



"Transforming Textile Waste: A Comprehensive Study On Papermaking Process"

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The fashion and textiles industry has witnessed a surge in demand, leading to an unprecedented increase in apparel production and subsequently, textile wastage. Recognizing the significance of recycling, a growing consumer segment is now gravitating towards brand-conscious, ethically produced goods. This paradigm shift has prompted major brands to adopt more sustainable practices. Despite these positive strides at the macro level, the challenge of resource wastage persists at the grassroots level. The investigators conducted a case study with the aim to document the process of papermaking from textile waste. Data was collected through interviews with the industry's management and employees, enabling a comprehensive understanding of the papermaking process from textile waste. Responses were meticulously recorded and subsequently analysed to draw meaningful conclusions. The papermaking process utilizing textile waste involves several key steps. It begins with the initial phase of Cotton Shredding, Followed by Pulp Beating, a process that further refines and softens the fibres. The next step entails dipping a Mold and Deckle in and out of a tub filled with the prepared pulp mixture. Subsequently, any excess water is drained from the newly formed sheet to achieve the desired consistency. The paper is then subject to a Drying phase. The paper is then Cut to attain the desired dimensions and shape. Finally, Printing can be applied to the paper to add specific designs or information. This comprehensive process transforms textile waste into functional and usable paper products. Utilizing textile waste in papermaking presents notable advantages, including environmental friendliness and reduced reliance on chemicals. It also encourages a sustainable practice that can be easily adopted in household settings using readily available tools and materials. However, challenges arise from escalating raw material costs, limited flexibility in pricing, and substantial overheads encompassing rent, labour, electricity, and infrastructure expenses. This study offers comprehensive documentation of the papermaking process from textile waste, emphasizing its potential as an eco-friendly and sustainable alternative to traditional paper production methods. By addressing both its advantages and challenges, this research aims to contribute to a more informed and conscientious approach to

paper production within the fashion and textiles industry.

Keywords: Textile Waste, Papermaking, Sustainability, Eco-Friendly, Raw Materials, Production Process

INTRODUCTION

WASTAGE IN THE APPAREL AND TEXTILE SECTOR

Overproduction (Supply exceeds Demand), High Transportation Costs, Inventory (Storage, Preservation), Inappropriate Processing (Inappropriate Techniques, Oversized Equipment), Waiting (Poor Man-Machine Coordination, Unreliable Process or Quality), Motion (Inappropriate Work Station Setup, Inappropriate Method Design, Poor Workplace Setup), and Defects (Incorrect Method, Inadequate Training, Incapable Processes/Supplier, Frequent Err Wastage in the knitting section (design change, machine set up, and machine maintenance), wastage in the dyeing section (G.S.M. measurement, and incorrect sample dyeing), and wastage in the garments section (incorrect marker making, miss size ratio, incorrect cut panel, and unskilled worker used) are the three types of fabric wastage, according to a study (Rumman, 2016).

Fabrics and trims like buttons, embroidery threads, and other ornaments make up the textile industry's waste. During this process, between 10 and 25 percent of the fabric is lost. Misprints and errors in embroidery can result in waste (Jadwani, 2019). Marker efficiency is linked to fabric waste in the ready-to-wear industry. Fabric wastage will decrease if marker efficiency decreases. Fabric wastage is inversely correlated with marker efficiency. However, some forms of fabric waste occur outside of the marker efficiency, such as losses due to ends of ply, selvage, loss of fabric in roll, and purchase loss (Islam, 2016).

THE APPAREL AND TEXTILE SECTOR IN INDIA

The Indian textile and apparel sector has strengths throughout the entire value chain, from apparel to fiber, yarn, and fabric. It has a wide range of segments, including the organized textile industry, handicrafts, wool, and silk products, and traditional handloom products. The organized textile industry includes processing, apparel manufacturing, spinning, weaving, and the use of capital-intensive technology for the mass production of textile products. In 2018, the domestic textile and apparel industry generated \$140 billion, of which \$100 billion was consumed domestically and \$40 billion was exported to the international market (Tyagi, 2019).

Sarees, dupattas, and dhotis made up the majority of the clothing that was recycled in Indian homes a few decades ago. These items could be made into things like bags, blankets, cushion covers, and curtains, among other things, rather quickly.

A study (Bairagi, 2018) found that 68% of people shop for clothes every month. Nearly 53% of respondents said they would rather toss the old clothes they no longer needed in the closet. In India, a small number of young

people also buy pre-owned clothing through online apps and websites and resell their used brand clothes. Only 74% of people donate their old clothes.

APPAREL AND TEXTILE WASTE MANAGEMENT

Recycling textiles has economic and environmental advantages. It reduces the need for dyes and fixing agents, energy consumption, pollution, landfill, and the use of scarce virgin resources. However, to recycle waste, certain mechanical, chemical, or biological processes must be carried out. These processes require a certain amount of energy and new raw materials, which in turn cause emissions to be released into the land, water, and air. As a result, recycling is not always the best option. According to Utebay (2020), the current recycling technologies must become better, cleaner, more energy-efficient, and less expensive.

Ethical product design should be the constant focus. The idea of sustainable fashion, which has a positive effect on the environment, is reflected in many initiatives. Designers play a crucial role in facilitating systemic change. Products that have a low impact on the environment and a high social quality, low production costs, low sales prices, and properties that quickly decompose are all aspects of sustainable design. New and more discerning customers have emerged as a result of the initiative, aware of the potential consequences of their actions for future generations. According to Brolga (2017), consumers also expect brands to adhere to the principles of making the world a better place.

MANAGEMENT OF TEXTILE AND APPAREL WASTE IN INDIA

The majority of textile and apparel waste in India is sold to the large, informal economy of waste workers for nominal amounts ranging from six to ten rupees per kilogram. This invisible force behind textile and dry waste recycling in India is often referred to as a chindi-walla. Many of them are members of the nomadic Waghri community in Gujarat. Through low-cost, cash-based trading, they collect, repair, and resell used clothing from households all over India, extending the product's lifespan (Bapat, 2016). These repurposed and recycled clothes end up in the many informal secondhand clothing markets all over the country, like Fashion Street in Mumbai and Sarojini and Janpath in Delhi. These are also sold to mid-sized aggregators, who collect comparatively larger quantities of waste of the same kind. This waste is then sold to small traders and merchants, who use it to make low-cost children's clothes, road laying, car seat stuffing, factories that use it to down-cycle, like cement factories, factories to use as rags to wipe oil and grease from machinery, and mattress manufacturers, who use it to make low-cost pillows and mattresses. A portion of this waste also reaches recyclers, primarily in Panipat, where it is mechanically recycled into low-cost, substandard blankets for the army, trains, prisons, and Red Cross donations (Shukla, 2020).

HISTORY OF PAPERMAKING

Traditional Paper Fabric Paper yarn, also known as Shifu & Saga Nishiki, was traditionally made in Japan from fresh paper made from tree bark.

Egypt was the first place to discover a portable writing medium around 3000 BC. *Cyperus papyrus* is a type of aquatic plant that grew near the Nile and was used by people to create a flexible, smooth surface. The Latin word "Papyrus" is the source of the word "Paper." It took in ink and held it without smudging or blurring. Before paper was introduced to the Middle East and Europe, it was used in ancient Egypt and other Mediterranean cultures (Aithal, 2016).

China is where paper, as we know it today, was invented. The cellulose in linen and cotton rags, old ropes, and other textile waste were utilized by papermakers, as well as bast fibers that were directly collected from semi-tropical plants and shrubs. After Muslims conquered Central Asia at the end of the 17th century, they started keeping records on paper because it was cheap, plentiful, and impossible to erase without being noticed (Bloom, 2017).

In 793, papermaking spread to Baghdad, Central Asia, and Samarkand. From 786 to 809, papermaking reached the European frontiers. Europe had several paper mills by the 14th century, especially in Spain, Italy, France, and Germany. In an 1800 book, practical methods for making paper from vegetable and wood pulps were found. (Britt, 2020).

HISTORY OF PAPERMAKING IN INDIA

In 751 AD, Arabs learned how to make paper from Chinese captives at the battle of Atalakh near Talas in Samarkand. They then spread the technique to other parts of the world. The Arabians improved the method and added flax and other vegetable fibers to the linen. Khurasani paper first arrived in India in the early 8th century AD after the Arabs conquered Sind. It remained imported for several centuries (Tiwari, 2002).

The first paper industry in India was established in Kashmir by Sultan Zainul Abedin (Shahi Khan) between 1417 and 67 AD. Due to a bad political situation, his father, Sultan Sikander, ran with him to Samarkand, where he learned. With a large number of skilled artisans and individuals in a variety of trades, including papermakers, bookbinders, harnessmakers, and midwives, Shahi Khan returned to Kashmir. Due to its high quality, Kashmiri paper soon became highly sought after for manuscript writing in India and the rest of the world (Tsang, 2015).

The Kagzis were a group of artisans who made paper by hand. Using rags and gunny bags, they made paper. In the 19th century, India's paper industry flourished on a large scale. William Carey opened the first paper mill in India in 1812 at Sreerampur, West Bengal. However, it ended up being a failure. 1870 saw the establishment of the Royal Bengal Paper Mills in Ballygunge, South Kolkata. Later, Lucknow in 1879, Titagarh in 1882, Pune in 1887, Raniganj in 1892, Kankinara in 1892, and Naihati in 1918 all saw the establishment of mills (Chakraborty,

2005).

PAPER PRODUCTION IN INDIA

India produces approximately 20.37 million tonnes of paper annually. Twelve of the approximately 600 paper mills are major players (Shenoy, 2018). Among the nations that produce paper, India is ranked 15th. India's paper industry employs 400,000 people. India consumes approximately 15 million tonnes of paper annually. As of the end of the fiscal year 2019, the national print industry was worth \$4.33 billion. According to Datta (2020), India's demand for domestic paper increased from 9.3 million tonnes in 2008 to 17.1 million tonnes in 2018.

Over the past five years, India's paper industry has invested more than Rs. 20,000 crores and is currently estimated to have made more than Rs. 60,000 crores in contributions 4,500 crores to the treasures of the nation. From Rs. in 2010 to Rs. in 2018, imports have increased in value. Rs. 3,411 crores 9,702 crores, or 16.11 percent, and the import volume grew from 0.54 million tonnes to 1.72 million tonnes (The Pulp and Paper Times, 2019).

India's CAGR (Compound Annual Growth Rate) was 8% from 2013 to 2018, compared to the global average of 1%. India uses 13 kg of paper per person annually. India's literacy rate increased from 63% in 2001 to 75% in 2018, increasing the demand for writing and printing paper. Sustainable packaging paper demand is also strongly influenced by Amazon and Flipkart's rapid growth in e-commerce (Ahmed, 2019).

In the next six years, India's demand for paper, which currently ranks as the fifth largest consumer, is anticipated to rise by 53%, primarily as a result of a sustained rise in the number of children attending schools in rural areas. According to PG Paper Company Ltd. (2018), demand is expected to rise from the current 13 million tonnes to 20 million tonnes by 2020.

WASTE FROM PAPER

Making paper requires twice as much energy as making a plastic bag. To produce anything, energy is required. Paper is made from 42% of all wood harvested worldwide. 1 kilogram of paper is made with 324 liters of water. One sheet of A4 paper requires ten liters of water. Paper makes up half of the waste that businesses generate. Paper makes up 33% of municipal waste and 25% of landfill waste. The primary effect of uncontrolled paper production is deforestation. The third-largest industrial polluter of air, water, and soil is paper and pulp. During production, chlorine-based bleaches are used, releasing toxic substances into our water, air, and soil. Methane gas, which is 25 times more harmful than CO₂, is released when paper rots.

MANAGEMENT OF PAPER WASTE

The most eco-friendly approach to reducing paper waste is prevention. Paper fibers can only be recycled five to ten times per fiber. According to CalRecycle (2018), reducing the environmental impacts of paper manufacturing and recycling can be accomplished through paper waste prevention.

Recovery methods are typically pricey and their impact on the environment is still unknown because of the high moisture content of the paper waste and the shifting waste composition caused by process conditions. As a result, research into various waste applications must continue, taking into account the economic and environmental aspects of these waste treatments.

PAPERMAKING FROM TEXTILE AND APPAREL WASTE

The art of making paper from textile and clothing waste is a great alternative to paper made from trees. Because ecological recycling conserves natural resources like water, trees, and other materials, it is appropriate and desirable to have a method and means for recycling textile waste back into useful products (Yeboah, 2013).

REVIEW OF LITERATURE

Giorgio et. al. (1996) produced a paper material of excellent characteristics from industrial textile waste and exhausted sugar beet pulp which was derived from the diffusion extraction of sucrose. It was pressed to bring the dry substance to a content of 22-28%, and stored, in the absence of chemical additives, by inducing anaerobic fermentation. Following treatment in conventional pulping facilities, in Bi-Vis machines, or a steam explosion facility, a paper pulp of exhausted beet pulp (2-50%) and industrial waste cellulosic textile fibers was prepared and the pulp was used traditionally to produce paper comparable with that produced using currently used chemical pulp.

DeVallance et al. (2012) conducted a study exploring the potential use of recycled cotton textiles as filler and reinforcement in oriented strand board (OSB) panels. They fabricated composite panels with a thickness of 11.1mm and dimensions of 686x686mm, incorporating recycled textile material blended with mixed hardwood core strands. The study involved producing 50 panels, with 10 panels for each combination of wood and textile material. Various properties such as internal bond strength, static bending strength and stiffness, water absorption, thickness swell, and nail withdrawal strength were evaluated. The major finding revealed that panels containing 5% recycled textiles showed no statistically significant difference in bending strength, elasticity, or nail withdrawal strength compared to panels without textile material. Additionally, while control panels had the highest average thickness swell, none of the groups tested exhibited a significant difference. This suggests that adding 5% recycled textiles to the core of OSB panels may not significantly impact their physical or mechanical properties.

Asare and Yeboah (2013) investigated the feasibility of recycling waste fabrics into high-quality paper suitable for art applications. The study aimed to empower Visual Arts teachers to encourage creative self-expression and skill development in various art forms using recycled materials. Pre-consumer waste fabrics (linen, nylon, acetate, cotton, polyester, and wool) were chosen due to their accessibility from local dressmakers in Ghana. The methodology involved pulping the fabrics and paper mulberry fiber, forming sheets with different colors and textures, and testing their suitability for various drawing and painting mediums. The results demonstrated that combining these fabrics with paper mulberry fiber produced versatile art papers supporting different mediums effectively, showcasing the potential for creative expression and skill development in Visual Arts.

Ashok (2017) focused his research on creating textile paper from textile waste, establishing it as a circular material. The study highlighted the potential of utilizing Textile dust fiber, a byproduct of textile mechanical recycling, to produce innovative textile paper suitable for various applications, including packaging. A comparative Life Cycle Assessment (LCA) was conducted on carrier bags made from virgin paper, recycled paper, and textile paper. The findings indicated that textile paper bags had a lower environmental impact compared to both virgin and recycled paper bags. This was attributed to the lower cost of textile dust fiber, resulting in reduced operating costs in the manufacturing process. The study also noted that the investment and maintenance costs of the facility varied based on specific conditions in a paper mill. Additionally, textile paper bags were found to have a lower carbon footprint. Energy consumption was highest during pulping and paper-making, as well as in the conversion process involving adhesives and printing ink. The author suggests that utilizing locally sourced raw materials, renewable energy, and non-toxic dust fiber can enhance the adoption of textile paper as a circular material, thereby allowing textile brand owners to promote sustainability through the use of secondary raw materials in their products.

Aishwariya (2018) explored innovative methods for recycling textile waste, emphasizing the urgency of addressing textile waste disposal. The study particularly delved into the potential of repurposing old textiles for high-quality paper production, a traditional yet effective approach. The post-consumer textile sector, though largely untapped, presents significant opportunities for recycling into various technical textile forms. The eco-friendly paper-making industry benefits from the excellent binding properties of old fabrics, utilizing biomass, agro-waste, and aged cotton textiles to form the paper matrix, thereby reducing the pressure on deforestation. This is crucial, given that deforestation contributes to as much as 25% of carbon emissions. The resulting recycled fibers can be employed in creating items like tea bags, carry bags, envelopes, and book papers. Aishwariya also discussed "downcycling," a process where products have lower value compared to conventional methods. This approach consumes less energy than conventional paper production and avoids the use of environmentally harmful chlorine as an effluent. Additionally, recycling technology can help minimize dye usage, as the recycled fabrics already have dye applied.

OBJECTIVES OF THE STUDY

1. To document the process of pulp from textile waste.
2. To find out the advantages and disadvantages of using textile waste for papermaking.

RESEARCH QUESTIONS OF THE STUDY

1. What is the process of making pulp from fabric waste?
2. What are the advantages and disadvantages of using textile waste for papermaking?

DELIMITATION OF THE STUDY

1. Only one industry in Jaipur was chosen as a case study, to document the process of making paper from textile waste.

RESEARCH METHODOLOGY

The research is a case study on one industry in Jaipur manufacturing papers from textile waste. This will help the researcher to gain in-depth knowledge about the industry, production, processes, and other relevant areas.

RESEARCH DESIGN

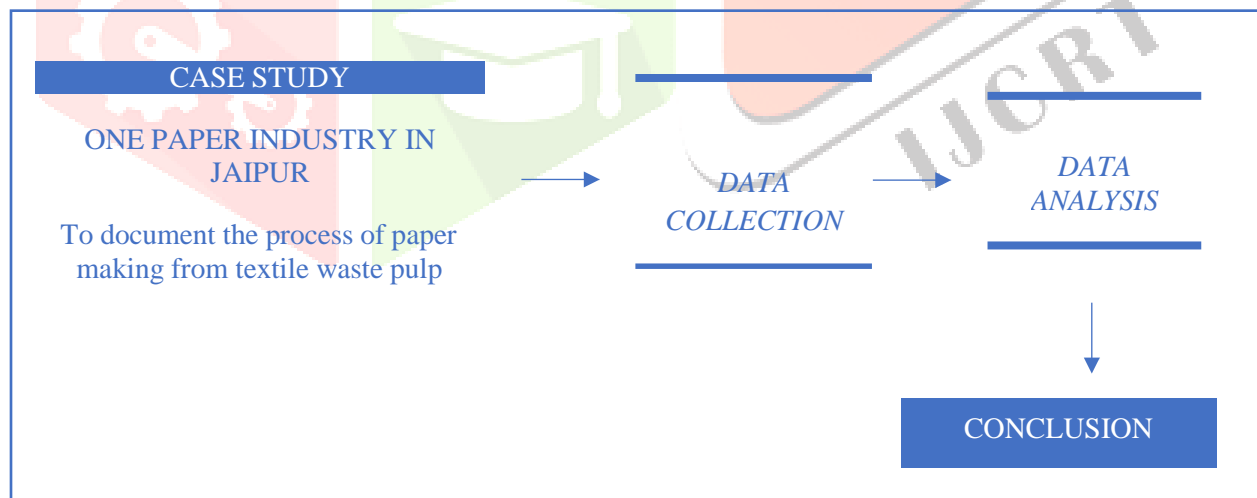


Figure 1: Research Design of the Study

SAMPLING

The industry undertaken was visited by the researcher-

1. Kagzi Industries, Gramodyog Road, Sanganer, Jaipur - 302 029, Rajasthan, India.

The industry's management and employees were interviewed through a questionnaire to gain in- depth knowledge of the process of paper-making from textile waste in detail.

TOOLS USED FOR DATA COLLECTION

For this research, the investigator will develop certain research tools in the form of questionnaires.

A questionnaire was developed to collect data from the industry owners which includes questions spanning over areas of Overview of the Industry chosen as a case study- Origin, Infrastructure, Workforce, Products; Production of paper from textile waste- Waste Collection, Process; Pricing; Marketing; Challenges. All the questions are open-ended in nature to gather detailed information for the study. The response to each question will be presented in short paragraphs.

DATA ANALYSIS AND INTERPRETATION

Data was collected by visiting the Kagzi Industry in Jaipur. This was done to gather in-depth knowledge about every stage of the paper-making process.

PROCESS OF PAPER MAKING FROM APPAREL AND TEXTILE WASTE

1. OBTAINING THE WASTE FABRICS-

- Various types of cotton waste are collected from Textile Industries in Tripur, Jaipur, Ludhiana, Calcutta.
- Same fabrics are then segregated into one category.
- Mainly hosiery, cotton and denim fabrics are obtained.

2. BLEACHING OF THE FABRICS-

- After collection of the textile waste, the fabrics are bleached to remove all the colors they already possess.

- Bleached fabric are sun-dried

- Cut into small pieces.

3. SOAKING FOR 5 DAYS-

- Then these fabric pieces are soaked in water for 5 days.

- Soaked fabric pieces are shredded and broken down into their constituent fibers.

- All the fibers are processed with caustic soda and beaten into pulp by frequently adding water, using methods such as hand beating, a blender, or beating in a Hollander beater.

- The pulp is added to a tub.
- VAT dyes are added to color the paper as they are most suitable for cotton fibers. Lurexyarn and glitter is also added to the pulp sometimes to make designer sheets.



Figure 2. Blending of Shredded fabrics (*Image taken by the investigator*)

4. MOULD & DECKLE

- A mould and deckle are then dipped in and out of the tub of pulp, allowing the pulp to settle on the screened surface of the mould as the water drains through the holes in the screen.
- Pulp is spread out evenly on the deckle.
- A wooden board is kept on the deckle to even out the thickness of the pulp and to drain extra water.
- With this, the deckle is removed and excess water is drained off.



Figure 3. Mould and Deckle dipped in blended fabrics (*Image taken by the investigator*)

5. WATER DRAINING

- The wet sheet on the mold is then transferred onto a felt or blanket.
- Multiple sheets of paper, one on top of the other, can be couched together, each separated by a layer of felt or blanket.



Figure 4. Stacked papersheets (*Image taken by the investigator*)

- The couched sheets are pressed with a Vertical- hydraulic paper Baling Press Machine to remove water from them.



Figure 5. Pressing of papersheets (*Image taken by the investigator*)

- The felt is placed on a flat wooden board and carefully lifted off the felt with both hands and held up to ascertain its holding capacity.
 - Good quality papers are those that can be held up while the couched sheets are wet without falling apart.
 - The pressed sheets are removed from the felt, placed on flat metal plates and brushed over to release air bubbles that could burst and create holes in the dried paper.
6. PAPER DRYING
- Sheets are dried naturally in sunlight for 24 to 48 hours.



Figure 6. Drying of paper sheets (*Image taken by the investigator*)

7. PAPER CUTTING

- Dried papers are cut into desired sizes using an Industrial paper-cutting machine.



Figure 7. Paper Cutting Machine (*Image taken by the investigator*)

8. PRINTING

- Desired designs are printed on paper using blocks, screens, stencils and VAT dyes.
- The paper produced can be used to make products like drawing files, diaries, boxes, bookmarks, envelopes, tags/labels, earrings, pendants, bracelets, coasters, lamps, bags, embossed paper, leather Paper, stationery, photo frames, wallpapers, etc.



Figure 8. Printing on papersheets (Image taken by the investigator)

TABLE 1- RESPONSES TO QUESTIONS ASKED DURING INTERVIEW FROM THE HEAD OF KAGZI INDUSTRY, JAIPUR

Q. No.	QUESTION	RESPONSE
1.	Name of the Industry	Kagzi Industries, Gramodyog Road, Sanganer, Jaipur - 302 029, Rajasthan, India.
2.	Head of this industry.	Mohammed Sharif Kagzi
3.	The industry overview	Established as a Partnership firm in the year 1992, they manufacture of a wide range of Designer Paper Bags, Designer Box, Ring Boxes, etc.
4.	Department	Production Marketing Quality checking Warehouse & packagingHR

5.	Workforce	Around 50-60 employees which include Designers Production & marketing managers Quality checking experts Warehouse & packaging personnel Accountants Sales officers Support staffs
6.	Reason for not expanding your business to other cities and states.	The papermaking business doesn't give back much profit And also doesn't sell at higher prices, also a lot of labor goes into it which gets expensive, so they expanded into apparel industry.
7.	Origin	Family Business Such practice was taught at 6-7 places in India, Aurangabad Maharashtra, Sanganer were some of them, in earlier times, there was no electricity so Jute was used and beaten with Hammer, paper was made on grass jali. Started with wedding cards, greetings 1st beater was established in 1957 by a cooperativesociety, after that other machine came into being
8.	Reason for Working with Textile And Apparel Waste	A lot of caustic soda is used in papermaking in mills from tree-based raw material, although quality doubles if boiled with caustic soda, other fiber are small, so it's not strong as compared to handmade paper. Apparel offers long fibers so the paper is stronger, also other raw materials take much processing which increases costs.
9.	Money Invested To Start The Industry	1960, 1 paper=2-2.25 Rs. The same paper sells at 3000 Rs.
10.	Raw Materials Needed To Make Products	Cotton knit Waste produces better paper Paper Waste can be added to make cheaper papers. Mould and Deckle
11.	Raw Material Sourced From	Textile Industries from- Tripur Jaipur Ludhiana Calcutta Earlier used to get them in 10-12 rs/kg, now 60 rs/kg

12.	Process Of Manufacturing Products Made OutOf Apparel Waste Paper	No pre-processing of waste fabric is done as the waste gathered is already final apparel. The same-colored fabrics are separated, and color can be added as per design.
13.	Various Kinds Of Paper Produced From Apparel/Textile Waste	2000-3000 types of different papers.Mills can't offer that much
14.	Parameters For Quality Assurance Of The Paper Produced	Since paper is made from long fibers, the quality increases automatically, paper waste decreases quality.
15.	Products Do You Make From RecycledPaper	Now they make on-demand only as paper doesn't sell easily
16.	Products Are Mostly Bought By Customers	Demand for Paper Bags is most.
17.	Price Range Of Your Products	Starts at Rs. 70. Exported products are sold at higher prices.
18.	Age Group Are Your Most Frequent Customers	We sell to stores or industries, not the customers directly. Although the designs are more Kids/youngsters oriented.
19.	Products Marketed/Promoted	Exhibitions, Website, handled by his children, Although our industry has created a brand name, so client can trustus.
20.	What Time Of The Year Are The Products Sold Mostly	Mostly orders mostly at Festivals
21.	Industry Grown Today In Terms Of Sales, Profits, Recognition, Etc.	Expenditure is more than Profits

22.	Collaborated With Famous Brands Or Designers	Not yet. Although the industry gives design and we make it accordingly.
23.	Products Also Sold Overseas	Exported in the UK, France, and Countries where gifting is in trend.
24.	Possibility Of Such A Business Being Successful	Maybe not in paper making coz profits are Less and expenses are too much, rent, labor, electricity, infrastructure, so maybe not.
25.	Major Problems/Challenges Have You Encountered	Paper damages easily in transportation due to various reasons, so risk of the buyer not accepting the order is high. Less buyers of paper. Although apparels are sold easily. No buyers since last 2 years.
26.	Advantages Of Recycling Paper From Apparel/Textile Waste	Eco-friendly Uses less chemicals and process than tree fibers. If hard adhesives are used, they can form a ply-like structure. A hydraulic press is needed.
27.	Disadvantages Of Recycling Paper From Apparel/Textile Waste	Since 8-9 Years, the raw material has gotten expensive and the price of the paper cant be increased after a point so people don't buy it much, also covid impacted loss. Profits are not increasing.
28.	Industry Impacted Or Contributed To Environmental Sustainability	Yes, the products and process is eco-friendly
29.	Suggestions/Opinions For People And Entrepreneurs Of The Country	The time is not correct for new ventures and the economy is slow.

CONCLUSION

The selected industry for this study is a family-owned business that was established in 1992. Initially, paper-making was a practice limited to just 6-7 states in India. In the early stages, jute was the sole raw material, and it was manually processed by hammering to create pulp. The industry head recalls a significant milestone in 1952 when the first electric beater for this purpose was invented.

The papermaking process utilizing textile waste involves several key steps. It begins with the initial phase of Cotton Shredding, where the textile waste is broken down into smaller, more manageable pieces. Following this, the material undergoes Pulp Beating, a process that further refines and softens the fibers. The next step entails dipping a Mold and Deckle in and out of a tub filled with the prepared pulp mixture. This action allows the fibers to adhere and form a cohesive sheet. Subsequently, any excess water is drained from the newly formed sheet to achieve the desired consistency. The paper is then subject to a Drying phase, which solidifies the sheet and prepares it for further processing. Once sufficiently dry, the paper undergoes Cutting to attain the desired dimensions and shape. Finally, if required, Printing can be applied to the paper to add specific designs or information. This comprehensive process transforms textile waste into functional and usable paper products.

Several machines are used to shred and separate the fibers from the textile waste fabric to make pulp. A storage tank with a batch of 100 kg of shredded fabrics takes about 8 hours to separate the fibers.

Currently, the primary raw material utilized is waste cotton knit fabrics. These fabrics possess extended fibers, which contribute to the enhanced strength of the resulting paper. Additionally, using other raw materials involves extensive processing, leading to increased production costs.

The utilization of textile waste in paper-making offers several advantages. It aligns with eco-friendly practices and requires fewer chemicals and processes compared to tree fibers. Moreover, it is a sustainable approach that can be easily implemented at home using common household tools and materials.

However, there are certain drawbacks to this method. The expense of procuring raw materials experiences a yearly increase, while there is a limit to how much the paper's price can be raised due to consumer demand constraints. This results in a challenging financial situation. The industry also grapples with substantial overheads including rent, labor, electricity, and infrastructure costs. Profits heavily rely on a loyal customer base, primarily located overseas. In the absence of consistent orders, the industry faces a precarious financial position.

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