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Identification of Waste in Outsole Production Process Using Waste Assessment Model and 5W 1H Method

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Abstract

UD. Santoso is a small and medium industry (IKM) engaged in the production of footwear, especially outsoles. In the production process, UD. Santoso faces various problems that result in waste such as: high percentage of defects, production not in accordance with market forecasts, long machine setup, long distances between rooms, and inefficient movement of materials. The company also realizes that the outsole production process is not efficient and there is a lot of waste. This study aims to identify the type of waste that occurs using the waste assessment model method, as well as provide recommendations for improvement to improve production efficiency with 5W1H analysis. From the results of the analysis, it was found that the three highest types of waste were the main causes, namely: motion (19.34%), which was caused by the distance between the production warehouse and the storage was quite far. Second, over-production (16.90%), caused by over-focusing on machine capacity and inaccurate forecasting. Third, defects (16.79%), caused by incorrect drawing techniques. As a solution, companies are advised to make more effective layouts, set production targets, and provide training in withdrawal techniques.

Introduction

In an increasingly competitive industrial era, production efficiency is the main key for companies to survive and thrive. This does not only apply to large companies, but is also very important for Small and Medium Industries (SMEs) that have a vital role in the national economy. SMEs often operate with limited resources. Every production process has the potential for waste that can reduce effectiveness and productivity (Aguado et al., 2013; Duflou et al., 2012). Waste is any type of work activity that does not add value to the process of changing input into output (Astutik et al., 2022; Kurniawan et al., 2022). Waste in the form of time, raw materials, energy, or labor can directly affect the performance and survival of a business. Therefore, waste identification and elimination are the main focus in efforts to improve company performance (Habib et al., 2023; Awan et al., 2022).

UD. Santoso is a company engaged in the field of footwear, this company has a production focus on three main lines: Outsole, Shoes, and Sandals. Although it is only classified as an IKM (Small and Medium Industry), as a manufacturer that produces various footwear products, starting from components (Outsole) to finished products (shoes and sandals).

In terms of defective waste, the Outsole production process has the highest percentage of defects, which is 8.5%. Meanwhile, sandals and shoes each have a defective percentage of 3% and 3.5%. The company is also aware that the Outsole production process is not yet

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efficient and there is a lot of waste. After analyzing this problem, I chose to identify each type of waste in the Outsole production process. My goal is to find out which waste is the most dominant, so that we can find the cause and provide good suggestions to improve the efficiency of Outsole production in the company. Based on direct observation and interviews with the head of production, several wastes were found, namely: Overproduction, Waiting, Tranportation, Over-processing, Inventory, Motion, and Defect. This research will be conducted by applying the WAM method as a tool to study the waste in the company. WAM is a model that aims to simplify and simplify in order to find the root of the Waste problem in order to identify the most critical Waste (Pomalia et al., 2020; Maizi et al., 2025; Setiawan et al., 2021).

Waste is categorized into 7 types, namely: Overproduction, waiting, transportation, overprocessing, inventory, motion, and Defect. (Krisnanti & Garside, 2022). From the seven Wastes, a Seven Waste Relationship (SWR) will be conducted to identify the relationship between the seven types of Waste. Then, the SWR results are used to form a Waste Relationship Matrix (WRM) which describes the strength of the relationship between Waste quantitatively. Furthermore, the Waste Assessment Questionnaire (WAQ) is conducted to collect further data on Waste in UD. Santoso. The results of the WAQ are then analyzed to produce a Waste ranking from the most significant to the least impactful. After the main Wastes are identified, a Fishbone analysis is conducted for the three priority Wastes to identify the root cause of the problem. The Fishbone diagram or also called the Ishikawa Diagram was developed in the early 1940s by Dr. Kaoru Ishikawa from the University of Tokyo. As the name suggests, the Fishbone diagram shaped like a fish skeleton. Where the fish head is the problem that you want to find the cause and effect of. The bones in the Fishbone diagram which are the cause and effect of the problem consist of five bones which are often also referred to as 5M (Sylvia et al., 2021). The Fishbone diagram will help visualize the various factors that contribute to Waste, including aspects of humans, machines, methods, materials, and the environment. Based on the results of the Fishbone analysis, specific and measurable improvement proposals can be developed to address the root cause of each priority Waste.

Based on the problems above, a study is needed on "Identification of Waste in the Outsole Production Process Using the Waste Assessment Model (Wam) Method at UD. Santoso" which is expected by UD. Santoso to be able to significantly reduce waste, increase production efficiency, and ultimately increase the company's competitiveness in the competitive footwear industry.

Methods

This study uses primary data for analysis obtained from two questionnaires, namely the Waste Relationship Matrix (WRM) questionnaire and the Waste Assessment Questionnaire (WAQ). The selected respondents were three, where each respondent can be said to be an expert in their respective departments, namely: production, inventory, and accounting departments. The researcher also conducted interviews with expert staff in the field who were actively involved in the outsole production process. This interview discusses seven wastes in the company. After obtaining data, researchers need to identify waste using the Waste Assessment Model (WAM) method (Suhardi et al., 2020).

This method consists of several stages, namely the Waste Relationship Matrix and the Waste Assessment Questionnaire. The Waste Relationship Matrix is an analysis tool that uses matrices to measure waste criteria. Each row in this matrix shows the relationship between one type of Waste and six other types of Waste. Similarly, each column reflects the extent to which one type of Waste can affect another. Thus, the Waste Relationship Matrix serves as a means to analyze and understand the interaction between types of waste (Maulana et al., 2023). The Waste Assessment Questionnaire was developed to allocate waste that occurs on

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the production line. According to Suhardi et al. (2020) this Assessment questionnaire consists of 68 different questions, where this questionnaire aims to determine Waste. Each constructor presents an activity, condition, or trait that causes a particular waste. Each stage consists of distributing questionnaires and processing data until the highest percentage of waste or can be called waste (Hidayatullah & Widjajati, 2024; Demirbas, 2011; Dou & Toth, 2021; Xia et al., 2021). The next step is to determine the root cause of waste using a fishbone diagram (Kurniasih, 2021). Fishbone Diagram is a tool for analyzing cause and effect that can be used to identify potential performance problems. This diagram provides a clear structure for group discussions regarding possible causes of problems, allowing team members to collaborate on finding root causes and formulating effective solutions. The waste that will be sought as the root cause is waste or the one that has the highest percentage level based on the results of the Waste Assessment Model. The improvement proposal was made using the 5W1H method based on the observation results of the fish bone diagram (Cahyono et al., 2022; Pramono et al., 2023). In this recommendation phase, researchers do not involve cost analysis and potential impacts that may occur.

The root cause of waste is analyzed using the 5W+1H method related to the type of waste (What), source of waste (Where), person in charge (Who), time of occurrence (When), cause (Why) and then given suggestions for improvement (How). Suggestions for improvement were made using the 5W1H method based on the observation results of the fish bone diagram. The root cause of waste is analyzed using the 5W+1H method related to the type of waste (What), source of waste (Where), person in charge (Who), time of occurrence (When), cause (Why) and then given suggestions for improvement (How) (Afriandi & Aidil Saifuddin, 2023).

Results and Discussion

Waste Relationship Matrix

Waste Relationship Matrix is an analysis tool that uses a matrix to measure waste criteria. Each row in this matrix shows the relationship between a type of Waste and six other types of Waste. Likewise, each column reflects the extent to which one type of Waste can affect other Waste. Thus, the Waste Relationship Matrix serves as a means to analyze and understand the interactions between types of waste (Maulana et al., 2023; Genc, 2025). The following are the results of the average weighted conversion of the three respondents presented in a matrix as seen in the table below:

Table 1. Waste Matrix Value Letter Conversion Results

F/T	O	I	D	M	T	P	W
O	A	E	O	I	E	X	E
I	I	A	E	I	E	X	X
D	E	I	A	E	E	X	E
M	X	E	E	A	X	A	E
T	E	E	O	E	A	X	I
P	O	E	I	E	X	A	I
W	I	I	I	X	X	X	A

The table above represents the Garbage Relationship Matrix that has been converted to letters taking into account the score range and the relationships between waste types. This table describes the relationship between one type of Waste and another type of Waste. For example, the letters in the third column and the second row indicate the relationship from Waste Overproduction (O) to Inventory (I), which has a relationship (E = Especially Important). After being converted into letters. The letters are again converted into numbers based on

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customized symbols. Each letter has a set value, such as A (Absolutely necessary) = 10, E (Especially Important) = 8, I (Important) = 6, O (Ordinary Closeness) = 4, U (Unimportant) = 2, and X (No relation) = 0 This conversion value is based on the first research using the WAM method conducted by Rawabdeh, 2005 (Naziihah et al., 2022). The results of this number conversion will later be used for the calculation of waste weighting. The following is a table of Waste Matrix Value conversion results:

Table 2. Waste Matrix Value Conversion Results

F/T	O	I	D	M	T	P	W	Score	%
O	10	8	4	6	8	0	8	44	15,28%
I	6	10	8	6	8	0	0	38	13,19%
D	8	6	10	8	8	0	8	48	16,67%
M	0	8	8	10	0	10	8	44	15,28%
T	8	8	4	8	10	0	6	44	15,28%
P	4	8	6	8	0	10	6	42	14,58%
W	6	6	6	0	0	0	10	28	9,72%
Score	42	54	46	46	34	20	46	288	100,00%
%	14,58%	18,75%	15,97%	15,97%	11,81%	6,94%	15,97%	100,00%	

Based on table 2 above, it is known that the percentage value of Waste from over production is 15.28%, meaning that the influence of Waste over production on other Waste is 15.28%. While the percentage of Waste to over production is 14.58%, meaning that the influence obtained by Waste over production from other Waste is 14.58%. Based on the table above, it can also be seen that Waste defect is waste that has the greatest influence in causing or producing other Waste with a percentage of 16.67%. While Waste Inventory is waste that is most influenced or caused by other Waste with a percentage of 18.75%.

Waste Assessment Questionnaire

After getting the results from the Waste Relationship Matrix (WRM), the next step is to conduct an initial assessment using the Waste Questionnaire (WAQ) based on the question categories that have been previously grouped for the WAQ. The Waste Assessment Questionnaire (WAQ) method is designed to identify and allocate the types of Waste that appear in the production process (Fitriadi et al., 2023; Setiawan et al., 2021; Suparno et al., 2021). This questionnaire consists of 68 different questions that aim to identify the types of Waste that occur. Each question in the questionnaire reflects an activity, condition, or characteristic that may be the cause of a particular type of Waste (Ojovan & Steinmetz, 2022). The following is a table grouping the types of questions in the Waste Assessment Questionnaire:

Table 3. Waste Assessment Questionnaire Question Grouping

It	Question Type	Number of Questions (Ni)
1	From Over production	3
2	From Inventory	6
3	From Defect	8
4	From Motion	11
5	From Transportation	4
6	From Process	7
7	From Waiting	8
8	To Defect	5
9	To Motion	8

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10	To Transportation	3
11	To Waiting	5
Number of Questions		68

Table 3 illustrates the types and number of questions in the questionnaire that have been submitted to three respondents. There are 3 questions for the type "From Overproduction", 6 questions for the type "From Inventory", 8 questions for the type "From defect", 11 questions for the type "From Motion", 4 questions for the type "From Transportation", 7 questions for the type "From Process", and 8 questions for the type "From Waiting". In addition, there are 4 questions for the type "To Defect", 9 questions for the type "To Motion", 3 questions for the type "To transportation", and 5 questions for the type "To Waiting". In total, there are 68 questions in the questionnaire. The following are the final results of the Waste Assessment Questionnaire calculation:

Table 4. Final Results of Waste Assessment Questionnaire Calculation

	O	I	D	M	T	P	W
Score (Yj)	0,129	0,112	0,1074	0,135	0,144	0,103	0,1028
Acting O Factor	0,022	0,025	0,027	0,024	0,018	0,01	0,016
Final Result (Yj Final)	0,00288	0,00277	0,00286	0,003295	0,002598	0,001039	0,001597
Final Result (%)	16,90%	16,25%	16,79%	19,34%	15,25%	6,10%	9,37%
Ranking	2	4	3	1	5	7	6

Based on table 4 above, it can be seen that the order of waste from highest to lowest in the UD. Santoso outsole production process starts from motion which has a final result value of 0.003295 with a percentage of 19.34%, followed by Waste over production which has a final result value of 0.002880 with a percentage of 16.90%, defect which has a final result value of 0.002860 with a percentage of 16.79%, inventory which has a final result value of 0.002770 with a percentage of 16.25%, transportation which has a final result value of 0.002598 with a percentage of 15.25%, waiting which has a final result value of 0.001597 with a percentage of 9.37%, and over process which has a final result value of 0.001039 with a percentage of 6.10%. This shows that motion waste, over production, and defects are included in the highest waste category with motion waste being the highest or most dominant waste.

Identification of Causes of Waste with Fishbone Diagram

The critical waste that will be observed is the waste with the highest percentage based on the results of the Waste Assessment Model, namely Motion, Over-production and Defect. The search for the root of the problem is carried out using a fishbone diagram.

Waste Motion

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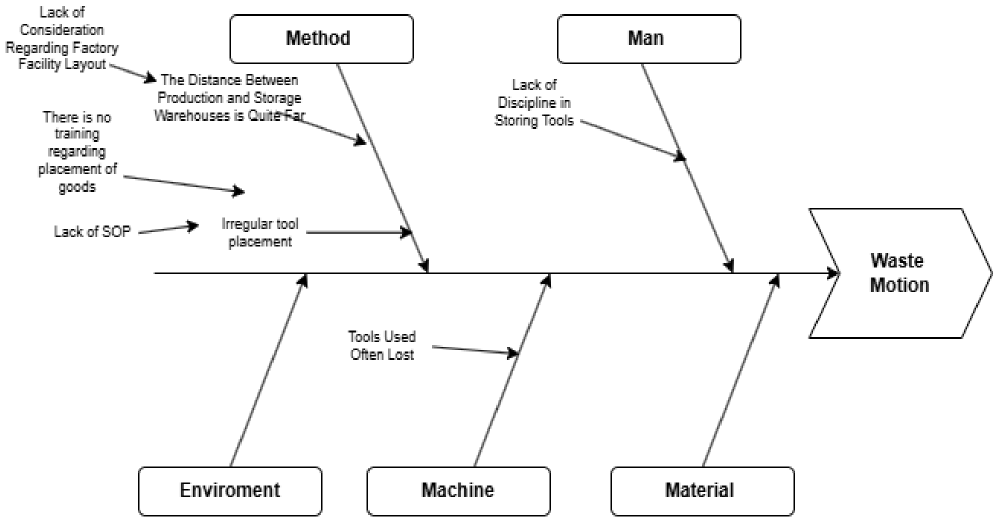

Figure 1. Fishbone Diagram Waste Motion

Based on the identification of waste using the Waste Assessment Model method, the most significant type of waste in UD. Santoso is a movement that-. This waste reduces operational efficiency because the long distance between the storage warehouse and the production area results in excessive employee movement, this is due to a lack of consideration regarding the layout of the factory facilities. The lack of standard operating procedures (SOPs) regarding the placement of work equipment in poor situations, causing difficulties in finding tools and creating a cluttered work area (Fibriani et al., 2021; Wiguna et al., 2022; Bashatah & Sherry, 2022). This limits the movement of employees and results in wasted time searching for equipment, which must be used for the production process. Every second lost looking for tools has the potential to hinder the production flow.

Waste Over-Production

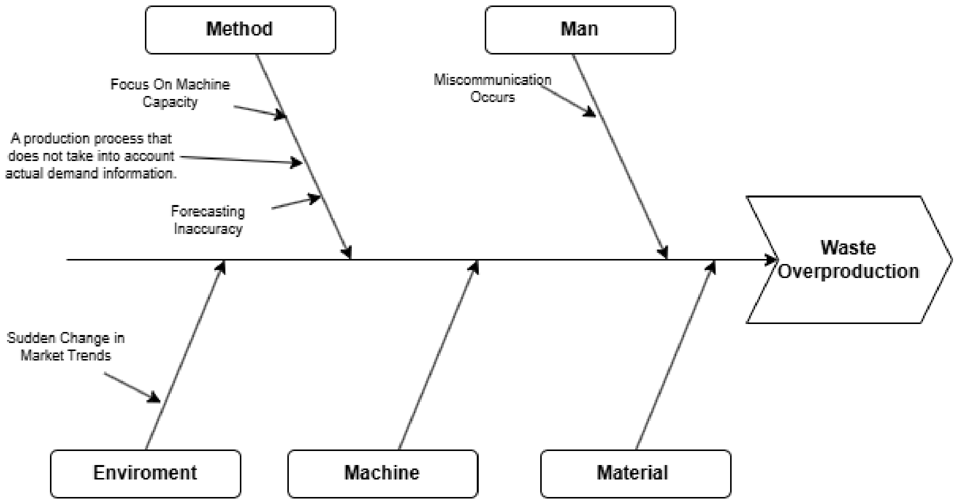

Figure 2. Fishbone Diagram Waste Over-Production

The main causes of this waste include uncertainty in product demand, a focus on maximizing machine capacity, and a lack of communication between production and marketing teams. This uncertainty arises from changes in market trends, customer preferences, or external economic factors. When companies do not have accurate data, they tend to produce more than they need. A focus on machine capacity can lead to excess product, while a lack of communication between production and marketing teams can potentially create a misalignment between production and actual market needs.

Defect

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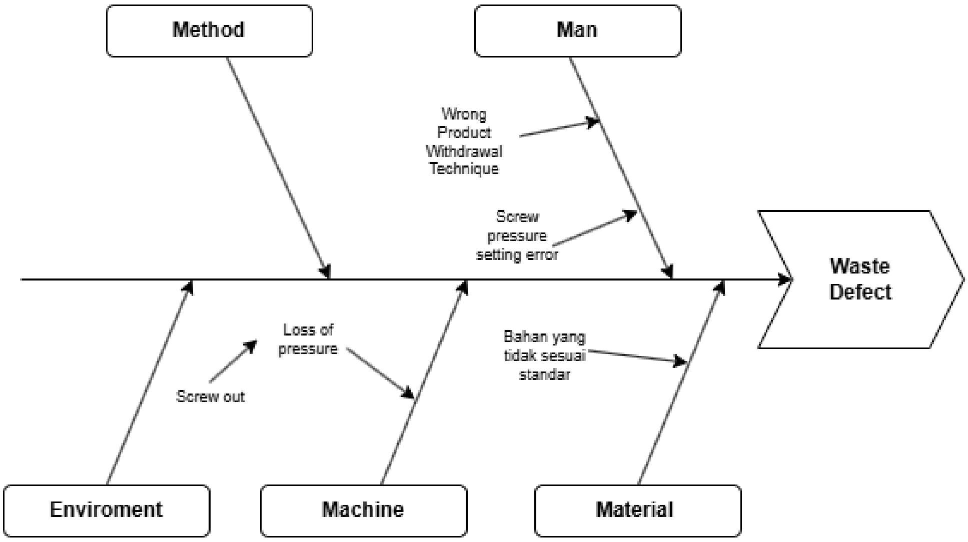

Figure 3. Fishbone Diagram Waste Defect

Based on identification using the Waste Assessment Model method, waste defect is the third type of critical waste in the production process at UD. Santoso. This waste is caused by several factors, especially inaccuracy in product withdrawal. Employees often withdraw products from molding at random, increasing the risk of physical defects and resulting in products that do not meet quality standards. Inconsistencies in this process increase the percentage of defects and reduce customer satisfaction. The use of materials that do not meet specifications also contributes to defects, resulting in final products that are too soft, hard, or defective. In addition, problems with injection pressure during the production process can cause defects in the product, both in terms of dimensions and material quality. Incorrect pressure results in products that are not formed properly, resulting in components that do not meet standards. The causes of this waste can be further described through a fishbone diagram.

Recommendations Proposed improvements using 5W1H

The 5W+H1 method is an analysis technique that is often used to understand a particular problem or situation in depth. The following is an analysis of proposed improvements using 5W+1H that focuses on the root causes of waste in the three highest Wastes, namely Motion, Over-production and Defect:

Table 5. Waste Motion Repair Alternative Recommendations

Factor	What (Cause of Waste)	Why (why improvements need to be made)	Who (who is responsible)	Where (where is the source of waste)	When (when waste occurs)	How (how to improve)
Method	Distance of Production Warehouse and Remote Storage	To reduce time and energy wasted in material transfer	Production and facility management team	Production and inventory warehouse area	At the time of moving finished products to the inventory warehouse	Perform more optimal layout analysis and relocation of storage areas
	Irregular placement of the tool	To make it easier to search and retrieve tools	Operator	Tool storage area	When looking for tools to use	Setting the appliance by its frequency of use, frequently used tools should be placed within easy reach. Use a clear and organized storage system, such

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						as shelves or cabinets with labels.
Man	Lack of discipline in tool placement	To ensure consistency of placement	Operators and production supervisors	Tool storage area	Any use and return of the appliance	Create and document standard procedures for tool placement, and ensure all employees understand and follow procedures. Organize regular training on the importance of discipline in tool placement.
Machine	The tools used are often lost	To prevent loss	Operator	Tool storage area	When the tool to be used is not found	Perform a periodic inventory of tools to identify missing tools. Designate a person to supervise the use and storage of the appliance.

Table 6. Waste Over-production Repair Alternative Recommendations

Factor	**What (Cause of Waste)**	**Why (why improvements need to be made)**	**Who (who is responsible)**	**Where (where the source of waste is)**	**When (when wastefulness occurs)**	**How (how to improve)**
Method	Focusing too much on the capacity of the machine	To optimize production capacity according to actual needs	Production operators	On the production floor/machine area	When production is carried out	Set production targets based on actual demand, not just machine capacity
	The production process does not consider the actual demand information	To align production with market demand	Production Planning and production operators	In the Production section	At the time of production is carried out without looking at the actual demand	Consider historical data, market trends, and customer feedback in forecasting. Regular coordination meetings between departments.
	Inaccurate forecasting	To improve the accuracy of production planning	Production Planning and Marketing	Production Planning Department	Each production planning period	Review historical sales data to identify patterns and trends that can be used in forecasting. Engage the marketing team in the forecasting process to gain insights into market trends and customer feedback.

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Man	Frequent miscommunication	To improve coordination between departments	Production and marketing team	Production area and Storage of finished goods	At the time of production is carried out without looking at the actual demand	Create a clear communication channel between production, sales, and marketing departments. Hold regular coordination meetings to discuss demand, production plans, and market updates.
Enviroment	Sudden changes in market trends	To anticipate market changes	Production Planning and Marketing	In the Production and inventory section	At the time of production, but the goods produced are not in accordance with market trends	Conduct regular monitoring of market trends and consumer behavior using data analysis and surveys. Create a neutral variety of products so that they can enter all different market segments.

Table 7. Waste Defect Repair Alternative Recommendations

Factor	What (Cause of Waste)	Why (why improvements need to be made)	Who (who is responsible)	Where (where is the source of waste)	When (when waste occurs)	How (how to improve)
Man	Incorrect Product Recall Technique	Reduce the risk of physical defects and meet quality standards	Production Employees	Area Molding	During the process of withdrawing products from molding	Provide training on correct recall techniques and create SOPs for product recall from molding
	Error Setting screw pressure	Prevents dimensional defects	Machine Operator	Production Machinery Area	During the process of setting the engine pressure	Standardize pressure parameters and provide machine setting training
Material	Non-Standard Materials	Prevents the product from being too limp/hard/deformed	Inventory Team	Warehouse Raw goods storage	When using materials that do not meet specifications	Make a checklist of material specifications and material checking procedures
Machine	Pressure loss due to asus screws	Maintain consistency of injection pressure	Machine Operator	Production Machinery Area	When production is in progress	Make a schedule for preventive maintenance and periodic checking of engine components

The results of this study are not merely inefficiency but it had shown the structure of structural inertia within a small-scale manufacturing business popular in the eddies of the competitive ocean without the guide of lean agility. It is then identified that the motion, overproduction and defects are the most dominant types of waste presented in the outsole production process of UD. Santoso is a moment of the diagnosis, clarity of how basic contradictions in physical

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design, human behavioral patterns and the clarity of information take concrete shape and the translations are in the domain of material waste, duplication of efforts and quality breakdown.

Top of the list is motion waste, which is not only a logistics hassle but is also an indicator of a design problem that is never analysed in most of the SMEs. This very distance between storage and production combined with disorganized tool placement creates a recurring complaint in lean literature; that layout inefficiency has a tendency to end up justified on grounds that it is immaterial due to its costs being spread over many operations. Nevertheless, as Womack & Jones (2003) articulate, lean thinking starts where complacency leaves off the idea that it is impossible to accept inefficiencies that take place every day. The issue, as this experience demonstrates, is not only related to the physical separation but also to the cognitive one, a lack of standardization, the absence of SOPs, or the cultural acceptance of ad-hoc improvisation, to the extent that it is all replicated in the findings by Shipman et al. (2023) who tracked down how the physical chaotic disorder in SMEs is directly proportional to lost productivity and employee frustration.

It is not a case of just moving work benches or re-designing pathways. Although Hyer & Wemmerlov (2022) note that, motion waste can be addressed more effectively using reactive changes, it is better to mitigate in the context of the systemic reengineering with the focus on the principles of cellular manufacturing. When the space and setup are not by departmental logic but are rather carried out with workflow logic in mind, shall space become purposeful. UD. In Santoso, there is a missing of such intentionality in his current arrangement. It creates additional waste in the workplace when employees have to deal with chaotic surroundings due to a loss of productive working time and energy, the chaos of which reminds one of the dynamic described by Bashatah & Sherry (2022) where failing to have good visibility and access to tools causes delays down the production line.

Then there is the overproduction waste (in this it is 16.90%) which is one of the standard lean failures, and also one of the most consistently misinterpreted. The mother of all wastes as Taiichi Ohno once said is overproduction since it gives birth to all the other wastes (Yarbrough et al., 2022). Making goods in excess of the demand not only blocks the capital and stores, it promotes undesirable transportation, stock building, and even moving, resulting in a chain multiplier impact of non-value add. In UD. The case of Santoso, an excessive focus on machine usage can expose a well-established concept of a so-called efficiency paradox as Kolokas et al. (2024) explain: machines are left to run not because demand justifies it, and because idling machines translates into failure. As a matter of fact, it is the surplus production that turns out being the failure, as it drags the system beyond what it has been ruled by the logic of demands, and throws the system into the whirlpool of speculative waste.

The cause? The faulty communicative architecture between the marketing and production- a trend reflected in the study by Fitriadi and colleagues, 2023 who attributed failures to forecast to the wall-divided operations of the functionally partitioned SMEs. Devoid of cross-functional feedback loop and common KPIs, production continues on guesses. Hu et al. (2024) argue that such mismatch could only be fixed by the use of integrated supply chain visibility whereby the production decisions will be dynamically translated to the market signals. What is the most immediate need at UD. Santoso, then, is a move not just away from push-based scheduling toward demand-pull systems, but also to kanban loops, takt time calibration, real-time sales data integration, and other methods to immunize production against the vagaries of guesswork.

What is even more troubling is the third major waste defect which is 16.79%. It is here to where the expense of activities inefficiency meets up with reputation danger. Defects are not units lost, but trust, repeat business and momentum lost as well. These events, traced here-- the inappropriate methods of withdrawing the products, the low grade materials used, the

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random pressure of the injections--kind of paints the picture of a system that worked with more Twinkies than design. These results are similar to Lubis (2021) who found that there was a strong relationship between the use of low-skilled labor and the adoption of high-defect rates in Indonesian manufacturing SMEs. Inability is however not the skill issue, and these are lack of inculcated knowledge systems (Malhotra, 2004). Unless there are SOPs where there is no externalization of tacit know-how in the form of training procedures, quality becomes intermittent and vulnerable (Kurniasih, 2021).

It is at this point that the lean principle of jidoka takes the center stage. Autonomation and its twin-stopping work when defects have been observed and working on the root causes and then returning to work-has long been a safeguard against normalizing failure. However at UD. Santoso, defect detection is a reactive process not preventive process. It is important to note, as Naziihah et al. (2022) note, that lean systems and the involvement of poka-yoke mechanisms, auditing of processes, and source-of-quality strategies can dramatically decrease the level of defects. Not simply better training, what is required is some form of institutional memory, what defects are, and how to use that information to continually adjust standards.

The consistency of integrating the Waste Assessment Model (WAM) and the Fishbone Diagrams and the 5W+1H when it comes to methodology should also be mentioned. All these tools combined not only recycle waste, but they track its heritage. They can give us an idea of how human failure works with machine unreliability, how informational breaches expand operational gaps. Briefly, they show the system of wastage. Such a multi-tool orientation is corroborated by the ideas of the authors of Maulana et al. (2023) and Pomalia et al. (2020) who argue in favor of the layered waste analysis approach but the next step beyond surface-type measures to structural diagnostics.

However, in this paper, they do not just list the problems because they also guide efforts at strategic solutions, which are feasible as well as expandable. The recommendations, including layout optimization and SOP implementations to cross-departmental coordination and preventative maintenance, conform to the global best practices and are implemented within the framework of the resource limitations of SMEs (Astutik et al., 2022; Maizi et al., 2025). More importantly, the adherence to human capital management- discipline, training and communication- is reflective of the larger trend in lean literature which acknowledges the importance of people over process as the only true differentiator (Womack et al., 2005; Alpenberg, 2004).

However, contextual humility, perhaps, is the most important lesson which this study offers. Unlike the idyllic lean settings, UD. Santoso is a tool of reality - poor budgets, strong worker orientation, and consumer pressure. Therefore, although the researched principles are universal, their value to the field is localizing them. It confirms that lean is not a template but a translation, or rather a list of ideas that those behind it have to translate into the grammar of their own, one-of-a-kind organization (Ojovan & Steinmetz, 2022).

The globalization, the digitization, and the sustainability pressures are meeting, and lean transformation in SMEs is not just an option anymore, but rather a matter of existence. UD. With this study Santoso is at the edge of such a transformation. Whether it proceeds depends not on tools or techniques, but on attitude: on whether it is willing to regard waste not as an unfortunate inevitability, but as a problem in design. Sustainable systems, in the manner of speaking, are designed, not found, as Genc (2025) phrased it so well. And all redings of redesign start with the ability to look and plainly see what is not working anymore.

Conclusion

The results of the study using the Waste Assessment Model method identified waste motion, overproduction, and defect as three types of critical waste in the outsole production process

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at UD. Santoso. Waste motion has the highest value, which is 0.003295 (19.34%), followed by waste overproduction 0.002880 (16.90%) and defect 0.002860 (16.79%). Analysis using fishbone diagrams and 5W1H shows that the causes of waste motion include lack of employee discipline, lost tools, and long distances between the storage warehouse and the production area. To reduce this waste, the company is advised to conduct training, conduct an inventory of lost tools, and design a more effective layout. Meanwhile, waste overproduction is caused by excessive focus on machine capacity, miscommunication, and sudden changes in market trends. The company can overcome this waste by setting production targets based on actual demand and involving the marketing team in forecasting. On the other hand, waste defects are caused by incorrect pulling techniques, substandard materials, and machine problems. To reduce waste defects, companies are advised to conduct training in pulling techniques, set machine parameter standards, and schedule machine component maintenance.

It is expected that this research can be further developed by applying different analysis methods to explore the complex factors that are the root causes of waste, so that the effectiveness of the proposed recommendations can be evaluated in depth. In addition, the use of more complete data in further research is expected to increase the complexity and accuracy of the analysis. Companies are also advised to consider implementing improvement recommendations to reduce existing waste levels.

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