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ANALYSIS OF OPERATIONAL FAILURES AT PT. APP USING ROOT CAUSE ANALYSIS

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Abstract

PT. APP faces significant challenges in meeting customer demands due to persistent production inefficiencies, particularly in the Kiln Dry and Finishing stages. These inefficiencies result in delays, poor product quality, and workflow disruptions, leading to customer dissatisfaction and increased operational costs. Key issues include cracks, peeling paint, and dents in the final product, which are rooted in inadequate training, outdated machinery, suboptimal methods, and environmental conditions. The study aims to analyze and address these bottlenecks to improve the company's operational performance and customer satisfaction. This research adopts a structured methodology, utilizing Root Cause Analysis (RCA) with the 5 Why technique to systematically investigate the underlying factors contributing to production inefficiencies. Complementary tools like Pareto Analysis and Fishbone Diagrams are employed to prioritize critical defects and categorize their root causes into six factors: Manpower, Machine, Materials, Methods, Measurement, and Mother Nature. Based on these analyses, practical solutions are proposed, including process standardization, equipment upgrades, enhanced quality control, and environmental controls to stabilize production conditions and reduce defects. The findings reveal that addressing the primary defects—cracks, peeling paint, and dents—can significantly enhance production efficiency and product quality. Implementing targeted interventions such as structured worker training, improved material handling, and updated equipment yielded substantial improvements in operational performance. This study highlights the importance of a systematic approach to problem-solving and provides actionable strategies for sustainable improvement, laying the groundwork for future research into advanced manufacturing technologies and sustainable practices.

Keywords: **Root Cause Analysis, Fishbone Analysis, Pareto Analysis**

1. INTRODUCTION

The prospects and challenges of the furniture industry in Indonesia are increasing. Throughout the last 5 (five) years, furniture export performance has continued to increase to reach USD 2.8 billion in 2021, an increase of 33% compared to the previous year. In 2022, exports of wooden furniture and rattan were stable at USD 2.9 billion.

Figure I.1 Export Industry Furniture
Source : Data Industri Research, 2023.

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During the Covid-19 pandemic, exports of furniture products from January to May 2020 increased significantly by 51.3 percent compared to the same period last year. This increase certainly gave fresh air to the performance of national exports. Furniture exports from Indonesia to the US in January-May 2020 were recorded at USD 582.11 million. This figure increased by 51.3 percent compared to the previous year's period, which was recorded at USD 384.82 million. The impact of the Covid-19 crisis on consumer behavior and manufacturing trends has heightened the importance of digitalization and automation for the furniture industry. The pandemic is strengthening consumer demand for socially active brands that share their values and for products that respect the environment (Mordor Intelligence, 2024).

Figure I.2 Furniture Industry Growth Per Quarter
Source: Data Industri Research, 2023.

The furniture industry in Indonesia has shown a varied contribution to the Gross Domestic Product (GDP) from year to year. In 2018 the furniture industry contributed around 1.36% to the GDP of the non-oil and gas industry, in 2021 the GDP growth of the furniture industry reached 8.16%. In 2022, the furniture industry's contribution to non-oil and gas GDP was 1.30% with an export performance of US$ 2.47 billion. The GDP growth of the furniture industry this year is only 0.21%. In 2023 in the second quarter, the GDP of the furniture industry decreased by 2.69% compared to the same period in the previous year. The furniture industry in Indonesia continues to strive to improve the quality and competitiveness of products to expand the export market and increase its contribution to the national economy (Muzdaffar, 2024).

The absorption of labor in Indonesia's furniture industry has fluctuated from year to year. In 2015, the furniture industry absorbed around 120,000 workers. In 2020, the furniture industry absorbed an increased workforce of around 140,000 people. In 2022, the furniture industry absorbed around 143,000 workers and in 2023 the furniture industry still absorbed more than 143,000 workers. The furniture industry is one of the important labor-intensive sectors in Indonesia (Purwanto, 2023). The level of utility of the furniture industry in Indonesia fluctuates from year to year. The utility level of the furniture industry in 2021 has reached a percentage of 74.16% and in 2022 the utility level remains stable at a percentage of 74.16%. The furniture industry in Indonesia continues to strive to improve efficiency and competitiveness in the global market.

The furniture industry is experiencing various challenges such as the availability of high-quality raw materials so that sustainable management of natural resources is very important to manage the supply so that it is stable; need to innovate in product design to meet changing market tastes, lack of innovation can make Indonesia furniture products less competitive in the global market; it is necessary to improve the competence of the workforce through training and education to improve product quality and production efficiency; The next challenge is the adoption of modern technology in the production process where technology can help improve product efficiency and quality and reduce environmental impact; and Indonesia's furniture industry faces stiff competition from other countries such as China and Viet Nam which also have a strong furniture industry.

The prospects of the furniture industry in Indonesia in increasing export value growth by getting government support and improving product quality with a furniture export target of US$5 billion in 2024 (J, 2023). an increase in demand for environmentally friendly and sustainable furniture products by providing opportunities for manufacturers to develop products that meet environmental standards, economic growth and increasing people's purchasing power Indonesia

provide opportunities large for the furniture industry to develop in the domestic market. The increased use of e-commerce platforms provides opportunities for furniture manufacturers to reach a wider market and increase sales; and the Indonesia government provides support through various policies and programs to improve the competitiveness of the furniture industry, including workforce training and export incentives. In order to realize success in an organization or company, of course, it cannot be separated from the operational role in the company. The operational role has an important role because this part is directly involved in the production process. Operational role in helping the company achieve its goals to increase profits, provide customer satisfaction and long-term growth of the company. The success of a company depends on the effectiveness and efficiency in the operational processes carried out by the company. To realize such conditions, of course, operational functions in increasing efficiency and productivity must be carried out optimally, the ability to control product quality, the role in supply chain management which includes inventory management and logistics, innovation in the production process and the ability to manage risks, able to support capacity planning and workforce management as well as operational cost control. PT. APP as a manufacturing company is certainly inseparable from the role of the operational division to support the company in achieving its goals. However, in its implementation, there were obstacles experienced by the company, namely not being able to meet consumer demand to operational problems.

2. IMPLEMENTATION METHOD

Mason (2002), defines qualitative research as a collection of explanations and arguments based on a deep understanding of the complexity of context. According to the Qualitative Research Consultants Association (QRCA), qualitative research is primarily concerned with understanding a topic. According to Sumarwan et al. (2018), qualitative research can use two techniques: focus group discussions (FGDs) and in-depth interviews. This final project research was carried out with a qualitative methodology. Problems are understood and proposed solutions are validated using focus group discussions and departmental interviews. Research methodologies are frameworks that researchers employ to plan and carry out their studies. This encompasses everything from identifying a research question, designing data collection and an analysis plan, interpreting and communicating the results, and disseminating the results.

Research methodology is important because it enables the research to be rigorous, systematic, and ethical. In addition to helping establish the strength of the research in terms of validity, generalizability means the transferability of the research results to other contexts or populations. Research methodology in this study are the case studies. This gives you a close-up look at a singular (or group of) case(s) in depth to understand a complex phenomenon or process. Some fields in the social sciences ending humanities often employ such methods to understand complex social, cultural, or historical phenomena.

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3. RESULTS AND DISCUSSION

Root Cause Analysis

The Root Cause Analysis (RCA) in this study utilizes the 5 Why methodology to systematically identify and address the underlying reasons behind production inefficiencies at PT. APP, This approach is chosen because the 5 Why method provides a structured framework for delving deep into problems, uncovering their root causes rather than merely addressing surface-level symptoms, and by repeatedly asking why at each stage of the analysis, the methodology ensures that the investigation goes beyond immediate issues and identifies fundamental factors that contribute to bottlenecks in the production process,

The primary reason for using the 5 Why method in this research is its simplicity and effectiveness in identifying cause-and-effect relationships, the initial problem is failure to meet customer demands and it can be traced back to production delays, Further probing reveals that these delays stem from bottlenecks in the Kiln Dry and Finishing stages and by continuing to explore why these bottlenecks occur, and the analysis identifies specific defects such as cracks,

peeling paint, and dents, as well as operational inefficiencies like inadequate moisture control and poor material handling.

Another rationale for employing the 5 Why technique is its ability to prioritize focus areas by identifying critical points of failure, In this case, the methodology highlights that bottlenecks in Kiln Dry and Finishing processes are the primary contributors to production inefficiencies, from those we have insight that allows the research to direct attention and resources to these specific stages, rather than addressing less significant factors, the result from the analysis provides a clear roadmap for targeted interventions that will have the greatest impact on improving production flow and quality.

The 5 Why approach is particularly valuable in this study because of its adaptability to complex manufacturing environments, The methodology can account for multiple interacting factors such as material properties, process inconsistencies, and human errors, which collectively contribute to production bottlenecks, This makes it a comprehensive tool for analyzing a multifaceted production process like the one at PT. APP, where problems in one stage often ripple through to others, compounding inefficiencies.

Finally, the choice of the 5 Why method aligns with the research's goal of driving continuous improvement, By identifying root causes rather than treating symptoms, the findings from the analysis provide a foundation for implementing sustainable solutions, This ensures that corrective actions address the actual problems and prevent their recurrence, ultimately enhancing production efficiency, reducing costs, and improving customer satisfaction, the use of the 5 Why methodology thus underpins the research's commitment to systematic problem-solving and operational excellence.

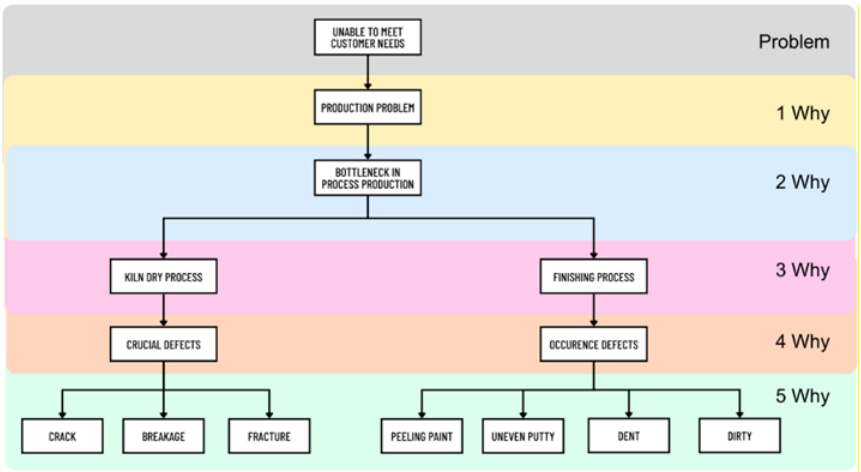

Figure IV.1 5 Why Analysis Diagram

The Root causes analysis in this research using 5 Why analysis of PT. APP begins with the primary problem which is the company is unable to meet customer needs, This issue stems from persistent delays in production, poor product quality, and inefficiencies in workflow, the challenges disrupt delivery schedules, reduce customer satisfaction, and increase operational costs, The analysis identifies that these problems are rooted in bottlenecks within the production process, specifically in the Kiln Dry and Finishing stages, which significantly slow down overall production efficiency.

The second level of analysis points to bottlenecks in the production process as the main cause of the problem, The Kiln Dry stage is responsible for reducing the moisture content of wood to an optimal level, but inherently time intensive and capacity-constrained on the other hand the Finishing stage which ensures the final quality and aesthetic of the product, is highly susceptible to defects, these bottlenecks create delays, increase rework, and disrupt the smooth flow of materials through the production line, compounding the company's inability to meet customer expectations.

At the third level, the analysis examines why the Kiln Dry and Finishing stages are bottlenecks, The Kiln Dry process frequently experiences issues such as cracks, breakages, and fractures in the wood, resulting from uneven moisture distribution, improper drying techniques, and inconsistent temperature control, the Finishing stage, meanwhile, faces defects like peeling paint, uneven putty, dents, and dirty surfaces, the defects arise due to poor surface preparation, inadequate material handling, and substandard environmental conditions, all of which negatively impact the production timeline and product quality.

The Fourth level focuses on why these defects occur in each stage for the Kiln Dry process, uneven drying conditions are caused by improper control of moisture levels and inconsistent drying methods, and factors lead to structural damage in the wood such as cracks and fractures, the Finishing stage defects like peeling paint are due to poor-quality materials and inconsistent application techniques, while dents and dirty surfaces result from careless handling and unclean production environments, recurring issues significantly disrupt production efficiency and result in high defect rates.

Finally, the Fifth level explores why these defects have such a significant impact on production outcomes, The accumulation of defects at the Kiln Dry and Finishing stages leads to frequent rework, material wastage, and extended production cycles and it creates delays in downstream processes such as assembly, packaging, and shipping, which ultimately disrupt delivery schedules and reduce customer satisfaction, the high defect rates undermine the company's ability to maintain consistent product quality, further damaging its reputation and competitiveness in the market, the analysis highlights the critical need to address the underlying causes of the bottlenecks to streamline production and improve overall operational performance.

Pareto Analysis

Pareto Diagram is a tool that helps identify the main problem that has the greatest impact based on the 80/20 principle (80% of the result is usually caused by 20% of the problem). Pareto diagrams are used to identify the main factors that cause delays in order fulfillment based on the 80/20 principle. Based on PT. APP's problems, the following represent the potential categories of issues and their respective contributions to the failure to meet order targets:

Defect Type	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
Crack	27,121	27,121	39.5%	39.5%
Peeling Paint	15,513	42,634	22.6%	62.1%
Uneven Putty	8,316	46,920	12.1%	74.2%
Breakage	5,226	52,146	7.6%	81.8%
Dent	4,867	60,462	7.1%	88.9%
Dirty Surfaces	4,286	65,329	6.2%	95.2%
Fracture	3,315	68,644	4.8%	100.0%

Tabel IV.1 Mapping the Causes of Delays

After calculating the percentage of the cause of the delay, the next step will be to produce a pareto diagram as shown in the figure below.

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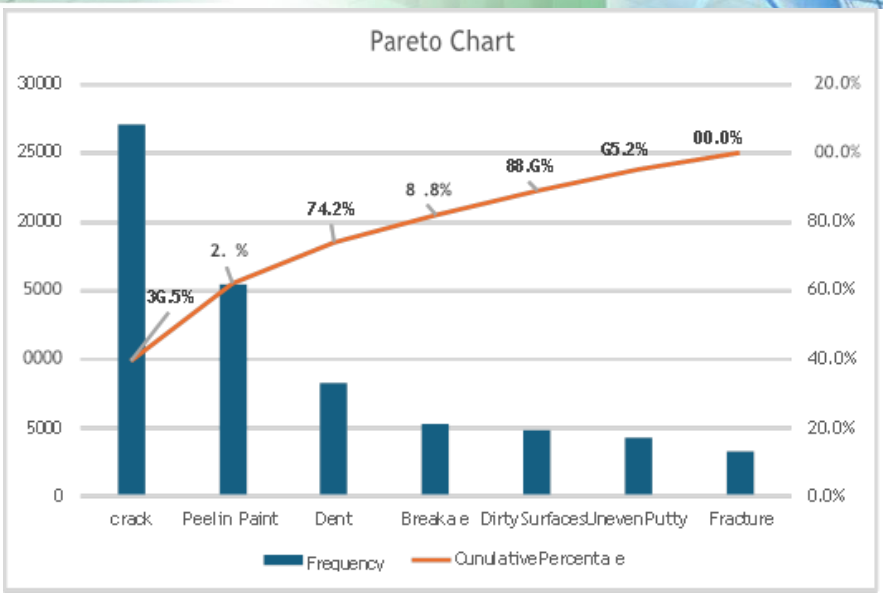

Figure IV.2 Pareto Chart

Based on the The Pareto chart reveals that focusing on the top defect types—Crack, Peeling Paint, and Dent—would resolve the majority of the quality issues, aligning with the Pareto principle (80/20 rule). These three defects collectively account for approximately 74.2% of the total defects, with Crack alone contributing the highest percentage at 39.4%. This indicates that addressing these critical issues first would yield the most significant impact on improving overall product quality and operational efficiency.

By prioritizing efforts to eliminate or reduce the occurrence of Cracks, Peeling Paint, and Dent, the company can address the root causes of defects that cause the most disruption. This approach allows for a strategic allocation of resources to solve problems that have the greatest influence on production outcomes and customer satisfaction. Once these high-priority defects are resolved, the company can gradually focus on less frequent issues, ensuring continuous improvement across the production process.

Fishbone Analysis

After the priorities are sorted using the Pareto method, the next step is to conduct a cause-and-effect analysis using a fishbone diagram (Ishikawa/Fishbone Diagram).

1. Crack Defect Fishbone Analysis

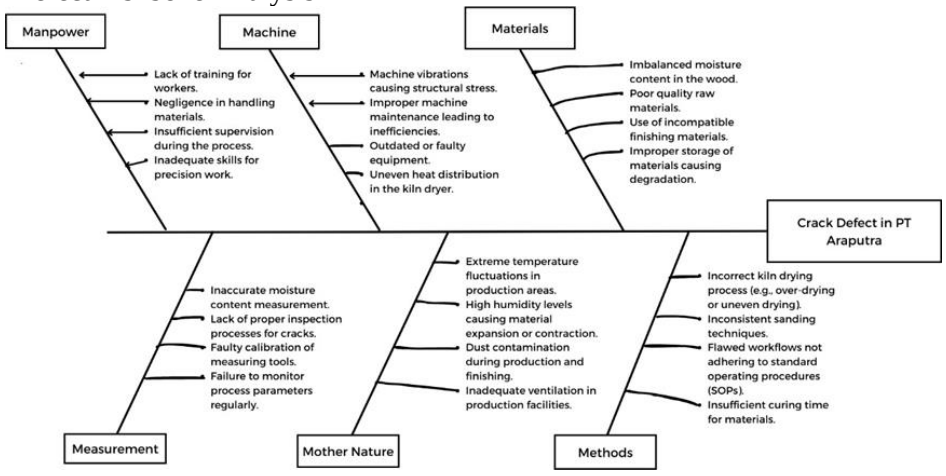

Figure IV.3 Fishbone Diagram Crack Defect

2. Peeling Paint Defect Fishbone Analysis

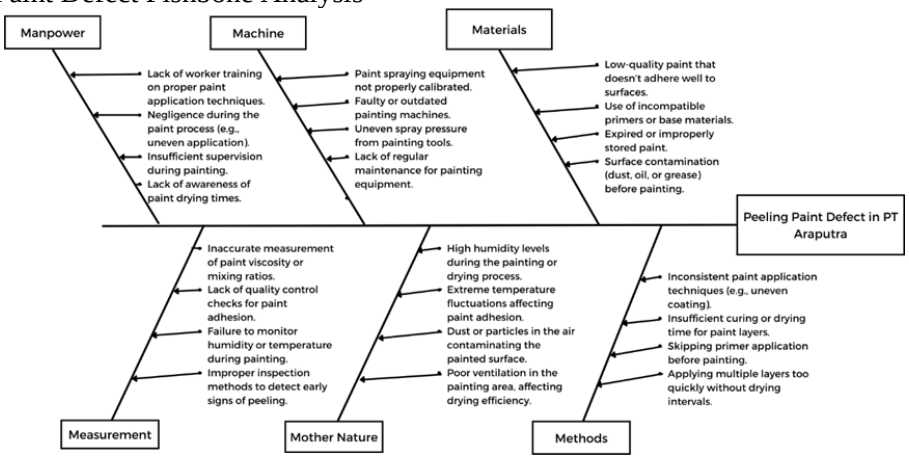

Figure IV.4 Fishbone Diagram Peeling Paint Defect

3. Dent Defect Fishbone Analysis

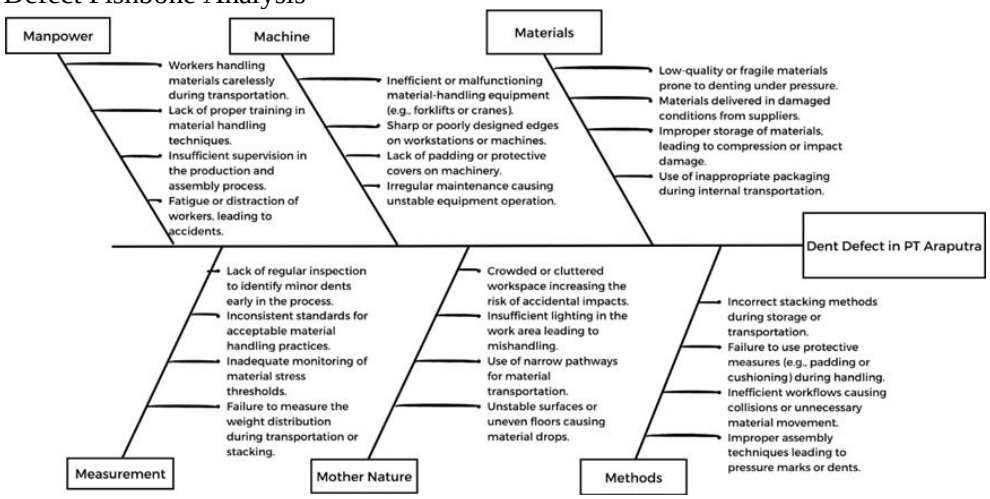

Figure IV.5 Fishbone Diagram Dent Defect

4. CONCLUSION

PT. APP's inability to meet customer needs is caused by persistent production inefficiencies, including delays and defects in key stages such as Kiln Dry and Finishing, and the bottlenecks disrupt workflow, resulting in frequent rework and extended production timelines, Additionally, poor quality control and inadequate training for workers exacerbate the problem, leading to defects like cracks, peeling paint, and dents that impact product quality and delivery schedules.

The biggest factors influencing the company’s inability to meet customer needs are bottlenecks in the Kiln Dry and Finishing stages, In the Kiln Dry process, issues such as uneven moisture distribution and improper drying techniques cause cracks and structural damage to the wood, Similarly, the Finishing stage suffers from defects like peeling paint and dents due to inconsistent application techniques, uncalibrated equipment, and poor handling practices, These problems significantly delay production and reduce the quality of the final product.

Effective solutions for PT. APP include implementing structured training programs to improve worker skills, upgrading machinery to enhance process efficiency, and enforcing standardized operating procedures (SOPs) for drying, sanding, and painting workflows, investing in quality control measures such as automated monitoring systems and regular inspections, can help

detect and address defects early, Environmental controls such as HVAC systems and proper ventilation, should also be installed to stabilize production conditions and minimize defects.

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