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Quality Control with Method Total Quality Management A case study at PT XYZ

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ABSTRACT - *This study aims to evaluate the implementation of Total Quality Management (TQM) at PT XYZ, a pulp manufacturing company, to enhance product quality and operational efficiency. A case study method was used. Data on product defects were collected from PT XYZ and analyzed using three TQM tools: Check Sheets, Histograms, and Pareto Charts. The study also recommends integrating four additional tools for a more comprehensive approach. Among eight defect categories, the most common issue was the Torn Wrapper defect. February's defect rate (0.36%) exceeded the target of 0.30%, indicating room for process improvement. The analysis is limited to descriptive statistics without inferential testing. Future research should apply broader statistical tools and compare findings across multiple companies. This study offers insight into the practical application of TQM in a local pulp industry setting, contributing contextual knowledge to the field.*

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1. INTRODUCTION

1.1 Total Quality Management

In the face of intense business competition, companies are increasingly required to produce high-quality products, offer competitive pricing, and provide excellent service [1]. Total Quality Management (TQM) has emerged as a vital management approach emphasizing continuous improvement in all business operations. TQM integrates quality control across all organizational levels and functions. It promotes the use of quality tools to analyze and improve production processes. In the pulp industry, TQM can enhance product quality, process efficiency, sustainable resource management, and customer satisfaction [2][3].

This study explores how PT XYZ implements TQM to identify and reduce defects in pulp production. Despite established quality control practices, PT XYZ continues to face recurring product defects, which undermine the effectiveness of its current quality assurance system. The study seeks to identify the most frequent types of product defects, evaluate the effectiveness of selected TQM tools, and recommend strategies for improving quality control. This study explicitly addresses three core questions centrally to understanding the quality control challenges at PT XYZ. First, it examines the dominant types of defects in pulp production to determine which issues are most prevalent and demand immediate attention. Second, it evaluates the effectiveness of the currently implemented TQM tools in identifying and mitigating these defects, assessing their adequacy in supporting quality assurance. Third, the study explores additional measures and quality control tools [3] that could further enhance PT XYZ's defect reduction efforts and overall process improvement.

This approach enables pulp companies to gain sustainable competitive advantages, ensure stable growth, and positively contribute to the pulp industry [4][5]. Thus, this background explores how TQM implementation has become a crucial pillar in the management strategy of pulp companies, leading to long-term success and sustainability.

Quality management or Total Quality Management (TQM) is a way to continuously improve performance at every level of operation or process, in every functional area of an organization, using all available human and capital resources [6]. TQM is a system currently being implemented by companies because it is considered to support their managerial performance [7][8]. TQM is also known as integrated management. TQM integrates all management functions, all parts of a company, and all people into a holistic

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philosophy built on quality, teamwork, productivity, and customer satisfaction. TQM is an approach to enhancing competitiveness, efficiency, and flexibility for the entire organization. TQM is a developing system that consists of practices, tools, and training methods for managing organizations in the context of rapid change. This system provides customer satisfaction and improves organizational performance by eliminating product defects and providing speedy services. Total quality is a philosophy, a total paradigm of continuous improvement in four dimensions [9]:

1. Personal and professional development.
2. Interpersonal relationships.
3. Managerial effectiveness.
4. Organizational productivity

1.2 Quality Control Tool Application

TQM is a management philosophy that embeds quality awareness in all organizational processes. TQM requires systemic improvements, team member involvement, and a focus on customer satisfaction [10].

Recent studies highlight the significance of linking service quality and customer satisfaction. However, many applications in the Indonesian industrial sector still rely on older models and tools. This study attempts to contextualize these concepts in a contemporary, local setting.

Despite widespread use of the seven basic quality tools—Check Sheets [12], Histograms, Pareto Charts, Scatter Diagrams, Control Charts [13], Cause-and-Effect Diagrams [14], and Flowcharts—many companies employ only a subset. Identifying which tools yield the best results in specific industrial settings remains underexplored.

2. METHODOLOGY

2.1 Quality Control

This study uses a case study approach focusing on PT XYZ's quality control process, aligning with qualitative research standards to examine management practices in a real-world industrial setting. Observational data on rejected pulp products were collected over a specific period. They were categorized into eight defect types: Over Height, Torn Wrapper, Bale Shape, Dirty, Marking Problem, Wire Cut Off/Defect, Quality Issue, and Reject Bale. These categories follow the company's internal defect classification system [15].

Three essential Total Quality Management (TQM) tools were employed for analysis. The Check Sheet was used to capture each defect's frequency systematically. The Histogram presented data distribution to identify trends, and the Pareto Chart helped prioritize defect types based on the 80/20 principle. These tools were selected for their practical applicability and proven effectiveness in industrial quality assessments [16].

Although insightful, the study acknowledges that these tools primarily offer descriptive analysis. To strengthen scientific rigor, future studies should incorporate inferential techniques such as statistical process control (SPC), Control Charts [13] for process monitoring, and Fishbone Diagrams [14] for identifying root causes. Furthermore, triangulation with qualitative data (e.g., worker interviews or operational audits) could provide a more holistic and validated understanding of quality challenges in pulp manufacturing.

3. RESULT & DISCUSSION

3.1 Quality Control Tool Application

a.Check Sheet

Based on the NC Record 2024 check sheet, the most frequent defect recorded at PT XYZ is the Torn Wrapper, totaling 289 occurrences, followed by Height issues (159) and Wire Cut Off/Defects (88). These three categories dominate the defect distribution and highlight the main quality challenges in the production process. Notably, PD 4 recorded the highest number of Torn Wrapper defects (147), while PD 3 showed significant Height and Torn Wrapper issues, indicating potential process or equipment problems in these divisions..

Tabel 1 Data Check Sheet

NC Record 2024								
PD	Height	Torn Wrapper	Bale shape	Kotor	Marking	Wire	Quality	Reject Bale
1	18	50	1	35	18	2	-	-
2	-	14	-	3	18	-	-	-
3	58	67	2	2	32	-	-	-
4	17	147	5	1	5	2	-	-
5	66	11	-	5	15	-	-	-
Total	159	289	8	46	88	4	-	-

In contrast, defect categories such as Bale Shape, Marking, and especially Quality and Reject Bale were minimal or not reported, which could reflect low actual occurrence or gaps in reporting. The data suggests an urgent need to improve packaging and wire handling processes, possibly through equipment maintenance or operator training supported by human resource alignment [17][18]. Further analysis using tools like the Fishbone Diagram [14] or Control Chart would help identify root causes and improve consistency in product quality.

b. Histogram

The NC 2024 bar chart visually reinforces the dominance of Torn Wrapper defects, with PD 4 contributing the most significantly to 147 instances, over half of the total for that category. Compared to other production divisions, this sharp spike suggests a serious localized issue, likely mechanical or procedural, in PD 4's packaging process. Height and Wire defects also show high frequencies, especially in PD 3 (58

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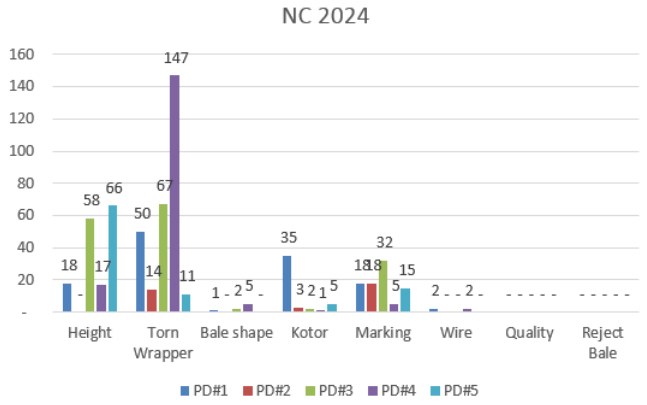
Height, 32 Wire), indicating potential inconsistencies in cutting or sizing operations. These concentrated occurrences point to operational disparities across divisions, requiring division-specific interventions.

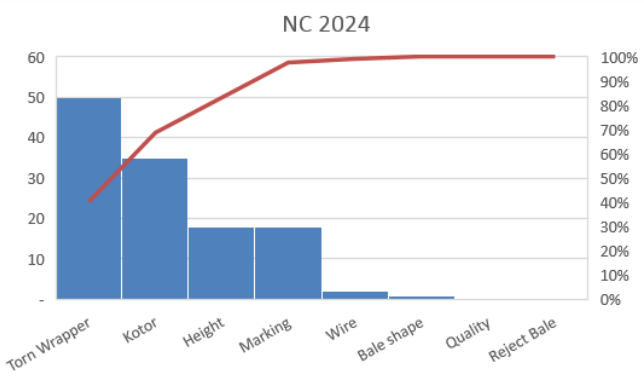


Gambar. 1 Histogram Data

In contrast, categories such as Bale Shape, Marking, Quality, and Reject Bale appear minimal or negligible across all PDs, which may indicate either effective control in those areas or underreporting. The relatively balanced distribution in Marking defects between PD 3 and PD 5, however, hints at isolated operator errors or inconsistencies in labelling standards. Overall, the chart highlights the urgency of process improvements in Torn Wrapper handling, reinforced monitoring of Height dimensions, and better standardization across production divisions to ensure uniform product quality.

c. Pareto Chart

The Pareto chart for NC 2024 highlights that most defects are concentrated in just a few categories Torn Wrapper is the most frequent defect, followed by Dirty, Height, and Marking issues. Together, these four defect types account for over 90% of the total defects, aligning with the Pareto principle (80/20 rule), which suggests that a small number of causes are responsible for most problems. This makes them prime targets for quality improvement efforts.



Gambar. 2 Pareto Chart

In contrast, defect types such as Wire, Bale Shape, Quality, and Reject Bale are negligible in occurrence and have minimal contribution to the cumulative defect rate. While these issues should still be monitored, priority should be given to resolving the top four categories. By focusing corrective actions on these key problem areas—especially Torn Wrapper and Kotor—PT XYZ can expect a significant reduction in overall non-conformities and improved product quality.

d. Percentage of Non-Conformity (NC)

The January–February 2024 NC percentage chart reveals a significant increase in non-conformance rates across most production divisions (PDs). The average defect rate in January was 0.21%, well below the 0.30% target, indicating generally effective quality control. However, in February, the average defect rate rose sharply to 0.36%, surpassing the target. PD#3 experienced the highest jump from 0.22% to 0.53%, followed by PD#1, which surged from 0.11% to 0.65%. These increases suggest that specific operational issues or lapses occurred during February, impacting productivity levels [19].

Tabel. 2 Percentage of Non-Conformity

NC on Jan - Feb 2024 (%)							
Month	PD#1	PD#2	PD#3	PD#4	PD#5	Target	Avrg PD
Jan-24	0.11	0.04	0.22	0.43	0.26	0.30	0.21
Feb-24	0.65	0.16	0.53	0.35	0.17	0.30	0.36

This upward trend in defects is concerning and may point to process instability or insufficient corrective measures following January's performance. Although PD#2 and PD#5 remained under control with low percentages, the significant increases in other PDs dragged the overall performance above the acceptable threshold. An immediate investigation is necessary to identify the root causes, whether due to machinery failure, human error, or inconsistent material quality, and apply a performance management system[20]. Addressing these spikes with targeted quality improvement strategies will be essential to realigning performance with the set defect target.

4. CONCLUSION

PT XYZ's Total Quality Management (TQM) application has successfully identified critical areas affecting product quality, particularly the Torn Wrapper defect, which was the most prevalent across production divisions. While January 2024's average defect rate remained below the 0.30% target at 0.21%, February's rate rose to 0.36%, exceeding the benchmark and indicating inconsistency in quality control implementation. To address this, the study recommends integrating the remaining four TQM tools for more comprehensive analysis, conducting a root cause analysis for Torn Wrapper issues, maintaining consistent monitoring of monthly production quality, and applying inferential statistical methods for deeper insights. The study's limitation lies in its reliance on descriptive data from a single company, which may affect generalizability; future research should

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consider larger datasets and more robust statistical techniques.

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