom:

a) Starting of loom: After adjusting the tension of warp and pick density, the loom is run pick by pick for about half metre. During this the dobby lattice movement was observed to be smooth. Required adjustments were done. The woven fabric was checked for the pick density and crossing of threads.

b) Fine tuning of different motions: Fine adjustments were done in picking force, picking timing, shedding timing, height of back rest and special tensioning attachments. Further, lift of dobby was adjusted and fine setting was done at heald shafts to adjust shed height & shed opening. Shuttle boxes were also adjusted to control rebounding of shuttle. Winding tension of woven fabric was also adjusted from the friction clutch driving mechanism.

c) Production of sample: After adjusting and fine tuning of all motions the loom was run at its trial speed. The sample bags were produced and checked for their quality. The results were found to be satisfactory.

b) Double Shuttle loom:

a) Starting of loom: The loom is run pick by pick for about half metre and checked for the pick density, beam tension and dobby lattice movement. Pick density was found less and hence increased. Warp tension was found to be varying in layers and hence adjusted the special tension attachment.

b) Fine tuning of different motions: Picking force was not correct. The adjustment in the timing and force was done. Further, lift of dobby was adjusted and fine setting was done at heald shafts. Shuttle boxes were also adjusted to control rebounding of shuttle.

c) Production of sample: After adjusting and fine tuning of all motions the loom was run at its trial speed. The sample bags were produced and checked for their quality. The results were found to be satisfactory.

CHAPTER – 6

RESULTS & OUTCOME OF R & D ACTIVITIES

Following are the outcome of the project:

1. **Products:**
2. Modified powerlooms
   a) Single Shuttle Leno Powerloom (Fig 38)
   b) Double Shuttle (Double Plush) Loom (fig 39)

Fig 38 : Single Shuttle Leno Loom

Fig 39 : Double Shuttle Loom

3. Jute Bags
   a) Jute Leno Bag (fig 40)
   b) Unfinished Jute Shopping Bag (Fig 41)

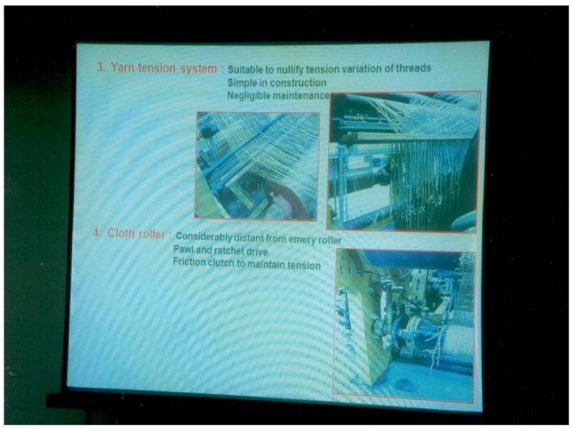
Fig 40 : Jute Leno Bag

Fig 41 : Unfinished Jute Shopping Bag

2. Organization of seminar – an awareness program for jute industry:

In association with National Jute Board, Kolkata one seminar was organized in Kolkata, the jute city of India, on 29th January, 2013. More than 50 delegates from various jute industries and institutions, scholars, technicians and loom manufacturers participated in this seminar.

The delegates shown their keen interest in the developed technology and various quarries were floated by them in order to understand the advantages of the same. Developed samples were displayed during the seminar which were appreciated by the visitors. Given below few photographs of the event.








3. Test Results:

Following essential parameters were tested in the Physical Quality Evaluation Lab of NITRA, Ghaziabad:

Sr. No.	Parameter	Test Method	Jute Bag (Sack)	Carry Bag
1	Resultant Count (Jute System)*	IS: 3442-1980 Ra 2008		
	- Warp		7.73_s	13.69 (2 ply)
	- Weft		9.29	13.44 (2 ply)
2	Thread density	IS : 1964:2001 Ra 2008		
	- Ends / dm		14	30
	- Picks / dm		13	27
3	Breaking Strength N (10x20 cms)	IS : 1969:1985 Ra 2006		
	- Warp		394.42	1133.65
	- Weft		346.08	1028.23
4	Bursting Strength (kg/cm^2)	IS : 1966 -95 Ra 2006	4.50	13.85
5	Seam Strength (N/10 cm)	ASTM D 1683	97.71	460.32

* No. of pounds / 14400 yards

CHAPTER – 7

PRODUCT / PROCESS STANDARDIZATION

1. **Product Standardization:** Product standardization, as such, depends upon the requirement of the product. Different parameters, such as construction, size, raw-material quality etc. are decided according to end use. Somehow, we have in this project we have taken following parameters:

a. Raw material – Jute yarn – 8 lb single ply & double ply

b. Weave – Leno weave & plain weave

c. Size of the bag – Leno bag : 20” x 42”
Shopping bag : 14” x 20”

d. Construction

	EPI	PPI
Leno bag	8	8
Shopping bag	14	12

2. **Process Standardization:** Process standardization is already discussed in the chapter 5 “Methodology of R & D Activities” for above products. In case of other products the process standards may be modified as and where required.

CHAPTER – 8

COST ANALYSIS / COST EFFECTIVENESS STUDY REPORT

Cost Estimation

1. Jute Leno Bag:

a. Parameters for calculation:

i)	EPI and PPI on loom	: 8 x 8
ii)	Bag size on loom	: 20” x 42”
iii)	Average wt. of bag	: 165 g
iv)	Loom efficiency	: 65% @ 120 r.p.m.
v)	Motor	: 1 HP 3 phase AC
vi)	Jute Yarn cost	: ₹ 60/- per kg
vii)	Power cost	: ₹ 8/- per unit
viii)	Labour charges	: ₹ 250/- per 8 hr. @ 1 loom / weaver
ix)	Overhead and other cost	: 3 labours per 1 ton production
x)	Proposed profit margin	: 25% of prodn. cost

b. Calculation:

i)	Total bags produced	: 110 bags per 8 hr.
ii)	Raw-material cost	: ₹ 9.90/- per bag
iii)	Labour cost	: ₹ 2.27/- per bag
iv)	Power cost	: ₹ 0.58/- per bag
v)	Overhead and other cost	: ₹ 0.13/- per bag
vi)	Total production cost	: ₹ 12.88/- per bag
vii)	Profit margin	: ₹ 3.22/- per bag
viii)	Proposed sale cost	: ₹ 16.10/- per bag

2. Shopping Bag:

c. Parameters for calculation:

i)	EPI and PPI on loom	: 14 x 12
ii)	Bag size on loom	: 14” x 20”
iii)	Average wt. of bag	: 75 g
iv)	Loom efficiency	: 65% @ 80 r.p.m.
v)	Motor	: 1 HP 3 phase AC
vi)	Jute Yarn cost	: ₹ 60/- per kg
vii)	Power cost	: ₹ 8/- per unit
viii)	Labour charges	: ₹ 250/- per 8 hr. @ 1 loom / weaver
ix)	Overhead and other cost	: 3 labours per 1 ton production
x)	Proposed profit margin	: 25% of prodn cost

d. Calculation:

i)	Total bags produced	: 208 bags per 8 hr.
ii)	Raw-material cost	: ₹ 4.50/- per bag
iii)	Labour cost	: ₹ 1.20/- per bag
iv)	Power cost	: ₹ 0.30/- per bag
v)	Overhead and other cost	: ₹ 0.08/- per bag
vi)	Total production cost	: ₹ 6.08/- per bag
vii)	Profit margin	: ₹ 1.52/- per bag
viii)	Proposed sale cost	: ₹ 7.60/- per bag

It is reflected in above calculation that major role in the cost of the bag is played by raw-material. Hence the efforts may be done to reduce the jute yarn cost without affecting quality of the yarn / product.

CHAPTER – 8

CONCLUSION WITH RECOMMENDATIONS

Conclusion: Leno weaving in Jute is not a new concept but weaving of “Seamless Leno bags” is a new technology developed by Northern India Textile Research Association, Ghaziabad by financial assistance of National Jute Borad, Kolkata. Seamless leno jute bags were successfully produced and displayed in the technological seminar, organized in Kolkata in presence of reputed technicians and entrepreneurs.

Similarly, double shuttle weaving is not a new concept but weaving of seamless carry bags, one over the other is a new technology developed by Northern India Textile Research Association, Ghaziabad by financial assistance of National Jute Borad, Kolkata. Seamless carry bags / shopping bags (finished and unfinished), produced in NITRA pilot plant were displayed in the technological seminar, organized in Kolkata in presence of reputed technicians and entrepreneurs.

Recommendations – way forward: Development of technology is meaningful only when it is acceptable and affordable. For the same we recommend that:

- The modified looms need to be examined for ease of operation and acceptability by shop floor personnel.
- At different regions test runs may be conducted by installing at least 4 to 6 looms in each locality / factory for fine tuning cost of production.

- Standardization / specifications of the bags for different varieties of goods / items to be carried out.
- As ban on plastics is not effectively implemented all across the country, acceptability / affordability depends on regions / localities. Therefore acceptability of these jute bags has to be studied at various regions / localities.
- As raw-material cost is a major component in the cost of product, efforts may be made to control jute yarn cost without compromising quality aspects.
- The invention is made available in the public demand so that interested jute industrialists and loom manufacturers may contact NITRA and adopt the technology.