

## LAYOUT REDESIGN ANALYSIS PLASTIC TARPAPER PRODUCTION FLOOR USES CRAFT ALGORITHM METHOD AT PT. LIMMAS ANUGRAH PLASINDO

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### Abstract

A good layout will provide efficient material flow, shorter material movement distances, and minimal material movement costs. Several techniques can be used to rearrange an inappropriate layout. One way to rearrange the layout is to use the CRAFT (Computerized Relative Allocation of Facilities Technique) method, which is a software improvement program that aims to find the optimal design by gradually improving the layout. The CRAFT method itself has been widely used to improve and develop the effectiveness of layouts in companies and agencies and optimize land use and emphasize OMH values. PT. Limmas Anugrah Plasindo is a manufacturing company engaged in the production of rolled plastic tarpaulins that always maintains product quality. Where the machines experience backtracking (land use problems) so that the distance traveled becomes far. Therefore, this study proposes a layout to reduce the distance and cost of OMH, resulting in a reduction in OMH costs of Rp. 306,622.74 from the initial total of Rp. 1,285,628.80. and a reduction in land by 272m. The implementation of the CRAFT method still refers to field conditions and agreements from the company by also considering aspects of worker comfort, storage of finished goods and others.

**Keywords:** Plastic Terpaulin, PT. Linmas Anugrah Plasindo, Reorganizing Facilities

## INTRODUCTION

Facilities are basic necessities for human life (Saputro, 2022). Facilities can be interpreted as means for life and facilities that are part of the infrastructure (Puspitasari et al., 2020). Broadly speaking, the word facility is interpreted as physical or non-physical facilities needed for life, or it can also be interpreted as physical objects needed for the functioning of infrastructure and attached to the infrastructure (Maharani et al., 2022). A facility's infrastructure includes chairs, tables, air conditioners, or even machines (Agung et al., 2020).

The arrangement of facilities is very important, where the final result is good quality but at a low cost (Yuliana, 2021). The science that studies the arrangement of machines or production floors is called factory layout science (Prabowo, 2009). In the industrial world, layout and work area are the most important things (Wignjosoebroto, 2009). According to Sugeng (2016), the effectiveness of factory layout helps companies achieve strategies that support established business strategies between low costs and fast response. Specifically, layout arrangements can provide benefits to companies (Wignjosoebroto, 2009), namely increasing production output, reducing delays, and reducing the material mobilization process.

The first thing to do in compiling a layout is to determine the pattern. The type of layout must be following the manufacturing process (Heragu, 2008). A layout that is adjusted to the process or function is a way of placing similar machines and production tools in one department (Hadiguna and Setiawan, 2008). The process type layout groups production floors according to the same function (Kumar and Suresh, 2008). Distance measurement can be done in 3 ways, namely Euclidean Distance is the distance measured in a straight line from the center point of one department to another, Squared Euclidean Distance is the distance calculated by squaring the distance between the two departments to be measured. The square distance is the distance measured perpendicularly from the center point of one department to another (Santoso & Heryanto, 2020). According to Wignjosoebroto (2009), Material transfer is an important activity in the production process and has a fairly close relationship with the planning of the production floor layout.

The factory layout can reduce moving costs, so it can be concluded that the planning or design of the factory facility layout is related to the planning of the material transfer

process (Yohanes, 2011). From to chart (FTC) which is also known as the trip frequency chart or Travel Chart is a conventional technique, generally used in factory layout planning and material transfer in the production process. Computer algorithms are sophisticated tools for comparing choices of activity area arrangements within the limits of selected criteria and available data (Prihastono, 2014). The CRAFT algorithm aims to minimize the cost of moving materials and optimizing land. The inputs used for the CRAFT algorithm (Yuliani et al, 2016) are: Initial layout, flow data (frequency of material movement), cost data (cost of handling material in one distance), and number of departments that do not change (fixed).

## **REVIEW OF LITERATURE**

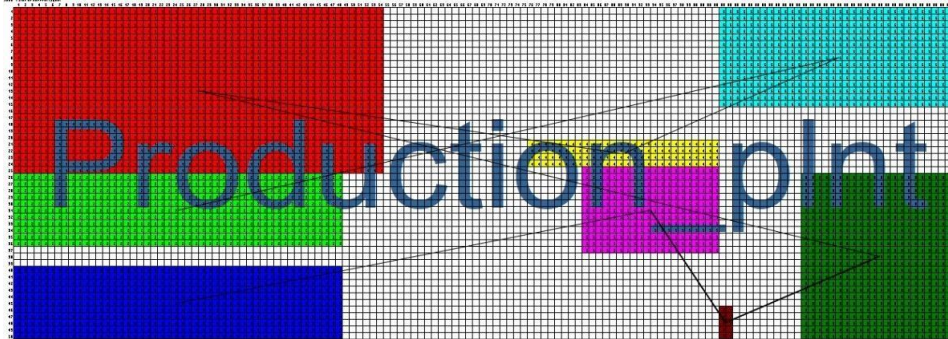
Based on research (Suhardini et al., 2018), the CRAFT method is used to improve the existing layout. The study shows that there is a decrease in OMH of 6.24% from the initial cost, meaning that CRAFT improves the layout effectively. The simulation results show a reduction in lead time of 23 minutes. Based on research (Kuswardhani et al., 2021) the results of the study show that the alternative graphic method 2 is the best solution based on the value (OMH). This method has a smaller displacement moment per day and total OMH compared to the existing design, 89 meters per day and Rp. 7,039.90, respectively.

## **RESEARCH METHOD**

This research was conducted at the tarpaulin production factory of PT Limmas Anugrah Plasindo located on Jalan Artikan Kecubung Kec. Pace, Nganjuk Regency, East Java 64472. This research will be conducted from February 2024 until the data needed for this research is complete. The independent variables are the sequence of the tarpaulin production process, the distance between stations, the area of the production station, the cost of material handling, the layout before the proposal, and the dependent variable is the proposed layout with a shorter distance. Data collection for this research with primary company data through interviews and observations, as well as secondary data through documents from the company.

## RESULTS AND DISCUSSION

The initial layout is owned by PT. Limmas Anugrah Plasindo is currently still arranged based on the limitations of the available space, so it does not pay attention to the sequence of production processes, proximity between workstations, and so on. Below is the initial layout of the company that shows the real conditions in the field:



**Figure 1**  
**Initial Layout with CRAFT Software**

**Table 1**  
**Work Station Area**

Workstation Code	Work Station Name	Long (m)	Wide (m)	Wide (m2)
A	Raw Material Warehouse	11	48	528
B	Station I	12	35	420
C	Semi-finished Material Warehouse	4	12	48
D	Station II	25	54	1350
E	Station III	25	23	575
F	Scales	2	5	10
G	Station IV	12	18	216
H	Finished Goods Warehouse	11	48	528

The table above is the initial area of each workstation that will be used as a comparison to the area after the layout. To find out whether the layout has succeeded in meeting the research objectives, namely shortening the distance of material flow movement, the initial area is needed as a comparison.

**Table 2**  
**Work Station Coordinates**

Workstation Code	Color Code	Work Station Name	X	Y
D	Red	Station II	27	12.5

A	Light green	Raw Material Warehouse	24	30.5
H	Dark blue	Finished Goods Warehouse	24	44.5
C	Yellow	Half Finished Warehouse	89	22
G	Pink	Station IV	93	30.5
B	Blue	Station I	120.5	7.5
F	Chocolate	Scales	104	47.5
E	Green	Station III	126.5	37.5

The coordinates above are obtained from the company's initial layout by showing the respective coordinates of each workstation.



**Figure 2**  
**Activity Relationship Chart**

Activity relationship char (ARC) is conducted to determine the level of relationship between activities that occur in each area with other areas in pairs. ARC is obtained based on field conditions at PT. Limmas Anugrah Plasindo. The relationship is assessed from several aspects including the relationship of the sequence of process flow, use of the same equipment, ease of supervision, and workplace conditions.

Init. Cost		1285628.8			
		Iterations: 3			
Index	Init. Seq.	Iter.	Type	Action	Cost
1	1	1	Switch:	6 and 4	990942.125
2	2	2	Switch:	6 and 1	979450.0625
3	3	3	Switch:	2 and 6	979006.0625
4	4				
5	5				
6	6				
7	7				
8	8				

**Figure 3**  
**CRAFT Method Calculation Results**

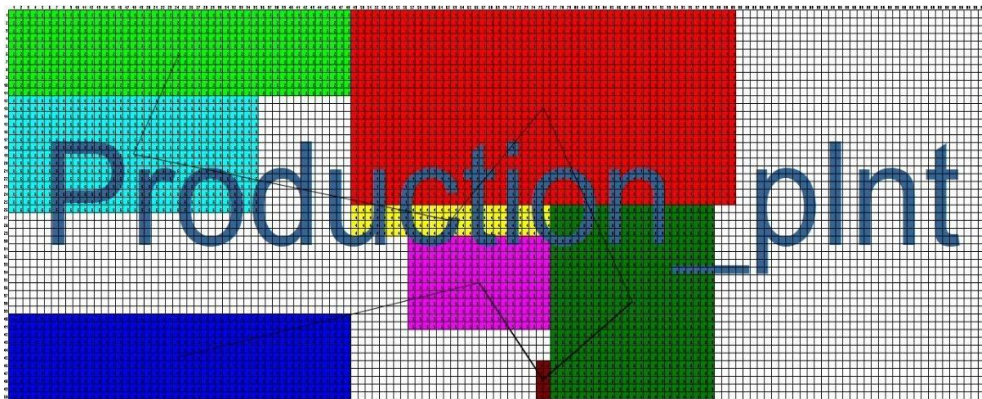
From the analysis data conducted using the CRAFT method, the results of the material flow transfer costs from the initial layout are Rp. 1,285,628.80. On the analysis output display, there is a Slove button that will find the best solution from the initial layout so that the shortest distance for material flow transfer is obtained. From the results obtained using the CRAFT method, the transfer of each workstation that can be changed is as follows: In the first iteration, Station I was moved to the Semi-Finished Warehouse position approaching the Raw Material Warehouse and Station II. By making this transfer, the material handling cost was reduced by Rp. 294,686.68. In the second iteration, Station I exchanged positions with Station II so that Station II approached the Semi-Finished Warehouse, the material handling cost was reduced by Rp. 11,492.0625 from the first iteration. In the third iteration, the lowest material handling cost was obtained by exchanging the position of the Raw Material Warehouse with Station I, with a nominal depreciation cost of Rp. 444.00.

**Table 3**  
**Total and Difference in Material Handling Costs**

Number	Layout	Total Material Handling Costs	Difference in Material Handling Cost	Total Distance (m)	Difference in Total Distance (m)
1	Initial layout	Rp. 1.285.628,80	-	505	-

2	Layout Iteration I	Rp. 990.942,12	Rp. 294.686,68	311	194
3	Layout Iteration II	Rp. 979.450,06	Rp. 11.492,06	254	57
4	Layout Iteration III	Rp. 979.006,06	Rp. 444	233	21

In the initial layout, the total distance was 505 meters. While in the first iteration layout, the total distance was 311 meters with a difference of 194 meters from the initial layout. In the second iteration, the total distance was 254 meters with a difference of 57 meters from the total distance of the first iteration. Then in the third or final iteration, the shortest total distance was 233 meters with a difference of 21 meters from the previous iteration. The following is the proposed layout from the 3<sup>rd</sup> iteration.



**Figure 4**  
**Proposed Layout with Craft Software**

From the results of the third iteration, a proposed layout was obtained with the lowest material handling costs and a shortened material flow movement distance as shown in the image above.

## CONCLUSION

The conclusion obtained: the total distance of the shortest material flow movement produced from three iterations with the CRAFT method is 233 m. The distance resulting from this iteration is reduced by 272 m from the total initial distance of 505 m, from data processing on the production floor of PT. Limmas Anugrah Plasindo using the CRAFT method with the help of the Microsoft Excel add-in, then a recommendation for the proposed layout design can be given in the form of: Bringing the position of Station I closer to Station II, then bringing the position of Station I closer to the Raw Material Warehouse so that backtracking does not occur, finally bringing Station II, the semi-finished warehouse, Station

III, Station IV, and scaling towards Station I. With this transfer, it will reduce OMH by Rp. 306,622.74 to Rp. 979,006.06. Research suggestions for further researchers can add variables in the measurement and use the 2 Method comparison method in their research

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