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WASTE MANAGEMENT COGNIZANCE IN KNITWEAR UNITS OF LUDHIANA

KIRANJOT KAUR, SAROJ YADAV, NEELAM M. ROSE AND DIKSHA BISHT

*Department of Textile and Apparel Designing,
I.C. College of Home Science,
CCS, Haryana Agricultural University, Hisar, Haryana, India*

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ABSTRACT

The increasing pace of industrial development has created concerns for the environmental issues. Knitting industry has been characterized as one of the highly polluting industries generating a huge amount of waste that creates various environmental problems and hazards. The present study was effectuated to study the different types of waste generation and waste utilization practices followed by the knitting units of Ludhiana. An exploratory survey of ten knitting units was conducted using a self structured interview schedule. It was noted that majority of the units were established during 1999 to 2009 with an initial investment of 90-95 lakhs and were having an annual turnover upto 15 crores. Total 2305 employees were employed in the selected knitting units, out of which 1233 were skilled workers, 751 were semi-skilled workers, 271 were unskilled workers, 30 were supervisors and 20 were managers. The waste hosiery fabrics were generated in the form of surplus fabric after order completion, fabric roll end waste and fabric with cuts or torn fabric (50%). In cutting and stitching sections, waste was mainly generated due to cutting left overs and thread waste (50% each). All the ten selected units sell the waste fabrics to rag collectors, five units to retailers and three units to shoddy industries. It was also reported that four units either dispose off or burn the waste to get rid of it. The major problem faced for proper utilization of waste fabrics was lack of designing knowledge (80%) followed by shortage of time (70%) and inadequate skills (60%).

KEY WORDS : Knitting units, Hosiery waste, Waste generation, Waste utilization

INTRODUCTION

Textiles and apparel have played a vital role in human life around the world since ancient times till the present era of globalization. Indian textile industry produces a wide variety of products for both domestic and international markets. The major segments of the Indian textile industry include spinning, knitting, handloom, power loom, apparel and handicraft. Among these, the knitting sector accounts for a large segment of the textile industry. India is the second largest producer of textiles and apparel in the world, presently the estimated production is around US \$141 billion and predicted to reach US\$ 209 billion by 2029. Textile and apparel industry is a major economic sector and one of the oldest industries in the Indian economy which

contributes about 12 percent to the total Indian export earnings (Tyagi, 2022).

Hosiery industry has exploded in recent decades because of the durability and quality of hosiery fabrics. The ability to take the form of the body snugly, comfort properties and ease of care made hosiery products popular among both young and old generations. Apparel industry is the largest buyer of hosiery fabrics at the industrial level and these materials are used in a wide range of applications. Nowadays, hosiery fabrics are also increasingly being used for the production of home textiles and utility articles. The majority of the knitting units are situated in Kolkata, Mumbai, Delhi, Tirupur and Ludhiana. Tirupur is famous for cotton hosiery whereas Ludhiana almost monopolizes winter wear production for the

country. More than 12,000 knitting units of Ludhiana are engaged in manufacturing T-shirts, sweat-shirts, winter and semi-winter apparel (Ray, 2012; Uddin, 2019). During manufacturing process waste is generated in hosiery industries including off-cuts, leftover, surplus, unused, unwanted, remainder and spare waste, selvages, rejected materials, garments etc. The amount of waste generated and its associated negative effects on the environment and human health are matters of concern to the government, industry and civil society. The quantity of waste that is increasing every day and the irreversible loss of valuable resources and energy upon its disposal impose the need to introduce sustainable ways of textile waste management (Rani and Jamal, 2018; Aggarwal, 2021; Zhou *et al.*, 2022). Hence, the study was designed to explore the sustainable activities followed in the knitting units for hosiery waste management.

METHODOLOGY

Ludhiana is known as Punjab's industrial capital and hub of knitting units in North India. Hence, the study was conducted to find out the existing waste utilization practices in knitting units of Ludhiana. Ten knitting units engaged in the manufacturing of hosiery products were selected randomly. For selection of knitting units, the relevant information was gathered from the Small Industries Service Institute, Ludhiana. A questionnaire-cum-interview schedule was formulated to elicit the information from the selected knitting units of Ludhiana. The prepared interview schedule was first administered on two units for pre-testing and these units were not included in the final sample for data collection. Based on the suggestions of the owners and employees of the units, required modifications were made in the questionnaire-cum-interview schedule and finalized for further data collection. The researcher personally visited the selected knitting units to collect data from owners/ representatives of the units by administering the prepared questionnaire-cum-interview schedule. The questionnaire-cum-interview schedule was divided into two parts, the first part dealt with the background information pertaining to the profile of selected knitting units and the second part was aimed at gathering information related to the existing hosiery waste utilization practices followed by the selected knitting units.

RESULTS AND DISCUSSION

Year of establishment: It is apparent from the data in Table 1 that six knitting units were established during the period of 1999 to 2009 whereas two units were established during 1989 to 1999 and rest of the two units were established during the period 2009 to 2019. The findings of Venugopal, 2012 also corroborated the results that the modern knitting industry grew only after the year 1984 when people started importing second-hand, reconditioned and brand new circular knitting machines. Kaur and Kaushal, 2016 also reported that most of the knitwear units in Ludhiana were established between the year 1991 and 2010 and none of the units were there before 1950.

Table 1. Profile of the selected knitting units n=10

Variables		Frequency	Percentage
Year of establishment	1989-1999	02	20
	1999-2009	06	60
	2009-2019	02	20
Capital investment (₹)	80-85 lakhs	01	10
	85-90 lakhs	02	20
	90-95 lakhs	04	40
	95 lakh-1 crore	03	30
Annual turnover (₹)	Upto 15 crores	06	60
	15-30 crores	01	10
	30-45 crores	02	20
	Above 45 crores	01	10
Ownership pattern	Partnership	02	20
	Proprietorship	08	80
Unit	Own	08	80
premises	Rented	02	20
Financial	Self-financed	01	10
support	With external support	09	90

Capital investment: At the time of starting a business, the business owner needs capital. The capital may comprise business owners' own money or money borrowed from other sources like friends, relatives and loan from banks etc. The data in Table 1 depict that out of the selected ten units, four hosiery manufacturing units were established with an initial investment of 90-95 lakhs, three units were started with an initial investment of 95 lakhs-1 crore whereas two hosiery manufacturing units started their business with an initial investment of 85-90 lakhs and only one unit was started with an initial investment of 80-85 lakhs. Gupta and Saini, 2019 also found that in Ludhiana about half of the hosiery units (53.34%) units in Ludhiana and (56.67%)

Tirupur were started with an initial investment of less than 2 crores.

Annual turnover: Annual turnover is the value of annual sales volume made by a company in a year. The data about annual turnover of the selected knitting units furnished in Table 1 reveal that the six units had an annual turnover of upto 15 crores. The annual turnover of the two knitting units was between 30-45 crores, one unit had an annual turnover between 15-30 crores and only one unit had an annual turnover above 45 crores. The size of any unit can be determined on the basis of its annual turnover. According to the Press Information Bureau, 2018 the industries having annual turnover between 5-75 crores are small scale industries while the industries with annual turnover between 75-250 crores are medium sized industries and those having a turnover above 250 crores per annum are large industries. The results confirmed that all the selected ten knitting units were small sized. According to Gupta and Saini, 2019 majority of hosiery units at Ludhiana (80%) and Tirupur (70%) had a turnover below 100 crores. None of the units in Ludhiana had a turnover above 300 crores.

Ownership pattern: The data in Table 1 depict that majority of knitting units (08) were owned by sole proprietors whereas only two hosiery manufacturing units were established in partnership pattern. Kaur and Kaushal, 2016 also mentioned that the form of organization in most of the hosiery units in Ludhiana was a sole proprietorship.

Unit premises: The data in Table 1 reveal that eight knitting units were running on their own premises and rest of the two knitting units were being run on the premise hired on a rental basis.

Financial support: It is clear from the data in Table 1 that the nine knitting units started their venture with the help of external financial support either from banks, cooperative societies or other sources whereas only one knitting unit was established by the owner with his own financial investment. Mysamy, (2002) reported that majority of the knitwear units of Tirupur had employed capital below 2500 thousand and capital was borrowed from banks.

Employment pattern

Total 2305 employees were employed in the selected ten knitting units, out of which 1233 were skilled workers, 751 were semi-skilled workers, 271 were unskilled workers, 30 were supervisors and 20 were managers. The employees were employed in

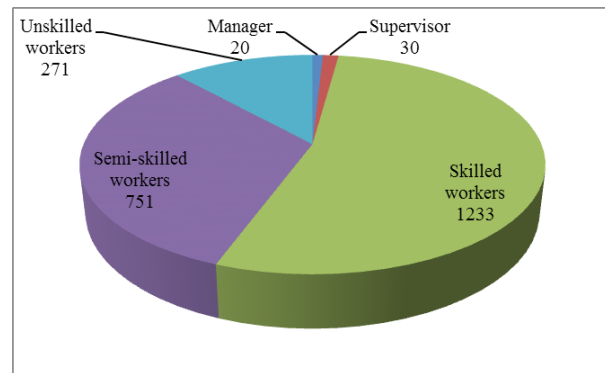


Fig. 1. Employees employed in the knitting units

knitting units according to the skills acquired by them i.e. manager, supervisor, skilled, semi-skilled and unskilled. Women were working as unskilled workers to do minor manual operations on manufactured hosiery garments like stitching, embroidering and finishing etc. Kaur and Kaur, 2004 also reported that in Ludhiana hosiery industry, majority of the workers were hired on daily wages or piece rate system. According to Titi, (2019) size of an industry is determined on the basis of number of employees and output levels. Majority of industries in Kisumu City, Kenya, were small scale and had 1-10 employees.

Type of products manufactured in the knitting units

The data about different type of hosiery products being manufactured by the selected knitting units are presented in Table 2. From the results, it becomes evident that the five units were manufacturing women's wear followed by four units which were manufacturing men's wear and three units were also manufacturing children's wear. Women's wear included sweater, cardigan, pullover, jacket, T-shirt, top, sportswear, slip, vest, innerwear and. The men's wear comprised of T-shirt, pullover, sweater, *pajama* and innerwear. Baby suit, frock, top, skirt, T-shirt, knicker suit, pant suit were being manufactured as children's wear. It was observed that the selected knitting units were manufacturing garments for women, men and children and majority of the units were producing more than one category of garments. Home furnishings such as bed cover, sofa cover and table cover were also being manufactured in one of the units. The results of the present study are in consonance with the findings of Kaur and Kaur, 2015; Kaur and Kaushal, 2016 that Ludhiana hosiery industry mainly manufactures gents' and

ladies' T-shirts and is also famous for knitting sweaters and cardigans, hence it is fondly called Manchester of India.

Table 2. Type of products manufactured in the selected knitting units n=10*

Products	Frequency	Percentage
Apparel		
Men's wear	04	40
Women's wear	05	50
Children's wear	03	30
Home textiles		
Bed cover	01	10
Sofa cover	01	10
Table cover	01	10

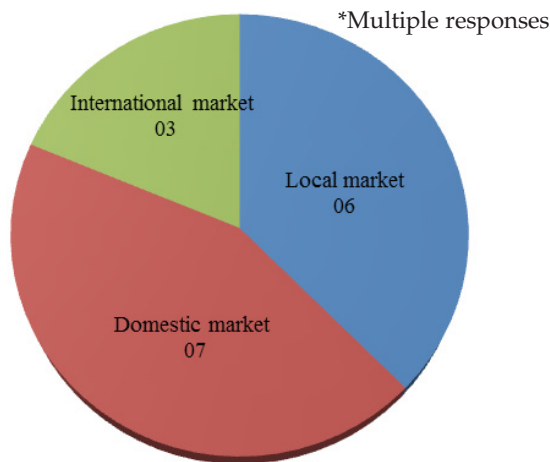
*Multiple responses

Marketing of hosiery products

The selected knitting units approach local, domestic as well as international markets for marketing of their manufactured hosiery products. The data in Figure 2 disclose that seven knitting units sell their products to domestic markets, six units sell to local markets within Ludhiana and three units to different international markets. International markets included countries like United States, Canada, Austria, Brazil, Mexico, Italy, France, Germany etc. The results are in concurrence with Kaur and Kaur, 2015 and Uchikawa, 2012 that European Union and North America are the main markets for exports of knitted and non-knitted apparel.

Types of waste generated in the selected knitting units

The different kinds of waste, i.e. fabric, cutting and



Type of markets

Fig. 2. Marketing of products by the knitting units

stitching wastes are being generated in the selected knitting units during manufacturing of different hosiery products. The data incorporated in Table 3 reveal that the fabric waste mainly comprised of surplus fabric after order completion(50%), fabric roll end waste (50%), fabrics with cut or torn fabrics (50%), sampling waste(30%), needle mark(30%) and colour fading (30%). In addition to them faulty fabric (20%) and missing wales (10%) were also the reasons for waste generation. In cutting, waste was mainly generated due to cutting left overs (50%), faulty cutting (40%), narrow width fabrics (30%) and poor marker making (20%). In stitching, waste was mainly in the form of thread waste (50%) followed by edge trimmings (30%), collar waste and faulty products. Only one unit reported that waste is also generated in the form of elastic waste. The findings are in consonance with Jain and Gupta, (2018) that in garment production houses of Delhi there is bulk production of surplus or rejected fabrics due to strict quality checks. The different

Table 3. Types of waste generated in the selected knitting units n=10*

Types of waste	Frequency	Percentage
Fabric waste		
Surplus fabric after order completion	05	50
Sampling waste	03	30
Rejected fabric rolls	04	40
Faulty fabric	02	20
Fabric cut offs or tear	05	50
Order cancellation	04	40
Fabric roll end waste	05	50
Holes	04	40
Needle marks	03	30
Oil or other stains	04	40
Missing wales	01	10
Snagging	03	30
Colour fading	03	30
Faulty design/ pattern	04	40
Cutting waste		
Poor marker making	02	20
Narrow width fabrics	03	30
Faulty cutting	04	40
Cutting left overs	05	50
Stitching waste		
Thread waste	05	50
Edge trimmings	03	30
Elastic waste	01	10
Collar waste	02	20
Faulty product	02	20

*Multiple responses

types of waste generated during garment manufacturing were fabric waste, cutting waste, garment waste, accessories and fasteners waste.

Reasons for waste generation in the knitting units

An inquiry into the reasons for generation of fabric waste in the selected knitting units reveals, that a multitude of factors were responsible for waste generation. These included obsolete technology and machinery, inferior quality of raw material and unskilled labour.

*Multiple responses

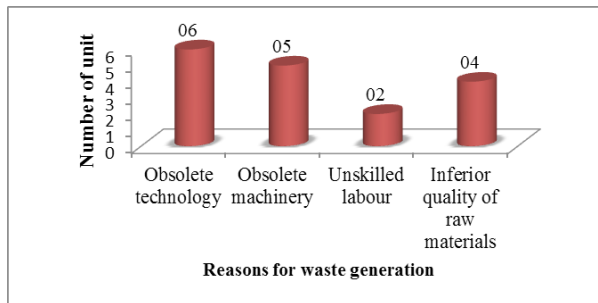


Fig. 3. Reasons for waste generation in the knitting units

It is clear from the data in Figure 3 that six knitting units reported obsolete technology as the foremost reason for waste generation. Half of the total number of selected knitting units cited obsolete machinery as another important reason for waste generation. Inferior quality of raw material (04) and unskilled labour (02) also contributed to the generation of waste during different product manufacturing operations. As per the findings of Gardetti and Torres, (2013) in the manufacturing sector, fabric cutoffs and fabric roll ends constituted a large amount of waste.

Waste utilization practices followed in the knitting units

The data in Table 4 present the waste utilization practices followed by the selected knitting units. It is clear from the table that all the units sell the waste hosiery fabrics to rag collectors, five units to retailers and three units to shoddy industries. It was also reported that four units either dispose off the hosiery waste directly into landfills or burn the waste to get rid of it. Two units reported to sell the waste hosiery fabrics to cottage industries or dump in corporation bins. Reuse and donation for charity practices were undertaken by only one unit. Roy *et al.*, 2015 also found that majority of the units sell this waste to the local retailers at a low price rather than

reutilizing. Some wastes were incinerated resulting in harmful smoke causing environmental pollution.

Table 4. Waste utilization practices followed in the knitting units n=10*

Practices	Frequency	Percentage
Dispose off		
Dump in corporation bin	02	20
Burn/ incineration	04	40
Directly into landfills	04	40
Sale		
Rag collectors	10	100
Retailers	05	50
Cottage industries	02	20
Shoddy industries	03	30
Reuse	01	10
Donate for charity	01	10

*Multiple responses

Problems faced by the knitting units in hosiery waste utilization

The data in Table 5 reveal about various problems faced by the hosiery units for utilization of waste. It can be observed from data incorporated in the table that lack of designing knowledge (80%) was the major problem faced for proper utilization of waste hosiery fabrics followed by shortage of time (70%), inadequate skills (60%), lack of expertise and scarcity of storage space (50% each). Financial constraints (30%) and increased cost of production (20%) were other constraints which hindered the utilization of waste hosiery fabrics by the knitting units. Kavitha and Manimekalai, 2014; Patel and Pandey, 2015 reported that the most important barriers to recycling of textile waste in South Africa and in Kanpur City were lack of equipment and technology, lack of materials, lack of consumer awareness, lack of market and cost of production.

Table 5. Problems faced in utilization of hosiery waste by the knitting units n=10*

Problems faced	Frequency	Percentage
Shortage of time	07	70
Inadequate skills	06	60
Lack of designing knowledge	08	80
Lack of expertise	05	50
Financial constraints	03	30
Increased production cost	02	20
Scarcity of storage space	05	50

*Multiple responses

CONCLUSION

- In the knitting units most of the hosiery waste was generated in the form of surplus fabric after order completion, fabric with cuts or torn fabric, roll end waste, cutting left-over and thread waste.
- The factors responsible for waste generation in the selected knitting units were obsolete technology, obsolete machinery and inferior quality of raw materials.
- The waste utilization practices followed by knitting units of Ludhiana comprised of sales, recycling, reusing and disposing off the hosiery waste as garbage existing.
- The major problems faced by the selected knitting units for utilization of waste hosiery fabrics were lack of designing knowledge, shortage of time and inadequate skills of workers.

Up-cycling prevents the termination of resources in landfills, saves energy, decreases ecological toxicity and helps promote the growth of local economies and create jobs. Though large scale units are more aware and are practicing environmental sustainable activities to a higher extent in comparison to medium and small scale units, still there is a dire need to create public awareness regarding recycling practices, so as to make corporate world conscious of their duty of conserving the environment.

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