

# FOSTERING THE ENERGY AND ENVIRONMENT THROUGH DECARBONISATION BY AGRO RESIDUE (WASTE)



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## **Abstract:**

*The world demand for paper is expected to grow by years. Due to this increase of demand, the growing concern over the environmental effect of paper mills is expected to increase, as well. Moreover, the increase cost of pulpwood and the constraints of fiber supply in the paper industry have led to the development of competitive alternatives to the wood fiber pulp. One of these alternatives is sugarcane paper, or bagasse paper. Processes of producing paper are similar in all types of fiber raw materials. The differences, if existent, only arise due to the availability of different process options for each section of the paper mills. This paper investigates the environmental effects caused by producing pulp from wood, or sugar cane and compares the effects of both in order to provide the more environmentally cleaner option.*

*The pulp and paper industry is among the top five most energy-intensive industries globally and is the fourth largest industrial energy user. This industry accounts for approximately 6% of global industrial energy use and 2% of direct industrial CO<sub>2</sub> emissions. The pulp and paper industry is also the largest user of original or virgin wood, with deleterious impacts on both human health and local flora and fauna, including aquatic ecosystems. This critical and systematic review seeks to identify alternatives for mitigating the climate impacts of pulp and paper processes and products, thus making the pulp and paper industry more environmentally sustainable.*

**Key words:** Energy, Environment, sustainability, carbon emission, energy conservation, Bagasse, Rice husk, Pith.

## **Introduction to Bagasse Pulping**

Bagasse pulping is a sustainable and efficient process that involves the transformation of sugarcane waste (bagasse) into pulp, which is used to manufacture a wide range of paper and packaging products. This process plays a significant role in reducing environmental impact by utilizing waste material and minimizing reliance on traditional wood-based pulping. The innovation and technological advancements in bagasse pulping have led to a substantial decrease in the industry's carbon footprint.

## **Overview of the Bagasse Pulping Process**

The bagasse pulping process involves several key stages, including extraction, preparation, and refinement. Initially, sugarcane bagasse is collected and transported to the pulping facility, where it undergoes rigorous

cleaning and depithing to remove impurities. Following this, the prepared bagasse is pulped using state-of-the-art equipment and chemical treatments, resulting in high-quality pulp ready for further processing.

### **Extraction**

The extraction phase involves the careful removal of bagasse from sugarcane after the sugar extraction process. This raw material is then transported to the pulping facility for further processing.

### **Preparation**

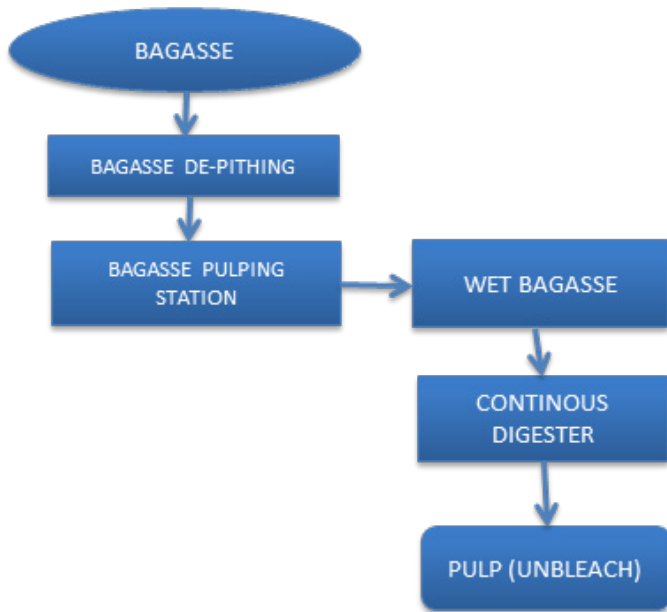
During the preparation phase, the bagasse undergoes thorough cleaning and de-pithing to ensure that it is free from impurities and contaminants.

### **Refinement**

Refinement involves the actual pulping of the

bagasse, which is achieved through the use of specialized equipment and chemical treatments to produce high-quality pulp.

**BAGASSE PULPING FLOW CHART**



**Benefits and Advantages of Bagasse Pulping**

Bagasse pulping offers numerous benefits and advantages, making it a preferred choice in the paper and packaging industry. The utilization of bagasse as a raw material presents environmental, economic, and operational advantages that contribute to sustainable production practices. Furthermore, the resulting pulp exhibits excellent quality, making it suitable for a wide array of applications.

**Sustainable Material**

Bagasse as a raw material supports sustainable practices and minimizes the environmental impact of pulp-paper and packaging production.

Bagasse is a fibrous residue left after the sugarcane is crushed for extraction of its juice. It contains about 48-50% moisture, 65-68% fiber and 2-4% sugar, and other minor constituents.

This is known as mill wet bagasse. Bagasse is used as a bio-fuel mainly because of its fiber content which in turn contains 45-55% cellulose, 20-25% hemicelluloses, 28% pentosans, 20% lignin (natural glue), 5% sugar, and 2% other minerals.

The cellulose content of bagasse makes it viable as a fibrous raw material in the paper industry.

**Operational Efficiency**

Bagasse pulping processes are highly efficient, resulting in high-quality pulp suitable for various applications.

**Economic Benefits**

The utilization of bagasse offers economic advantages by reducing the reliance on traditional wood-based pulping.

**Case Study Methodology and Data Collection**

The case study methodology involves a comprehensive analysis of bagasse pulping practices in a real-world industrial setting. Through

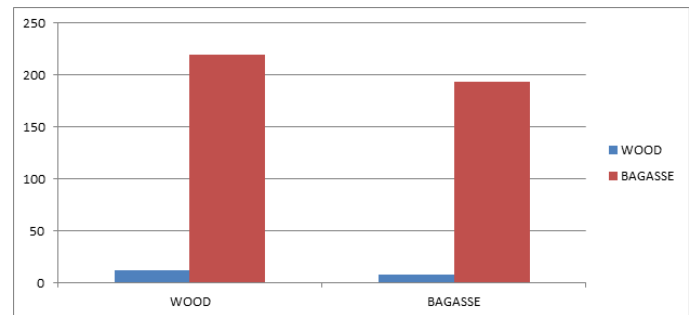
meticulous data collection and in-depth observations, key insights into the efficiency, viability, and environmental impact of bagasse pulping will be obtained. Various parameters such as energy consumption, waste management, and product quality will be critically assessed.

**Data Collection**

Detailed collection of data relating to various aspects of bagasse pulping, including production output, energy consumption, and waste generation.

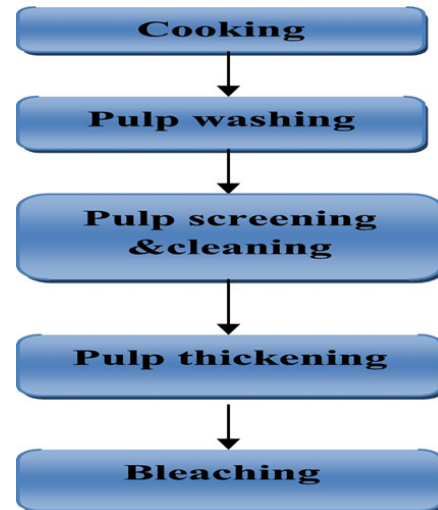
**WOOD VS BAGASSE RAW MATERIAL**

RAW MATERIALS	REQUIRED RAW MATERAIL PER TON	TREE CUTTING
WOOD	2.3	17
BAGASSE	6.8	0



**Observations**

Close observation of the bagasse pulping process and its associated stages to identify operational efficiencies and environmental impact.

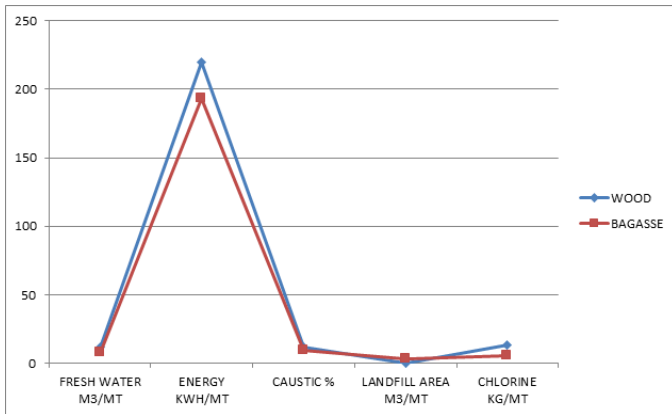


**Analysis**

Meticulous analysis of the collected data to derive meaningful insights into the sustainability and viability of bagasse pulping.

**PARAMETERS ANALYSIS OF WOOD VS BAGASSE PULPING**

VARIABLES	WOOD	BAGASSE
FRESH WATER M3/MT	12	7.85
ENERGY KWH/MT	220	193
CAUSTIC %	12	9.06
LANDFILL AREA M3/MT	0	3.3
CHLORINE KG/MT	13	5.5



**Findings and Results of the Case Study**

The analysis of the collected data has revealed impactful findings and results regarding the efficiency, environmental sustainability, and economic benefits of bagasse pulping. These outcomes will provide significant insights into the best practices and potential enhancements in bagasse pulping processes. The findings will be presented through detailed reports and comprehensive documentation.

**Operational Efficiency**

The case study identified key areas where operational efficiency can be optimized to enhance productivity and cost-effectiveness.

**Environmental Impact**

Insights into the environmental impact of bagasse pulping revealed opportunities for sustainable improvements and waste reduction.

One of the ways to dispose of sugarcane fiber from the sugar making process is to burn it. However, this causes air pollution and increases greenhouse gas emissions. Instead of using sugarcane in an environmentally harmful way, the fibers can be redirected.

Instead, the fibers can be reused and processed into paper. Sugarcane is pulped, bleached without the use of chlorine, and finally made into paper.

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**Economic Viability**

Financial considerations and economic viability played a crucial role in shaping the overall outcomes and recommendations of the case study.

**Saving landfill**

7 Ton of bagasse could create almost 3.3 cubic meter of landfill space, with pulping we could save 3.3 cubic meter of landfill space.

**Conclusion**

In conclusion, the case study provides valuable insights and actionable recommendations for enhancing bagasse pulping practices, promoting sustainable production, and fostering environmental responsibility. The recommendations focus on optimization strategies, innovative technologies, and best practices. Additionally, suggestions for further research and development in the field of bagasse pulping will be discussed to propel the industry towards a more sustainable and efficient future.

One of the conclusions of the study is that energy and water consumption, Chlorine and raw materials used, and Greenhouse Gases emitted are less for sugarcane paper than in virgin wood paper. In other words, producing paper from bagasse can save trees, water, of gasoline, air pollutants, chemicals and 3.3 cubic meter of landfill space.

*Reference-Google, pulp-paper.com, Pakka limited, researchgate*



**For every tree harvested,  
another is planted**