

A STUDY ON SUSTAINABLE MANUFACTURING IN KANTI CHIRAN CORPORATION PRIVATE LIMITED COMPANY

Submitted in partial fulfilment of the requirements for the award of

MASTER OF BUSINESS ADMINISTRATION

By

VAISHNAVI V

REGISTER NO:42410138



**DEPARTMENT OF BUSINESS ADMINISTRATION
SCHOOL OF MANAGEMENT STUDIES**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade “A++” by NAAC | 12B Status by UGC | Approved by AICTE
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SCHOOL OF MANAGEMENT STUDIES

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **VAISHNAVI V 42410138** who carried out the Project Training “**A STUDY ON SUSTAINABLE MANUFACTURING IN KANTI CHIRAN CORPORATION PRIVATE LIMITED COMPANY**” under my supervision from September 2023 to November 2023.

Dr. PRINCY.A.S

Internal guide

External Guide

**Dr. BHUVANESWARI. G, MBA., Ph. D
Dean – School of Management Studies**

Submitted for Viva voce Examination held on 21.12.2023

Internal Examiner

External Examiner

DECLARATION

I **VAISHNAVI V (42410138)** hereby declare that the Project Report entitled “**A STUDY ON SUSTAINABLE MANUFACTURING IN KANTI CHIRAN CORPORATION PRIVATE LIMITED COMPANY**” done by me under the guidance of **Dr. PRINCY** is submitted in partial fulfilment of the requirements for the award of Master of Business Administration degree.

DATE: 21.12.3023

PLACE: Chennai

VAISHNAVI V

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ABSTRACT

Sustainable Manufacturing is a manufacturing approach to minimize waste and pollution while conserving natural resources and reducing landfill waste. It focuses on streamlining components, optimizing materials, and promoting component reuse to enhance manufacturing efficiency. The objective of this study is to study the optimized energy consumption positively impacts the company, to analyse the alternative sustainable suppliers, and to assess how damages can be used alternatively. The research methodology employed in this study encompasses a literature review, in-depth interviews, and questionnaire surveys. This paper delves into the essential criteria of sustainable manufacturing practices in Kanti Chiran Corporation Private Limited. Furthermore, it presents an analysis of 110 employees who are working in Kanti Chiran Corporation Private Limited. Chi-square analysis and correlation, facilitated by the Statistical Package for the Social Sciences (SPSS) software, aids managers in comprehending the critical environmental dimensions.

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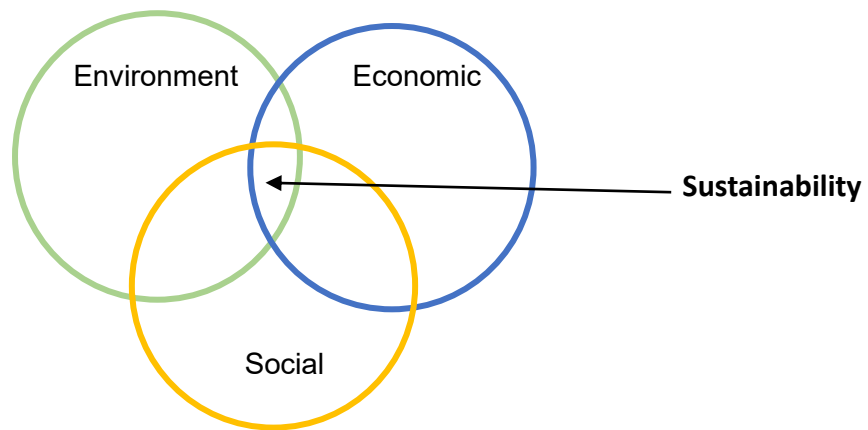
CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Sustainable manufacturing is a method of industrial production that aims to maximize the effectiveness and lifespan of manufacturing processes and products while minimizing their negative effects on the environment, society, and economy. It aims to balance economic activity with the welfare of people and the earth, representing a fundamental shift in how we view and approach manufacturing. Sustainable manufacturing aims to minimize production's detrimental effects on the environment. This entails minimizing the use of resources, cutting back on waste and emissions, and managing pollution. It sets a focus on using resources like energy, water, and raw materials efficiently. This lowers prices while simultaneously conserving limited resources and lowering the environmental impact of manufacturing. Sustainable manufacturing encourages the circular economy concept, in which goods are made to be long-lasting, repairable, and recyclable. This decreases waste disposal and increases product lifecycles. It promotes the use of green technology, including sophisticated manufacturing techniques, renewable energy sources, and eco-friendly materials. Sustainable manufacturing takes into account the effects of production on society, including the welfare of communities near industrial sites, worker safety, and ethical labor practices.

Sustainable manufacturing emphasizes both the product's characteristics and the way it is created. This covers the materials used, the production methods, and the product design. Sustainable manufacturing practises can range from very small process improvements to significant investments in new technologies and product redesign. Sustainable manufacturing includes things like making products with less energy and materials, producing less waste, using fewer hazardous materials, as well as products that have greener attributes like recyclability or lower energy use.



Sustainable Manufacturing in Practice:

Utilising resources that are renewable and don't deplete the environment

Using non-hazardous, recyclable, and minimally processed materials and inputs

Changing the way things are made so that less waste is produced and less energy, water, and materials are used.

Less packing, lighter products, and more efficient shipping and logistics.

collaborating with stakeholders like customers and merchants to lessen the effect of sales and distribution on the environment.

Increasing the product's lifespan, making it simpler to repair, or designing it to use fewer resources when in use

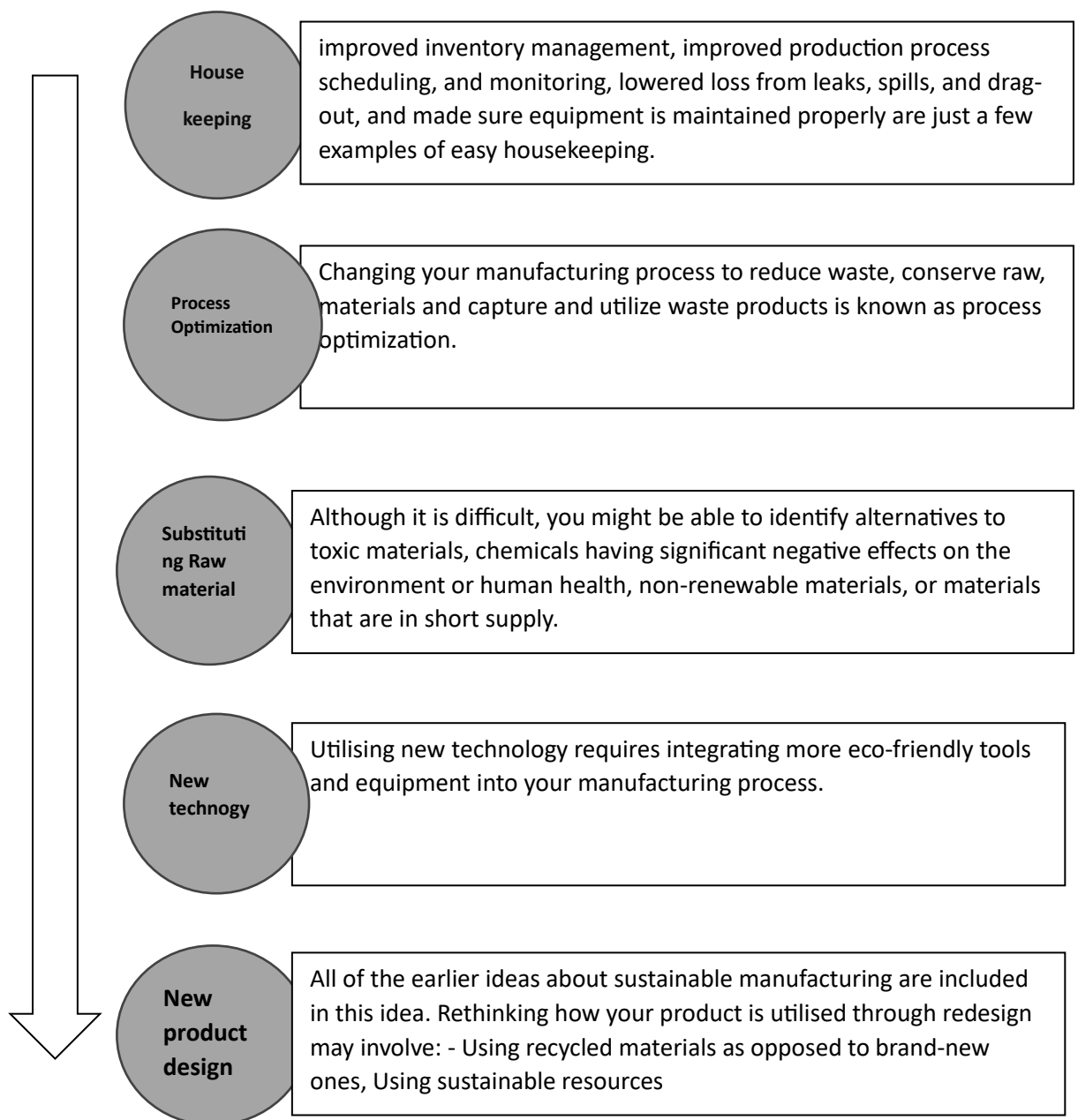
Creating a product that is biodegradable, recyclable, reusable, or can be recycled

Key aspects and strategies associated with sustainable manufacturing:

- **Resource Efficiency:** Sustainable manufacturing places a strong emphasis on maximising the use of energy, water, and raw materials. To lessen the negative effects on the environment, this includes cutting back on waste and increasing resource efficiency.
- **Lean Manufacturing:** To reduce waste and increase efficiency, lean manufacturing practises such just-in-time production and inventory reduction are frequently used.
- **Renewable Energy:** Reducing greenhouse gas emissions and dependency on fossil fuels can be accomplished by using renewable energy sources, such as solar or wind power, during the manufacturing process.
- **Design for Sustainability:** Materials, product life cycles, and ease of recycling or disposal are taken into consideration while designing products. Design decisions can have a big effect on how sustainable a product is overall.
- **Energy Efficiency:** Energy efficiency in manufacturing facilities, machinery, and processes can reduce energy usage and greenhouse gas emissions.
- **Sustainable Supply Chain:** Ensuring that suppliers and partners follow sustainable practises is critical for the product's overall sustainability.
- **Life Cycle Assessment (LCA):** Conducting a product's life cycle assessment helps to understand its environmental impact from raw material extraction to disposal.
- **Environmental Certifications:** Obtaining ISO 14001 (Environmental Management System) or LEED (Leadership in Energy and Environmental Design) certifications can demonstrate a commitment to manufacturing sustainability.
- **Worker Well-Being:** Sustainable manufacturing considers worker welfare by providing safe working conditions and fair wages.
- **Sustainable Supply Chain:** To preserve the overall sustainability of the product, suppliers and partners must follow sustainable practises as well.
- **Life Cycle Assessment (LCA):** Analysing a product's life cycle, from raw material extraction through disposal, can assist determine how it affects the environment overall

Implementing Sustainable Manufacturing in Process Plants:

- Thinking about all of the efforts that would be required to make a company more sustainable can be overwhelming.
- However, there is a range of measures that may be made to promote sustainable production. Some require more time and money than others.



1.2. INDUSTRY PROFILE:

Beads composed of polystyrene are used to create Polystyrene. Then, after being heated or steam-treated at rather high temperatures, these beads expand and fuse together. When these beads are fully blown, 95% of them are made of air, with the remaining 5% being polystyrene. As a result, a huge quantity of space is occupied by a small amount of material. Due to its low density, this makes the material exceedingly light and reasonably durable.

Polystyrene will dissolve if it is exposed to any petroleum solvent because it is made of petroleum. Additionally, it absorbs a tonne of water, especially when compared to Styrofoam. Polystyrene is converted into Polystyrene by combining it with additional chemicals to make a liquid. It is cooled, as opposed to being heated like Polystyrene, and expands as a result, much like water does when it freezes. It's interesting to note that Polystyrene and Styrofoam are both C_8H_8 at their bases. These variations are caused by the treatment and manufacturing features.

When Polystyrene in its finished form is contrasted with Styrofoam, a number of distinctions in physical characteristics stand out. First off, while both materials absorb water, Polystyrene has a far higher absorption capacity than Styrofoam. Polystyrene can only absorb up to 5% by volume, whereas it can absorb 2-4%.

Second, polystyrene is a significantly better heat insulator than Polystyrene. When opposed to Polystyrene, polystyrene has a far smaller number of air pockets and gaps inside the material, which is referred to as a closed structure. Water and air both act as excellent heat conductors. As a result, Polystyrene's capacity to absorb a lot of water and have numerous air pockets, relative to other materials, lessens its capacity to insulate against heat. This problem can be avoided by sandwiching the material between two nonporous materials, which will keep it dry and prevent the air inside from being impacted by the environment outside.

Thirdly, Polystyrene has a generally lower density than Styrofoam. This is a result of the air pockets that were formed during the manufacturing process and are present within the material. Both substances do have different densities. This diversity is deliberate, with denser versions designed for heavier-duty applications like insulation or refrigeration. Finally, Polystyrene and polystyrene are also very combustible materials. Burning them releases noxious vapours that are

dangerous to people and can be lethal because of their chemical makeup. To be more precise, the vapours can be fatal to the nervous system, which is crucial to every body function. Both materials are disposed of under safe, regulated circumstances due to this threat. If sufficient safety precautions are taken, there will be minimal to no environmental harm.

Improve manufacturing procedures to reduce material waste and offcuts. Repurpose any excess polystyrene within the company or look into collaborations with other sectors to reuse it. Create lighter-weight goods that require less material to manufacture while preserving desired functionality. Investigate and incorporate alternative resources into product lines, such as bio-based polymers or recycled polystyrene.

Use energy-saving technologies and techniques to reduce resource consumption during production. Consider renewable energy sources such as solar or wind. Invest in water recycling and conservation methods to reduce the amount of water used in manufacturing operations. Implement pollution control measures and invest in cleaner technology to reduce pollution from manufacturing activities in the air and water.



Application:

The majority of people deal with Polystyrene and Styrofoam on a daily basis. These two materials are utilised by the construction, packaging, medicinal, and food

industries. These two materials are used to package items such as takeaway food, medication, and technology. Polystyrene is more frequently employed in refrigeration and pharmaceuticals because of its higher average density. Polystyrene, on the other hand, is more frequently used for roofing insulation and packaging items like shipping goods and food because to its lower density and lower manufacturing cost.

1.3. COMPANY PROFILE

Kanti Chiran Corporation (KCC) Private Limited is an Expanded Polystyrene (EPS) manufacturer. It has high shock absorption qualities and can withstand jerks from the outside environment without breaking. It also resists moisture, is lightweight, and is robust. Thus, fragile things are packed with polystyrene. EPS is an all-purpose crystal polystyrene that contains 5% to 8% of a volatile blowing agent, typically pentane. It can be transformed into a number of low-density compounds when heated, especially with steam. KCC creates sheets for packing, which we can see when we buy a product, as well as ice boxes, which are regularly used in transportation. The expanded polystyrene moulded products are used in packaging applications in the Light Engineering industry - Fan, Motor, Typewriter, Fuel Pump, Mixer, Grinder, Electric Iron, etc. These sheets are preserved on the sides of the goods to protect them. To give the products a good hold, KCC creates these sheets in the shape of the product. KCC ships its goods to reputable logistics firms like DHL Logistics and Kerry Logistics, as well as to manufacturers like Samsung, Siemens, Bosch, Preethi, Vidiem, Dixon, etc. The forecast for the market for various polystyrene packaging materials is quite bright and optimistic. The forecast for polystyrene packaging material appears promising given the wide range of applications and the overall double-digit growth attained in the plastic and packaging industry as well as the end-use industries. According to estimates, this sector will develop faster than the average rate for the plastic processing industry.

Due to a surge in the production of electronic equipment, computer audio, TV sets, and other items such ornamental glass products, instruments, handicraft products, etc., there is a high need for expanded polystyrene moulded products and sheets. Expanded polystyrene is a superb packaging material with a variety of qualities, including light weight, rigidity, shock absorption, internal insulation, resistance to moisture and weathering, etc., which may explain the high demand for expanded

polystyrene products. The product has many uses in the insulation and packaging industries.



There are three steps in the process of moulding expandable polystyrene beads.

1. Initial growth
2. Developing
3. moulded

Pre-expansion is accomplished by heating the expandable beads in a system that simultaneously softens the polystyrene and raises the pressure of the blowing agent inside the beads. The blowing agent condenses inside the pre-expanded beads as they cool, carrying a weak partial vacuum inside the beads. During the maturation period, air permeates into the bead until equilibrium with the atmosphere is attained. The pre-expanded beads are poured into the mould to its full capacity, after which it is sealed and heated using steam injection. The polystyrene is softened and expanded by the residual blowing agent and air that entered the bead during maturation. The expansion of the beads leads them to bend and fill the blank area between the beads because they are contained within a closed mould. As the individual beads combine to form a mass, a coherent microcellular structure is created. After cooling, the mould is opened, and the object is taken out.



- Polystyrene beads are the major raw material for polystyrene thermocol. These beads are created by polymerizing styrene monomers.
- Depending on the volume of operations, the corporation may purchase these raw ingredients from chemical suppliers or make them in-house.
- EPS is made by expanding polystyrene beads with steam and a blowing agent. As a result of this technique, lightweight, stiff foam beads are formed.
- Based on the client's specifications, the enlarged beads are subsequently moulded into a variety of shapes and sizes, including sheets, blocks, and custom forms.
- Moulds are often used to shape EPS beads into specified forms. These moulds can be created for a variety of applications, including packaging, insulation, and construction.
- The company may have various moulding machines and equipment for producing a wide range of items.
- Quality control is critical in ensuring that the thermocol products manufactured meet industry standards and customer needs. Regular inspections, testing, and adherence to specified production standards may be required.
- The products are packaged for delivery after they have been created and quality-checked. Depending on the type and size of the product, packaging methods may differ.

- The corporation oversees the distribution of its products to a variety of clients, which may include construction firms, packaging material wholesalers, retailers, and other end-users.
- Logistics is critical to assuring on-time delivery and lowering transportation expenses.
- Customer service is critical for responding to client inquiries, giving product information, processing orders, and resolving any problems that may arise.
- Continuous R&D activities are frequently performed to improve product quality, find new uses, and investigate more sustainable production practises.
- Given the environmental concerns over plastic items, some companies in this area may concentrate on producing ecologically acceptable alternatives or implementing recycling programmes for their products.
- It is critical to follow all safety, environmental, and industry requirements. Companies must stay up to speed on current rules and guarantee that their operations are legal.



1.4 STATEMENT OF THE PROBLEM

- The study of research purpose is to know the sustainable manufacturing activities is carried in Kanti Chiran Corporation Private Limited and to study the Optimized energy consumption, to analyse the alternative sustainable suppliers and to assess how damages can be used alternatively.

1.5. NEED OF THE STUDY

- In today's manufacturing industry, stringent environmental regulations are becoming increasingly important due to factors like resource scarcity, global warming, and waste management concerns. The growing awareness of environmental issues is pushing manufacturers worldwide to embrace eco-friendly manufacturing practices. However, the challenges faced by the Manufacturing industry in implementing these sustainable practices differ from those encountered by large enterprises. Many companies often lack the necessary data, resources, technical expertise, and experience needed for sustainable initiatives.
- The main need for the study of sustainable manufacturing in KCC Corporation Private Limited Company is to assess the alternative Materials, study the Cost-Benefit Analysis, and study the Implementation of Recycling Programs.
- Due to reasons such as resource scarcity, global warming, and waste management problems, strong environmental rules are becoming increasingly vital in today's industrial business. Environmental awareness is driving manufacturers all over the world to adopt eco-friendly production practices.
- This study also help to assess whether reusing damages will bring a positive impact to the company.

1.6. OBJECTIVE OF THE STUDY

- To study the optimized energy consumption positively impact the company
- To analyse the alternative sustainable suppliers
- To assess how damages can be used alternatively

1.7. SCOPE OF THE STUDY

- The production of manufactured goods using cost-effective procedures that limit negative environmental impacts while conserving energy and natural resources is known as sustainable manufacturing.
- Sustainable production benefits employee, community, and product safety.

- This research is focused on determining whether optimized energy use will benefit the company, assessing alternative sustainable suppliers, and determining how damages can be used otherwise.

CHAPTER 2

REVIEW OF LITERATURE

Trushna Dhanendra Patle, Isha Khedikar (2018), An Experimental Study on Use of Waste Polystyrene and Thinner Waste as an Admixture in Concrete:

The study explores the use of Polystyrene waste and thinner waste in concrete, derived from the automobile industry. The mixture was mixed with Portland cement, sand, aggregate, and water to create Polystyrene-thinner concrete. The study compares the effectiveness of different replacement ratios and workability.

Larisa Ivascu (2020), Measuring the Implications of Sustainable Manufacturing in the Context of Industry 4.0:

The manufacturing industry in Romania is addressing sustainability through a hierarchical framework, tested by an automotive manufacturing organization. Improvements include Industry 4.0 facilities and recovering product value at the end of life cycle. Measurement and motivation of waste management and stakeholder interests are crucial for sustainable development.

Dr. Sumit Gupta, G. S. Dangayach, Nageswara Rao Posinasetti (2018), Implementation of sustainable manufacturing Practices in Indian manufacturing companies:

This research is focused on sustainable manufacturing practices. From this research, it is found that sustainable product & and process design, lean practices, agile practice and customization, sustainable supply operation & and distribution, and product recovery & and return practices lead to the sustainable manufacturing.

Hamed Gholami (2021), Sustainable Manufacturing 4.0—Pathways and Practices:

This bibliometric study explores the convergence of sustainable manufacturing and Industry 4.0, focusing on "Sustainable Manufacturing 4.0." It presents original findings on Industry 4.0's application to sustainable manufacturing, contributing to a bibliometric structure of literature. The study presents an initial research agenda for Sustainable Manufacturing 5.0, paving the way for a futuristic view of Industry 5.0.

Priyanka Pathank, Mahendra Pratap Singh (2020), Sustainable manufacturing concepts: a literature review: This paper identifies research gaps in sustainable

manufacturing concepts through quantitative and qualitative descriptive and thematic analysis, thereby identifying research opportunities.

Anastasiia Moldavska, Torgeir Welo (2017), The Concept of Sustainable Manufacturing and its Definitions: A content-analysis based literature review:

This paper analyzes various definitions of sustainable manufacturing (SM) from 1990 to 2016, revealing a lack of consensus on its true meaning. The most commonly used definition is the 2008 one proposed by the U.S. Department of Commerce. The majority of researchers agree on eleven sub-categories, but a wide range of issues (67 sub-categories) indicate inconsistency in the general understanding. The findings can serve as a foundation for developing a common language for SM in both research and industrial practice.

Ali Bastas (2021), Sustainable Manufacturing Technologies: A Systematic Review of Latest Trends and Themes:

The increasing population, energy poverty, global warming, and increasing demand for products and services make sustainability a crucial concept. Manufacturing, with its economic contribution and environmental impact, is well-positioned to address these challenges. This article reviews sustainable manufacturing technologies literature, focusing on sustainable processes, lubricant elimination, and sustainability assessment technologies. It provides a conceptual framework for knowledge acquisition and future directions, stimulating growth in this research stream.

Z.Ebrahim, N.A.Ahmad, M.R.Muhamad (2019), A Model for Manufacturing Sustainability in Manufacturing Operations:

Sustainability's three pillars are economics, environment, and society. Manufacturing organizations must incorporate sustainability principles into their operations. A study using the Pareto 80-20 rule identified core components of sustainability. A model based on the manufacturing industry's input-output system categorizes these components into four groups: sustainability drivers, enablers, measures, impacts, and measures.

Dr. Vasdev Malhotra, Sameer Kumar (2017), The Literature Review of Lean and Green Manufacturing System:

The rapid development of the world has led to a rise in global warming, necessitating the adoption of green manufacturing systems. Lean manufacturing, a methodical approach, aims to reduce waste and pollution, but adoption remains challenging. This research review examines lean green manufacturing systems.

Brooke Marten, Andrea Hicks (2018), Expanded Polystyrene Life Cycle Analysis Literature Review: An Analysis for Different Disposal Scenarios:

Expanded polystyrene, a low-cost and lightweight packaging material, is a petroleum product with no clear post-use recycling pathway. This review uses life cycle assessment to explore its environmental impact and debate on best end-of-life management. Recycling could reduce demand and environmental impacts of virgin expanded polystyrene.

Jaworski Capricho, Krishnamurthy Prasad, Nishar Hameed (2022), Upcycling Polystyrene:

This review discusses the benefits of a circular cycle for polystyrene waste management, focusing on upcycling technologies available in the last five years. It provides an overview of polystyrene's chemistry, types, and applications, and highlights the market demand for its properties. The review also discusses the potential of hybrid technologies and their compatibility with technologies like 3D printing, human space habitation, flow chemistry, vertical farming, and green hydrogen.

Tengku Nuraiti Tengku Izhar, Irnis Azura Zakarya, Sara Yasina Yusuf (2021),

Life cycle assessment of expanded polystyrene: A cradle-to-grave life cycle assessment (LCA) study was conducted on expanded polystyrene (EPS), a widely used packaging material in Malaysia. The study examined the environmental impacts of EPS in two scenarios: ozone depletion, global warming, acidification, and eutrophication. Results showed that EPS manufacture has a significant negative impact on the environment, with GWP having the greatest potential. Recycling was found to have the least negative effects, potentially promoting its adoption as a new end-of-life treatment in Malaysia.

Dolor Roy Enarevba, Karl R. Haapala (2023), A Comparative Life Cycle Assessment of Expanded Polystyrene and Mycelium Packaging Box Inserts:

This study proposes a biobased composite of mycelium and hemp for packaging inserts, aiming to reduce the environmental and health impacts of EPS. The study uses a comparative life cycle assessment to assess the environmental effects of EPS and mycelium, finding that EPS packaging is more energy and carbon-intensive than mycelium inserts, based on cumulative energy demand and global warming potential techniques.

Timothy Lindstrom, Andrea L Hicks (2022), Life cycle assessment of expanded polystyrene shipping boxes at a public research institution: insights for infrastructure at the end of life: The study explores infrastructure sustainability for managing EPS, considering four disposal options: delivery to a landfill, closed-loop reuse with biotechnology, traditional open-loop recycling with a specialty recycler, and a novel open-loop recycling agreement with an on-campus lab. Traditional recycling yields net environmental benefits while remaining logistically feasible.

Arantxa M. Gonzalez-Aguillar, Vicente Perez-Garcia, Jose M. Riesco-Avila (2023): A Thermo-Catalytic Pyrolysis of Polystyrene Waste Review: The production of polystyrene (PS) has been affected by its lightness and heat resistance, leading to environmental issues. Pyrolysis is a recycling technique that converts PS waste into useful chemicals. This study examines the thermo-catalytic pyrolysis of PS and its waste, revealing that it can transform PS into a liquid with high aromatic content, and can be used as fuel. The study also examines the impact of temperature, reactor layout, and catalysts on product yield.

Hari Priya Abburi, Angan Sengupta (2022), A Case Study on Online Estimation of Polystyrene Formation Runaway Reaction Process Parameters: Thermal runaway is a risk in batch reactors with polymerization reactions and inadequate cooling systems. A case study investigated thermal runaway during a free radical styrene polymerization reaction in adiabatically or non-adiabatically heated reactors. The study found that the well-mixed reactor reaction conditions accurately describe thermal runaway polystyrene formation. The Extended Kalman Observer (EKO) algorithm accurately estimates runaway reaction parameters, aiding in efficient manipulation of initiator concentration and increasing operational safety in non-adiabatic batch reactors.

N. Siva Bhaskar Reddy; S. P. Raju V.; T. Srinivas; Srinivas Vasam (2023), Effect of expanded polystyrene on strength and workability of concrete reinforced with steel fiber: India's rapid urbanization and population growth have led to increased carbon emissions, necessitating the use of new materials like expanded polystyrene in construction. Expanded polystyrene beads (EPS), a lightweight, rigid plastic foam insulator, can be used as a substitute for aggregates in concrete. A study examining the effects of EPS on compressive strength and workability of geopolymer concrete found a minor positive impact.

Sachin A. Gaikwad, Mukund M. Pawar (2018), Study of Use of Polystyrene as a Partial Replacement for Fine Aggregate in Concrete: Urbanization necessitates sustainable construction materials, highlighting the need for alternative materials like polystyrene. Despite its non-biodegradable nature and long landfill life, polystyrene's strong thermal conductivity, sound insulation, and lightweight properties make it suitable for concrete. This essay compares polystyrene-based concrete to traditional concrete, focusing on compressive and tensile strength.

Shamraiz Ahmad, Kuan Yew Wong and Shahid Ikramullah Butt (2022), Status of sustainable manufacturing practices: literature review and trends of triple bottom-line-based sustainability assessment methodologies: The review of sustainability approaches revealed that life cycle assessment and analytic hierarchy process-based approaches were the most commonly used integrating tools. However, most studies focused more on environmental dimensions than economic and social ones. Indicators were based on a few without expert validation, suggesting future research for more inclusive and trustworthy techniques.

Satya Shah; Sarath Menon; Olumide Olajide Ojo; Elmira Naghi Ganji (2020), Digitalisation in Sustainable Manufacturing – A Literature Review: This paper reviews early studies on digitalization's role in sustainable manufacturing, focusing on the Digital Supply Chain (DSC) and Industry 4.0 parameters. It highlights a gap between sustainable manufacturing practices and Industry 4.0's effects on DSC. The authors focus on food manufacturing industries and digitalization's application in manufacturing processes.

Mélanie Despeisse, Arpita Chari, Clarissa A. González Chávez, Helena Monteiro, Carla Gonçalves Machado & Björn Johansson (2022) A systematic review of empirical studies on green manufacturing: eight propositions and a research framework for digitalized sustainable manufacturing, Production & Manufacturing Research: Manufacturers face pressure to adapt to sustainability goals, with Industry 4.0 offering new opportunities. However, digitization and sustainability are not always compatible. A bottom-up methodology was used to review 208 studies, identify environmental solutions, and formulate eight propositions for future work. A framework for digitalized sustainable manufacturing was proposed to link industrial advancement with sustainable development objectives.

I.D. Paul, G.P. Bhole and J.R. Chaudhari (2014), A review on green manufacturing: it's important, methodology and its application: The paper discusses green manufacturing, its benefits, and techniques for reducing waste and pollution. It emphasizes environmentally friendly design, energy efficiency, and product development with minimal waste. Green manufacturing aims for environmental protection and cost reduction.

Marc A. Rosen and Hossam A. Kishawy (2012), Sustainable Manufacturing and Design: Concepts, Practices and Needs: The article emphasizes the importance of integrating sustainability in manufacturing and design, emphasizing the need for tools like environmental design and life cycle assessments. Future decisions will prioritize sustainability and environmental stewardship, influencing the development of manufacturing processes and technologies. Further research and cooperation are needed to advance technology transfer and sustainability applications.

Chris Yuan a, Qiang Zhai a, and David Dornfeld (2012), A three dimensional system approach for environmentally sustainable manufacturing: This paper presents a three-dimensional system approach for sustainable manufacturing, focusing on pollution prevention and addressing technology, energy, and material components. It examines emerging nano-manufacturing technology, atomic layer deposition, and suggests its potential for sustainable manufacturing practices.

Ba Thanh Ho, Timothy K. Roberts and Steven Lucas, (2017), An overview on biodegradation of polystyrene and modified polystyrene: the microbial approach: Polystyrene is a widely used plastic in many aspects of human life and in industries due to its useful characteristics of low cost, light weight, ease of manufacture, versatility, thermal efficiency, durability, and moisture resistance. However, polystyrene is very stable and extremely hard to degrade in the environment after disposal. Polystyrene can be used as a carbon source for microorganisms similar to many other hydrocarbons. The ability of microorganisms to use polystyrene as a carbon source has been recently established. However, the high molecular weight of polystyrene limits its use as a substrate for enzymatic reactions to take place. In this paper, we review studies on biodegradation of polystyrene to give an overview and direction for future studies.

Appala Naidu Uttaravalli a, Srikanta Dinda b and Bhanu Radhika Gidla (2020), Scientific and engineering aspects of potential applications of post-consumer

(waste) expanded polystyrene : A review: The production of expanded polystyrene (EPS) has increased significantly in the past two decades, leading to an alarming increase in post-consumer EPS in the environment. Proper disposal and reuse of EPS is a global concern. Waste thermocol can be used for various applications, including value-added chemicals, construction aggregate, composite and porous carbon materials, and adhesives. The conversion of EPS depends on degradation temperature, duration, catalyst type, and loading. Waste thermocol can also improve concrete setting times, slump value, and water absorption capacity.

Wei Zhao, Hai-Bo Zhao, Jin-Bo Cheng, Wenxiong Li, Jiayan Zhang and Yu-Zhong Wang (2022), A green, durable and effective flame-retardant coating for expandable polystyrene foams: A formaldehyde-free phosphorus-containing polysiloxane coating has been developed to act as both an adhesive and flame retardant for Expandable Polystyrene (EPS) foams. This coating ensures durable thermal insulation even under high humidity conditions and promotes the formation of P/Si-containing graphited char layers during combustion. The EPS composite shows excellent flame retardancy, a high limiting oxygen index, and reduced peak heat release rate. This new strategy offers environmentally friendly coatings for EPS foam.

Brooke Marten and Andrea Hicks (2018), Expanded Polystyrene Life Cycle Analysis Literature Review: An Analysis for Different Disposal Scenarios: Expanded polystyrene, a low-cost and lightweight packaging material, is a petroleum product with no clear post-use recycling pathway. This review uses life cycle assessment to explore its environmental impact and discusses the debate on best end-of-life management. Recycling could reduce demand and environmental impacts of virgin expanded polystyrene.

Carlos Bruno Barreto Luna, Danilo Diniz Siqueira, Eduardo da Silva Barbosa Ferreira, Wallisson Alves da Silva, Jessika Andrade dos Santos Nogueira and Edcleide Maria Araújo (2020), From Disposal to Technological Potential: Reuse of Polypropylene Waste from Industrial Containers as a Polystyrene Impact Modifier: The study evaluates the potential of mixtures of polystyrene (PS) and recycled copolymer polypropylene (PPr) using styrene-(ethylene/butylene)-styrene (SEBS) as a compatibilizing agent. The mixtures showed increased viscosity, elongation at break, and impact strength compared to neat PS. The addition of a semi-crystalline recycled material increased thermomechanical strength. SEBS was

found to be effective in making PS/PPr mixtures compatible, adding value to discarded material and reducing costs, thus reducing pollution.

Danil Yu Pimenov Mozammel Mia, Munish K. Gupta, Álisson R. Machado, Giuseppe Pintaude, Deepak Rajendra Unune, Navneet Khanna, Aqib Mashood Khan, Ítalo Tomaz, Szymon Wojciechowski and Mustafa Kuntoğlu (2022), Resource saving by optimization and machining environments for sustainable manufacturing: A review and future prospects: Sustainability in manufacturing is crucial for preserving energy and natural resources. Modern production requires optimized processes with low, clean, and renewable energy consumption. Greener cooling methods, such as Dry, Conventional, and MQCL, can reduce pollution, emissions, and waste in machining. Optimizing cutting conditions, minimizing power consumption, and reducing carbon dioxide emissions are also essential. This article discusses modern trends in resource-saving and environmentally efficient technologies in sustainable manufacturing.

Sunil Luthra a, Kannan Govindan b, Devika Kannan b, Sachin Kumar Mangla c, Chandra Prakash Garg (2017), An integrated framework for sustainable supplier selection and evaluation in supply chains: This work proposes a framework for evaluating sustainable supplier selection using an integrated Analytical Hierarchy Process (AHP), ViseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR). The framework identifies 22 sustainable supplier selection criteria and three dimensions (economic, environmental, and social). The top five criteria are 'Environmental costs,' 'Quality of product,' 'Price of product,' 'Occupational health and safety systems,' and 'Environmental competencies'. The framework helps managers and business professionals identify important criteria and evaluate the most efficient suppliers for sustainability in their supply chain.

Konrad Zimmer, Magnus Fröhling & Frank Schultmann (2015), Sustainable supplier management – a review of models supporting sustainable supplier selection, monitoring and development: This paper reviews scientific literature on sustainable supplier management (SSM) focusing on formal models supporting decision-making in sustainable supplier selection, monitoring, and development. It analyzes 143 peer-reviewed publications between 1997 and 2014, identifying established and overlooked research fields. Major findings include growing interest in academia, predominant Analytic Hierarchy Process, Analytic Network Process,

and fuzzy-based approaches, focus on final evaluation and selection, and rare investigation of social and quantitative metrics.

Vanessa Batista Schramm, Luciana Priscila Barros Cabral, Fernando Schramm (2020), Approaches for supporting sustainable supplier selection -

A literature review: This paper reviews various approaches to sustainable supplier selection, focusing on economic, environmental, and social aspects. It identifies the most frequently applied MCDM/A methods and their applications, including individual or group decision-making, dealing with imprecision, uncertainties, and order quantity assignments. The study highlights that compensatory methods are not suitable for sustainability decisions where environmental and social aspects cannot be compensated by economic factors.

Marco Garetti and Marco Taisch (2012), Sustainable manufacturing: trends and research challenges: Sustainability is a critical issue for present and future generations, as the current assumption of unlimited natural resources and the environment's regenerative capacity is no longer acceptable. This shift requires a change in all aspects of human life, including culture, economy, and technology. The manufacturing sector, which is the main pillar of civilized lifestyle, will play a crucial role in establishing a sustainable way ahead. New technology, business models, and lifestyle models will be essential for a sustainable world. Research and development will play a crucial role in providing appropriate options for society to address these needs. The IMS international project 'IMS2020: Supporting Global Research for IMS2020 Vision' aims to prepare a roadmap for future manufacturing research.

Karl R. Haapala, Fu Zhao, Jaime Camelio, John W. Sutherland, Steven J. Skerlos, David A. Dornfeld, I. S. Jawahir, Andres F. Clarens, Jeremy L. Rickli (2013), A Review of Engineering Research in Sustainable Manufacturing: Sustainable manufacturing involves considering economic, environmental, and social impacts in production and delivery. It requires advanced decision-making, public policy, and descriptive metrics. Recent research explores concepts, methods, and tools for sustainable manufacturing, addressing issues at the process and systems levels. Despite advancements, challenges remain in manufacturing process and system research, development, implementation, and education.

Daniel R. Cooper, Timothy G. Gutowski (2015), The Environmental Impacts of Reuse: A Review: The article discusses the growing interest in reuse due to concerns about climate change, biodiversity loss, and mineral scarcity. It highlights the potential benefits and pitfalls of reuse, highlighting the importance of understanding the environmental impacts of new production. While reusing products can provide energy-saving benefits, it's important to consider restoring and upgrading old efficiencies, minimizing overspecification, and exploring more efficient alternatives. While reused goods can provide social value, they may represent additional consumption rather than a net environmental benefit.

Lai, K.-h., & Wong, C. W. Y. (2012), Sustainable logistics management and performance: Some empirical evidence from Chinese manufacturing exporters: The adoption of green logistics management (GLM) in Chinese manufacturing exports presents an opportunity to meet international demand for resource conservation and achieve environmental performance profitably. The study identifies GLM components, its relation to environmental and operational performance in a developing country context, institutional and operational antecedents, and the moderating effect of environmental regulatory pressure. Results show that GLM positively affects environmental and operational performance, and regulatory pressure enhances the relationship.

Saxena, R. P., & Khandelwal, P. K. (2012). Greening of industries for sustainable growth: An exploratory study on durable, non-durable and services industries. This paper explores the perception of industries in India towards green philosophy and their initiatives to adopt it. The study reveals that industries in India generally have a positive view of greening, believing it will help them gain a competitive advantage and support sustainable growth. The research provides a starting point for further research, exploring whether industries adopting green practices gain a competitive advantage, gain market share, and profits. The study fills a gap in green marketing and social economics studies in developing Asian countries.

Huang, J. Y., Zhu, H. Y., (2020) Analysis of Implementation the Key Technologies of Green Manufacturing. Applied Mechanics and Materials. This paper introduces green manufacturing, analyzing its implementation process, identifying market, organizational, and technological barriers, and their influence on

green manufacturing. It also explores key technologies and their impact on the entire product life cycle, from design to scrap.

Rehman, Minhaj Ahemad, Shrivastava, Rakesh (2013), Green manufacturing (GM): Past, present and future(a state of art review): Green manufacturing (GM) is a sustainable solution that addresses global problems by maximizing resource use and reducing waste. The 4Rs model of growth and sustainability is being adopted worldwide. This paper reviews GM literature, identifying emerging issues and challenges. The authors propose a unified, comprehensive GM framework, addressing the lack of such a framework.

S. A. Shaheen, T. E. (2007). Reducing greenhouse emissions and fuel consumption – sustainable approaches for surface transportation: Climate change is a pressing issue that needs to be addressed to avoid future environmental consequences. Transportation contributes significantly to CO₂ emissions, accounting for 14% of global emissions and 27% in the U.S. Developing technologies like automotive and fuel technologies, intelligent transportation systems (ITS), and mobility management strategies can help address climate change. However, more research is needed to quantify potential impacts. Traffic signal control, electronic toll collection, bus rapid transit, and traveler information have shown positive impacts. Mobility management approaches like road pricing policies and carsharing have the greatest CO₂ reduction potential.

Dr. Devi K. Kalla, Prof. Aaron Brown, “Infusing A Sustainable Green manufacturing into manufacturing /mechanical Engineering Programme: Green manufacturing is a growing field that combines technical issues, energy conservation, pollution prevention, and health and safety. To remain competitive, industries need to train engineering and technology professionals to understand environmental and societal impacts. This paper assesses the undergraduate mechanical engineering technology program curriculum at Metropolitan State College of Denver, focusing on sustainable green manufacturing. Key topics and the ABET process are reviewed to incorporate sustainability principles into the curriculum.

Rusinko, C. A., (2021). Green manufacturing: An evaluation of environmentally sustainable manufacturing practices and their impact on competitive outcomes: This paper explores the relationship between environmentally

sustainable manufacturing practices and competitive outcomes in the U.S. commercial carpet industry. Surveying 84 respondents, the study finds that sustainable practices, such as pollution prevention and product stewardship, positively impact competitive outcomes like manufacturing cost and product quality. These findings can help engineering and operations managers respond to environmental and competitive demands.

K.C.Shang, C.S.Lu, S.Li (2010), A taxonomy of green supply chain management capability among electronic related manufacturing firms in Taiwan: The study analyzed green supply chain management (GSCM) capability dimensions and firm performance in Taiwanese electronics-related manufacturing firms. Six dimensions were identified: green manufacturing, packaging, environmental participation, marketing, suppliers, stock, and eco-design. Firms were divided into four groups: weak GSCM oriented, green marketing oriented, green supplier oriented, and green stock oriented. The green marketing oriented group performed best, emphasizing its importance as a strategic asset for competitive advantage.

Geda A., Ghosh V., Karamemis G., and Vakharia A. (2020), Coordination strategies and analysis of waste management supply chain: The study analyzed green supply chain management (GSCM) capability dimensions and firm performance in Taiwanese electronics-related manufacturing firms. Six dimensions were identified: green manufacturing, packaging, environmental participation, marketing, suppliers, stock, and eco-design. Firms were divided into four groups: weak GSCM oriented, green marketing oriented, green supplier oriented, and green stock oriented. The green marketing oriented group performed best, emphasizing its importance as a strategic asset for competitive advantage.

Raja Ariffin, R. G. (2015). Drivers and Barriers Analysis for Green Manufacturing Practices in Malaysian SME,s: The manufacturing industry faces challenges in adhering to environmental regulations due to scarcity of resources, global warming, and waste management issues. Increasing environmental awareness drives manufacturers to adopt green manufacturing practices. However, SMEs face barriers due to lack of data, resources, technical expertise, and experience. This paper reports preliminary findings on the drivers and barriers faced by SMEs in Malaysia, using a Delphi survey method. The study aims to help

prioritize key factors influencing green manufacturing practices and contribute to economic growth.

X. C. Tan, F. L. (2014). A decision making framework model of cutting fluid selection for green manufacturing and a case study: Green manufacturing (GM) reduces environmental burdens by incorporating cutting fluid selection in manufacturing processes. This paper presents a multi-object decision-making model for GM, considering quality, cost, and environmental impact. E minimizes environmental impact, Q maximizes quality, and C minimizes cost. A case study on gear hobbing shows the model's practicality, demonstrating its effectiveness in GM decision-making problems. This approach addresses the root causes of environmental pollution in machining processes.

Sudipta Sinha, Nikunja Mohan Modak (2021), A systematic review in recycling/reusing/re-manufacturing supply chain research: a tertiary study : This study reviews literature on recycling/reusing/re-manufacturing supply chain research using SCOPUS. It develops classification schemes for 67 review works, focusing on sustainability in environmental, economic, and social aspects. Emerging issues include waste utilization, rare earth metal collection, reverse and forward supply chain integration, and sustainable production systems. The classification framework helps researchers identify research gaps and create high-quality work in the future.

Annelise M. de Jong and Ann-Charlotte Mellquist (2021), The Potential of Plastic Reuse for Manufacturing: A Case Study into Circular Business Models for an On-Line Marketplace: The plastic industry is focusing on recycling and reuse to address resource scarcity. A circular economy approach is being explored, but challenges persist due to waste material quality. This study investigates the potential of an online marketplace for waste exchange, market potential, and business model requirements. Interviews with platform providers and plastic manufacturing companies reveal business models and data. The study suggests the plastic industry can lead a circular initiative, potentially utilizing it with other industries.

Kassim N, Rahim SZA, Ibrahim WARAW, Shuaib NA, Rahim IA, Karim NA, Sandu AV, Pop M, Titu AM, Błoch K, Nabiałek M. (2023), Sustainable Packaging Design for Molded Expanded Polystyrene Cushion: This study aims to identify

design parameters for sustainable molded expanded polystyrene (EPS) cushion packaging. Drop testing and design simulation analysis were conducted, revealing four key elements: rib positioning, EPS cushion thickness, package layout, and packing size. These factors contribute to sustainable design, reducing development costs, mold modification time, and carbon dioxide emissions. The findings also aid in the development of productive packaging design, reducing environmental impact and impacting the manufacturing industry.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 METHODOLOGY:

Research technique is mostly required for the purpose of framing the research process as well as the designs and instruments that will be employed for the project. Sustainability Manufacturing in the company can be discovered via research techniques. This time study methodology is designed to determine the amount of Employees in the Current System. A standardized questionnaire is used to obtain data on employees' attitudes towards the sustainability manufacturing in the company.

3.2. RESEARCH DESIGN:

Descriptive Research Design

Descriptive research is a study designed to depict the participants in an accurate way. More simply put, descriptive research is all about describing people who take part in the study.

3.3. SAMPLING TECHNIQUE:

Convenience sampling method

A convenience sample is one of the main types of non-probability sampling methods. A convenience sample is made up of people who are easy to reach.

3.4 SOURCE OF DATA

For a research design, the data collection method stands as the backbone. Both the primary and secondary data were utilized as the source of data for analysis and report preparation.

Primary data

The primary data collection was done by getting the questionnaire filled out by the employees, who are working in Kanti Chiran Corporation (KCC) Private Limited, who were willing to spend some time for sharing their view. The data was also collected through a small interaction with these employees.

Secondary data:

Secondary data is the data collected from the already available sources. These sources are analysed and interpreted to give final conclusion for the study. Internet, journals, magazines, websites and research papers were the main source of secondary data.

3.5. STRUCTURE OF QUESTIONNAIRE:

The questionnaire was divided into two sections. The first part was designed to know the general information about employees and the second part contained the respondent's opinion about sustainable manufacturing at Kanti Chiran Corporation Private Limited.

- Basic Introduction
- Personal Details
- Research related Questions
- Perception Questions
- Suggestion Question

3.6 SAMPLE SIZE

110 employees were surveyed during the study period.

3.7 PERIOD OF THE STUDY

The period of study is 4 weeks from September 2023 to October 2023.

3.8 HYPOTHESIS:

Hypothesis 1

- Ho: There is no relationship between the gender of the respondents and their opinion that Optimized energy consumption positively impacts the company.
- H1: There is a relationship between the gender of the respondents and their opinion that Optimized energy consumption positively impacts the company.

Hypothesis 2

- H0: There is no relationship between the age of the respondents and their opinion regarding what the company should adopt regarding the supplier.
- H1: There is a relationship between the age of the respondents and their opinion regarding what the company should adopt regarding the supplier.

Hypothesis 3

- Ho: There is no association between reusing the damages and its positive impact on the company.
- H1: There is an association between reusing the damages and its positive impact on the company.

3.9 ANALYTICAL TOOL

For the purpose of analysis of data, Simple percentage analysis and tabulation are used. In order to give a pictorial representation of the analysis, a Pie chart and bar diagram are used.

3.9.1. PERCENTAGE ANALYSIS:

A descriptive statistic is always used to answer research questions: either a percentage or a mean. When it is important to know how many of the participants gave a specific answer, a percentage is ideal. When the responses contain clear categories, a percentage is usually stated.

$$\text{Simple percentage} = \frac{\text{No. Of respondents}}{\text{Total no. of respondent}} \times 100$$

3.9.2. ANALYTICAL TOOLS(SPSS)

CORRELATION:

A correlational research design examines relationships between variables without manipulating them, revealing the strength and direction of the relationship, which can be positive or negative. Correlation enables predictive analysis by indicating a

strong positive correlation between two variables, allowing one variable to predict the other to some extent.

CHI-SQUARE TEST:

The chi-square test is used to estimate how likely the observations that are made would be, by considering the assumption of the null hypothesis as true. A hypothesis is a consideration that a given condition or statement might be true, which we can test afterward. Chi-squared tests are usually created from a sum of squared falsities or errors over the sample variance.

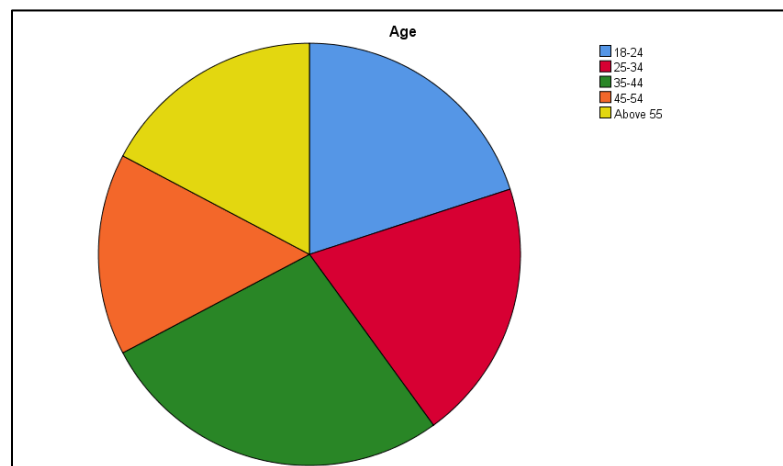
CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

4.1 PERCENTAGE ANALYSIS

4.1.1 Table indicating age of respondents

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-24	22	20.0	20.0	20.0
	25-34	22	20.0	20.0	40.0
	35-44	30	27.3	27.3	67.3
	45-54	17	15.5	15.5	82.7
	Above 55	19	17.3	17.3	100.0
	Total	110	100.0	100.0	



Interpretation

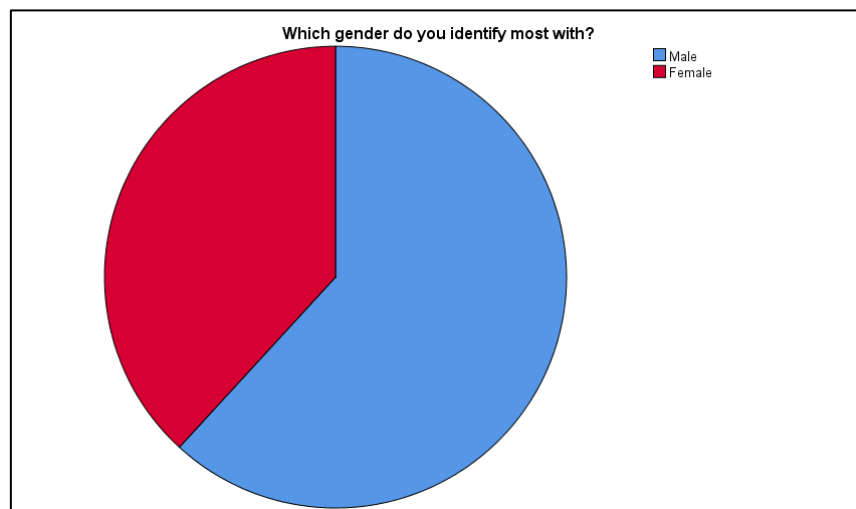
From the above table, it is interpreted that 20% of the respondents belong to the age group 18-24, 20% of the respondents belong to the age group 25-34, 27.3% of the respondents belong to the age group 35-44, 15.5% of the respondents belong to the age group 45-54, and 17.3% of the respondents belong to the age group Above 55.

Inference

The majority 20% of the respondents belong to the age group 18-24 and 20% of the respondents belong to the age group 25-34.

4.1.2 Table indicating gender of respondents

Which gender do you identify most with?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	68	61.8	61.8	61.8
	Female	42	38.2	38.2	100.0
	Total	110	100.0	100.0	



Interpretation

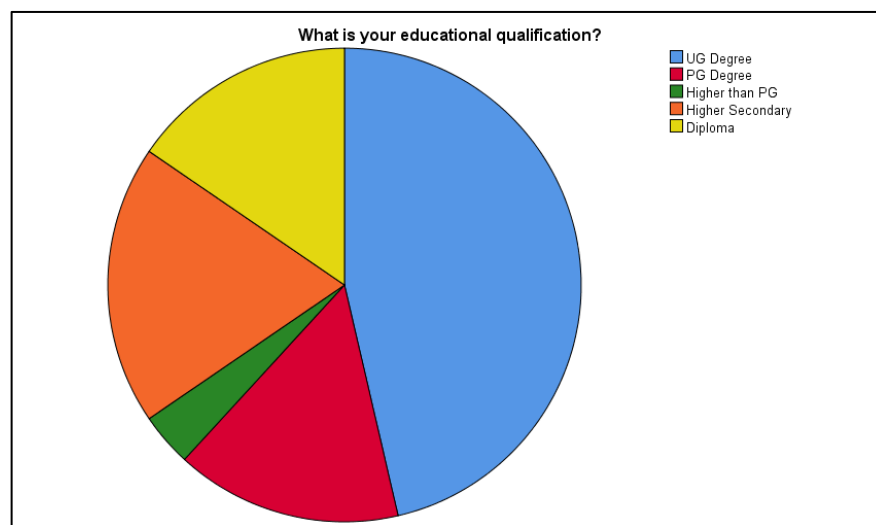
From the above table, it is interpreted that 61.8% of the respondents are Male and 38.2% of the respondents are female.

Inference

The majority 61.8% of the respondents are Male.

4.1.3 Table indicating educational qualification of respondents

What is your educational qualification?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	UG Degree	51	46.4	46.4	46.4
	PG Degree	17	15.5	15.5	61.8
	Higher than PG	4	3.6	3.6	65.5
	Higher Secondary	21	19.1	19.1	84.5
	Diploma	17	15.5	15.5	100.0
	Total	110	100.0	100.0	



Interpretation

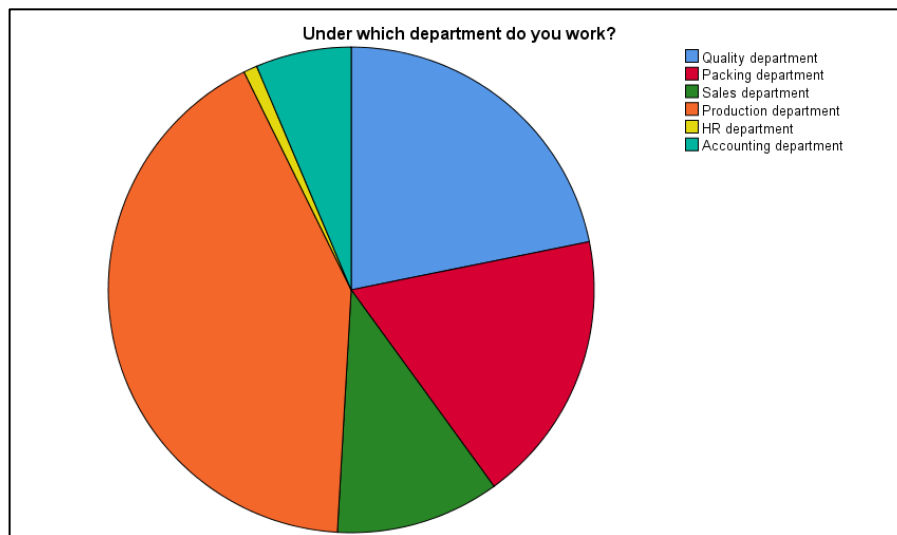
From the above table, it is interpreted that 46.4% of the respondents hold a educational qualification of UG Degree, 15.5% of the respondents hold a educational qualification of PG Degree, 3.6% of the respondents old a educational qualification of Higher than PG, 19.1% of the respondents hold a educational qualification of Higher Secondary, 15.5% of the respondents old a educational qualification of Diploma.

Inference

The majority 46.4% of the respondents hold a educational qualification of UG Degree.

4.1.4 Table indicating Department in which the respondents work

Under which department do you work?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Quality department	24	21.8	21.8	21.8
	Packing department	20	18.2	18.2	40.0
	Sales department	12	10.9	10.9	50.9
	Production department	46	41.8	41.8	92.7
	HR department	1	.9	.9	93.6
	Accounting department	7	6.4	6.4	100.0
	Total	110	100.0	100.0	



Interpretation

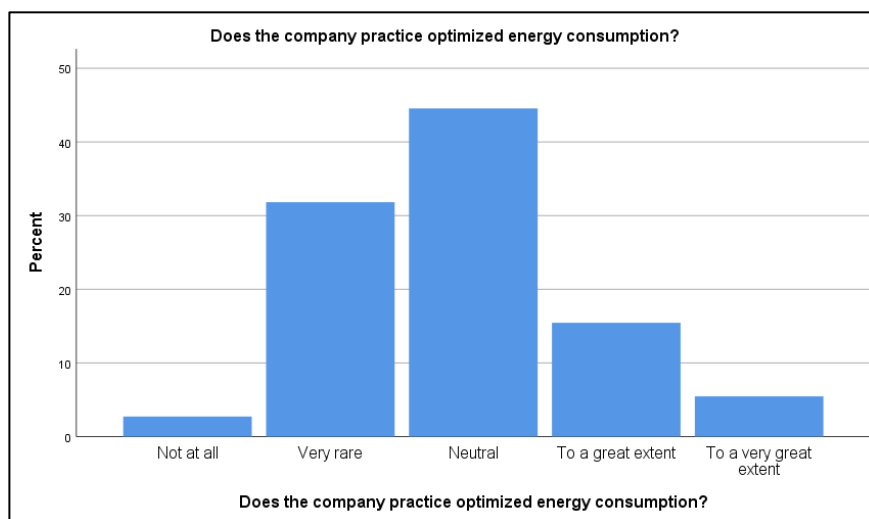
From the above table, it is interpreted that 20.9% of the respondents belong to Quality department, 18.2% of the respondents belong to Packing department, 10.9% of the respondents belong to Sales department, 41.8% of the respondents belong to Production department, 0.9% of the respondents belong to HR department and 6.4% of the respondents belong to accounting department.

Inference

The majority 41.8% of the respondents belong to Production department.

4.1.5. Table indicating whether the company practices optimized energy consumption

Does the company practice optimized energy consumption?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	3	2.7	2.7	2.7
	Very rare	35	31.8	31.8	34.5
	Neutral	49	44.5	44.5	79.1
	To a great extent	17	15.5	15.5	94.5
	To a very great extent	6	5.5	5.5	100.0
	Total	110	100.0	100.0	



Interpretation

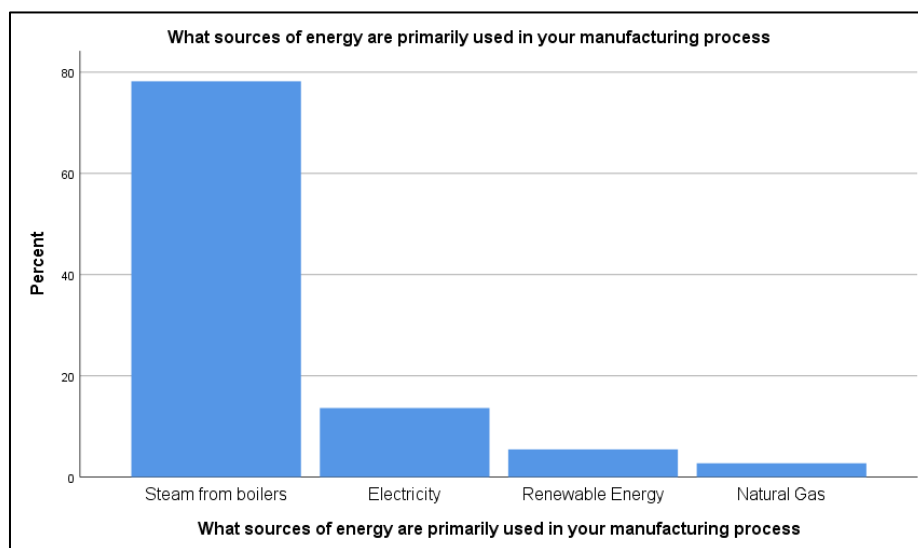
From the above table, it is interpreted that 2.7% of the respondents say that the company not at all practice optimized energy consumption, 31.8% of the respondents say that the company very rarely practice optimized energy consumption, 44.5% of the respondents neutrally say that the company practice optimized energy consumption, 15.5% of the respondents say that the company practice optimized energy consumption to a great extent and 5.5% of the respondents say that the company practice optimized energy consumption to a very great extent.

Inference

The majority 44.5% of the respondents neutrally say that the company practice optimized energy consumption.

4.1.6. Table indicating sources of energy that are primarily used in the manufacturing process

What sources of energy are primarily used in your manufacturing process					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Steam from boilers	86	78.2	78.2	78.2
	Electricity	15	13.6	13.6	91.8
	Renewable Energy	6	5.5	5.5	97.3
	Natural Gas	3	2.7	2.7	100.0
	Total	110	100.0	100.0	



Interpretation

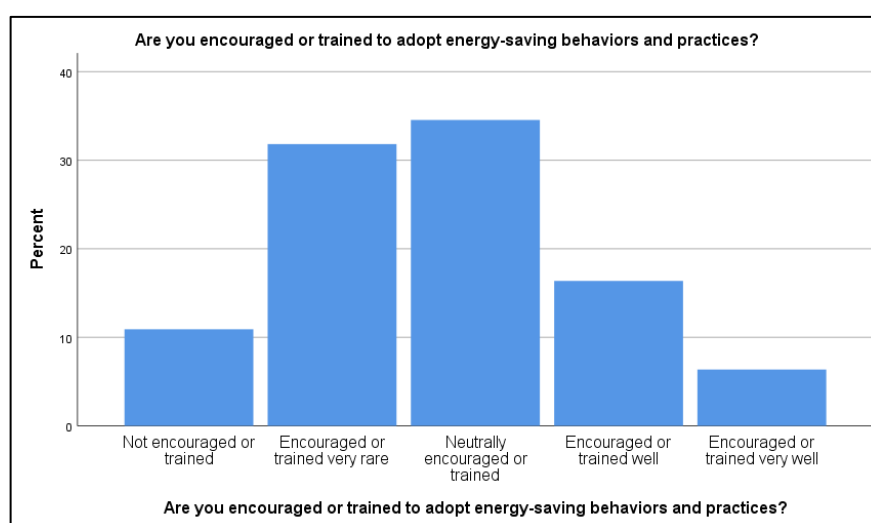
From the above table, it is interpreted that 78.2% of the respondents say that the company uses Steam from boilers as the primary source of energy in their manufacturing process, 13.6% of the respondents say that the company uses Electricity as the primary source of energy in their manufacturing process, 5.5% of the respondents say that the company uses Renewable energy as the primary source of energy in their manufacturing process, 2.7% of the respondents say that the company uses Natural Gas as the primary source of energy in their manufacturing process.

Inference:

The majority 78.2% of the respondents say that the company uses Steam from boilers as the primary source of energy in their manufacturing process.

4.1.7. Table indicating whether the respondents are encouraged or trained to adopt energy-saving behaviors and practices

Are you encouraged or trained to adopt energy-saving behaviors and practices?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not encouraged or trained	12	10.9	10.9	10.9
	Encouraged or trained very rare	35	31.8	31.8	42.7
	Neutrally encouraged or trained	38	34.5	34.5	77.3
	Encouraged or trained well	18	16.4	16.4	93.6
	Encouraged or trained very well	7	6.4	6.4	100.0
	Total	110	100.0	100.0	



Interpretation

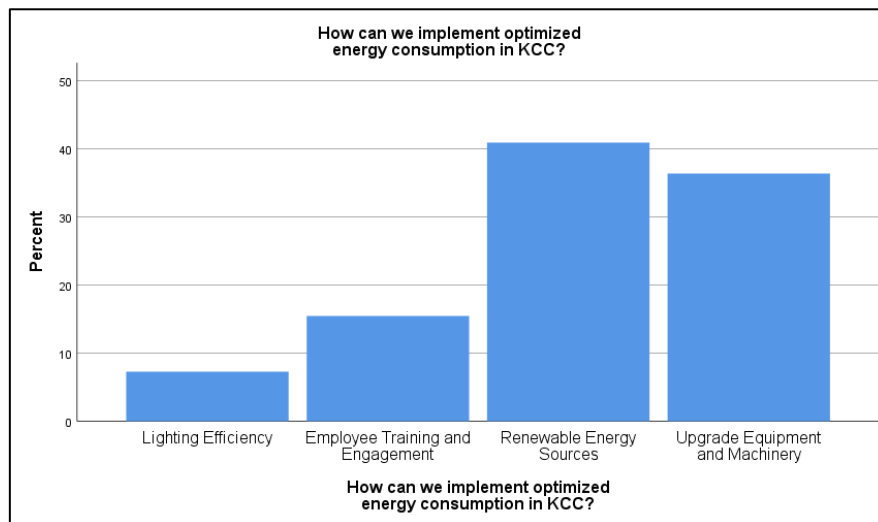
From the above table, it is interpreted that 10.9% of the respondents say that they are not encouraged or trained to adopt energy-saving behaviours and practices, 31.8% of the respondents say that they are encouraged or trained very rarely to adopt energy-saving behaviours and practices, 34.5% of the respondents neutrally agree that they are either encouraged or trained to adopt energy-saving behaviours and practices, 16.4% of the respondents say that they are encouraged or trained well to adopt energy-saving behaviours and practices, 6.4% of the respondents say that they are encouraged or trained very well to adopt energy-saving behaviours and practices.

Inference:

The majority 34.5% of the respondents neutrally agree that they are either encouraged or trained to adopt energy-saving behaviours and practices

4.1.8. Table indicating about the respondent's opinion on how can we implement energy consumption in KCC

How can we implement optimized energy consumption in KCC?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lighting Efficiency	8	7.3	7.3	7.3
	Employee Training and Engagement	17	15.5	15.5	22.7
	Renewable Energy Sources	45	40.9	40.9	63.6
	Upgrade Equipment and Machinery	40	36.4	36.4	100.0
	Total	110	100.0	100.0	



Interpretation

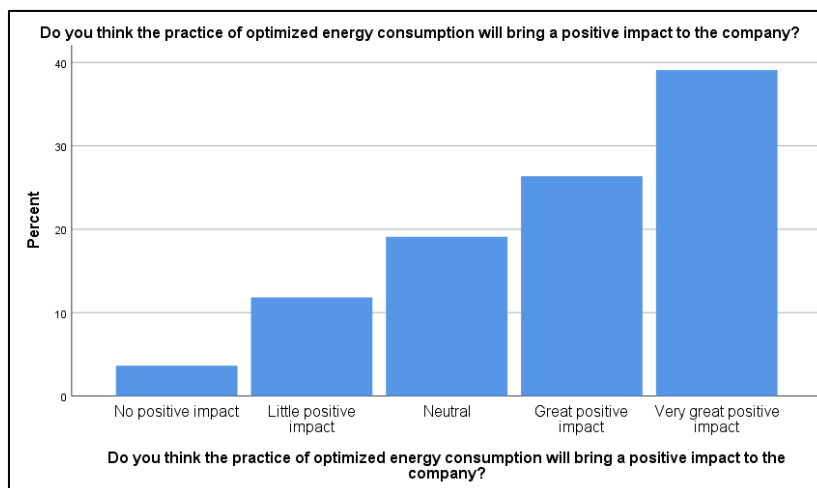
From the above table, it is interpreted that 7.3% of the respondents say that the company can implement optimized energy consumption through light efficiency, 15.5% of the respondents say that the company can implement optimized energy consumption through Employee training and engagement, 40.9% of the respondents say that the company can implement optimized energy consumption through Renewable energy sources and 36.4% of the respondents say that the company can implement optimized energy consumption through Upgrade equipment and machinery.

Inference

The majority 40.9% of the respondents say that the company can implement optimized energy consumption through Renewable energy sources.

4.1.9 Table indicating does the respondents think about the practice of optimized energy consumption will positively impact the company

Do you think the practice of optimized energy consumption will bring a positive impact to the company?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No positive impact	4	3.6	3.6	3.6
	Little positive impact	13	11.8	11.8	15.5
	Neutral	21	19.1	19.1	34.5
	Great positive impact	29	26.4	26.4	60.9
	Very great positive impact	43	39.1	39.1	100.0
	Total	110	100.0	100.0	



Interpretation

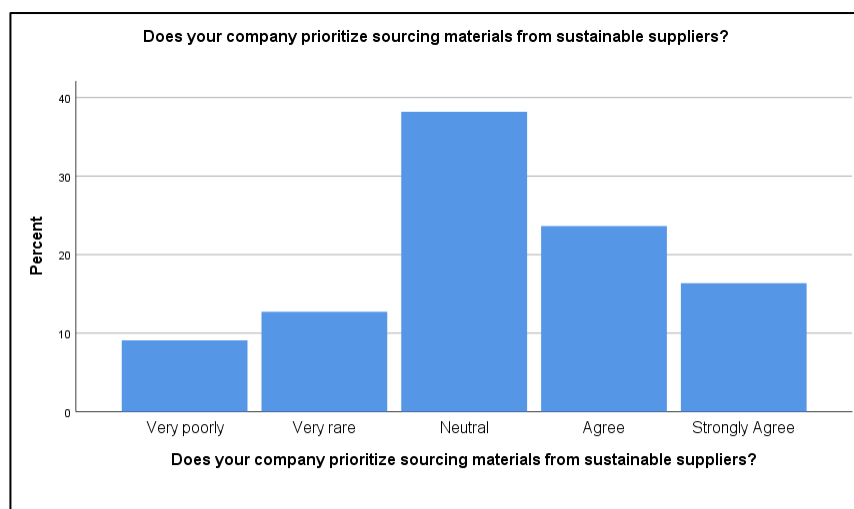
From the above table, it is interpreted that 3.6% of the employees say, practice of optimized energy consumption will bring no positive impact to the company, 11.8% of the employees say, practice of optimized energy consumption will bring little positive impact to the company, 19.1% of the employees neutrally say practice of optimized energy consumption will bring no positive impact to the company, 26.4% of the employees say, practice of optimized energy consumption will bring great positive impact to the company, 39.1% of the employees say that the practice of optimized energy consumption will bring very great positive impact to the company.

Inference

The majority 39.1% of the employees say that the practice of optimised energy consumption will bring very great positive impact to the company.

4.1.10 Table indicating whether the company prioritize sourcing materials from sustainable suppliers

Does your company prioritize sourcing materials from sustainable suppliers?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very poorly	10	9.1	9.1	9.1
	Very rare	14	12.7	12.7	21.8
	Neutral	42	38.2	38.2	60.0
	Agree	26	23.6	23.6	83.6
	Strongly Agree	18	16.4	16.4	100.0
	Total	110	100.0	100.0	



Interpretation

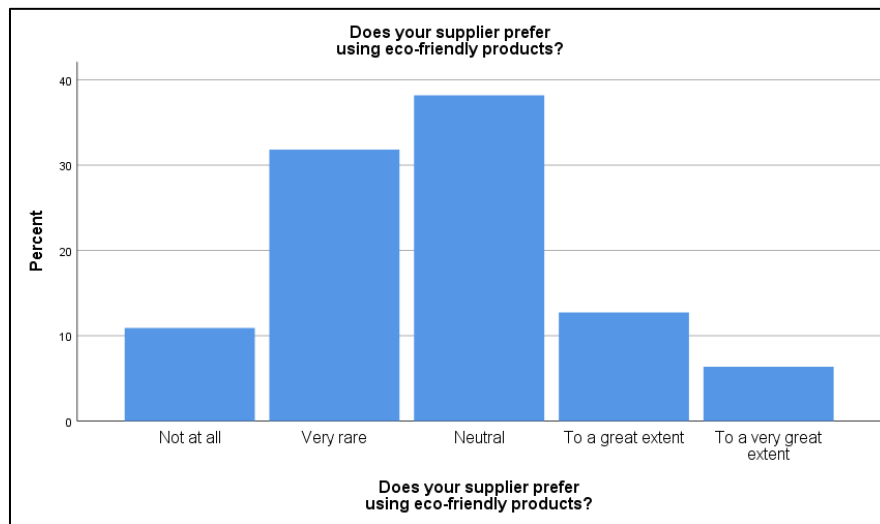
From the above table, it is interpreted that 9.1% of the respondents say that the company very poorly prioritize sourcing materials from sustainable suppliers, 12.7% of the respondents say that the company very rarely prioritize sourcing materials from sustainable suppliers, 38.2% of the respondents neutrally say that the company prioritize sourcing materials from sustainable suppliers, 23.6% of the respondents agree that the company prioritize sourcing materials from sustainable suppliers and 16.4% of the respondents strongly agree that the company prioritize sourcing materials from sustainable suppliers.

Inference

The majority 38.2% of the respondents neutrally say that the company prioritize sourcing materials from sustainable suppliers.

4.1.11. Table indicating whether the supplier prefer using eco-friendly products

Does your supplier prefer using eco-friendly products?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	12	10.9	10.9	10.9
	Very rare	35	31.8	31.8	42.7
	Neutral	42	38.2	38.2	80.9
	To a great extent	14	12.7	12.7	93.6
	To a very great extent	7	6.4	6.4	100.0
	Total	110	100.0	100.0	



Interpretation

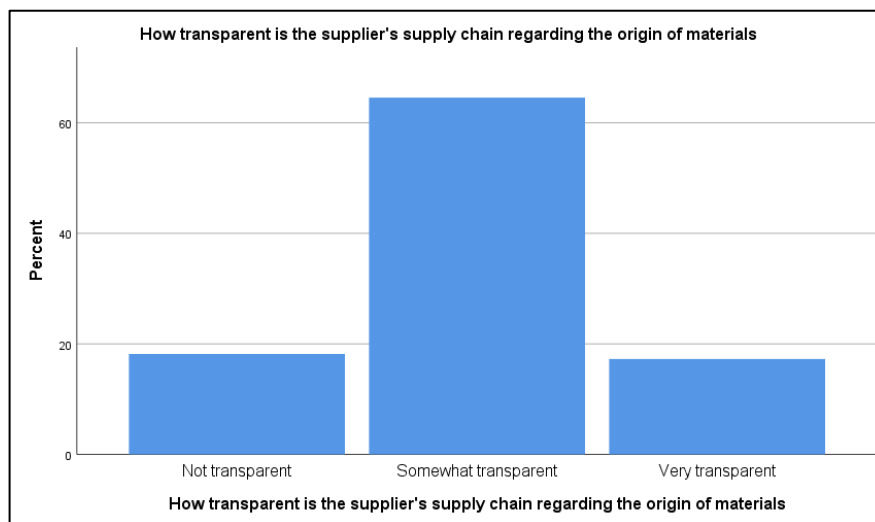
From the above table, it is interpreted that 10.9% of the respondents say that the supplier does not at all uses eco-friendly products, 31.8% of the respondents say that the supplier very rarely prefer using eco-friendly products, 38.2% of the respondents neutrally say that the supplier prefers using eco-friendly products, 12.7% of the respondents say that the supplier often prefers using eco-friendly products and 6.4% of the respondents say that the supplier uses eco-friendly products to a very great extent.

Inference

The majority 38.2% of the respondents neutrally say that the supplier prefer using eco-friendly products.

4.1.12. Table indicating the transparency in the supplier's supply chain regarding the origin of materials

How transparent is the supplier's supply chain regarding the origin of materials					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not transparent	20	18.2	18.2	18.2
	Somewhat transparent	71	64.5	64.5	82.7
	Very transparent	19	17.3	17.3	100.0
	Total	110	100.0	100.0	



Interpretation

From the above table, it is interpreted that 64.5% of the respondents say that the supplier is somewhat transparent regarding the origin of materials, 18.2% of the respondents say that the supplier is not transparent regarding the origin of materials and 17.3% of the respondents say that the supplier is very transparent regarding the origin of materials.

Inference

The majority 64.5% of the respondents say that the supplier is somewhat transparent regarding the origin of materials.

4.1.13. Table indicating the type of sustainable products the supplier can use according to the respondents

What type of sustainable products can the supplier use?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Jute Gunny bag	59	53.6	53.6	53.6
	Cloth Sack	32	29.1	29.1	82.7
	Jute plastic Gunny bags	6	5.5	5.5	88.2
	Recycled plastic bags	13	11.8	11.8	100.0
	Total	110	100.0	100.0	



Interpretation

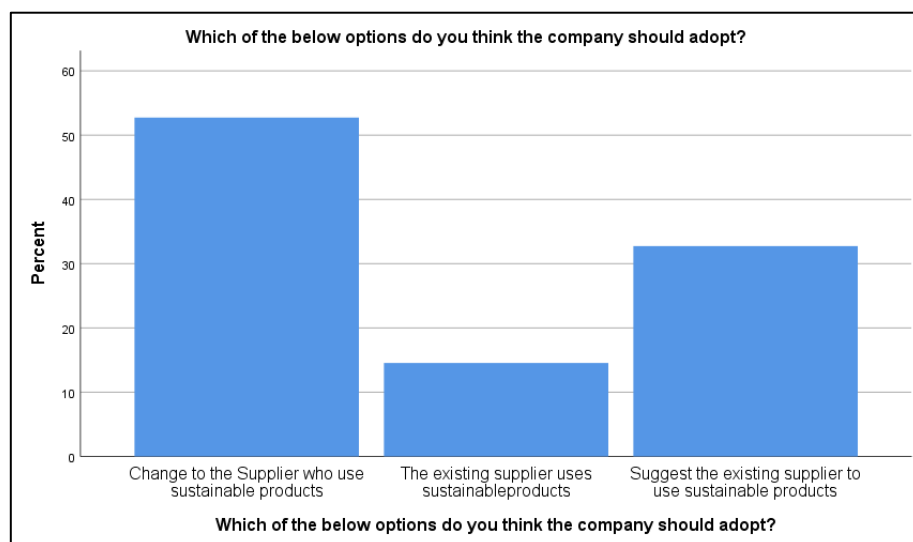
From the above table, it is interpreted that 53.6% of the respondents suggest in use of Jute Gunny bags for the supplier to the company, 29.1% of the respondents suggest to use of cloth sacks for the supplier to the company, 11.8% of the respondents suggest to use Recycled plastic bags for the supplier to the company and 5.5% of the respondents suggest to use Jute plastic gunny bags for the supplier to the company.

Inference

The majority 53.6% of the respondents suggest in use of Jute Gunny bags for the supplier to the company.

4.1.14 Table indicating the opinion of the respondents regarding the supplier

Which of the below options do you think the company should adopt?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Change to the Supplier who use sustainable products	58	52.7	52.7	52.7
	The existing supplier uses sustainable products	16	14.5	14.5	67.3
	Suggest the existing supplier to use sustainable products	36	32.7	32.7	100.0
	Total	110	100.0	100.0	



Interpretation

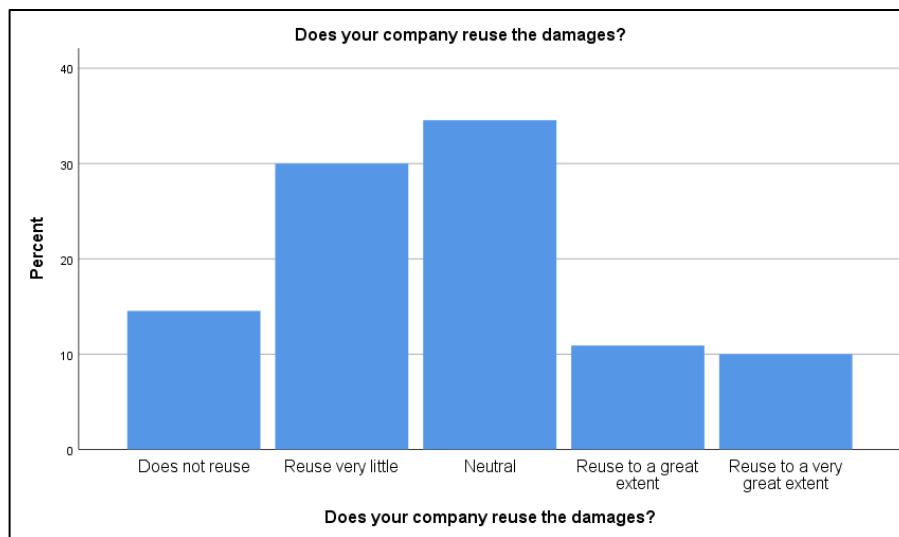
From the above table, it is interpreted that 52.7% of the respondents suggest to Change to the Supplier who uses sustainable products, 32.7% of the respondents Suggest the existing supplier use sustainable products and 14.5% of the respondents suggest the existing supplier uses sustainable products.

Inference

The majority 52.7% of the respondents suggest changing to the Supplier who uses sustainable products.

4.1.15. Table indicating the reuse of damages in the company

Does your company reuse the damages?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Does not reuse	16	14.5	14.5	14.5
	Reuse very little	33	30.0	30.0	44.5
	Neutral	38	34.5	34.5	79.1
	Reuse to a great extent	12	10.9	10.9	90.0
	Reuse to a very great extent	11	10.0	10.0	100.0
	Total	110	100.0	100.0	



Interpretation

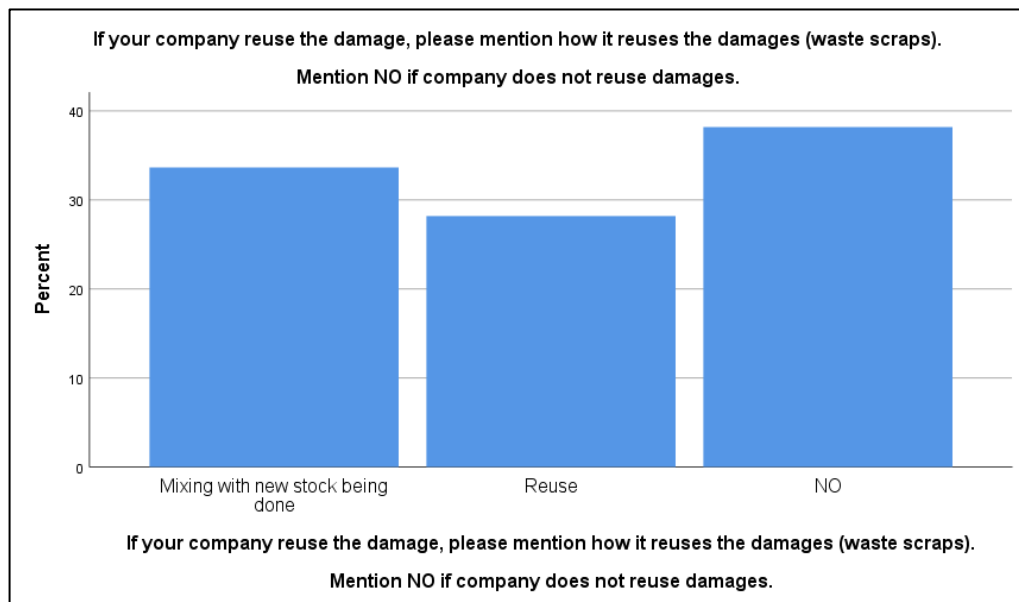
From the above table, it is interpreted that 14.5% of the respondents say that the company does not reuse the waste scraps, 30% of the respondents say that the company reuses the damages very rarely, 34.5% of the respondents neutrally accept, 10.9% of the respondents say that the company reuses damages often and 10% of the respondents say that the company reuses the damages to a very great extent.

Inference

The majority 34.5% of the respondents neutrally accept the reusing of damages in the company.

4.1.16. Table indicating how the company reuses the damages

If your company reuse the damage, please mention how it reuses the damages (waste scraps).					
Mention NO if company does not reuse damages.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Mixing with new stock being done	37	33.6	33.6	33.6
	Reuse	31	28.2	28.2	61.8
	NO	42	38.2	38.2	100.0
	Total	110	100.0	100.0	



Interpretation

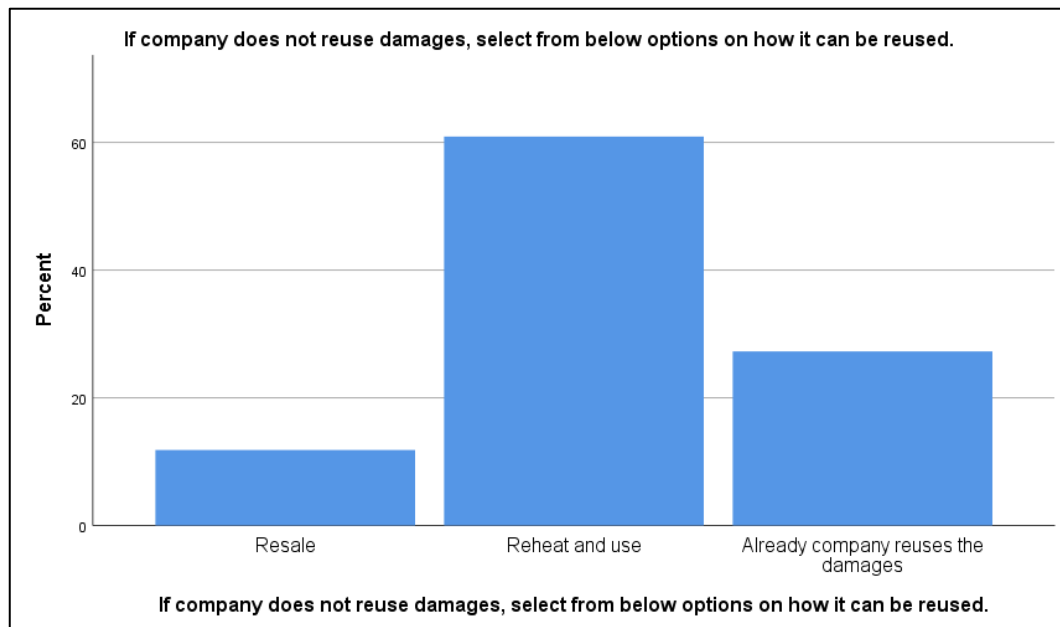
From the above table, it is interpreted that 28.2% of the respondents say that the company reuses the damaged waste scraps, 50% of the respondents say that the company reuses the damaged waste scraps by mixing them with the new stocks made and 21.8% of the respondents say that the company does not reuse the waste scraps.

Inference

The majority 50% of the respondents say that the company reuses the damaged waste scraps by mixing them with the new stocks made.

4.1.17. Table indicating how the damages can be reused according to the respondents

If company does not reuse damages, select from below options on how it can be reused.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Resale	13	11.8	11.8	11.8
	Reheat and use	67	60.9	60.9	72.7
	Already company reuses the damages	30	27.3	27.3	100.0
	Total	110	100.0	100.0	



Interpretation

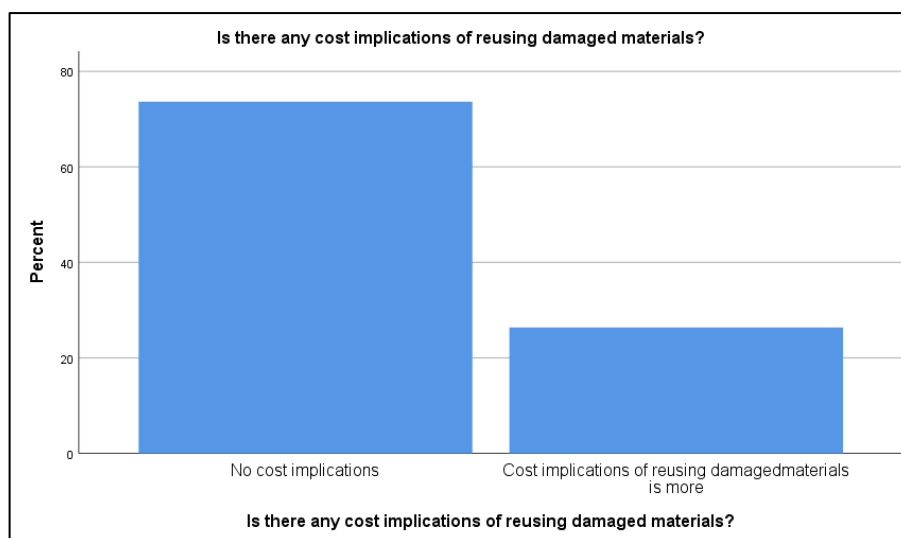
From the above table, it is interpreted that 39.1% of the respondents say that the company already reuses the damages, 50.9% of the respondents say that the company can reheat and reuse the damages and 10% of the respondents say that the company can resale the damages.

Inference

The majority 50.9% of the respondents say that the company can reheat and reuse the damages.

4.1.18. Table indicating the cost implications of reusing damaged materials

Is there any cost implications of reusing damaged materials?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No cost implications	81	73.6	73.6	73.6
	Cost implications of reusing damaged materials is more	29	26.4	26.4	100.0
	Total	110	100.0	100.0	



Interpretation

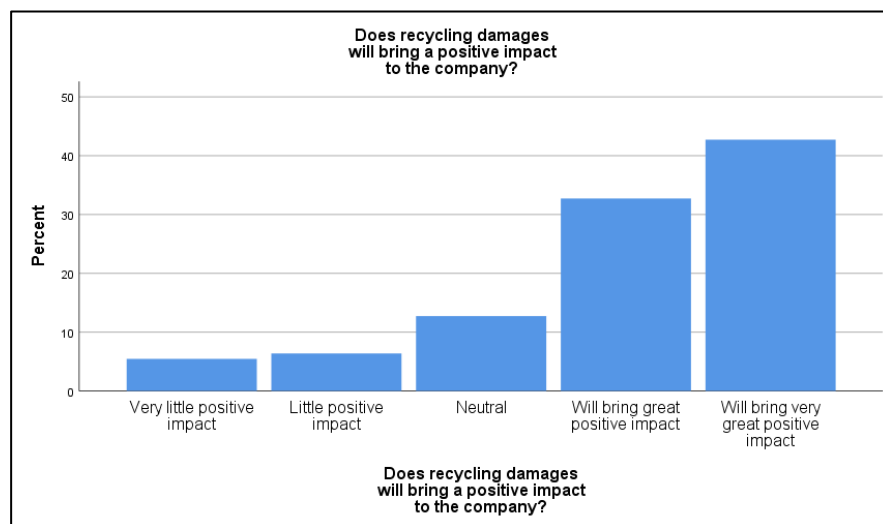
From the above table it is interpreted that 73.6% of respondents say that there are no cost implications in reusing damaged materials and 26.4% of respondents say that there are cost implications in reusing damaged materials.

Inference

The majority 73.6% of respondents say that there are no cost implications in reusing damaged materials

4.1.19. Table indicating whether recycling will bring a positive impact on the company

Does recycling damages will bring a positive impact to the company?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very little positive impact	11	10.0	10.0	10.0
	Little positive impact	5	4.5	4.5	14.5
	Neutral	29	26.4	26.4	40.9
	Will bring great positive impact	31	28.2	28.2	69.1
	Will bring very great positive impact	34	30.9	30.9	100.0
	Total	110	100.0	100.0	



Interpretation

From the above table, it is interpreted that 10% of the respondents say recycling damages will bring very little impact to the company, 4.5% of the respondents say that recycling damages will bring little impact to the company, 26.4% of the respondents neutrally accept that recycling damages will bring a very little impact to the company, 28.2% of the respondents say recycling damages will bring a great impact to the company and 30.9% of the respondents say recycling damages will bring a very great impact to the company.

Inference

The majority 30.9% of the respondents say recycling damages will have a very great impact to the company.

HYPOTHESIS I

RELATIONSHIP BETWEEN THE GENDER OF THE RESPONDENTS AND THEIR OPINION THAT OPTIMIZED ENERGY CONSUMPTION POSITIVELY IMPACTS THE COMPANY

Ho: There is no relationship between the gender of the respondents and their opinion that Optimized energy consumption positively impacts the company.

H1: There is a relationship between the gender of the respondents and their opinion that Optimized energy consumption positively impacts the company.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.591 ^a	4	.810
Likelihood Ratio	1.601	4	.809
Linear-by-Linear Association	.125	1	.724
N of Valid Cases	110		
a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is 1.53.			

Interference:

The p-value, .810 is greater than the standard alpha value of .05, so the null hypothesis is accepted, and alternate hypothesis H1 is rejected.

Inference:

There is no relationship between the gender of the respondents and their opinion that Optimized energy consumption positively impacts the company.

HYPOTHESIS II

RELATIONSHIP BETWEEN THE AGE OF THE RESPONDENTS AND THEIR OPINION REGARDING WHAT THE COMPANY SHOULD ADOPT REGARDING THE SUPPLIER

H0: There is no relationship between the age of the respondents and their opinion regarding what the company should adopt regarding the supplier.

H1: There is a relationship between the age of the respondents and their opinion regarding what the company should adopt regarding the supplier.

Correlations			
		Age	Which of the below options do you think the company should adopt?
Age	Pearson Correlation	1	.103
	Sig. (2-tailed)		.286
	N	110	110
Which of the below options do you think the company should adopt?	Pearson Correlation	.103	1
	Sig. (2-tailed)	.286	
	N	110	110

Interpretation:

The p-value is 0.286 which is greater than the significance value (0.05) hence null hypothesis (H0) is accepted.

Inference

Therefore, there is no relationship between the age of the respondents and their opinion regarding what the company should adopt regarding the supplier.

HYPOTHESIS III

ASSOCIATION BETWEEN REUSING THE DAMAGES AND ITS POSITIVE IMPACT ON THE COMPANY.

Ho: There is no association between reusing the damages and its positive impact on the company.

H1: There is an association between reusing the damages and its positive impact on the company.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	26.705 ^a	16	.045
Likelihood Ratio	27.086	16	.041
Linear-by-Linear Association	.841	1	.359
N of Valid Cases	110		
a. 19 cells (76.0%) have expected count less than 5. The minimum expected count is .50.			

Interference:

The p-value, .045 is less than the standard alpha value .05, so the null hypothesis is rejected, and alternate hypothesis H1 is accepted.

Inference:

There is a statistically significant association between reusing the damages and its positive impact on the company. This means that reusing damages is likely to have a positive effect on the company.

CHAPTER 5

FINDINGS, SUGGESTIONS AND CONCLUSION

5.1 FINDINGS OF THE STUDY

- About 20% of the respondents belong to the age group 18-24, 20% of the respondents belong to the age group 25-34, 27.3% of the respondents belong to the age group 35-44, 15.5% of the respondents belong to the age group Above 55.
- About 61.8% of the respondents are Male and 38.2% of the respondents are female.
- About 46.4% of the respondents hold an educational qualification of UG Degree, 15.5% of the respondents hold an educational qualification of PG Degree, 3.6% of the respondents old an educational qualification of Higher than PG, 19.1% of the respondents hold an educational qualification of Higher Secondary, 15.5% of the respondents hold an educational qualification of Diploma.
- About 20.9% of the respondents belong to the Quality department, 18.2% of the respondents belong to the Packing department, 10.9% of the respondents belong to the Sales department, 41.8% of the respondents belong to the Production department, 0.9% of the respondents belong to HR department and 6.4% of the respondents belong to Accounting department.
- About 2.7% of the respondents say that the company does not at all practice optimized energy consumption, 31.8% of the respondents say that the company very rarely practices optimized energy consumption, 44.5% of the respondents neutrally say that the company practice optimized energy consumption, 15.5% of the respondents say that the company practice optimized energy consumption to a great extent and 5.5% of the respondents say that the company practice optimized energy consumption to a very great extent.
- About 78.2% of the respondents say that the company uses Steam from boilers as the primary source of energy in their manufacturing process, 13.6% of the respondents say that the company uses Electricity as the primary source of energy in their manufacturing process, 5.5% of the respondents say that the company uses Renewable energy as the primary source of

energy in their manufacturing process, 2.7% of the respondents say that the company uses Natural Gas as the primary source of energy in their manufacturing process.

- About 10.9% of the respondents say that they are not encouraged or trained to adopt energy-saving behaviours and practices, 31.8% of the respondents say that they are encouraged or trained very rarely to adopt energy-saving behaviours and practices, 34.5% of the respondents neutrally agree that they are either encouraged or trained to adopt energy-saving behaviors and practices, 16.4% of the respondents say that they are encouraged or trained well to adopt energy-saving behaviours and practices, 6.4% of the respondents say that they are encouraged or trained very well to adopt energy-saving behaviours and practices.
- About 7.3% of the respondents say that the company can implement optimized energy consumption through light efficiency, 15.5% of the respondents say that the company can implement optimized energy consumption through Employee training and engagement, 40.9% of the respondents say that the company can implement optimized energy consumption through Renewable energy sources and 36.4% of the respondents say that the company can implement optimized energy consumption through Upgrade equipment and machinery.
- About 3.6% of the employees say that the practice of optimised energy consumption will bring no positive impact to the company, 11.8% of the employees say that the practice of optimised energy consumption will bring little positive impact to the company, 19.1% of the employees neutrally say that the practice of optimised energy consumption will bring no positive impact to the company, 26.4% of the employees say that the practice of optimised energy consumption will bring great positive impact to the company, 39.1% of the employees say that the practice of optimised energy consumption will bring very great positive impact to the company.
- About 9.1% of the respondents say that the company very poorly prioritize sourcing materials from sustainable suppliers, 12.7% of the respondents say that the company very rarely prioritize sourcing materials from sustainable suppliers, 38.2% of the respondents neutrally say that the company prioritize sourcing materials from sustainable suppliers, 23.6% of the respondents agree that the company prioritize sourcing materials from sustainable

suppliers and 16.4% of the respondents strongly agree that the company prioritize sourcing materials from sustainable suppliers.

- About 10.9% of the respondents say that the supplier does not at all uses eco-friendly products, 31.8% of the respondents say that the supplier very rarely prefer using eco-friendly products, 38.2% of the respondents neutrally say that the supplier prefers using eco-friendly products, 12.7% of the respondents say that the supplier often prefers using eco-friendly products and 6.4% of the respondents say that the supplier uses eco-friendly products to a very great extent.
- About 64.5% of the respondents say that the supplier is somewhat transparent regarding the origin of materials, 18.2% of the respondents say that the supplier is not transparent regarding the origin of materials and 17.3% of the respondents say that the supplier is very transparent regarding the origin of materials.
- About 53.6% of the respondents suggest in use of Jute Gunny bags for the supplier to the company, 29.1% of the respondents suggest to use of cloth sacks for the supplier to the company, 11.8% of the respondents suggest to use Recycled plastic bags for the supplier to the company and 5.5% of the respondents suggest to use Jute plastic gunny bags for the supplier to the company.
- About 52.7% of the respondents suggest to Change to the Supplier who uses sustainable products, 32.7% of the respondents Suggest the existing supplier use sustainable products and 14.5% of the respondents suggest the existing supplier uses sustainable products.
- From the above table, it is interpreted that 14.5% of the respondents say that the company does not reuse the waste scraps, 30% of the respondents say that the company reuses the damages very rarely, 34.5% of the respondents neutrally accept, 10.9% of the respondents say that the company reuses damages often and 10% of the respondents say that the company reuses the damages to a very great extent.
- About 28.2% of the respondents say that the company reuses the damaged waste scraps, 50% of the respondents say that the company reuses the damaged waste scraps by mixing them with the new stocks made and 21.8% of the respondents say that the company does not reuse the waste scraps.

- About 39.1% of the respondents say that the company already reuses the damages, 50.9% of the respondents say that the company can reheat and reuse the damages and 10% of the respondents say that the company can resale the damages.
- From the above table it is interpreted that 73.6% of respondents say that there are no cost implications in reusing damaged materials and 26.4% of respondents say that there are cost implications in reusing damaged materials.
- From the above table, it is interpreted that 10% of the respondents say recycling damages will bring very little impact to the company, 4.5% of the respondents say that recycling damages will bring little impact to the company, 26.4% of the respondents neutrally accept that recycling damages will bring a very little impact to the company, 28.2% of the respondents say recycling damages will bring a great impact to the company and 30.9% of the respondents say recycling damages will bring a very great impact to the company.

5.2 SUGGESTIONS

- Recognise the respondents' diverse educational backgrounds. Encourage those who have completed higher secondary levels to continue their education and training, since this can contribute to a more skilled and educated workforce.
- Encourage and train personnel to adopt energy-saving behaviours and practices, as well as to reuse damaged merchandise by reusing and mixing it with new merchandise, which will benefit the organization.
- Recognise the respondents' good impression of sustainable manufacturing practices. Use this as a chance to promote and apply these practices inside your organization, as they have been shown to be effective in decreasing waste, pollution, and resource consumption.
- The company should continue to reuse damages whenever possible. The company should track the impact of reusing damages to see if it continues to have a positive effect on the company.
- Prioritise purchasing goods from sustainable suppliers who package raw materials in environmentally friendly products like Jute Gunny bags.

- Investigate the potential to improve product design to facilitate material recycling. Consider using computerized procurement techniques to streamline operations and decrease waste.
- Investigate the use of renewable energy sources to reduce energy consumption in the company.
- Maintain the company's commitment to sustainability by ensuring that product designs continuously exceed environmental legislation and safety standards.

5.3 CONCLUSION

- This study provides a valuable 5-point assessment measure to assist practitioners in examining several areas of their sustainable manufacturing processes. While sustainable manufacturing is a new environmental concern for the business, this empirical study focuses on the company's application of sustainable manufacturing practises. The study's primary purpose is to explore essential performance metrics for long-term supplier selection, analyse whether reusing damages will benefit the company, and investigate Optimised energy usage using chi-square analysis and correlation.
- Reusing the damages and its beneficial effects on the company are statistically significantly correlated. This indicates that the corporation will probably benefit from reusing damages.
- According to the conclusions of this study, everyone believes that optimized energy use is helpful to businesses. This is significant for the adoption of energy efficiency solutions since it means fewer barriers to overcome.
- In conclusion, this study not only introduces a practical measurement scale for sustainable manufacturing evaluation, but also sheds light on the priorities and preferences of the Kanti Chiran Corporation Private Limited Company when it comes to optimizing energy consumption, sustainable supplier selection, and reusing the damages. It emphasizes the importance of eco-friendly products and environmentally conscious suppliers, all of which contribute to the company's wider embrace of sustainable manufacturing practices.

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QUESTIONNAIRE

Demographic profile

1. **Name:**
2. **Age:**
 - ☐ Under 18
 - ☐ 18-24
 - ☐ 25-34
 - ☐ 35-44
 - ☐ 45-54 Above 55
3. **Which gender do you identify most with?**
 - ☐ Male
 - ☐ Female
4. **Educational qualification:**
 - ☐ UG Degree
 - ☐ PG Degree
 - ☐ Higher than PG
 - ☐ Higher Secondary
 - ☐ Diploma
5. **Under which department do you work?** _____
6. **Does the company practice Optimized Energy Consumption?**
Not at all ☐ ☐ ☐ ☐ ☐ To a very great Extent
7. **What sources of energy are primarily used in your manufacturing process?**
 - ☐ Steam from boilers
 - ☐ Electricity
 - ☐ Renewable Energy
 - ☐ Natural Gas
8. **Are you encouraged or trained to adopt energy-saving behaviours and practices?**
Not encouraged or trained ☐ ☐ ☐ ☐ ☐ Encouraged or trained very well
9. **How can we implement energy consumption in KCC according to you?**
 - ☐ Lighting Efficiency
 - ☐ Employee Training and Engagement
 - ☐ Renewable Energy Sources
 - ☐ Upgrade Equipment and Machinery
10. **Do you think the practice of optimized energy consumption will positively impact the company?**
No positive impact ☐ ☐ ☐ ☐ ☐ Very great positive impact

11. Does your company prioritize sourcing materials from sustainable suppliers?
Very Poorly ☐ ☐ ☐ ☐ ☐ Strongly Agree
12. Does your supplier prefer using eco-friendly products?
Not at all ☐ ☐ ☐ ☐ ☐ To a very great Extent
13. How transparent is the supplier's supply chain regarding the origin of materials?
☐ Not transparent
☐ Somewhat transparent
☐ Very transparent
14. What type of sustainable products can the supplier use?
☐ Jute Gunny bag
☐ Cloth Sack
☐ Jute plastic Gunny bags
☐ Recycled plastic bags
15. Which of the below options do you think the company should adopt regarding the supplier?
☐ Change to the Supplier who use sustainable products
☐ The existing supplier uses sustainable products
☐ Suggest the existing supplier to use sustainable products
16. Does your company reuse the damages?
Does not reuse ☐ ☐ ☐ ☐ ☐ Reuse to a very great extent
17. If your company reuses the damage, please mention how it reuses the damages (waste scraps). Mention NO if the company does not reuse damages.
-
18. If the company does not reuse damages, select from the options below on how it can be reused.
☐ Resale
☐ Reheat and use
☐ Repurposing
☐ Already company reuses the damages
19. Do you think is there any cost implications of reusing damaged materials?
☐ No cost implications
☐ Cost implications of reusing damaged materials is more
20. Will recycling damages have a positive impact on the company?
☐ Very little positive impact
☐ Little positive impact
☐ Neutral
☐ Will bring great positive impact
☐ Will bring very great positive impact