The Layout Design of Department Based on Material Handling Cost on Cab Enclosure Semimacro 8U19' In PT. Telehouse Engineering Ujung Berung Bandung

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Abstract - *Designing the layout of the facilities must be able to regulate the handling of material from one place to another in an appropriate and proper way and in order to reduce waste.*

PT. Telehouse Engineering (TE) is a private company which was established on June 9, 2003, is engaged in the business of manufacturing Mechanical, Electrical and Infrastructure. The most important issue at this company is how to generate a production floor layout design that is expected to accommodate all of the departments are in the area of production, as well as minimizing the displacement distance delivery of materials in the production floor.

From the results of this research is that the placement of the optimum engine layout can minimize the total cost of Material Handling (OMH) in the production process. The calculation of the total initial OMH is Rp. 1,864,590.438 / day. After a change of layout OMH obtained a total of Rp. 1,267,903.418 / day. It can be concluded that there has been a decrease of 32% OMH. By making changes to the layout of the mileage material becomes shorter. Layout change can also accommodate departments / Powder Coating machines and Shipping department to be in a production floor.

Keywords: *Distance, Material Handling Cost, Layout*

I. PRELIMINARY

A. Background of the Problem

Designing the layout of the facilities must be able to regulate the handling of material from one place to another in a way that is appropriate and proper to reduce wastage.

PT. Telehouse Engineering (TE) is a private company which was established on June 9, 2003, is engaged in the business of manufacturing Mechanical, Electrical and Infrastructure.

From preliminary observations were made on the production floor of PT. Telehouse Engineering, there is one department that not set in a production floor, causing the flow of material movements is quite long. Another thing that matters is the placement of the finished product on assembling department thus causing buildup and narrowing production floor area.

B. Identification of Problems

1. How to plan the placement of the department in the achievement and smooth performance, especially in the efficiency and effectiveness of the company?
2. How to plan the layout of the production floor so that the production flow going well?

C. Research Objectives

This research aims to fulfill the needs and answer the problems mentioned in the previous section. Thus the purpose of this research is to produce a design of the production floor layout that is expected to accommodate all of the departments are within the area of production, as well as minimizing the displacement distance delivery of materials in the production floor.

D. Systematics of Writing

CHAPTER 1 PRELIMINARY

This preliminary chapter contains an explanation of the background of the problem, identification of problem, research objectives, restrictions on the problem and assumptions, systematic discussion and systematic writing that will be done.

CHAPTER 2 BASIC THEORY

This chapter describes the basic theory that contains theories according to the issues to be discussed with the model used for solving problems that will be created.

CHAPTER 3 RESEARCH METHODOLOGY

This chapter contains models of problem-solving and discussion of problem-solving measures described in the form of a flowchart.

CHAPTER 4 COLLECTION AND PROCESSING DATA

This chapter discusses the process of collecting the necessary data for the study, which includes data on the company's history in general, as well as the data to be processed and analyzed so that it can be used as a basis for discussion of the issues.

CHAPTER 5 ANALYSIS

This chapter contains the analysis and discussion based on the results of data processing of the previous chapter, which leads to the solution of the problem of research.

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

Contains conclusion of processing data that has been analyzed and is accompanied by recommendations from the author to the continuation of the research that has been done.

II. RESEARCH METHODOLOGY

A. The Flowchart of Problem-Sloving

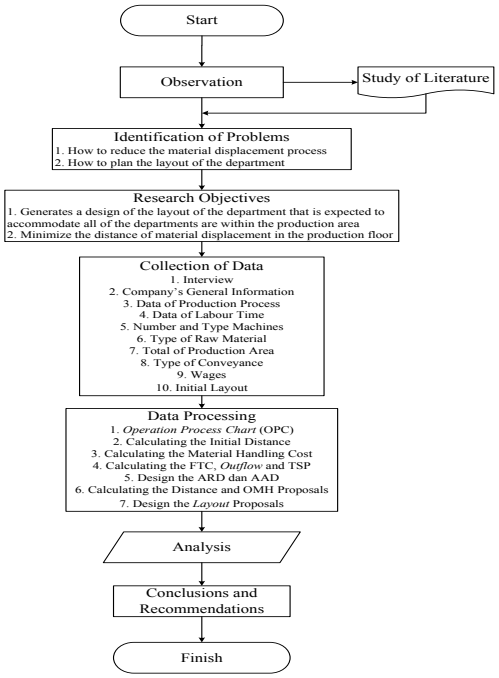


Image 1. The Flowchart of Problem-Solving

III. RESULTS AND DISCUSSION

A. Collection of Production Data

1) The Production Process Data

- *Punching Process*
  Punching process in PT. Telehouse Engineering carried out with two mechanisms, namely by using Hydraulic Machines and using the Laser Plasma Cutting Machine. Punching process using a hydraulic machine CNC Punching is the process of making the holes in the plate surface by using turrets were pressed with great force. Whereas punching process using Laser Plasma Cutting machine is a process used to cut the plate using a plasma torch with a very high temperature.
- *Bending Process*
  Bending process is a process of bending the material in accordance with a predetermined pattern.
- *Welding Process*
  Welding process is a process of joining between the components with other components. Welding process is comprised of two mechanisms, namely by using Argon Welding Machine and Electricity Welding Machine. Argon welding machines are used to this type of material such as aluminum plate, while the Electric welding machines are used to this type of material in the form of SPCC plate.
- *Grinding Process*
  Grinding process is a process of refining the components. Coarse component parts that have been through the process Welding removed first by way smoothed by using a grinding machine before Powder Coating Process.
- *Powder Coating Process*
  Powder Coating process is the process of casting components, which coats the surface of the component with a film layer in powder form of powder. The powder is then dissolved in the form of films and heated for polymerization, and then attached to the surface of the component by using electric spray gun.
- *Assembling Process*
  Assembling process is a process of assembly of all the components into a finished product. The components that have been through the entire production process then assembled into CAB ENCLOSURE SEMIMACRO 8U19' product.

2) Total of Production Area

Table 3. Total Area Production Business Unit Sheet Metal PT. Telehouse Engineering Ujung Berung Bandung

No	Department	Total Area (m)		Total Area (m2)
		p	l	
1	Receiving	6.94	5.05	35.05
2	Mesin TruPunch CNC Punching	5.5	5.5	30.25
3	Mesin LVD Strippit S-1225	5.55	5.4	29.97
4	Mesin CNC Plasma Cutting	11.6	6.1	70.76
5	Mesin Salvagnini P2Xe	6.58	3.9	25.66
6	Mesin LVD CNC Bending	6.15	5.45	33.52
7	Mesin TruBend CNC Bending	5.35	6.45	34.51
8	Mesin Kantohm	6.55	6.3	41.27
9	Mesin YSD NC Bending	6.55	6.3	41.27
10	Mesin Las – Thermaweld	4.7	3.5	16.45
11	Mesin Las – Inverter Powcon	4.7	3.5	16.45
12	Mesin Las – Moswell	4.7	3.5	16.45
13	Mesin Gerinda – Kinfuji	15	5.8	87
14	Mesin Powder Coating	14.6	6	87.6
15	Assembly Area	17.11	16.5	282.32
16	Project Part	7.2	1.45	10.44
17	Shipping	4.75	4.125	19.59
18	Rak	6	1.45	8.7
19	R. Ganti	6	1.45	8.7
20	R. Maintenance	6	1.45	8.7
TOTAL				**904.64**

3) Conveyance Costs

Material displacement costs is one type of transport that is carried out in industrial companies, which means moving raw materials, semi-finished or finished goods from point of origin to the destination that has been set. Some conveyances commonly used:

- Material Handling Costs by using Manpower

$$Operator\ Wages = \frac{Rp.2.310.000,-/Month}{25\ days\ x\ 7\ hours\ x\ 60\ minutes\ x\ 60\ seconds} = Rp.3.67/seconds$$

So the displacement of material costs using manpower is:

$$OMH\ manpower < Operator\ Wa\langle es\ x\ 3\ seconds\ per\ meter$$
$$OMH\ manpower\ per\ meter = Rp.3.67\ x\ 3\ seconds\ per\ meter = Rp.11.01\ per\ meter$$

- Material Handling costs by using Hand Truck

$$Price\ of\ Hand\ Truck = \frac{Rp.1.105.000,-}{5\ years\ x\ 12\ months\ x\ 25\ days\ x\ 7\ hours\ x\ 60\ minuites\ x\ 60\ seconds} = Rp.0.0292$$

So the material handling costs by using Hand Truck is:

$$OMH\ Hand\ Truck = (Operator\ Wages + Proce\ of\ Hand\ Truck)\ x\ 5\ seconds\ /meter\ movement = (Rp.11.01 + Rp.0.0292)\ x\ 5\ seconds\ /meter\ movement = Rp.55.20$$

- Material Handling costs by using Forklift

$$Price\ of\ Forklift = \frac{Rp.190.000.000,-}{15\ years\ x\ 12\ months\ x\ 25\ days\ x\ 7\ hours\ x\ 60\ minutes\ x\ 60\ seconds} = Rp.1.67549/seconds$$

So the material handling costs by using Forklift is:

$$OMH\ Fork\ Lift = (Operator\ Wages + Price\ of\ Fork\ Lift)\ x\ 5.56\ seconds\ /meter\ gerakan = (Rp.11.01 + Rp.1.67549)x\ 5.56\ seconds\ /movement = Rp.70.53\ per\ meter$$

B. Processing Data

1) Operation Process Chart (OPC)

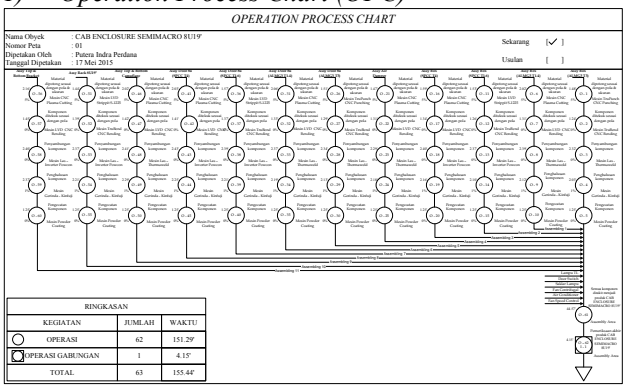


Image 2. Operation Process Chart Product CAB ENCLOSURE SEMIMACRO 8U19'

2) Material Handling Cost

Total value of Material Handling Cost derived from the total cost of the use of conveyance, operator wages, the distance of conveyance and weight of components delivered. By summing the total material handling costs that occurs each process, the importance of the total value of the initial material handling costs by Rp.1864590.438 per day.

3) From to Chart FTC)

Table 7. From To Chart (FTC) Based on Material Handling Cost

***From To Chart* (FTC)**													
Symbol	***To*** / ***From***	**Receiving**	**Mesin TruPunch CNC Punching**	**Mesin CNC Plasma Cutting**	**Mesin TruBend CNC Bending**	**Mesin LVD CNC Bending**	**Mesin Las – Thermaweld**	**Mesin Las – Inverter Powcon**	**Mesin Gerinda – Kinfuji**	**Mesin Powder Coating**	**Assembly Area**	**Shipping**	**TOTAL**
A	**Receiving**		37364.093	49205.432							422.123		**86991.649**
B	**Mesin TruPunch CNC Punching**				56850.177								**56850.177**
C	**Mesin CNC Plasma Cutting**					61362.069							**61362.069**
D	**Mesin TruBend CNC Bending**						2033.327	39880.880					**41914.206**
E	**Mesin LVD CNC Bending**						5591.649	185796.234					**191387.882**
F	**Mesin Las – Thermaweld**								5486.029				**5486.029**
G	**Mesin Las – Inverter Powcon**								162370.504				**162370.504**
H	**Mesin Gerinda – Kinfuji**									80981.747			**80981.747**
I	**Mesin Powder Coating**										176780.860		**176780.860**
J	**Assembly Area**											1000465.316	**1000465.316**
K	**Shipping**												
TOTAL			**37364.093**	**49205.432**	**56850.177**	**61362.069**	**7624.976**	**225677.113**	**167856.532**	**80981.747**	**177202.984**	**1000465.316**	**1864590.438**

4) Outflow

Table 8. *Outflow*

Outflow													
Symbol	***To*** / ***From***	**Receiving**	**Mesin TruPunch CNC Punching**	**Mesin CNC Plasma Cutting**	**Mesin TruBend CNC Bending**	**Mesin LVD CNC Bending**	**Mesin Las – Thermaweld**	**Mesin Las – Inverter Powcon**	**Mesin Gerinda – Kinfuji**	**Mesin Powder Coating**	**Assembly Area**	**Shipping**	**TOTAL**
A	**Receiving**		0.657	0.802							0.000		**1.460**
B	**Mesin TruPunch CNC Punching**				1.356								**1.356**
C	**Mesin CNC Plasma Cutting**					0.321							**0.321**
D	**Mesin TruBend CNC Bending**						0.371	0.246					**0.616**
E	**Mesin LVD CNC Bending**						1.019	1.144					**2.164**
F	**Mesin Las – Thermaweld**								0.068				**0.068**
G	**Mesin Las – Inverter Powcon**								2.005				**2.005**
H	**Mesin Gerinda – Kinfuji**									0.458			**0.458**
I	**Mesin Powder Coating**										0.177		**0.177**
J	**Assembly Area**												
K	**Shipping**												
TOTAL			**0.657**	**0.802**	**1.356**	**0.321**	**1.390**	**1.390**	**2.072769953**	**0.458**	**0.177**		**8.624**

5) Priority Scale Table

Table 9. Priority Scale Table

Priority Scale Table				
To / ***From***	**Symbol**	**1**	**2**	**3**
Receiving	**A**	**C**	**B**	**J**
Mesin TruPunch CNC Punching	**B**	**D**		
Mesin CNC Plasma Cutting	**C**	**E**		
Mesin TruBend CNC Bending	**D**	**F**	**G**	
Mesin LVD CNC Bending	**E**	**G**	**F**	
Mesin Las – Thermaweld	**F**	**H**		
Mesin Las – Inverter Powcon	**G**	**H**		
Mesin Gerinda – Kinfuji	**H**	**I**		
Mesin Powder Coating	**I**	**J**		
Assembly Area	**J**	**K**		
Shipping	**K**			

6) Activity Relation Diagram (ARD)

Activity Relation Diagram **(ARD)**			
K		**C**	**A**
J	**G**	**E**	**B**
I	**H**	**F**	**D**

Image 3. *Activity Relation Diagram* (ARD)

7) Designing the Area Allocation Diagram (AAD) and the Layou Proposals

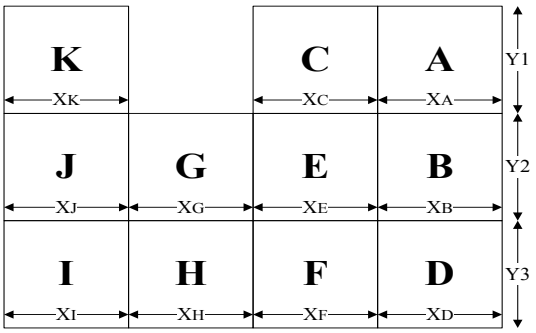


Image 4. The determination of Length and Width of Each Department

- Y1 is the width for the department A, C and K
- Y3 is the width for the departments D, F, H and I
- Xn is the length of department n

Examples of calculation of the size of the layout of each department:

- Y_1 $Y1 = \frac{\Sigma\, Luas_Departemen_ACK}{Lebar_Lantai_Perusahaan} = \frac{35.05+70.76+19.59}{72\ meter} = 1.74\ meter$
- $Y_2 = \frac{\Sigma\, Luas_Departeme_BEGJ}{Lebar_Lantai_Perusahaan} = \frac{30.25+34.51+16.45+282.32}{72\ meter} = 5.05\ meter$
- $Y_3 = \frac{\Sigma\, Luas_Departemen_DFHI}{Lebar_Lantai_Perusahaan} = \frac{33.52+16.45+87+87.6}{72\ meter} = 3.12\ meter$
- X_A $XA = \frac{Luas_{Departemen_A}}{Y1} = \frac{35.05}{1.74} = 20.14\ meter$

From the calculation of broad measure of the floor and placing the location of the department based Priority Scale Table, it can form a Allocation Area Diagrams and layout proposals.

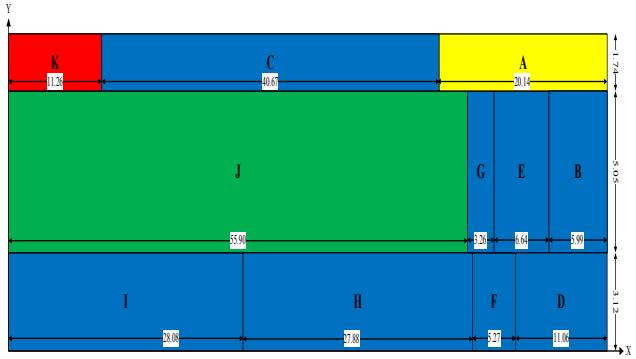


Image 5. Area Allocation Diagram Based Proposed Priority Scale Table

8) The distance of Material Handling Proposals

Based on the allocation area diagram that have been designed previously, there is one department that has several alternative shipments distance of material towards the destination department, namely the Department of CNC Bending TruBend machine to the Department of Welding - Inverter Powcon machine. It is known there are 4 alternatives distances for TruBend machine to CNC Bending Welding - Inverter Powcon machine, such as 18:31 m, 14.85 m, 16.30 m and 29.68 m. By considering the minimization of distance between departments, the alternatives taken the distance is the shortest distance alternative, which is 14.85 m.

9) Material Handling Cost Proposals

Table 11. Material Handling Cost Proposals

MATERIAL HANDLING COST							
From	**To**	**Component**	**Weight (kg)**	**Conveyance**	**Cost (Rp.)**	**Distance (m)**	**Total Cost (Rp.)**
RECEIVING	**FABRICATION**						
	Mesin TruPunch CNC Punching	Assy Box (ALMGT3 T3) (O-1)	8.24	Manusia	11.01	5.71	517.865
		Assy Box (SPCC T1.6) (O-11)	30.90	*Hand Truck*	55.20	5.71	9740.237
		Assy Door 8u (ALMGT3 T3) (O-26)	6.96	Manusia	11.01	5.71	437.715
		Assy Door 8u (SPCC T1.6) (O-36)	28.56	*Hand Truck*	55.20	5.71	9002.136
		Assy Rack 8U19" (O-51)	23.19	*Hand Truck*	55.20	5.71	7308.247
		TOTAL					**27006.199**
	Mesin CNC Plasma Cutting	Assy Box (ALMGT3 T1.4) (O-6)	13.57	Manusia	11.01	7.17	1071.373
		Assy Box (SPCC T4) (O-16)	89.23	*Hand Truck*	55.20	7.17	35317.568
		Assy Air Damper (O-21)	6.91	Manusia	11.01	7.17	545.586
		Assy Door 8u (ALMG3 T1.4) (O-31)	11.99	Manusia	11.01	7.17	946.657
		Assy Door 8u (SPCC T4) (O-41)	85.02	*Hand Truck*	55.20	7.17	33648.527
		Assy Top & Bottom Camuflage (O-46)	9.33	Manusia	11.01	7.17	736.147
		Assy Top & Bottom Bracket (O-56)	79.59	*Hand Truck*	55.20	7.17	31499.716
		TOTAL					**103765.574**
	ASSEMBLING						
	Assembly Area	Lampu TL, Door Switch, Saklar Lampu, Fan Centrifugal, Air Conditioner, Fan Speed Control	1	Manusia	11.01	26.79	294.9579
		TOTAL					**294.9579**
FABRICATION	**FABRICATION**						
Mesin TruPunch CNC Punching	**Mesin TruBend CNC Bending**	Assy Box (ALMGT3 T3) (O-2)	8.24	Manusia	11.01	5.64	511.516
		Assy Box (SPCC T1.6) (O-12)	30.90	*Hand Truck*	55.20	5.64	9620.829
		Assy Door 8u (ALMGT3 T3) (O-27)	6.96	Manusia	11.01	5.64	432.349
		Assy Door 8u (SPCC T1.6) (O-37)	28.56	*Hand Truck*	55.20	5.64	8891.777
		Assy Rack 8U19" (O-52)	23.19	*Hand Truck*	55.20	5.64	7218.653
		TOTAL					**26675.124**
Mesin CNC Plasma Cutting	**Mesin LVD CNC Bending**	Assy Box (ALMGT3 T1.4) (O-7)	13.57	Manusia	11.01	7.14	1066.890
		Assy Box (SPCC T4) (O-17)	89.23	*Hand Truck*	55.20	7.14	35169.795

		Assy Air Damper (O-22)	6.91	Manusia	11.01	7.14	543.303
		Assy Door 8u (ALMG3 T1.4) (O-32)	11.99	Manusia	11.01	7.14	942.696
		Assy Door 8u (SPCC T4) (O-42)	85.02	*Hand Truck*	55.20	7.14	33507.738
		Assy Top & Bottom Camuflage (O-47)	9.33	Manusia	11.01	7.14	733.067
		Assy Top & Bottom Bracket (O-57)	79.59	*Hand Truck*	55.20	7.14	31367.918
		TOTAL					**103331.408**
Mesin TruBend CNC Bending	**Mesin Las - Thermaweld**	Assy Box (ALMGT3 T3) (O-3)	8.24	Manusia	11.01	4.92	446.216
		Assy Door 8u (ALMGT3 T3) (O-28)	6.96	Manusia	11.01	4.92	377.156
		TOTAL					**823.372**
Mesin TruBend CNC Bending	**Mesin Las - Inverter Powcon**	Assy Box (SPCC T1.6) (O-13)	30.90	*Hand Truck*	55.20	14.85	25331.438
		Assy Door 8u (SPCC T1.6) (O-38)	28.56	*Hand Truck*	55.20	14.85	23411.859
		TOTAL					**48743.297**
Mesin LVD CNC Bending	**Mesin Las - Thermaweld**	Assy Box (ALMGT3 T1.4) (O-8)	13.57	Manusia	11.01	4.97	742.639
		Assy Air Damper (O-23)	6.91	Manusia	11.01	4.97	378.182
		Assy Door 8u (ALMG3 T1.4) (O-33)	11.99	Manusia	11.01	4.97	656.190
		Assy Top & Bottom Camuflage (O-48)	9.33	Manusia	11.01	4.97	510.272
		TOTAL					**2287.283**
Mesin LVD CNC Bending	**Mesin Las - Inverter Powcon**	Assy Box (SPCC T4) (O-18)	89.23	*Hand Truck*	55.20	4.97	24480.936
		Assy Door 8u (SPCC T4) (O-43)	85.02	*Hand Truck*	55.20	4.97	23324.014
		Assy Rack 8U19" (O-53)	23.19	*Hand Truck*	55.20	4.97	6361.118
		Assy Top & Bottom Bracket (O-58)	79.59	*Hand Truck*	55.20	4.97	21834.531
		TOTAL					**76000.599**
Mesin Las - Thermaweld	**Mesin Gerinda - Kinfuji**	Assy Box (ALMGT3 T3) (O-4)	8.16	Manusia	11.01	6.69	600.678
		Assy Box (ALMGT3 T1.4) (O-9)	13.44	Manusia	11.01	6.69	989.653
		Assy Air Damper (O-24)	6.84	Manusia	11.01	6.69	503.971
		Assy Door 8u (ALMGT3 T3) (O-29)	6.89	Manusia	11.01	6.69	507.711
		Assy Door 8u (ALMG3 T1.4) (O-34)	11.87	Manusia	11.01	6.69	874.450
		Assy Top & Bottom Camuflage (O-49)	9.23	Manusia	11.01	6.69	679.997
		TOTAL					**4156.459**
Mesin Las - Inverter Powcon	**Mesin Gerinda - Kinfuji**	Assy Box (SPCC T1.6) (O-14)	30.59	*Hand Truck*	55.20	6.69	11297.821
		Assy Box (SPCC T4) (O-19)	88.34	*Hand Truck*	55.20	6.69	32623.679
		Assy Door 8u (SPCC T1.6) (O-39)	28.28	*Hand Truck*	55.20	6.69	10441.689
		Assy Door 8u (SPCC T4) (O-44)	84.17	*Hand Truck*	55.20	6.69	31081.947
		Assy Rack 8U19" (O-54)	22.95	*Hand Truck*	55.20	6.69	8476.926
		Assy Top & Bottom Bracket (O-59)	78.79	*Hand Truck*	55.20	6.69	29097.039
		TOTAL					**123019.102**
Mesin Gerinda - Kinfuji	**Mesin Powder Coating**	Assy Box (ALMGT3 T3) (O-5)	8.16	Manusia	11.01	9.34	838.614
		Assy Box (ALMGT3 T1.4) (O-10)	13.44	Manusia	11.01	9.34	1381.668
		Assy Box (SPCC T1.6) (O-15)	30.59	*Hand Truck*	55.20	9.34	15773.042
		Assy Box (SPCC T4) (O-20)	88.34	*Hand Truck*	55.20	9.34	45546.363
		Assy Air Damper (O-25)	6.84	Manusia	11.01	9.34	703.600
		Assy Door 8u (ALMGT3 T3) (O-30)	6.89	Manusia	11.01	9.34	708.823
		Assy Door 8u (ALMG3 T1.4) (O-35)	11.87	Manusia	11.01	9.34	1220.831
		Assy Door 8u (SPCC T1.6) (O-40)	28.28	*Hand Truck*	55.20	9.34	14577.784
		Assy Door 8u (SPCC T4) (O-45)	84.17	*Hand Truck*	55.20	9.34	43393.928

		Assy Top & Bottom Camuflage (O-50)	9.23	Manusia	11.01	9.34	949.353
		Assy Rack 8U19" (O-55)	22.95	*Hand Truck*	55.20	9.34	11834.752
		Assy Top & Bottom Bracket (O-60)	78.79	*Hand Truck*	55.20	9.34	40622.772
		TOTAL					**177551.530**
FABRICATION	***ASSEMBLING***						
Mesin Powder Coating	***Assembly Area***	*Assembling + Accessories (O-61)*	390.5551	*Hand Truck*	55.20	13.08	281987.031
		TOTAL					**281987.031**
ASSEMBLING	***ASSEMBLING***						
Assembly Area	***Assembly Area***	Pemeriksaan (O-62) + (I-1)	390.5551	Manusia	11.01	0	0
		TOTAL					**0**
ASSEMBLING	***SHIPPING***						
Assembly Area	***Shipping***	CAB ENCLOSURE SEMIMACRO 8U19'	390.5551	*Fork Lift*	70.53	10.61	292261
		TOTAL					**292261**
TOTAL PRODUCTION COST							**Rp. 1267903.418**

OMH on the initial layout prior to the change, the costs which occurred Rp. 1,864,590.438 per day, whereas after the changes to the layout based on the calculation of the cost value obtained Rp. 1,267,903.418 per day. It can be seen that there has been a decrease of 32%.

$$\frac{OMH\ Initial - OMH\ Proposed}{OMH\ Proposed}\ X\ 100\%$$
$$= \frac{Rp.1864590.438 - Rp.1267903.418}{Rp.1864590.438}\ X\ 100\% = \frac{596687.02}{1864590.438}$$
$$= 0.32 \rightarrow 0.32\ X\ 100\% = 32\%$$

10) The Proposed of Depatment Layout

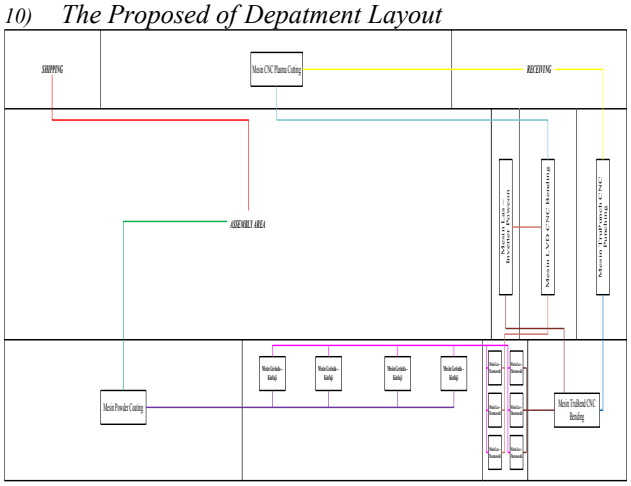


Image 7. The proposed of Department Layout of Business Unit Sheet Metal PT. Telehouse Engineering Bandung

C. Initial Layout Analysis

The main problems were seen on the production floor is the one department, namely the Department / Machine Powder Coating, who are not on the production floor, as well as the placement of the finished product on assembling department. This resulted in displacement of flow of material occurs quite long and the buildup and the narrowing of production floor area.

1) Analysis of the Initial Material Handling Costs

The initial material handling costs are material handling costs that occur in the production floor with Layout initial conditions and real happening in the field. It shall be obtained from the total the cost the use of conveyances, operator wages, conveyance distance and weight of components delivered. By summing the total material handling costs that occur each process, the importance of the total value of the initial material handling costs by Rp.1864590.438 per day.

2) Analysis of Priority Scale Table

Priortas scale seen in the table should Receiving department adjacent to TruPunch CNC Punching Machine. Then TruBend CNC Bending machine should adjacent to Welding – Thermaweld Machine. This causes the material handling process is not optimal, in other words it is this which causes the displacement distance delivery of materials to be too long. Scale initial priority is a revision of the initial conditions Layout and optimum has to be said, because it refers to the cost outflow each department that occur in the production process.

3) Analysis of Activity Relation Diagram (ARD)

In the ARD proposal showed that consists of 3 lines department with details of the first line consists of 3 departments, second and third row amounted to respectively 4 departments.

D. Analysis of the Layout Proposals

1) Analysis of the Area Allocation Diagram (AAD) Proposals

After performing calculations OMH and designing ARD, it is certain that almost all the department changed its layout. From the calculation of broad measure of the floor and placing the location of

the department based Priority Scale Table, it can form an Area Allocation and Layout Diagram proposal. This Area Allocation Diagram proposals was made widened three line departments in accordance with the draft Acivity Relation Diagram initial.

2) Analysis of Material Handling Distance Proposals

After calculating the distance of material handling proposals based on AAD has been designed previously, it is known that the distance through which the material becomes shorter, although there are some distances become longer due to factors that optimum engine placement.

3) Analisis of Material Handling Cost Proposals

From the calculation of Material handling costs that were done, the result is total material handling costs proposed is Rp. 1267903,418. This value is obtained due to changes some mileage stream or transport material from one department to other departments. This change is affected by the change department layout based on tables priorities.

From the results obtained in the calculation of the material handling cost proposals, compared with initial material handling costs clearly different. The Layout OMH at initial prior to the change, the cost which occurred Rp. 1,864,590.438 per day, whereas after the change Layout obtained based on calculating the cost value of Rp. 1,267,903.418 per day. It can be seen that there has been a decrease of 32%.

4) Analysis of the Proposed Layout

The Layout in the initial it is known that the department / Powder Coating machine and Shipping department not set in a production floor. After a variety of data processing, then the department can be accommodated so as to are within a production floor. This proposal is based on the design layout can be noted that displacement distance delivery of materials from one department to another is becoming more minimal, so the production process can be run optimally.

Moreover, by designing a new layout there are some benefits that can be obtained, including:

1. The delivery time of materials from one department to another department becomes shorter as the distance between departments become shorter.
2. The total production of the product can be improved.
3. Physical Load produced by workers can be minimized so as to reduce the occurrence of human error due to fatigue in the work.

VI. CONCLUSION

A. Conclusion

Layout changes that occurred after the investigation and processing of the data showed some improvement in activity on the production floor. Based on research that has been done and then generate a total output value of material handling costs and the layout of the proposal, then some of the conclusions that can be drawn is:

1. Department / Powder Coating Machines and the Department of Shipping can be accommodated to are within the production floor.
2. Total material handling costs can be minimized. In the OMH initial with the initial layout prior to the change that occurs is the total cost of Rp. 1,864,590.438 / day. Whereas after the change of the layout obtained total material handling costs Rp. 1,267,903.418 / day. It can be concluded that there has been a decrease of 32%.

Changes in the value of OMH is affected by changes in material delivery mileage. While changes within the material flow is influenced by changes in the placement of each department in order of priority of each department.

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