

Re-layout of Material Storage Room at PT. Andalan Fluid System with Allocation Area Diagram Method

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ABSTRACT

The redesign of this layout aims to provide information on improvements to the material storage space (warehouse) at PT. Andalan Fluid System (PT. AFS), can be more effective and efficient both from the outside, material handling costs, and workers. The condition of placement of irregular / unregulated material makes the condition ineffective and dangerous, material handling costs become larger and difficult to measure due to searching time and longer, there is also no clear identity on the material or storage location. The data used, the measurement of the area directly storing the data and looking for supporting data from the area owner, the method used in making the Re-layout is the area allocation diagram (AAD) by first calculating material handling costs (OMH) and making tables from the chart (FTC) and priority scale table (TSP). From the results of the research and analysis of the initial (existing) layout the company requires material handling costs of Rp. 65,431,026,54 with a number of matrices of 580 Pcs, and the weight of 23,457, 57 Kg, while the results obtained from the layout of 1 material handling costs became Rp. 40,242,822.12 -, in the strategic layout 2 the cost of material handling was Rp. 42. 578,302.60-, but in a better and more optimal layout of space, from a better safety factor than the initial conditions.

Key Words: Re-layout, Area Allocation Diagram, Material Handling Cost.

1. INTRODUCTION

The strategy of implementing layout and facility design can be used to get consumers and maximum benefits, where companies can minimize costs, marketing effectiveness, speed of production processes, production accuracy, to increase company image. The implementation of these strategies must be supported by the handling of raw materials, the process of handling finished goods so that the product quality is maintained until it is used by consumers.

Handling of goods cannot be separated from the initial to the end of the production system before the distribution / delivery of customers. In the process of handling this item can not be separated from the layout of factory facilities. A good layout is a layout that is able to utilize space for processes effectively in order to increase space utility and minimize material handling costs (Heragu, 1997). Lack of utilization of space and storage that is less effective will cause many products or raw materials that are not accommodated in the warehouse and the cost of high material handling. The design of warehouse facilities must regulate how assets in the form of objects can achieve the objectives or functions of these assets. in the industrial manufacturing facility planning determines how production facilities can support well in the production process (Tompkins, 1996).

The design of facility layout is one of the important factors in the preparation of the physical elements of the plant and also services such as warehousing, post offices, shops, restaurants and hospitals (Apple, 1990). The importance of the plant layout will be more visible when linked to activities that take place in the company. One of them is in the process of storing and handling

material in the warehouse, where one of the problems in it is the convenience factor for the retrieval and storage of material (performance aspects) as well as the safety or worker safety (safety aspects) factors. With the implementation of a good factory layout, it will be able to reduce the time needed in a material handling and the energy that must be expended by workers, and the safety of workers is even better.

An effective layout can help organizations achieve a strategy that supports differentiation, low cost or rapid response (Heizer and Render, 2006). Layout design in general aims so that companies can make work arrangements, available space, equipment or facilities used so that all kinds of existing flow in the company in the form of information and materials can run effectively and efficiently (Irmayani Hasan, 2011). This research was conducted to propose a good layout of material storage (warehouse), so as to reduce the risk of workplace accidents, optimize existing space, reduce material handling costs and facilitate material handling, so that it can provide added value to the company.

The research objective is to find out the initial conditions of material storage space layout, determine the layout of the proposed facilities in order to optimize the available space, so as to provide efficiency from the changes made, and optimize the space and minimize potential hazards during material handling processes.

2. RESEARCH METHOD

Data Collection Method, Observation is a method of data by direct observation and systematic recording of the object to be studied. This observation is done by observing and measuring directly on the object. Interview (interview) is a form of research conducted by interviewing parties who have knowledge and about the object under study. Documentation, including photos of research implementation activities.

Data Analysis Method, Data analysis in this study was carried out descriptively, namely classifying data into two groups, namely qualitative and quantitative data. Qualitative data expressed in the form of words or symbols of quantitative data are data in the form of numbers (Suharsimi, 2006).

The analytical method used in analyzing the data obtained using the Data Allocation Allocation Method, but to make it happen.

1. Performing preliminary data (list of raw materials, initial layout).

2. Calculating the starting and destination material handling costs (OMH), to determine the distance of transportation by the formula:

Total OMH (Cij) = Ca x Cij x Fij, where:

Cij = Material Handling Fee

Ca = Cost of transit unit / distance / weight unit

Cij = Distance of departmental activities i to j

Fij = Transmission frequency from i to j

3. Creating front to chart (FTC) tables and priority scale tables (TSP Tables) based on data materials and initial material handling costs that will be adjusted according to the planned placement of materials on the stand. Picture of Initial Warehouse Conditions. The picture below shows the initial condition of the warehouse that is still not optimal both in terms of layout and in terms of distance

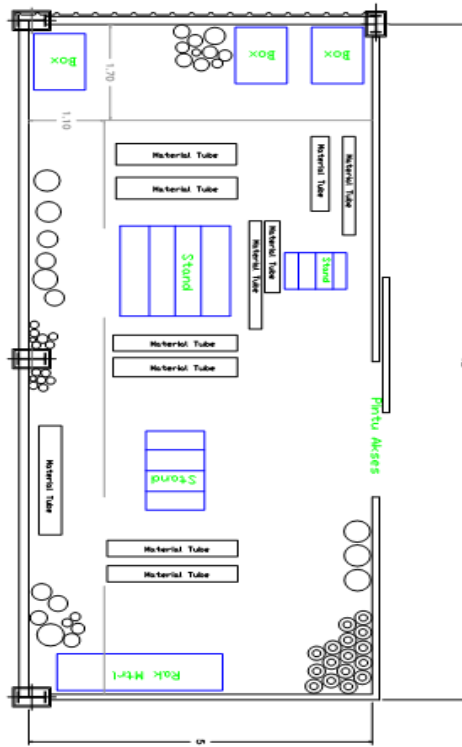


Figure 1. Initial Warehouse Condition

3. RESULTS

Layout of storage material (Warehouse) PT. AFS Taxi. Makassar, there are some disturbances in the complete layout:

1. Storage space is not well organized, material storage is irregular.
2. Potential causes danger when material handling power because the distance between material coincides and is not neat, human power / operator must step on the existing material to be able to remove the material to be used.
3. Material handling costs are difficult to measure, and the efficiency of difficult time results because when taking the material must check the dimensions first.



Figure 2. Initial Conditions of Material Placement

Data from the measurement of the location of the material and equipment storage warehouse (in the form of shelves / stands) contained in it.

Table 1. Results of Measurement of Warehouse Rooms and Equipment

No	Description	Dimension			Qty	Note
		P (m)	L (m)	T(m)		
1	Dim Material Room	12	5	-	1	Dimension Fix Room
2	Existing Rack	2,4	0,6	1,56	1	
3	Stand Existing Big	1,6	2	2,05	1	
4	Stand Existing Medium	1,2	2	1,6	1	
5	Stand Existing Small	0,8	1,5	1,33	1	

Data from material measurements and data information from the owner of the area, the material contained in the material warehouse is divided into 2, namely consignment stock material data and Makassar stock stock shop material data.

Table 2. Stock Material Resume

No.	Variation	Quantity	Note
1	62	271	ST Konsinyasi
2	80	309	ST Makassar

For unit costs based on lifting equipment and transport used are:

1. Human resources with a maximum weight limit of 40.5 kg, the cost of the unit is Rp. 15,606, -
2. Over head crane, with a maximum capacity of 5 tons, the unit cost is Rp. 59,008, -

Table 3. Simplification OMH Existing

No.	OHM Stock early	Qty Material	Material weight	transport distance (m)	Total Cost (Rp)
1	OHM Stock Konsinyasi	271,00	9,171,55	3,87	28,124,706,42
2	OHM Stock Makassar	309,00	14,286,02	3,87	37,306,320,12
Total		580,00	23,457,57		65,431,026,54

Table 4. OHM after repairs

No.	OHM use material	Qty Material	Material weight	transport distance (m)	Total Ongkos
1	OHM Use Konsinyasi	229,00	7,702,91	3,87	24,076,416,52
2	OHM Use Makassar	86,00	2,432,87	3,87	8,553,303,72
Total		315,00	10,135,78		32,629,720,720,24

Proposed Layout 1

From the data - data and calculation of the Existing OMH, can provide a description of how much the total material handling costs from the activity in the warehouse to other activities in the factory. From this description can be made a Flowchart / Map which is commonly referred to as front to chart (FTC). The following are the Front to chart tables that have been grouped based on the material placement plan with the main reference based on the dimensions of the material and the size of the equipment available.

Table 5. Front To Chart

Rack/ Stand	1	2	3	4	5	6	Total
1	5,270,594.56						5,270,594.56
2		5,000,337.92					5,000,337.92
3			1,194,321.92				1,194,321.92
4				1,492,902.92			1,492,902.92
5					15,750,511.56		15,750,511.56
6						11,420.858.40	11,420.858.40
Total							

From the description of table 5, an illustration can be drawn to determine the order of priorities between the Rack / Stand in the proposed warehouse material layout. The description is outlined in the priority scale table 6, as for the purpose of making TSP are:

1. To minimize costs
2. Minimize the distance of handling (handling)
3. Optimize layout.

Table 6. Priority Scale Table

Kode	Name Rack	Scala Priority					
		1		2		3	
A	1					1	1
B	2			1	2		
C	3	1	3				
D	4	1	4				
E	5			1	5		
F	6	1	6				

The description of the table can provide a general description of the relationship or closeness between the shelves / stands with each other, briefly illustrated in the activity relationship diagram (ARD) which is then illustrated by the area allocation diagram (AAD) which is a global template / description of information what can be seen about area placement. The following is a detailed description of AAD

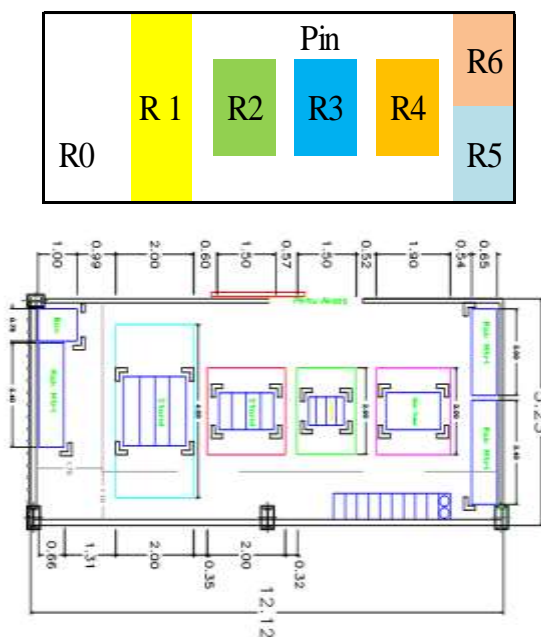


Figure 3. ARD and AAD Proposed Layout 1

From the OMH calculation Layout 1 proposal can be simplified as follows:

Table 7. Simplification of OMH Proposed Layout 1

No.	OHM Stock early	Qty Material	Material weight	transport distance (m)	Total Cost (Rp)
1	OHM Stock Konsinyasi	271,00	9,171,55	Variasi	17,230,887.32
2	OHM Stock Makassar	309,00	14,286,02	Variasi	22,898,639.44
Total		580,00	23,457,57		40.129.529.76

Table 8. OHM after repairs Proposed Layout 1

No.	OHM Stock early	Qty Material	Material weight	transport distance (m)	Total Ongkos
1	OHM Use Konsinyasi	229,00	7,702,91	Variasi	14,867,115.66
2	OHM Use Makassar	86,00	2,432,87	Variasi	5,520,708.42
Total		315,00	10,135,78		20,387,824,08

Proposed Layout 2.

In principle, the proposal layout 2 is almost the same as the proposed layout 1, except that there is a change and addition of equipment in the form of bandsaw / saw machine, the purpose of which is to simplify and speed up the cutting process of the material, in addition to keeping the machine more controlled for its use. because at this time the machine is still free to be used by the operator without the hassle of using it, so that the saw blade will be quickly damaged, even the machine will also be damaged quickly. Following Layout proposal 2.

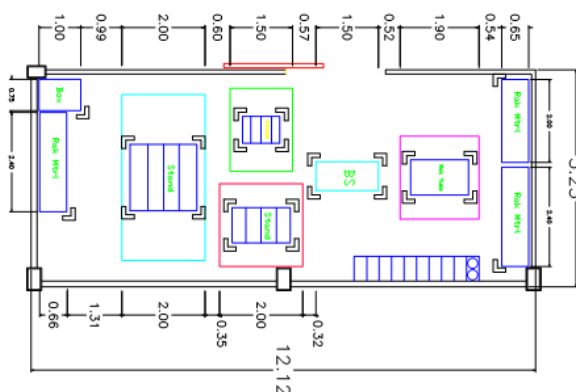


Figure 4. AAD Proposed Layout 2

4. DISCUSSION

From the results of field observations and data processing can be analyzed and discussed about the data and facts which are as follows:

1. Initial / existing layout design.

Based on observations and facts obtained in the field and proven by data processing, it can be said that the arrangement of the material warehouse is less planned and organized, both in terms of space efficiency, time, safety, and material handling costs. This is also evidenced by photographs from the results of field observations that the condition is worsened by the storage of material and others who seem to store origin, no base / valet, no identity or other information about the dimensions of material and others.

To do material handling in the warehouse there are only two alternatives, namely with human power and by using an over head crane. As a reference in calculating material handling costs the hauling distance in the initial calculation is equal to 3.87 M, from the calculation of omh as presented, the material handling costs needed to move the consignment stock material and Makassar stock from the warehouse to the access point warehouse is Rp. 65,431,026,54, - whereas for materials that have been used both consignment stock and Makassar stock are Rp. 32,629,720,24-.

2. Layout of proposal 1.

To deal with and improve the condition of the warehouse, the proposed relay layout is expected to provide space efficiency, cost, time and safety. Based on the results of observations and interviews with the area owner, and the results of calculations that have been

done as stated in table 8, material handling costs are based on proposal layout 1, for the transfer of consignment stock material and Makassar stock to the warehouse access door point is Rp. 40,242,822.12, - whereas for materials that have been used if done with the proposed layout 1 condition, the material handling costs will be Rp. 20,387,824.08, -

In this layout proposal, there is additional equipment in the form of 1 stand tube unit, 2 units of shelves and 1 unit of stand gas, this is needed so that there is room efficiency so that it can accommodate more material (figure 5). Then to make it easier in the retrieval of material, painting is done on one side of the material and then given the dimensions of the material, designation and others (figure 4). For layout 1, the method used is AAD, by describing the actual conditions or dimensions (Figure 5).

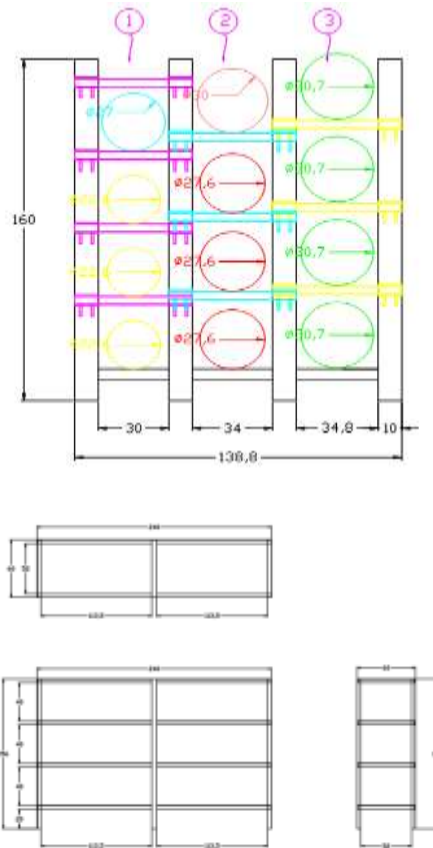


Figure 5. Tube Stand and Proposed Rack

The proposed layout 1 has now begun to run, but the condition has only reached 70%, there are 2 equipment that are still on process, namely 1 unit of material shelves and 1 unit of gas cylinder safety stand.



Figura 6. Placement and Marking of Material in Accordance with Proposed Layout 1

3. Layout Proposal 2.

In principle, proposal layout 2 is the same as proposal layout 1, but the difference is that there are 1 additional bandsaw unit into the material warehouse area, this is because there is planning for development and expansion in the production line, on the other hand the area owner feels that the bands are too far away when going cutting material, too often damage to saw blades due to bandsaw being used by anyone, so it is quickly damaged and less efficient.

Based on Figure 3. the results of the calculation of material handling costs as stated in table 7, material handling costs in the proposed layout 2 for the transfer of stock material from the warehouse to the access point for both consignment material and Makassar stock if this layout is applied to Rp. 42,578,302.64 - while for material that has been used the cost is material handling to Rp. 21,435,182.14.

To see and compare which is more effective and efficient, from the three existing layout designs, the following is based on the calculation of omh that has been done.

Table 9. Comparison of cost material handling proposed 1 and proposal 2

Cost OMH	Value OMH (Rp)	Difference (Rp)	Percentage (%)
OMH fist	65,431,026.54	-	
OMH Proposed 1	40,242.822.12	25,188,204.42	38.5%
OMH Proposed 2	42,578,302.60	22,852,723.94	34.9%

Table 10. Comparison of usage costs for OMH proposed 1 and proposal 2

Cost OMH	Value OMH (Rp)	Difference (Rp)	Percentage (%)
OMH fist	32,629,720.24	-	0.00%
OMH Proposed 1	20,387,824.08	12,241,896,16	37.5%
OMH Proposed 2	21,431,641.66	11,198,078.58	34.3%

5. CONCLUSIONS

1. Initial conditions of material storage space (warehouse) PT. Andalan Fluid Makassar branch system, Based on observations and facts obtained in the field and proven by data processing, it can be said that the material warehouse arrangement is not well planned and organized, both in terms of space efficiency, time, safety, and material handling costs, conditions it is also exacerbated by treatment and handling that is not optimal. Material handling costs for these initial conditions are also quite high with a calculation of the same distance of 3.87 meters, the cost of which reaches Rp. 65,431,026,54- with the total quantity of 580 Pcs of Materials with a weight of 23,457.57 kg.

2. To provide solutions to these problems, in this study 2 proposed layouts were given where each of these proposals had their respective advantages as listed in table 4.25. in value based on the calculation of the cost of material handling layout proposal 1, the cost will be Rp. 40,242,82212 - or its efficiency reaches 38.5% with a range of transport distance. For the proposed layout 2 the value of material handling costs is Rp. 42,578,302.60 or the efficiency reached 34.9%, but according to proposal 2 this space efficiency became more maximal, and cost / efficiency cost savings in the future will be greater.

3. With the layout 1 proposal and layout 2 proposal, the room efficiency is much better and more maximal compared to the initial / existing layout, as well as the potential danger / safety of the operator, facilities or the other becomes more safety, this is because people can traffic when material handling becomes safer because there is no material scattered below, and there is already a distance between the stands / shelves. The maintenance process will also be easier.

4. In terms of search time even though it is not discussed and carried out by research but it is certain that it will save more time, this is due to one side of the material facing outwards that has been marked and sized to make it easier to retrieve the material, because the operator or replace it can easily search without having to measure or check one by one.

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