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PROPOSED IMPROVEMENT OF FACILITY LAYOUT IN PRODUCTION AREA IN UD. ARSHAINDO USING THE FROM TO CHART (FTC) METHOD

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ABSTRACT
Small and medium industry engaged in fast food. Currently, the layout of the facilities at the production site is experiencing problems related to the distance of material movement. This study aims to redesign the layout of the facility and make suggestions to the trade business to minimize material movement to make it more comfortable and efficient. The method used in the process of redesigning the layout of the facility at UD. ARSHAINDO is to use the FTC (From To Chart) method. From To Chart is a method that can help to solve problems then described in more detail by going through several stages of completion to the maximum point. The results obtained from the From To Chart calculation with a total distance between departments of 36 meters (proposed layout), while the distance applied to UD. ARSHAINDO currently has a distance between departments of 56 meters (initial layout), therefore the proposed layout design has minimized the material transfer distance between departments by 20 meters so that it can produce a maximum layout and the production process is more efficient in terms of the distance between previous departments.
Keywords: *Facility layout, Production Area, From To Chart (FTC)*

1. Introduction

The most influential factor on the success of a factory is the layout of the production floor (Ukurta Tarigan et al., 2019). If the spatial layout used is good and appropriate, it will indirectly save distance, cost, time and energy (Tarigan & Zetli, 2022). Factory layout is planning the layout of machines, facilities, material flow to employees when working at each work station. If the layout is arranged properly, during the operation process it will be more optimal and efficient (Amalia et al., 2017). layout has various strategic implications because the layout determines the competitiveness of the company (Yohanes, 2011). Improvements to the layout design are carried out to pay attention to the production process from beginning to end so that it can determine the layout in the production room properly and can improve room facilities and minimize material handling costs (Adiyanto & Clistia, 2020). Nowadays, industrial competition is very much found in society. Therefore, In addition to requiring a guaranteed production quality guarantee, it also requires a fairly supportive facility layout. (Puspasari, 2019). In general, the industry is currently experiencing many obstacles in the distance of moving raw materials which is less efficient, such as in the production process where there is a flow of material moving back and forth (backtracking) due to the irregular layout of the machine (Faishol et al., 2013).

Small and medium industries to arrange an optimal layout can facilitate the implementation and productivity of work because the optimal layout design will harmonize the work and work area and vice versa (Kholidasari et al., 2022). Culinary business actors arrange the layout by determining how the condition of each production facility is arranged in such a way that it can support the achievement of efficiency and effectiveness of production activities (S. S. Henni, 2021). Therefore, it is necessary to consider how to make or change the layout of the facility more effectively and efficiently (Triagus Setiyawan et al., 2017) . UD. ARSHAINDO itself is an industry that is engaged in food from milkfish which is processed into milkfish brains, milkfish peppers, smoked milkfish and presto milkfish. Currently the industry is experiencing problems in the layout and spatial arrangement such as fish processing places, raw material warehouses and finished material warehouses which are still not optimal and to transfer materials between departments to other departments requires a very long distance so it takes a very long time, such

as the smoking area still travels a distance of 12m to get to the packing place and there is also a raw material warehouse where it is still a 10m distance to go to the fish fillet place.

Production layout analysis is carried out based on the results of material displacement distances that experience backtracking (Pangestika et al., 2016). And to reduce activities during the back-tracking production process, which results in the length of the production process being carried out. So that when handling the case using the from to chart (FTC) method in order to see the efficient accuracy of the flow in each department during the production process at UD. ARSHINDO.

2. Literature Review

2.1 Facility Layout

Facility layout is the main foundation in most industries today, a layout that is arranged optimally will have the efficiency and effectiveness of the ongoing production process and will participate in the development or success of a company. Sophisticated and expensive production equipment will not mean the importance of the layout design that is done carelessly, so mistakes in the layout design will cause the company's losses are not small (Chaerul et al., 2019). The main purpose of the facility layout is to arrange the most economical production facility area for safe and comfortable production operations so as to increase the performance of the operator (Fauzan et al., 2013). The things that are very important in the layout of the facility are cost, distance, time and distance of moving goods between departments, Facility layout is a production stage that has a very complicated production flow and must require a layout design and maximum material transfer so as to reduce back tracking during the production process (Pramesti et al., 2019). The most important objective of the facility layout is to arrange the production facilities in a more effective way to improve the comfortable production process so as to increase employee morale and performance (Wahyudi et al., 2022).

Determination and laying of a good layout must pay attention to the early stages in the design of facilities in the production room, the layout that will be used can determine the physical relationship between ongoing production activities, to determine the type of quality, yield and area of production facilities required early stages before design layout, here are the kinds of layouts, namely: based on the production flow (product layout), based on a fixed position (fixed layout), based on the group of each item (group layout), based on the production process (process layout) (Handoko, 2013).

2.2 Backtracking Layout

The arrangement of production sites and production machines that are not well organized can lead to a messy production process flow and frequent backtracking (Ferdian et al., 2015). A good layout is a layout that can minimize the occurrence of backtracking (backflow). Departments that have several backtracking, namely: meat milling machine to spice grinding machine, place the fish fillet to the fish processing place, fish processing place to smoking area.

2.3 From To Chart (FTC)

From To Chart is a diagram that is used to find out the results of the production process from one department to another. The data obtained are primary data and secondary data. Primary Data: Initial production layout, area and distance between production departments and distance in material movement, Secondary Data: Description of the production process and production volume. (Barbara & Cahyana, 2021). From to chart is an adaptation of the "Mileage chart" found on a road map, the numbers in a from to chart show the total weight between departments that must be moved (Pratiwi et al., 2012).

from to chart is a conventional technique used to plan the layout and transfer of materials in a process, this technique is very useful for conditions where a lot of goods flow through an area such as machine shops and warehousing (Handoyo et al., 2021). Data processing from to chart is divided into 2 parts, namely processing existing layout data and processing alternative layout data (Andryzio et al., 2014). From the magnitude of the weight of the existing inter-departmental product flow, then perform calculations using the From To Chart (FTC) method to find out the

results of the minimum and efficient backward value to be used as a proposed layout (Murnawan & Wati, 2018). From to Chart (FTC) usually called trip frequency chart or travel chart, is a conventional technique commonly used in planning the layout of facilities and the movement of each product in the ongoing production process. This technique is very useful in managing where many products pass through a department, such as job shops, machine shops, offices, and others (Nasution, 2015)

3. Research Methods

Collecting data from research conducted by carrying out observations and measurements directly on the production floor at industrial companies engaged in food from milkfish which is processed into milkfish brains, milkfish peppers, smoked milkfish and presto milkfish at UD. ARSHAINDO which is located in Tanggulrejo Village, Manyar District, Gresik Regency. Measurements and observations were carried out using meter measuring instruments, writing instruments accompanied by field supervisors. The main data collected by direct measurement is data on the size of the department of each production room, the layout of the initial production floor, and the sequence of production processes between departments and other departments. In addition to direct measurements, the data that has been obtained will be carried out manually by collecting data that has been designed by experts related to the problems that have been observed in the previous data collection by considering related journals or books on the topics that have been studied. Learn about milkfish processing companies from journals or production facility layout books that use the From To Chart (FTC) method.

The data processing that was carried out the first time was a description of the initial layout in the production area that was in accordance with the measurement of the floor area in the milkfish processing production room area based on direct measurements on location. Before measuring the distance of material movement, what must be done is to determine the coordinates of each work station, then look for the results of backtracking by calculating the journey from each department to another using the From To Chart calculation.

4. Results and Discussions

4.1 Initial Layout Data

The data needed to process data using the From To Chart (FTC) method is the initial layout. After making observations and seeing the conditions that existed when the production process was running, the data needed in designing the layout of this facility was the initial layout map in the production process and the distance between existing machine facilities or processes. The following is the initial layout data, it can be seen in Figure 1.

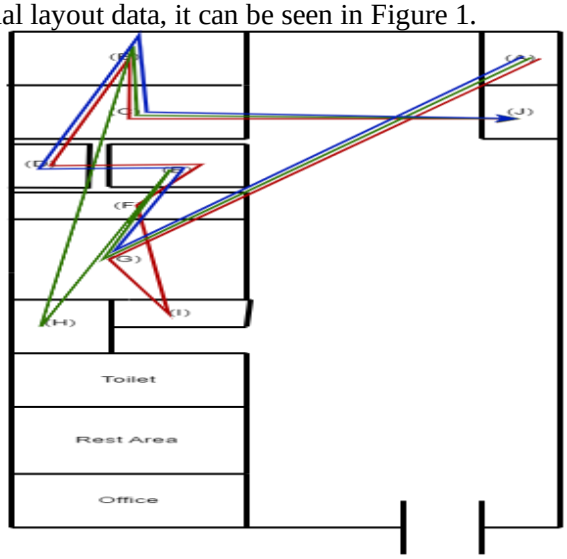

Fig 1. Initial Layout

Milkfish Brains: AGIFEDBCJ (Red)
Pepes Milkfish: AGEDBCJ (Blue)

Presto Milkfish: AGEDBCJ (Blue)
Smoked Milkfish: AGEHBCJ (Green)

4.2 Identify existing facilities/machines

In the manufacture of milkfish otak-otak, milkfish pepes, presto milkfish and smoked milkfish there are several facilities and machines used, namely:

A. Raw Material Warehouse
B. Packing
C. Vacuum
D. Steaming
E. Fish Processing
F. Seasoning Mill
G. Fish Fillet
H. Fumigation
I. Meat Grinder
J. Finished Material Warehouse

The following is a table of the operating floor area of each department.

Table 1 - floor area of each department

Code	Facilities/Machinery	Total Operating Floor Area (m^2)
A	Raw Material Warehouse	2
B	Packing	8
C	Vacuum	8
D	Steaming	4.5
E	Fish Processing	7.5
F	Seasoning Mill	4
G	Fish Fillet	16
H	Fumigation	4
I	Meat Grinder	3
J	Finished Material Warehouse	2

4.3 Identifying Production Flow of Each Product

For production at UD. ARSHAINDO in the production flow of making milkfish otak-otak, pepes bandeng, presto milkfish and smoked milkfish uses the same facilities, with the following production flow flow:

Milkfish Brains: AGIFEDBCJ
Pepes Bandeng: AGEDBCJ
Presto Milkfish: AGEDBCJ
Smoked Milkfish: AGEHBCJ

Before performing calculations using From To Chart (FTC), first identify the process flow along with the distance of material transfer between the production areas of each department so that the process in assessing the linkage level produces the best value. :

Table 2 - distance of product flow in each department

From		To		Distance
Area	Dep	Area	Dep	(m)
Raw Material Warehouse	A	Fish Fillet	G	10
Fish Fillet	G	Meat Grinder	I	2.75
Fish Fillet	G	Fish Processing	E	4.5
Fumigation	H	Packing	B	12
Meat Grinder	I	Seasoning Mill	F	5.25
Bumnbu Mill	F	Fish Processing	E	2
Fish Processing	E	Fumigation	H	7.5
Fish Processing	E	Steaming	D	2
Steaming	D	Packing	B	4.5

Packing	B	Vacuum	C	2
Vacuum	C	Finished Material Warehouse	J	3.5
TOTAL				56

4.4 From To Charts (FTC)

After obtaining the flow of the production process for each product, then a layout analysis will be carried out by analyzing the distance relationship between facilities/machines using From To Chart (FTC). The following table shows the initial journey obtained from the process flow of each product.

Table 3 - From To Initial Chart

To	From										Amount
	A	B	C	D	E	F	G	H	I	J	
A											0
B				4.5				12			19.5
C		2									2
D					2						2
E						2	4.5				6.5
F									5.25		5.25
G	10										10
H					7.5						7.5
I							2.75				2.75
J			3.5								3.5
Amount	10	2	3.5	4.5	9.5	2	7.25	12	5.25	0	56

After filling out the FTC table, the next step is to carry out forward & backward analysis which aims to determine the efficiency of a production line because the efficiency of the production line is not said to be good if the percentage is below 75% (Pramono & Widyadana, 2015).

4.5 Forward & Backward Analysis

Forward & backward analysis aims to determine the efficiency of a production line is known based on the percentage of forward. There are 2 kinds of distance from each department point, namely forward distance form diagonal and backward distance form diagonal. For example, in the diagonal calculation of the forward area, the formula used is $\sum Diagonaln \times n \times 1$, if the diagonal used is in the backward area then use the formula $\sum Diagonaln \times n \times 2$ (Fajar & Murnawan, 2022).

Table 4 - From To Initial Chart

To	From										Amount
	A	B	C	D	E	F	G	H	I	J	
A											0
B				4.5				12			19.5
C		2									2
D					2						2
E						2	4.5				6.5
F									5.25		5.25
G	10										10
H					7.5						7.5
I							2.75				2.75
J			3.5								3.5

Amount	10	2	3.5	4.5	9.5	2	7.25	12	5.25	0	56

Forward & backward analysis:

forwards:

1. 2 + 0 = 2
2. 2.75 + 0 = 2.75
3. 7.5 + 0 = 7.5
4. 10 + 0 = 10
5. 3.5 + 0 = 3.5

%Forward = (25.75 : 56) x 100% = 45.98%

Backwards:

1. 2 + 2 = 4
2. 4.5 + 4.5 = 9
3. 5.25 + 0 = 5.25
4. 12 + 0 = 12

%Backward = (30.25 : 56) x 100% = 54.02%

Because the Forward value is still below 75%, which is still 45.98%, it is still necessary to make improvements to the production line. Changed the flow from ABCDEFGHIJ to AIFEDGHBCJ.

Table 5 - From To Chart Alternative

To	From										Amount
	A	I	F	E	D	G	H	B	C	J	
A											0
I						2.75					2.75
F		5.25									5.25
E			2			4.5					6.5
D				2							2
G	10										10
H				7.5							7.5
B					4.5		12				16.5
C								2			2
J									3.5		3.5
Amount	10	5.25	2	9.5	4.5	7.25	12	2	3.5	0	56

Forward & backward analysis:

forwards*:*

1. 5.25 + 2 + 2 + 12 + 2 + 3.5 = 26.75
2. 7.5 + 4.5 = 12
3. 10 + 0 = 10

%Forward = (48.75 : 56) x 100% = 87.06%

Backwards*:*

1. 4.5 + 0 = 4.5
2. 2.75 + 0 = 2.75

%Backward = (7.25 : 56) x 100% = 12.94%

The Forward value is more than 75%, namely 87.06%, the Backward or Backtracking value is also lower than the initial value of 54.02% to 12.94%.

From the alternative From To chart (FTC) calculation in table 5, the most efficient is the alternative calculation with a forward value of 87.06%, and the backward or backtracking value is smaller than all other alternative calculations with a backward value of 12.94%.

4.6 Analysis

The next stage is the analysis carried out by comparing the initial layout in UD. ARSHAINDO with a Layout that has been processed using the From To Chart (FTC) method. Here is the proposed Layout:

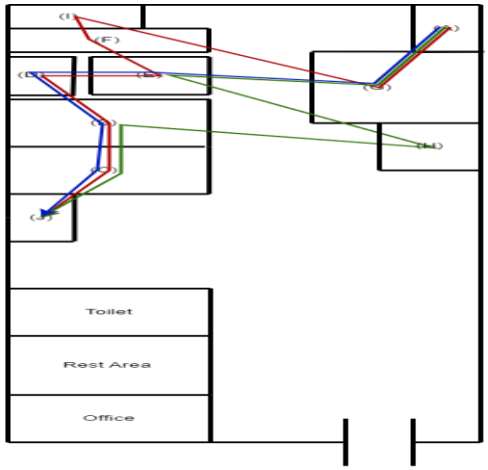

Fig 2. Proposed Layout

Milkfish Brains: AGIFEDBCJ (Red)
Pepes Bandeng: AGEDBCJ (Blue)
Presto Milkfish: AGEDBCJ (Blue)
Smoked Milkfish: AGEHBCJ (Green)

After determining the proposed layout, the following is the distance of product material movement in the production area which has been described in table 6 below:

Table 6 - Distance of product flow in each department in the proposed layout

From		To		Distance(m)
Area	Dep	Area	Dep	
Raw Material Warehouse	A	Fish Fillet	G	3
Fish Fillet	G	Meat Grinder	I	5
Fish Fillet	G	Fish Processing	E	4.5
Fumigation	H	Packing	B	4.5
Meat Grinder	I	Seasoning Mill	F	2
Bumnbu Mill	F	Fish Processing	E	2.5
Fish Processing	E	Steaming	D	2
Fish Processing	E	Fumigation	H	5.5
Steaming	D	Packing	B	3
Packing	B	Vacuum	C	2
Vacuum	C	Finished Material Warehouse	J	2
TOTAL				36

5. Conclusion

Based on the results of the analysis of UD. ARSHAINDO related to Layout before designing the layout are: Many locations are not used properly, and there are still many distances between departments that should still be maximized properly. From the production flow process before repairs, there is a material transfer distance of 56m.

Comparison of the initial layout and the proposed layout there is a displacement distance in the production area above resulting in the following advantages:

1. The movement distance between work stations can be minimized
2. From the production flow process, there is a material transfer distance from 56m to 36m.

Alternative FTC calculation with a forward value of 87.06%, and a smaller backward or backtracking value of 12.94%. To fix this, make a draft proposal that might improve the layout arrangement in UD. ARSHAINDO in order to maximize its production process by using the From To Chart (FTC) method to minimize back and forth during the production process (Backtracking).

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