
PRODUCTION FACILITY LAYOUT DESIGN USING SLP AND BLOCPLAN METHODS AT ANGGUN BAKERY MSME

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ABSTRACT

Anggun Bekery, a small and medium-sized enterprise (SME), which produces sweet bread and donuts, still has an inefficient layout, resulting in overlapping flows, back- and-forth movements, long material transfer distances, and longer production times. This study aims to redesign the production facility using the Systematic Layout Planning (SLP) and BLOCPLAN methods to improve material flow efficiency at Anggun Bakery.

This research was conducted through observation, interviews, and measurements of the production area. The analysis included identifying the existing layout, developing an Operation Process Chart (OPC), calculating movement distances using the rectilinear method, constructing an Activity Relationship Chart (ARC), an Activity relationship Diagram, and designing proposed layout using BLOCPLAN software. The evaluation was conducted by comparing material movement distances and production lead times before and after the layout improvement.

The study found that the proposed layout was able to eliminate crossing flow and backtracking, as well as reduce material movement distance from 66 meters to 37 meters (43,94), and production lead time from 72,25 minutes to 56,25 minutes per product (22,42). These results indicate that the SLP and BLOCPLAN methods are effective in increasing the efficiency of the Anggun Bakery MSME production facility layout.

KEYWORDS

Facility layout, Systematic Layout Planning (SLP), BLOCPLAN, material flow, lead time.



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INTRODUCTION

Facility layout planning is a method of managing existing resources in an industry to support the smooth running of the production process. These resources can include machinery, production tools, raw materials, and labor (Maulidah, P Anggela, 2022). An effective layout describes the characteristics of the alignment between operational facilities and the type of product or service produced and the conversion process. Good layout design will contribute to increased company productivity (Suhandinata, 2023). If the production layout is not effective and efficient, this will result in significant wasted time in moving materials, resulting in suboptimal production results (R. Z. S. Albar, 2024).

Based on initial observations, the production area off Anggun Bakery's sweet bread and donut SMES is 103,6 m². This production area is divided into several departments, including the mixer department, the oven department, the baking pan greasing department, the sweet bread pan stacking department, the donut pan stacking department, the donut frying department, the bakery equipment department, the equipment washing department, the dough cutting department, the kneading table department, the mobile rack department, and the raw material weighing department. In addition, facilities such as tables, chairs, a lift, and a buttercream mixer are also available.

The problem encountered in the production area of Anggun Bakery's sweet bread and donut SMES is the irregular flow pattern. This is the presence of cross-flow and backtracking movements, with a total distance of 11,4 meters per production run. This causes material transfers to disrupt production times and makes the process less efficient, taking up space, and making the area appear cramped, furthermore, the placement of several facilities, such as the lift and the raw material weighing area, is not linear, resulting in a non-linear flow. Furthermore, the kneading department tables are not arranged optimally to ensure optimal process manually and utilizes rolling racks. However, the rolling racks also frequently obstruct access to the bread oven, requiring workers to move the racks before baking. This condition results in wasted worker time, as each material transfer requires approximately 23 seconds. The need for a facility layout redesign is primarily driven by two factors: (1) the placement of facilities without considering the material flow pattern, and (2) an inefficient production process sequence.

According to Bayu et al., (2024), the systematic layout planning (SLP) method emphasizes production management to improve efficiency. Layout design using the SLP method integrates various principles related to material flow techniques, operational management, and space planning to create an optimal and effective layout design. However, the results of the SLP analysis need to be visualized in the form of alternative layout designs. Therefore, the BLOCPLAN approach is used as a supporting method for a construction algorithm that converts qualitative data into quantitative data to determine the initial location of facilities within the existing layout.

The use of the SLP and BLOCPLAN methods at the Anggun bakery MSME is expected to provide a more structured, efficient facility layout proposal that aligns with the process flow of making donuts and sweet bread. This research is expected to provide practical contribution to the Anggun Bakery MSME in improving operational efficiency and serve as a reference for similar MSMEs facing production facility layout issues. Therefore, this research was conducted using the Systematic Layout Planning (SLP) method to analyze the proximity requirement between departments based on the production process flow, and the BLOCPLAN approach to generate the most recommended and effective layout design proposal.

LITERATURE REVIEW

Facility Layout Design

Facility layout design is a combination of art and engineering (Rahmawanti et al., 2026). Facility layout design is one of the factors that can influence production capacity in an industry (Simanjuntak et al., 2022). Facility layout design is an activity that involves arranging an area that includes facilities, divisions, or buildings in a planned manner to reduce travel distances based on the sequence of processes in that area, with the main goal of increasing an organization's profits and reducing losses such as energy, time, and costs (Mudhofar et al., 2023). The application of facility layout design in a factory can make improvements to achieve the main objectives expected (Saputra et al., 2022). The main objective of facility layout design is to organize workspaces and all production and facilities in the most efficient way to produce a safe and comfortable production process, so as to increase the morale and performance of workers (Kurniadi & Pratama, 2022).

Systematic Layout planning

The Systematic Layout Planning (SLP) method was introduced by Richard Muther in 1961, an American professor and industrial engineer (Bayu et al., 2024). The SLP method uses a structured and planned approach to layout design (Indriyanto, 2024). The required information includes the initial design, material flow, production activities, workforce data, existing area, and size of machines or facilities (Yulia et al., 2022).

Area Allocation Diagram (AAD)

An Area Allocation Diagram (AAD) is a diagram used to show how activities and tasks are allocated to work areas and human resources within a facility. AAD is typically used in planning factory and facility layouts, as well as in business process modeling. This diagram considers the relationships between activities and human resources by utilizing rectangular shapes and connecting lines (Immanuel et al., 2023).

AAD is also frequently used when designing a space's layout. It only depicts space utilization, but the overall visualization can be seen in a template, which represents the final result of the analysis and planning of facility layout and material flow (Hanjaya et al., 2024).

BLOCPLAN

BLOCPLAN is an application created by Donaghey and Pire in 1991. This application can optimize single- and multi-level layouts (Fahrinani, 2024). This program designs and evaluates various types of layouts based on the provided input. The data required to run the BLOCPLAN program is ARC. The following are the values or points frequently used in data processing with the BLOCPLAN program according to (R. Z. Albar, 2024):

1. Symbol A has a value of 10 points.
2. Symbol E has a value of 5 points.
3. Symbol I has a value of 2 points.
4. Symbol O has a value of 1 point.
5. Symbol U has a value of 0 points.
6. Symbol X has a value of -10 points.

The basis of the BLOCPLAN algorithm analysis is the highest R-Score, which is then considered based on the lowest Rel-disk Score. The following are the steps for using the BLOCPLAN software according to (R. Z. Albar, 2024):

1. Enter the department name and available area.
2. Enter the Activity Relationship Chart (ARC).

3. Enter data regarding the location area.
4. Select the single-story layout menu.
5. Create a layout using the random layout method.
6. Analyze the results of all saved layouts.

The best layout is determined based on the Adj Score, R Score, and Rel-Dist Score.

RESEARCH METHODOLOGY

The following are the steps in layout improvement using the SLP procedure according to (Sibarani et al., 2024) :

1. Collecting Input Data and Activities

The initial step is to collect company-related data, product design examples, and process sequences using an Operation Process Chart (OPC) or Flow Process Chart (FPC) using American Society of Mechanical Engineers (ASME) symbols used in an Operation Process Chart (OPC).

Table 1 Symbol Description OPC

Simbol	Keterangan
	Operation : This symbol represents a process in which the object being worked on undergoes physical or chemical changes.
	Inspection : This symbol represents a step to assess quality and quantity. This symbol can be used to compare against certain criteria or standards.
	Transportation : This symbol represents the process of moving goods from one part to another.
	Storage : This symbol represents the storage step that can occur when an item is stored for a significant period of time.
	Delay : This symbol represents the waiting process
	Inspection and Operation (Executed simultaneously) : This symbol indicates an activity carried out simultaneously between operation and inspection within a single process sequence.

Source: Lubis, 2022

2. Material Flow Analysis and Operation Activities

This analysis emphasizes the movement of materials between various operational activities. After data collection, material and equipment flow analysis is performed to identify layouts that support production, with the option of transitioning to a product layout.

3. Activity Relationship Chart (ARC)

An Activity Relationship Chart (ARC) is a method for showing the proximity relationships between various activities or facilities by considering the intensity of interaction, material flow requirement, and placement options. ARC supports layout design by identifying the proximity sequence between work zones before determining their final locations in the layout diagram (Andhieta et al, 2025)

Table 2 Activity Relationship Chart (ARC) Codes

Degree of Proximity	Deskription
A	Absolutely essential that the activities are close together
E	Very important that the activities are close together
I	Important that the activities are close together
O	Proximity is not problem anywhere
U	There is no need for a geographic connection between any places
X	The activities are not close together

Source: Pradana, 2025

4. Activity Relationship Diagram (ARD)

Contains a series of material flows and relationships between parts in layout design. These factors include both numerical and non-numerical elements.

Table 3 Activity Relationship Diagram (ARD) Code

Symbol	Color Code	Line Code
A	Red	4 line
E	Orange	3 line
I	Green	2 line
O	Blue	1 line
U	White	No code
X	Brown	

Source: Pradana, 2025

5. Area Requirements and Available Area

Next, an analysis is conducted to determine the amount of space required for the company's facilities. This analysis will determine the required factory area and consider the usable area for the factory facility.

6. Space Relationship Diagram (SRD)

The space Relationship Diagram combines ARC, ARD, and area requirements to assist in developing the proposed layout.

7. Facility Layout Alternative Design

This process then continues with the creation of alternative facility layout design, resulting in several proposed layouts. Will be selected and used as the company's proposed layout design.

8. Decision Alternatives, implementation, and evaluation.

RESULT AND DISCUSSION

Existing Layout

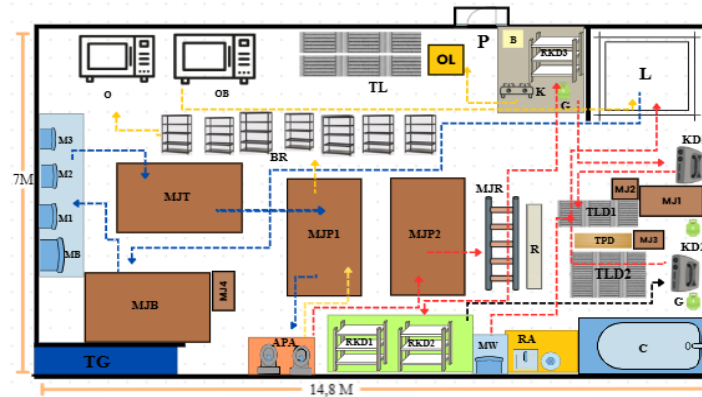


Figure 1. Layout Existing

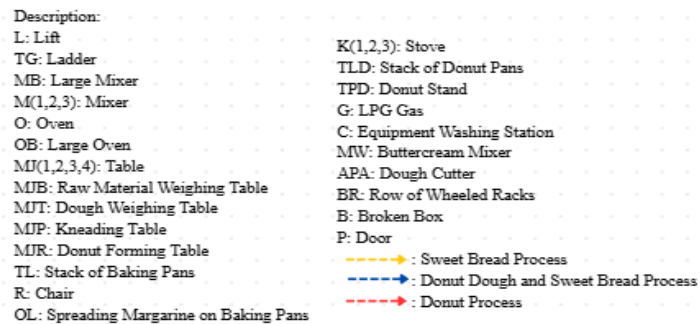


Figure 2 Description Layout Existing

Table 4 Description Of Process Flow, Movement Distance, Process Time In The Existing Layout

No	Process Flow	Travel Distance (m)	Process Time (min)	Description
1	Elevator (L) → Raw Material Table (MJB)	8.5	4	Raw material transfers from the first floor to the production area and to the raw material weighing table.
2	MJB → Mixer (M1/M2/M3)	3	5	Weighed raw materials enter the mixing process.
3	Mixer → Dough Weighing Table (MJT)	4,5	2	The mixed dough is weighed according to production requirements.
4	MJT → Dough Cutting Equipment (APA)	5,0	1	Dough is transferred for the dividing/cutting process
5	APA → Sweet Bread Kneading Table (MJP1)	4	6	Sweet Bread Dough Process line
6	MJP1 → OL (Pain Grease)	6	1	Sweet Bread Dough moves to the pan preparation
7	OL → Wheeled Rack (BR)	3.5	0.5	Dough pans awaiting the oven process
8	BR → Oven (O/OB)	4	3	Transferring the pans to the baking process

No	Process Flow	Travel Distance (m)	Process Time (min)	Description
9	Oven → BR (Donut Wheel Rack)	4	17	The rack is used as a temporary storage for the product after it is cooked
10	APA → Donut Forming Table (MJR)	6.5	2	Donut dough enters the forming process
11	MJR → Proofing Rack (RKD1/RKD2/RKD3)	3	17	Fermentation/resting process for the donut dough.
12	RKD → Donut Stove (KD1/KD2)	4.5	2	Transferring the dough to the frying process.
13	KD → Draining Table (MJ1/MJ2/MJ3)	2	3	Draining the donuts after frying.
14	MJ1/MJ2/MJ3 → Stack Of Donut Pans (TLD1/TLD2)	2.5	2	Donuts move to the topping process
15	TLD → BR	7	2	Products are collected and moved using a rolling rack
16	BR → Elevator (L) For Distribution	7.5	5	Finished products are moved to the packaging floor
Total		66	72,5	

Source : Observation Data

Identification results indicated that there are intersecting flow paths between the sweet bread and donut production processes. This cross-flow occurs in the kneading table (MJP 1 and MJP2), the rolling rack (BR), and the donut forming table (MJR). These areas are used simultaneously by the sweet bread and donut process flows, causing material flow paths to intersect. Furthermore, there is backtracking at several process stages, particularly during the transfer of raw material table (MJB), the transfer of baking pans from the kneading table to the margarine spreading area and oven, and the transfer of donut products from the fermentation rack to the frying and topping areas.

The material movement distance is based on the production process flow, from raw material input to the finished product to the packaging area in the initial layout using the rectilinear distance method. The coordinates of each department can be determined from the X and Y symbol obtained from each facility. (X1, X2) indicate the leftmost and rightmost points on the X-axis, while (Y1, Y2) are the topmost and bottommost points on the Y-axis. Equation 1 :

$$x = \frac{x_1 + x_2}{2} \text{ and } y = \frac{y_1 + y_2}{2}$$

Once the coordinates of each department are obtained, the distance between departments can be calculated using Equation 2 :

$$D_{ij} = |x_i - x_j| + |y_i - y_j|$$

Table 5. Production Facility Area Data

No	Description	Length	Width	Area (m)
1	Dough mixer station (donuts and sweet bread)	2.8	1	2.8
2	Oven station (sweet bread)	4	0.9	3.6
3	Baking pan stacking station (sweet bread)	3.1	1	3.1
4	Dough cutting station (donuts and sweet bread)	1	1	1

No	Description	Length	Width	Area (m)
5	Tool washing station	1.6	1.3	2.08
6	Small equipment station	1.2	0.5	0.6
7	Donut pan stacking station 1	0.7	0.9	0.63
8	Donut pan stacking station 2	1.2	0.7	0.84
9	Donut Rack 1	1.7	1.5	2.55
10	Donut Rack 2	1.4	1.5	2.1
11	Donut Rack 3	1.5	1.5	2.25
12	Medium table (near the raw material weighing table)	1.2	0.6	0.72
13	Small table 1 (donut)	0.6	0.6	0.36
14	Small table 2 (donut)	0.6	0.6	0.36
15	Butter cream mixer (donut)	0.8	0.6	0.48
16	Stack of donut stands	1.5	0.7	1.05
17	Stove 1 (donut frying)	0.9	0.5	0.45
18	Stove 2 (donut frying)	1.8	0.7	1.26
19	Stove 3 baking pan greaser	0.6	0.3	0.18
20	Chairs (donut)	2	0.5	1
21	Donut forming table	2	0.5	1
22	Kneading table 1 (sweet bread)	2.5	1.2	3
23	Kneading table 2 (donuts)	2.5	1.3	3.25
24	Weighing table for donuts and sweet bread ingredients	2.5	1.3	3.25
25	Table 1 (weighing table entry)	1.6	0.7	1.12
26	Lift	2.6	1.5	3.9
27	Spreading margarine on baking pans (sweet bread)	0.5	1	0.5
28	Mobile rack station (donuts and sweet bread)	5	3	15
30	Ladder	3	1	3
Total				61.44

Source : Observation Data

Department Grouping According to Production Activity Function

Department grouping was carried out taking into account the proximity between facilities and the sequence of the sweet bread and donut production process. Based on the data identification results, production facilities were grouped into seven departments, as shown in Table 6 below.

Table 6. Department grouping

Code	Departement	Facilities	Luas (M ²)
A	Raw Material Preparation	Table 1, medium table	6
B	Dough Processing	Dough mixer, dough cutting, weighing table, kneading table 2	12,5
C	Donut Shaping and Storage	Donut shaping table, small table 1, small table 2, stove 1, stove 2, donut chair	6
D	Donut Finishing	Stack of donuts pans1, stack of donut pans 2, wooden donut racks 1-3	10
E	Sweet Bread Production and Finishing	Oven, kneading table 2, stack of bread pans, margarine grease, baking stove, butter cream mixer	13
F	Finished Product	Mobile rack	15
G	Utilities Dan Sanitation	Tool washing area, small tools	2,7
H	Elevator	Elevator	3,9
I	Ladder	Ladder	3

Source : Data Processing

Operation Process Chart (OPC)

The OPC (Operation Processing Unit) was created to demonstrate the production process within the current layout. The OPC is used to identify the operational and inspection activities that occur during the production of donuts and sweet breads, from incoming raw materials to packaging.

Observations indicate that the production process begins with transporting raw materials from the storage area using an elevator, followed by weighing the raw materials,

mixing the dough, and weighing the dough. After dough preparation, the process flow is divided into two product categories: sweet bread and donut production.

The OPC is also used as a basis for determining the sequence of production activities and the relationships between processes, which are then used in facility layout analysis using the Systematic Layout Planning (SLP) method. The Operation Process Chart (OPC) diagram can be seen in Figure 3 below.

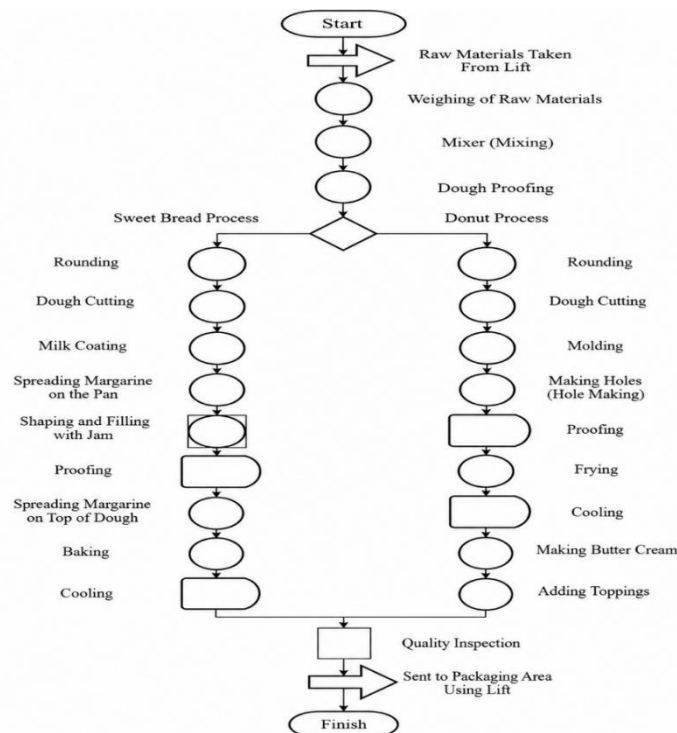
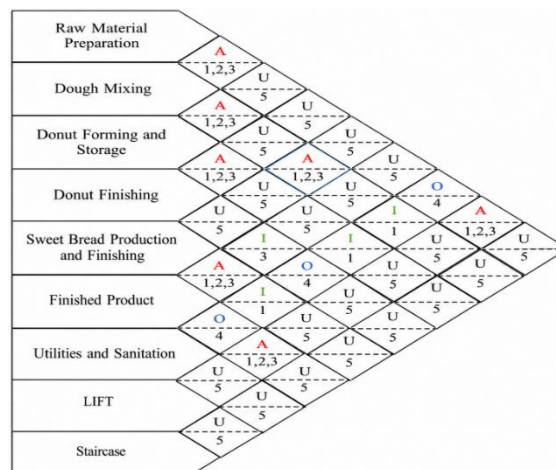


Figure 3. Operation Process Chart (OPC)

Activity Relationship Chart (ARC)

ARC is a tool that displays the level of proximity between activities at the donut and sweet bread production site of the Anggun Bakery MSME. Each relationship is assessed based on the intensity of interaction, material flow, and coordination requirements



between areas. The proximity assessment uses letter codes (A, E, I, O, U, X) and colors as visual representations to facilitate layout analysis.

Figure 4. Activity Relationship Chart (ARC) (Data Processing)

Activity Relationship Diagram (ARD)

ARD is based on data from ARC. This diagram visualizes the proximity requirements between activities as colored lines. ARD is the primary tool in developing the proposed layout to ensure more efficient material flow.

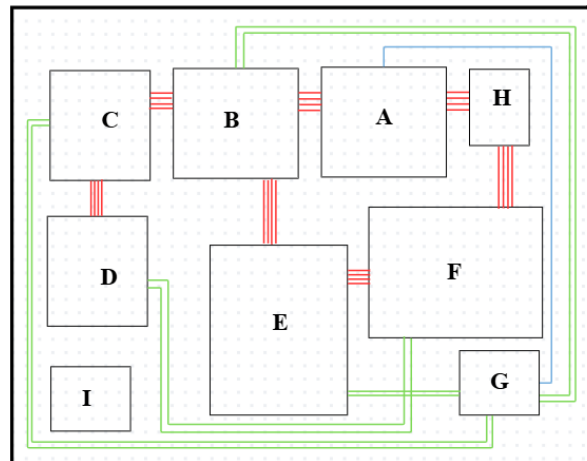


Figure 5. Activity Relationship Diagram (ARD) (Data Processing)

BLOCPPLAN

BLOCPPLAN software is used as a tool to help design facility layouts. The process begins by entering the total area for each facility and the proximity between them. Next, BLOCPPLAN converts the proximity levels into numbers. For example, proximity A is given a value of 10 points, proximity E is given a value of 5 points, while proximity X is given a value of -10 points. BLOCPPLAN allows users to change the existing proximity values. Based on these values, BLOCPPLAN calculates an overall score for each facility. After that, BLOCPPLAN generates several layout alternatives complete with proximity values, R-scores, and R-dist. The best layout alternative is the one that offers the highest adjacency value, the highest R-score, and the lowest R-dist. Layout alternative number 9 was chosen because it has the highest adjacency and R-score. The results and analysis of BLOCPPLAN can be seen in Figure 6.

DOSBox 0.74-3, Cpu speed: 3000 cycles, Frameskip 0, Progra...

LAYOUT	ADJ. SCORE	REL-DIST	SCORES	PROD	MOVEMENT
1	0.90 - 3	0.87 - 1	314 - 1	0 - 1	
2	0.80 - 9	0.77 - 9	355 - 7	0 - 1	
3	0.93 - 1	0.83 - 2	351 - 6	0 - 1	
4	0.80 - 9	0.76 -12	378 -10	0 - 1	
5	0.81 - 6	0.77 -10	385 -12	0 - 1	
6	0.80 - 9	0.71 -14	419 -18	0 - 1	
7	0.80 - 9	0.73 -13	407 -16	0 - 1	
8	0.80 - 9	0.68 -17	440 -20	0 - 1	
9	0.93 - 1	0.81 - 4	350 - 5	0 - 1	
10	0.78 -17	0.69 -16	387 -13	0 - 1	
11	0.90 - 3	0.80 - 6	346 - 3	0 - 1	
12	0.80 - 9	0.76 -11	392 -14	0 - 1	
13	0.78 -17	0.78 - 7	359 - 8	0 - 1	
14	0.81 - 6	0.65 -20	438 -19	0 - 1	
15	0.79 -16	0.65 -18	413 -17	0 - 1	
16	0.80 - 9	0.77 - 8	372 - 9	0 - 1	
17	0.90 - 3	0.71 -15	383 -11	0 - 1	
18	0.69 -20	0.65 -19	406 -15	0 - 1	
19	0.78 -17	0.81 - 3	350 - 4	0 - 1	
20	0.81 - 6	0.81 - 5	344 - 2	0 - 1	
				TIME PER LAYOUT	1.11

DO YOU WANT TO DELETE SAVED LAYOUT (Y/N) ?

Figure 6. Best Alternative With Adjacency Value, Highest R-Score and Lowest R-dist
(BLOCPLAN Data Processing)

The following are the results of the best alternative layouts for the production floor of donuts and sweet breads from UMKM Anggun Bakery using BLOCPLAN software, namely Layout number 1, which has the highest adjacency value of 0.90, the highest R-score of 0.87, and the lowest R-dist of 314. which can be seen in the figure 7.

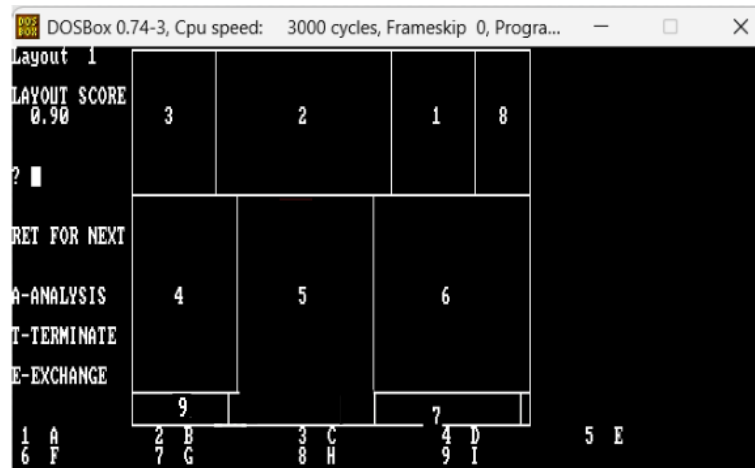


Figure 7 Alternative Layout Proposed Results (BLOCPLAN Data Processing)

The next step is to create an Area Allocation Diagram (AAD), which is a template area compiled based on the results obtained from the BLOCPLAN software. The area allocation diagram for the production of donuts and sweet breads at the Anggun Bakery UMKM can be seen in Figure 8 below.

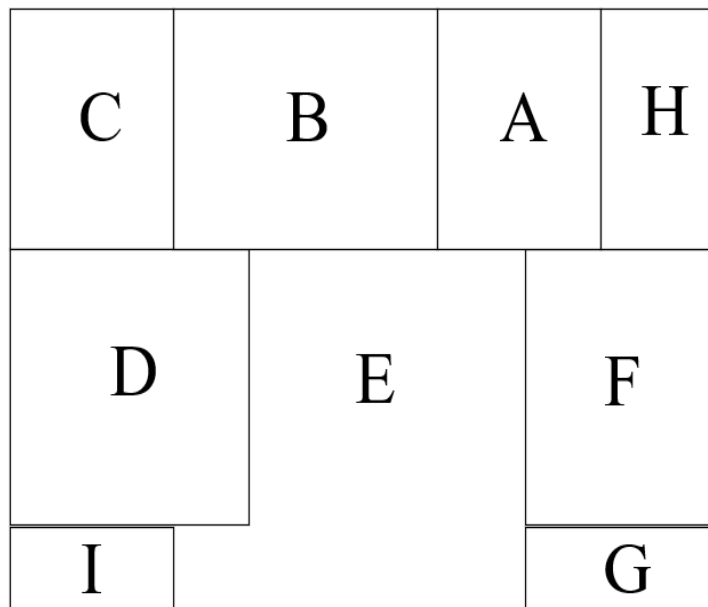


Figure 8 Area Allocation Diagram (AAD) (Data Processing)

Comparison of Existing Layout and Proposed Improvement Layout

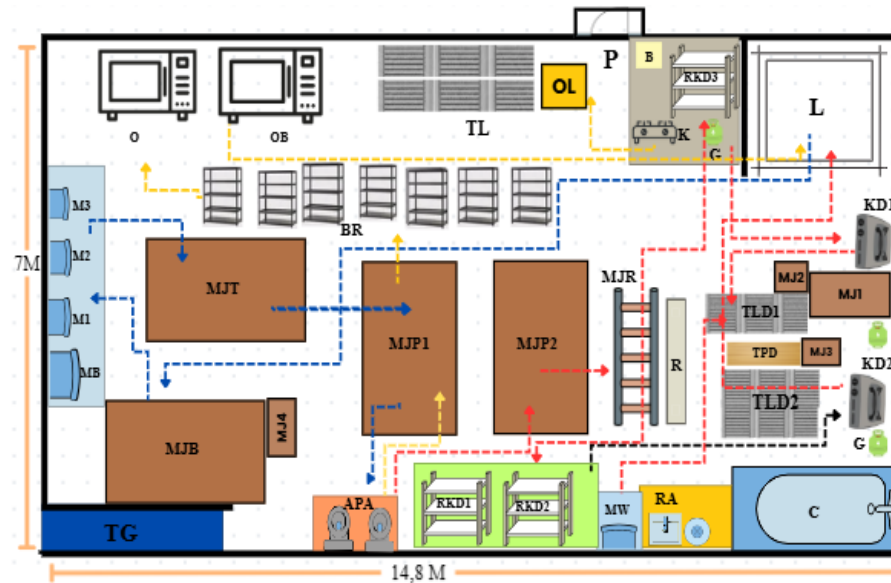
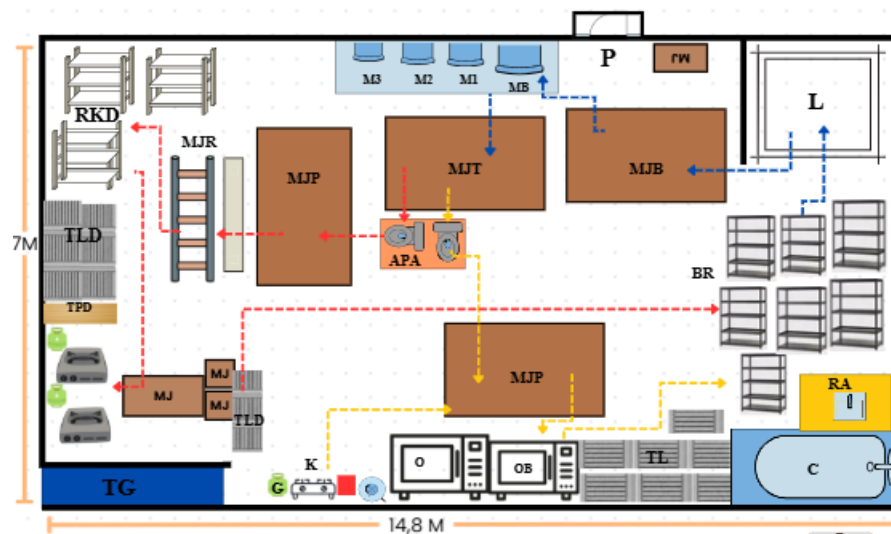


Figure 9 Layout Existing (Data Processing)



Description:

L: Lift
TG: Ladder
MB: Large Mixer
M(1,2,3): Mixer
O: Oven
OB: Large Oven
MJ(1,2,3,4): Table
MJB: Raw Material Weighing Table
MJT: Dough Weighing Table
MJP: Kneading Table
MJR: Donut Forming Table
TL: Stack of Baking Pans
R: Chair
OL: Spreading Margarine on Baking Pans

K(1,2,3): Stove
TLD: Stack of Donut Pans
TPD: Donut Stand
G: LPG Gas
C: Equipment Washing Station
MW: Buttercream Mixer
APA: Dough Cutter
BR: Row of Wheeled Racks
B: Broken Box
P: Door
--- : Sweet Bread Process
--- : Donut Dough and Sweet Bread Process
--- : Donut Process



Figure 10 Proposed Improvement Layout (Source : Data Processing)

Table 7 Description Proposed Improvement Layout

No.	Process Flow	Travel Distance (m)	Processing Time (min)	Description
1	Lift (L) → Raw Material Table (MJB)	2	2	Raw materials are transferred from the first floor to the production area and weighed at the raw material table.
2	Raw Material Table (MJB) → Mixer (M1/M2/M3)	3	2	The weighed raw materials are transferred to the mixing process.
3	Mixer → Dough Weighing Table (MJT)	2	1	The mixed dough is weighed according to production requirements.
4	Dough Weighing Table (MJT) → Dough Cutting Machine (APA)	0.5	0.25	The dough is transferred for dividing and cutting.
5	Dough Cutting Machine (APA) → Sweet Bread Kneading Table (MJP1)	3	1	Dough is transferred to the sweet bread processing line.
6	Sweet Bread Kneading Table (MJP1) → Pan Greasing Area (OL)	1	1	The dough is transferred for pan preparation.
7	Pan Greasing Area (OL) → Mobile Rack (BR)	4	3	Dough-filled baking pans are placed on a mobile rack while waiting for baking.
8	Mobile Rack (BR) → Oven (O/OB)	1	2	Baking pans are transferred to the oven for baking.
9	Oven → Mobile Rack (BR)	6	12	The baked products are placed on a mobile rack for temporary storage after baking.
10	Dough Cutting Machine (APA) → Donut Forming Table (MJP)	0.5	1	Dough is transferred to the donut forming process.
11	Donut Forming Table (MJP) → Proofing Rack (RKD1/RKD2/RKD3)	1	17	Dough undergoes proofing (fermentation/resting).
12	Proofing Rack (RKD) → Donut Fryer (KD1/KD2)	3	2	Proofed dough is transferred to the frying process.
13	Donut Fryer (KD1/KD2) → Draining Table (MJ1/MJ2/MJ3)	0.5	3	Fried donuts are transferred to the draining table.
14	Draining Table (MJ1/MJ2/MJ3) → Donut Tray Stack (TLD1/TLD2)	1	2	Donuts are transferred for topping application.
15	Donut Tray Stack (TLD) → Mobile Rack (BR)	6	2	Finished donuts are collected and transported using a mobile rack.
16	Mobile Rack (BR) → Lift (L) for Distribution	3	5	Finished products are transferred to the first floor for packaging and distribution.
Total		37	56.25	

Source : Data Processing

Table 8 Comparison of Existing Layout and Proposed Improvement Layout

Performance Indicator	Existing Layout	Proposed Layout	Reduction	Improvement (%)
Travel Distance (m)	66	37	29 m	43.94%
Processing Time (min)	72.50	56.25	16.25 min	22.41%

Source : Data Processing

Based on the comparison results, the existing layout has a material handling distance of 66 meters and a production lead time of 72.5 minutes per product. After the layout improvement was implemented, the material handling distance was reduced by 29 meters to 37 meters, while the production lead time decreased by 16.25 minutes to 56.25 minutes per product. These results indicate that the implementation of the Systematic Layout Planning (SLP) and BLOCPLAN methods effectively improved material flow efficiency by reducing the material handling distance by 43.94% and the production lead time by 22.41%.

CONCLUSION

The results indicate that the existing production layout was inefficient because it created crossing flows and backtracking, leading to a material handling distance of 66 m and a production lead time of 72.5 min per product. By integrating the Systematic Layout Planning (SLP) and BLOCPLAN methods, an improved facility layout was developed based on department relationships, space requirements, and material flow considerations. The proposed layout successfully eliminated crossing flows and backtracking by arranging workstations according to the production sequence. As a result, the material handling distance was reduced from 66 m to 37 m (43.94%), while the production lead time decreased from 72.5 min to 56.25 min per product (22.41%). These findings demonstrate that the integration of SLP and BLOCPLAN is an effective approach for improving facility layout, optimizing material flow, and enhancing production efficiency.

REFERENCES

- Albar, R. Z. (2024). *Perancangan Ulang Tata Letak Fasilitas Menggunakan Metode SLP dan BLOCPLAN PROGRAM STUDI S1 TEKNIK INDUSTRI FAKULTAS TEKNIK*.
Albar, R. Z. S. (2024). *LANDASAN TEORI*. 7–23.
Andhieta et all. (2025). *Jurnal Taguchi*. 593–603.
Bayu, A., Yanto, H., Abimanyu, R., Fauzi, A., & Indriyani, N. (2024). *Tata Letak Fasilitas Pabrik Menggunakan Metode Systematic Layout Planning (SLP) Pada PT Tesena Inovindo*. 5(2), 53–60.
Hanjaya, T. J., Susanto, N., Industri, D. T., Teknik, F., & Diponegoro, U. (2024). *USULAN PERBAIKAN TATA LETAK AREA PROSES WARPING DENGAN METODE KONVENSIONAL BERBASIS 5S (STUDI KASUS : PT DUNIA SETIA SANDANG ASLI TEKSTIL 4)*.
Immanuel, J., Santoso, A., & Hartono, M. (2023). *Analisis perancangan tata letak fasilitas di perusahaan XYZ produksi kedelai dengan systematic layout planning Analysis of facility planning at XYZ company production soybean with systematic layout planning*. 4(November), 250–261. <https://doi.org/10.37373/jenius.v4i2.555>
Indriyanto, R. W. H. & R. (2024). *ANALISIS PERANCANGAN ULANG TATA LETAK FASILITAS LANTAI PRODUKSI MENGGUNAKAN METODE SLP (SYSTEMATIC LAYOUT PLANNING)*. 19(2), 181–193.
Kurniadi, D., & Pratama, A. P. (2022). *Relayout tata letak fasilitas produksi untuk meminimalisasi material handling di pabrik tahu tradisional pangkalan*. 22, 75–83.
Lubis, A. H. (2022). *METODE SYSTEMATIC LAYOUT PLANNING DI CV SUKA SKRIPSI OLEH : ANDRI HADI LUBIS FAKULTAS TEKNIK UNIVERSITAS MEDAN AREA MEDAN* Diajukan sebagai Salah Satu Syarat untuk Memperoleh Gelar Sarjana di Fakultas Teknik Program Studi Teknik Industri Universitas Medan.
Maulidah, P Anggela, I. (2022). *REDESIGN TATA LETAK FASILITAS MENGGUNAKAN METODE ACTIVITY RELATIONSHIP CHART DAN ALGORITMA BLOCPLAN PADA PABRIK XYZ*. 6(2), 78–82.
Mudhofar, M., Suroso, H. C., Rahadian, A. R., & Sholekhah, L. N. (2023). *Perancangan Ulang Tata Letak Fasilitas Produksi dengan Menggunakan Metode Systematic Layout Planning dan CRAFT untuk Mengurangi Biaya Material Handling pada PT . Prima Daya Teknik*. Senastitan Iii.
Pradana, G. R. (2025). *PERANCANGAN TATA LETAK LANTAI PRODUKSI MENGGUNAKAN METODE SYSTEMATIC LAYOUT PLANNING PADA DEPARTEMEN PRODUKSI FAKULTAS TEKNOLOGI INDUSTRI UNIVERSITAS*

ISLAM INDONESIA.

- Rahmawanti, G., Mellisa, F., & Putri, Y. (2026). *Perbaikan Tata Letak IMKM Bengkel Las Jaya di Kota Dumai Menggunakan Metode Systematic Layout Planning (SLP) dan Grafik.*
- Saputra, M. A., Rachmawaty, D., & Karima, H. Q. (2022). *MATRIK Jurnal Manajemen dan Teknik Industri-Produksi Perancangan Tata Letak Fasilitas Pada UMKM Sepatu “ Prohana ” menggunakan Systematic Layout Planning. XXIII(1).* <https://doi.org/10.350587/Matrik>
- Sibarani, A. A., Syahrullah, Y., Setyaningrum, D. T., & Prasetyo, M. A. (2024). *Usulan Tata Letak Fasilitas dengan Menggunakan Metode Systematic Layout Planning (SLP) Pada Departemen Coumpound Industri Manufaktur Sepatu. XVIII(3), 353–366.*
- Simanjuntak, R. A., Asih, E. W., & Winardi, F. (2022). *USULAN PERBAIKAN TATA LETAK FASILITAS PRODUKSI KAYU OLAHAN MENGGUNAKAN METODE ACTIVITY RELATIONSHIP CHART , CRAFT DAN FROM TO. November, 10–17.*
- Suhandinata, Y. (2023). *Perancangan Ulang Tata Letak Fasilitas Produksi dengan Metode from to Chart pada Perusahaan Meubel di CV . Esa Banyuwangi. 1(1).*
- Yulia, A., Nurdziky, I., & Oktaria, F. (2022). *Perancangan Ulang Tata Letak Fasilitas Pabrik PD Ayam Ras dengan Metode Systematic Layout Planning (SLP). 11(2), 121–128.*

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