ISSN: 2278-4632
Vol-15, Issue-02, No.02, February: 2025

TO STUDY THE FACTORS LEADS TO WASTAGE IN POTATO CHIPS, AT ITC LIMITED

Dr. Nirmesh Sharma, Professor & Head,Dept. Of Business Administration Quantum University, Roorkee
Anant Kumar, Student, Masters of Business Administration Quantum University, Roorkee
Rohit Kumar, Student, Masters of Business Administration Quantum University, Roorkee

ABSTRACT: Waste creation at several phases of the manufacturing process is a major concern for the food processing sector, especially the production of potato chipss. The purpose of the given study is to look into the elements that lead to waste in ITC Limited's potato chips production. This study finds key locations where waste happens by examining procedures including peeling, slicing, cooking, packaging, and other ancillary tasks. The study also looks at how waste creation is affected by handling procedures, raw material quality, operational inefficiencies, and equipment failures. Employee opinions on present waste management procedures, their efficacy, and possible enhancements are gathered using a survey-based method. The study also looks at the ways that garbage is currently used or disposed of, such as recycling, composting, and animal feed. This study supports sustainable practices that can reduce waste and increase resource efficiency in the potato chips manufacturing process by offering practical suggestions for process optimization, improved equipment calibration, and improved training. By lowering waste and encouraging sustainable production practices, the findings seek to assist ITC Limited in attaining both financial and environmental advantages.
Key-words: Waste Management; Sustainability; Recycling; Composting; Process Optimization; Resource Efficiency

INTRODUCTION:

The potato chips industry is one of the most dynamic sectors within the food processing industry, characterized by high consumer demand and stringent quality requirements. However, the production of potato chipss often generates significant waste at various stages of the manufacturing process. This waste not only impacts the operational efficiency and profitability of manufacturers but also poses environmental challenges due to improper disposal practices.

At ITC Limited, a prominent player in the Indian food processing industry, understanding and managing production waste is critical to aligning with its sustainability goals. Waste can arise from various stages of production, including peeling, slicing, frying, and packaging, each of which presents unique challenges. Factors such as raw material quality, equipment efficiency, operator practices, and process settings can exacerbate waste generation. This study aims to delve into the
factors leading to wastage in potato chips production at ITC Limited. It also seeks to evaluate existing waste management practices and identify opportunities for improvement. By addressing these issues, ITC can enhance operational efficiency, reduce environmental impact, and achieve greater sustainability in its production processes. The production of potato chipss is a complex process that transforms raw potatoes into a ready-to-eat snack through various stages such as peeling, slicing, frying, seasoning, and packaging. Each of these stages involves intricate operations that must be precisely controlled to ensure product quality and minimize waste. Despite advancements in automation and quality control systems, waste remains a critical challenge for manufacturers. For a company like ITC Limited, which emphasizes sustainability and operational excellence, addressing this challenge is both a business necessity and a responsibility toward the environment.

Wastage in potato chips production can take many forms, including material loss during peeling, uneven or excess slicing, chips rejected due to quality defects, oil degradation during frying, and damaged

packaging. Factors such as the quality of raw potatoes, variability in equipment calibration, inadequate maintenance, and inconsistent handling practices contribute significantly to these losses. Additionally, unexpected equipment malfunctions or operational inefficiencies can further amplify waste generation.

This study explores these factors in depth, aiming to uncover the root causes of waste in ITC's potato chips production processes. It also evaluates how current waste management measures, such as recycling programs, composting, and waste utilization for animal feed, are implemented and perceived by employees. Furthermore, the study investigates opportunities for improvement through better quality control, enhanced staff training, and process optimization.

This introduction sets the stage for a comprehensive analysis of waste in potato chips production, offering insights that align with ITC's mission to deliver quality products while minimizing environmental impact.

GAP DUE TO WHICH THE CURRENT STUDY WAS DONE:

Previous studies highlight that waste in potato chips production can be attributed to inefficiencies in raw material handling, equipment operations, and quality control processes.

LITERATURE REVIEW:

According to *Muth et al. (2014)*, a significant portion of waste arises during peeling and slicing, where uneven cuts or excess removal of potato skin leads to raw material loss.

Research by Smith et al. (2015) emphasizes the role of equipment calibration and maintenance in minimizing waste. Malfunctioning machinery can lead to uneven slicing, over- or under-frying, and defective packaging, resulting in higher reject rates. Regular maintenance schedules and real-time monitoring systems are recommended to address these issues.

Studies such as those by *Brown and Green (2016)* underscore the importance of staff training and adherence to standard operating procedures (SOPs) in reducing waste.

Inconsistent handling practices, such as improper loading or unloading of potatoes and inadequate monitoring during frying, contribute significantly to waste generation.

Frye et al. (2017) identified oil degradation during frying as another major contributor to waste, affecting product quality and necessitating disposal.

The quality of raw potatoes is a critical determinant of waste levels, as pointed out by *Kumar et al. (2018).* Variability in size, shape, or moisture content of potatoes can lead to inconsistent processing outcomes. Procurement strategies that focus on uniformity in raw material specifications are suggested as a means to mitigate this issue.

The literature also highlights various methods for waste management and utilization. According to *Jones et al. (2020),* potato peel waste can be effectively composted or used as animal feed, providing an eco-friendly disposal option. Advances in waste-to-energy technologies, as discussed by *Lopez et al. (2019*), offer additional avenues for sustainable waste utilization in the potato processing industry.

Recent studies focus on integrating circular economy principles into potato chips production. This involves designing processes that minimize waste at the source, promote recycling, and repurpose by-products. Research by *Chopra et al. (2021)* explores innovations such as enzymatic peeling and advanced frying technologies to enhance resource efficiency.

While significant progress has been made in understanding and addressing waste in potato chips production, gaps remain in areas such as real-time waste monitoring systems and the economic feasibility of advanced waste management technologies. Additionally, limited studies have explored the behavioral aspects of employees and their impact on waste reduction efforts.

OBJECTIVES OF THE STUDY:

i. To analyze the factors leads to waste of potato flesh at ITC Ltd.
ii. To suggest ways to overcome the potato waste during production of chips.

PROJECTS AND TASKS UNDERTAKEN:

Understanding the Production Process and Identifying Waste

The first and the foremost task of the researcher were to get a thorough understanding of the entire production process, from receiving raw potatoes to the final packaging of chips. The researcher observed each stage closely, noting down the amount of waste generated. For instance, during the peeling stage, it was noticed that approximately 10-15% of the potato's weight was lost as peel waste. Similarly, during slicing, there was a significant amount of potato that didn't meet the size requirements and was discarded. It was also observed that during frying, a small percentage of chips were overcooked or burnt, leading to waste.

DATA COLLECTION AND ANALYSIS :

To quantify the waste, the researcher systematically collected data over several production cycles and measured the weight of potatoes before and after each stage to calculate the percentage of waste. For example, if 1000 kg of potatoes were processed and 150 kg of peels were discarded, and further recorded a 15% waste for the peeling stage. It was done for each stage—peeling, slicing, frying, and packaging—over multiple batches to get an average waste percentage.

ANALYZING CAUSES OF WASTE:

After collecting data, the researcher moved on to analyzing the root causes of the waste. The researcher conducted interviews with the production staff and maintenance teams to understand the challenges they faced and discovered that some of the waste was due to variations in the quality of raw potatoes, while other waste resulted from machine inefficiencies or improper handling during processing. For instance, uneven slicing often led to some slices being too thin and getting burnt during frying.

DEVELOPING WASTE REDUCTION STRATEGIES:

Based on findings, the researcher proposed several strategies to reduce waste. For the peeling stage, It was suggested of using a more precise peeler that could reduce the amount of potato flesh removed with the peel, potentially decreasing peel waste by 2-3%. For the slicing stage, the researcher recommended regular maintenance and calibration of the slicing machines to ensure consistent slice thickness, which could reduce slicing waste by 5%. The researcher also suggested implementing strict and stringent quality control measures to ensure that only the best quality potatoes were used, thereby reducing waste from defective potatoes.

EXPLORING UTILIZATION OF WASTE

The researcher explored different ways to utilize the waste effectively. For the peel waste, the researcher suggested collaborating with local farms to use the peels as animal feed, which is a common practice in the industry.

Additionally, the researcher proposed setting up a small composting unit on-site to convert organic waste into compost, which could be used to support ITC's sustainability initiatives in agriculture. The researcher also looked into the possibility of using potato waste to produce biogas, which could help reduce energy costs for the facility.

ISSN: 2278-4632
Vol-15, Issue-02, No.02, February: 2025

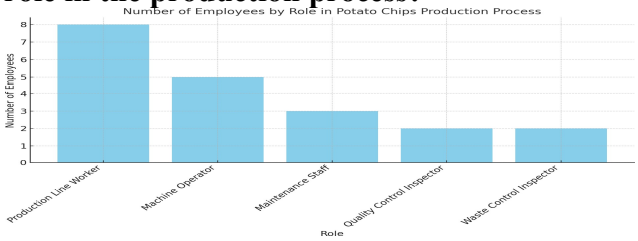
METHODOLOGY OF THE STUDY:

This section outlines the methodological approach taken to study the factors contributing to waste in potato chips production at ITC Limited. The primary focus is to understand the processes and practices that lead to waste generation and identify potential areas for improvement. Primary data collection was essential to gather real-time insights from employees and production processes. The study adopts a **descriptive research design** to investigate and describe the factors leading to wastage. This design is suitable for understanding operational inefficiencies, equipment issues, and waste management practices in the production process.

- **Direct Observation:** I collected data by observing the entire production process firsthand. This included watching how potatoes were peeled, sliced, fried, and packaged, as well as noting the points where waste was generated.
- **Measurements and Records:** I gathered quantitative data by measuring the weight of potatoes before and after each processing stage. This helped in calculating the amount of waste generated at each step.
- **Interviews with Staff:** I conducted informal interviews and discussions with production line workers, machine operators, and maintenance staff. These conversations provided insights into operational challenges, equipment issues, and common sources of waste.
- **Production Logs and Records:** I reviewed ITC's internal production logs and waste records, which provided detailed information on production volumes, waste generated, and any recorded inefficiencies or malfunctions.

DATA ANALYSIS AND INTERPRETATION:

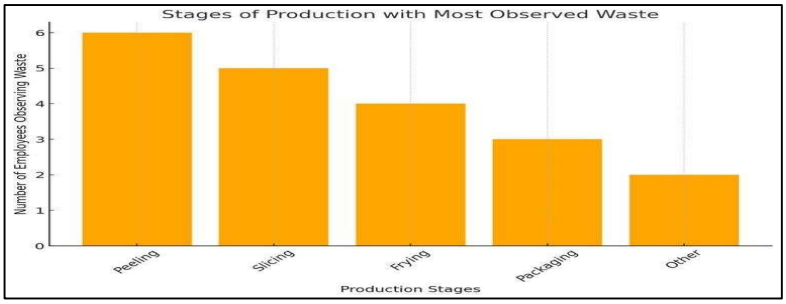
What is your role in the production process?



Interpretation

The bar chart shows that most employees (8 out of 20) work as Production Line Workers, indicating a strong focus on direct production tasks. Machine Operators make up the second largest group (5 employees), reflecting the importance of machine handling. Maintenance Staff (3 employees) are fewer, suggesting that equipment upkeep is necessary but less prioritized. Quality Control Inspectors and Waste Control Inspectors each have 2 employees, highlighting that these specialized roles are important but have fewer resources compared to production.

At which stage of the production process do you observe the most occurrence of the wastage?

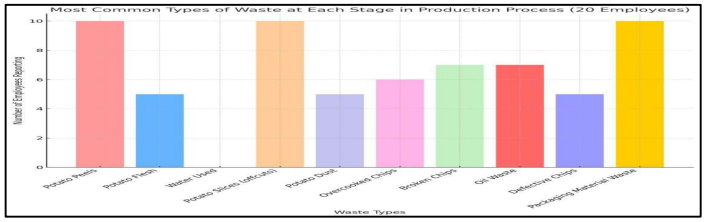


ISSN: 2278-4632
Vol-15, Issue-02, No.02, February: 2025

Interpretation

The majority of waste is observed during the Peeling stage (30%), followed by Slicing (25%) and Frying (20%). Packaging contributes less (15%), while the "Other" category is the least significant (10%). This indicates that the earlier stages of production are more prone to waste.

What type of waste is most commonly generated at each stage?



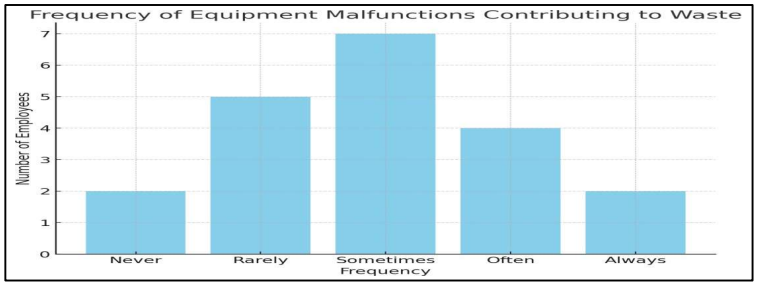
Interpretation

Peeling: The most common waste generated is Potato Peels, reported by 10 employees. Slicing: Potato Slices (offcuts) are the most frequent waste, also reported by 10 employees.

Frying: The waste is somewhat split, with Overcooked Chipss reported by 6 employees, Broken Chipss by 7, and Oil Waste by 7.

Packaging: The most significant waste comes from Packaging Material Waste, reported by 10 employees**.**

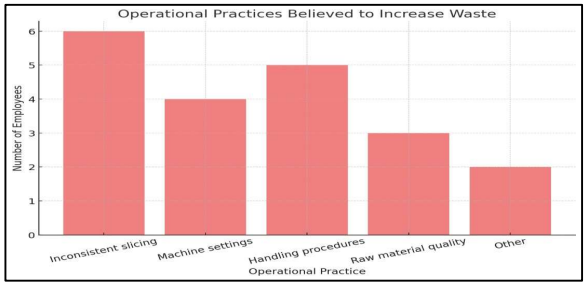
How frequently do you notice equipment malfunctions that contribute to waste?



Interpretation

The majority of employees (7 out of 20) reported that equipment malfunctions "Sometimes" contribute to waste. 5 employees mentioned that it "Rarely" happens. 4 employees observed that it occurs "Often." A smaller group, 2 employees each, indicated that malfunctions "Never" or "Always" contribute to waste. This suggests that equipment malfunctions are a recurring issue, with a notable impact on waste, though not consistently frequent across all employees. It may indicate that there are periods or specific conditions under which the equipment is more prone to malfunction.

Is there any specific operational practices that you believe increase waste?

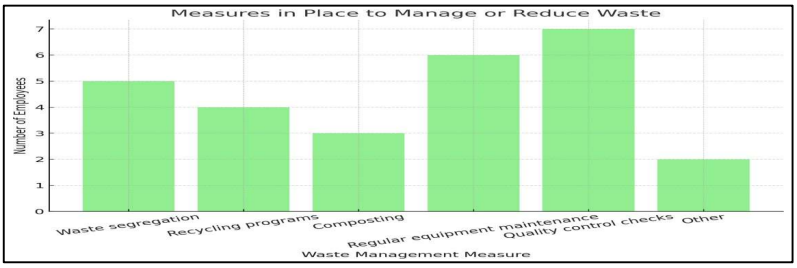


ISSN: 2278-4632
Vol-15, Issue-02, No.02, February: 2025

Interpretation

The survey results indicate that inconsistent slicing is the most significant operational practice contributing to waste, as identified by the majority of employees. This suggests that variations in slicing may lead to uneven cooking, resulting in more discarded chipss. Handling procedures also contribute notably to waste, likely due to inefficiencies or mistakes during the manual aspects of production. Issues related to machine settings and raw material quality are also of concern, though they appear to have a slightly lesser impact. A small number of employees identified other factors, hinting that there may be additional, less common practices that also lead to waste. Overall, improving slicing consistency and refining handling procedures could be key areas to target for reducing waste in the production process.

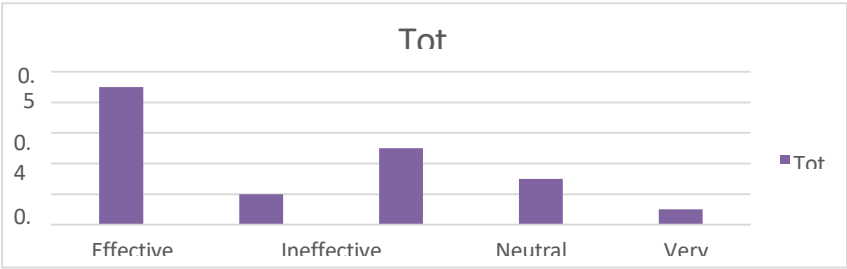
What measures are currently in place to manage or reduce waste?:



Interpretation

The survey results indicate that quality control checks are the most commonly implemented measure tomanage or reduce waste, as identified by 7 employees. This suggests a strong focus on ensuring that products meet specific standards to minimize waste. Regular equipment maintenance is also a significant measure, highlighted by 6 employees, which helps prevent malfunctions that could lead to waste.

How effective do you think these waste management measures are?



Interpretation

The survey results show that out of 20 employees, 12 (60%) consider the waste management measures to be effective, with 3 employees (15%) rating them as "Very Effective" and 9 employees (45%) as "Effective." Five employees (25%) feel neutral, suggesting a mixed perception of the measures' success. Meanwhile, 3 employees (15%) view the measures as inadequate, with 2 (10%) considering them "Ineffective" and 1 (5%) "Very Ineffective." While the majority of employees are satisfied with the current strategies, the neutral and negative feedback suggests that there may be areas where improvements are needed to enhance overall effectiveness.

What additional measures do you think could help reduce waste?

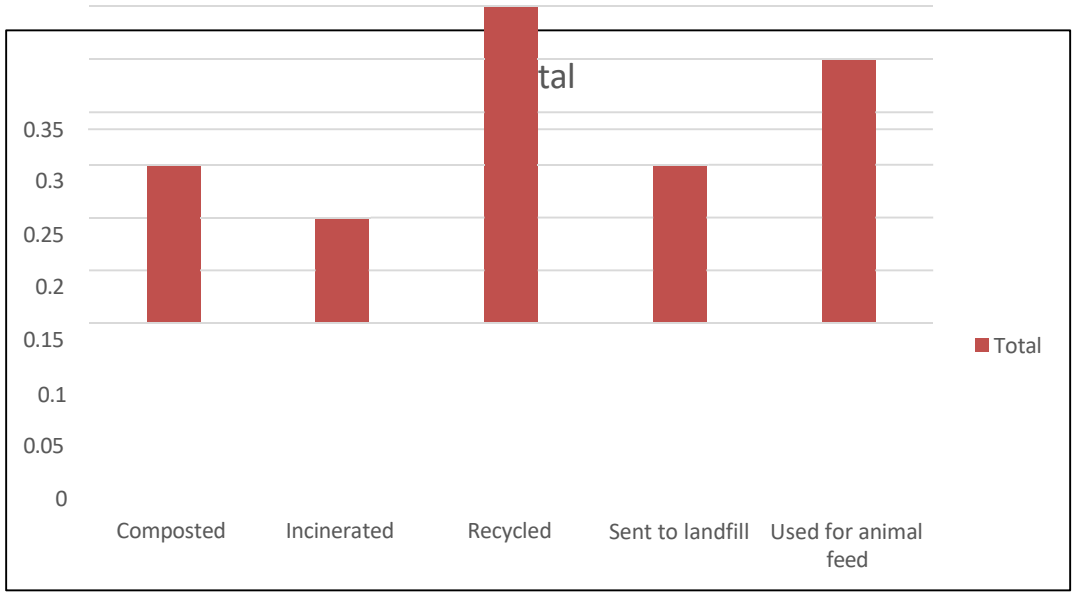
ISSN: 2278-4632
Vol-15, Issue-02, No.02, February: 2025

Interpretation

The survey data indicates that employees see multiple opportunities to reduce waste in the potato chips production process. The most commonly suggested measure is "Improved equipment calibration," with 25% of employees advocating for it, highlighting a belief that better-tuned machinery could significantly reduce waste. "Enhanced training for staff" and "Process optimization" each garnered support from 20% of employees, suggesting that both better training and more efficient processes are seen as critical areas for improvement.

Additionally, 15% of employees believe that "Better quality control at raw material intake" and "Increased use of waste reduction technologies" could help minimize waste.

1. How is the waste currently utilized or disposed of in the organization?

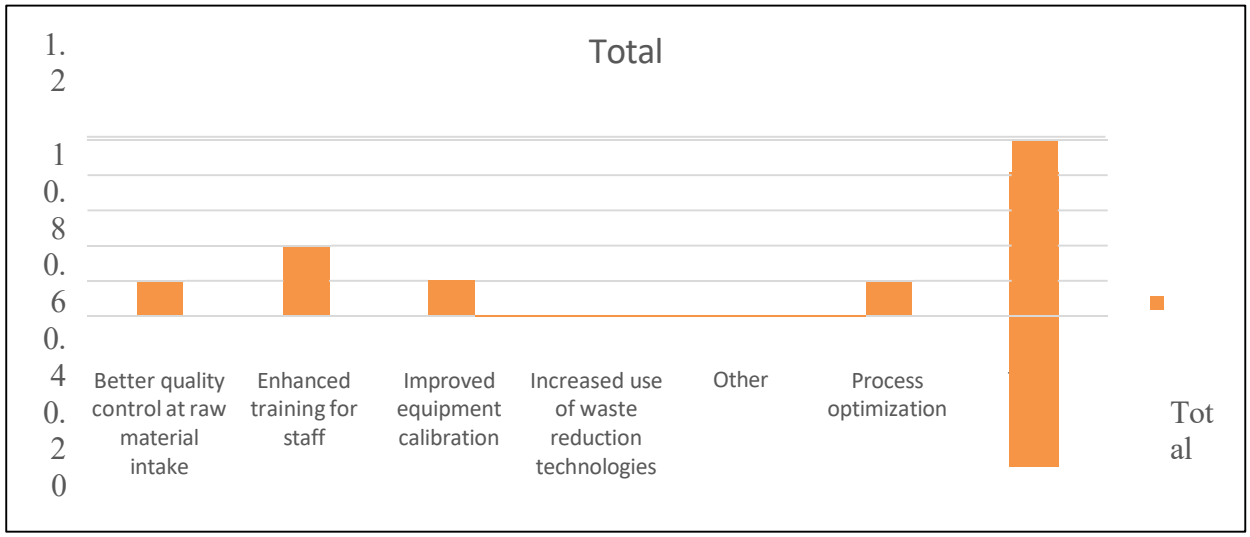


Interpretation

The survey data reveals that the majority of employees (30%) view recycling as the primary method for disposing of waste in the potato chips production process. This is followed by using waste for animal feed, as indicated by 25% of the respondents. Composting is utilized by 15% of employees, reflecting a commitment to organic waste management. Incineration and land filling each account for 10% and 15% of the disposal methods, respectively, indicating that a smaller portion of waste is either incinerated or sent to landfills. Lastly, a small percentage (5%) of employees reported using an alternative method for waste disposal. Overall, the data suggests a strong emphasis on recycling and repurposing waste, while highlighting areas where more sustainable practices might be explored.

Do you have any additional comments or suggestions regarding waste management in the production process?

ISSN: 2278-4632
Vol-15, Issue-02, No.02, February: 2025



Interpretation

Suggestions for process optimization (15%) and increased use of waste reduction technologies (5%) were less prominent but still highlight opportunities for refining production workflows and adopting advanced waste management solutions. Notably, no respondents selected the "Other" category, indicating that the predefined themes captured the majority of employee concerns.

Overall, the data underscores the importance of targeted interventions, with a focus on staff training, equipment calibration, and raw material quality control as immediate priorities for waste reduction.

FINDINGS OF THE STUDY :

Waste Generation Analysis: The researcher observed that waste is generated at several key stages of the potato chips production process. The peeling stage was identified as a significant source of waste, with potato peels accounting for a substantial portion. Slicing, frying, and packaging stages also contributed to waste, though to varying extents. For instance, overcooked and defective chips during frying and packaging were notable sources of waste.

Operational Inefficiencies: During observations made it was found that operational inefficiencies, such as inconsistent slicing and frequent equipment malfunctions, were major contributors to waste. These inefficiencies were often linked to variations in raw material quality and equipment performance.

Current Waste Management Practices: ITC has established several waste management practices, including recycling, composting, and using waste for animal feed. While these practices are commendable, the researcher noted opportunities for enhancement. For example, waste utilization programs could be expanded to include biogas production, which would further support sustainability goals.

RECOMMENDATIONS & SUGGESTIONS:

Process Optimization: It was recommended to implement more precise machine calibration and enhanced quality control measures to reduce waste. By refining these processes, ITC can minimize waste at the peeling and slicing stages, and improve overall efficiency.

Equipment Maintenance and Upgrades: Regular maintenance of existing equipment and investing in modern, high-efficiency machines can help address issues related to equipment malfunctions and inconsistencies. This approach will contribute to reducing waste generated during production.

Staff Training: It was suggested to expand training programs for staff to include best practices for waste reduction and efficient handling of equipment. Proper training can lead to significant improvements in minimizing waste and optimizing production processes.

Enhanced Waste Utilization: It was proposed to explore additional ways to utilize waste, such as setting up biogas production systems or developing partnerships with local farmers for composting. These initiatives will not only help in managing waste more effectively but also contribute to ITC's sustainability efforts.

CONCLUSION:

The study on the factors leading to wastage in potato chips production at ITC Limited has provided valuable insights into the underlying causes of waste and potential areas for improvement. The findings reveal that waste generation is influenced by a combination of factors, including inadequate training of staff, suboptimal equipment calibration, and inconsistent quality control at the raw material intake stage. These factors, along with inefficiencies in process optimization and limited adoption of advanced waste reduction technologies, contribute significantly to production losses.Enhanced training for staff emerged as the most critical area of focus, highlighting the importance of equipping employees with the skills and knowledge to minimize waste during production. Similarly, regular equipment maintenance and calibration were identified as essential measures to reduce mechanical inefficiencies. Furthermore, stricter quality checks on raw materials can help address waste at the source, preventing downstream inefficiencies. The study underscores the need for a comprehensive and integrated waste management strategy at ITC Limited, combining employee training, technological upgrades, and process improvements. Implementing these recommendations will not only reduce wastage but also enhance operational efficiency, contributing to cost savings and sustainability goals. By addressing these factors, ITC Limited can further strengthen its position as a leader in the potato chips industry while aligning with its commitment to sustainable and efficient production practices.

REFERENCES:

1. Brown, D., & Green, M. (2016).*Operational Practices and Their Impact on Waste Generation in Food Manufacturing: A Case Study in Potato Chips Production.* International Journal of Operations and Production Management, 36(4), 400-415.
2. Chopra, D., Gupta, A., & Mehta, S. (2021).*Advancements in Potato Chips Manufacturing: A Circular Economy Perspective.* Sustainable Production and Consumption, 27, 10-18.
3. Frye, J., White, J., & Anderson, P. (2017).*Impact of Frying Parameters on Potato Chips Waste and Oil Consumption.* Journal of Food Science, 82(5), 1085-1093.
4. Jones, P., Thomas, H., & Lee, M. (2020).*Sustainable Disposal and Utilization of Waste in Potato Chips Production.* Journal of Cleaner Production, 265, 121-129.
5. Kumar, V., Sharma, S., & Patel, R. (2018).*Effects of Raw Material Quality on Waste Generation in Potato Chips Manufacturing.* International Journal of Food Science & Technology, 53(6), 1505-1512.
6. Lopez, S., Garcia, P., & Martinez, L. (2019).*Emerging Technologies for Waste-to-Energy Conversion in Potato Processing Industries.* Energy and Environmental Science, 12(7), 2233-2242.
7. Muth, M. K., Albright, L. D., & Choi, Y. J. (2014).*Waste Reduction in Potato Chips Manufacturing: An Assessment of Peel and Slice Waste.* Journal of Food Engineering, 122(1), 1- 9.
8. Smith, R., Thompson, B., & Lee, C. (2015).*The Role of Equipment Maintenance in Reducing Waste in Snack Food Manufacturing.* Food Quality and Safety, 4(3), 125-130.

