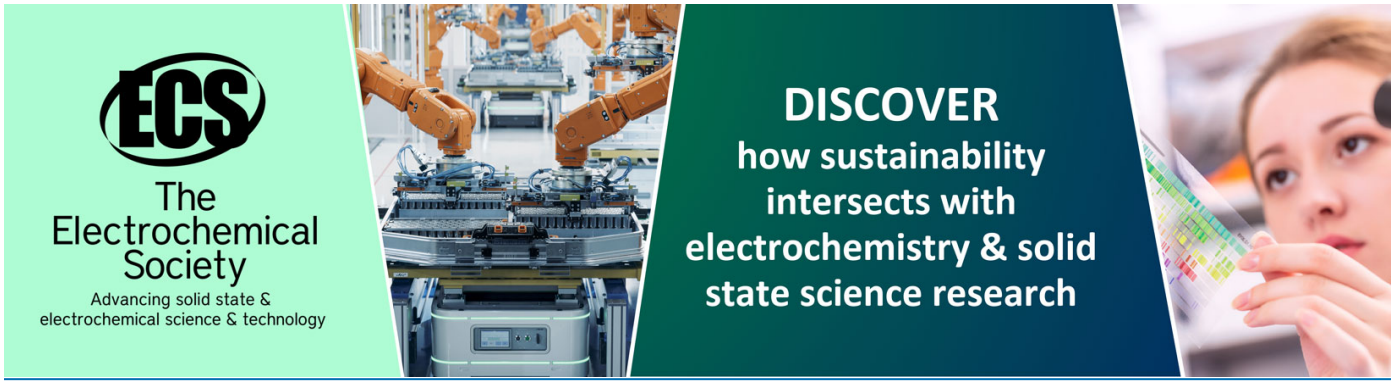
Planning the New Factory Layout of PT Hartekprima Listrindo using Systematic Layout Planning (SLP) Method



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Planning the New Factory Layout of PT Hartekprima Listrindo using Systematic Layout Planning (SLP) Method

L Gozali[1], L Widodo[2], S.R. Nasution[3], and N Lim[4]

[1,2,3,4]Industrial Engineering Department, Faculty of Engineering, Tarumanagara University, Jl. S.Parman no.1, Jakarta, Indonesia
[1]ligoz@ymail.com, [2]lamtow@yahoo.com, [3]sitirohananasution@gmail.com, [4]nicholsonlim28@gmail.com

Abstract. PT Hartekprima Listrindo is a manufacturer that produces silent, open and mobile/trailer types of diesel-powered generators, along with AMF/ATS panels and synchronous panels with the HARTECH brand. The generators produce eight Kva power variants up to 3000 Kva power. PT Hartekprima Listrindo plans to increase the production capacity by relocating its factories to a new place. The production capacity of the new plant is planned to achieve 20 generators/year in a 5184 m2 total land area of production. This relocation design uses Systematic Layout Planning (SLP) method, and the layout design is simulated. The SLP method is carried out by describing material flow in the production process using a Multi-Product Process Chart (MPPC), and then continued by using Activity Relationship Chart (ARC) which illustrates the relationship among the activities of the departments. The next stage of layout design is describing the Activity Relationship Diagram (ARD) and Area Allocation Diagram (AAD). The comparison layout design resulted in 2 alternative layouts that are better than the initial layout. The chosen layout design is alternative design 1 because it reduces transportation time and increases movement efficiency.
Keywords: Systematic Layout, Activity Relationship Chart, Activity Relationship Diagram, Area Allocation Diagram.

1. Introduction

The recently tight competition pushes the companies to increase efficiency and productivity in all production process. These activities are carried out by reducing the production costs, improving the quality of goods or products and on-time delivery. With the increased demand from consumers, the company plans to do a factory facility layout that is more flexible, productive, effective and efficient in order to improve customer service. Re-layout activities also include designing new layout for work facilities and production by arranging the order of the process flow with the existing production facilities.

Facility layout is the design of plant layout as a planning and integration of the production flow for getting the most effective and efficient interrelation between operators, equipment, and the process of material transformation from receiving area to finishing area. [1]. The factory layout is a part of facility design, which consists of the allocation of the factory and the design of the building where the factory layout is closely interrelated with material handling [2]. The purpose of these activities is to arrange the layout of production facilities to be more effective and efficient so that production time is

minimal and produces a quantity of products of the highest quality. Facility layout is defined as the process of designing a facility, including analysis, planning, design and arrangement of facilities, physical equipment, and people which aimed for improving the production efficiency and services [3]. Setting the layout of facilities and work areas is a problem found in this industry.

The problems found in the production process of this company are because the layout does not match the order of the production process and many delays occur among the production processes. The purpose of this research is to produce a good factory layout which comply with the production flow with Systematic Layout Planning method to increase productivity.

1.1 Systematic Layout Planning (SLP)

Systematic Layout Planning is a systematic and organized approach to planning a layout [4]. The SLP method is applied because it can minimize the flow of material and consider the relationship between the room, the need for space and available space. In addition, the SLP method is also a simple and an easy method to implement.

Richard Muther developed a layout design method called Systematic Layout Planning (SLP) [4], with factory layout planning procedures such as:

- Conduct initial data collection, namely product design data, process design and production schedule design.
- Determine material flow (Flow Process Chart/FPC).
- Determine the relationship between activities or activities (Activity Relationship Chart/ARC).
- Create a relationship diagram of activity and flow (Activity Relationship Diagram/ARD).
- Determine the number of rooms needed and adapted to the available room size.
- Make a room relationship diagram (Area Allocation Diagram/AAD).
- Make modifications and limits in making alternative layouts.
- Make alternative layouts.
- Evaluate and choose alternative layouts.

The Systematic Layout Planning (SLP) method is included in the conventional analysis techniques. The SLP method is often used in designing layouts because it is done by following a sequence of interrelated (systematic) stages [5]. The SLP method also uses quantitative inputs such as distance and frequency of material movement and qualitative input such as the degree of relationship of activities in the stages of analysis, so that the analysis is done better. In addition, the condition of the company where the research was conducted also supports the application of the SLP method, which is not too large, have relatively simple layouts, and the irregularities in the flow of materials.

In addition, the SLP method also has detailed procedures in arranging layouts based on the sequence of processes, then building block diagrams, and ultimately making detailed layouts of each plant.

2. Methods

This research uses the SLP method, starting with Operation Process Chart, then continued with Multi Product Process Chart, From To Chart, Activity Relationship Chart (ARC), Activity Relationship Diagram (ARD), Area Allocation Diagram (AAD). After AAD, the research purpose 2 layout problem solutions. After testing the problem with distance criteria, then the research found the best solution for the problem.

3. Result and Discussion

3.1. Flow Process Chart (FPC)

Flow Process Chart is the most commonly used map for layout design which is based on the planning process. FPC is a complete operating diagram/chart that includes an analysis of the material flow of production for generator. In addition, FPC is also a tool for recording all of production activities and showing the distance of equipment from raw materials to finished goods [6]. Below is Figure 1, the FPC of PT Hartekprima Listrindo.

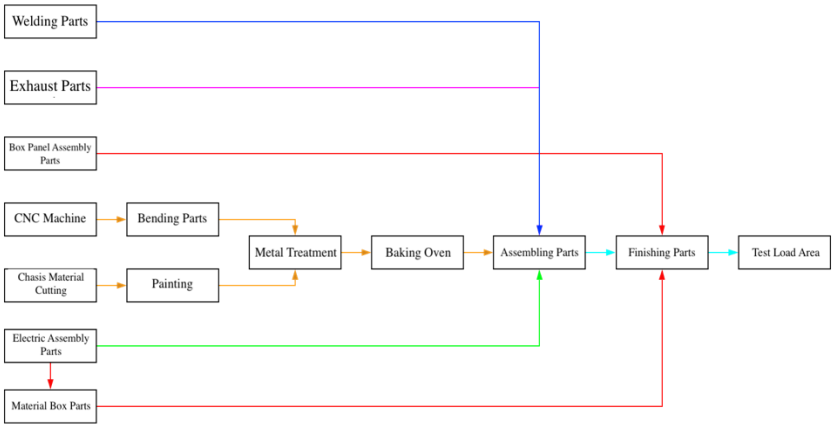

Figure 1. FPC of PT Hartekprima Listrindo

3.2. Operation Process Chart (OPC)

OPC is a diagram that describes the steps of the production process experienced from operations and quality checking [6]. Figure 2 shows the Operation Process Chart of Generator HT 80P (silent).

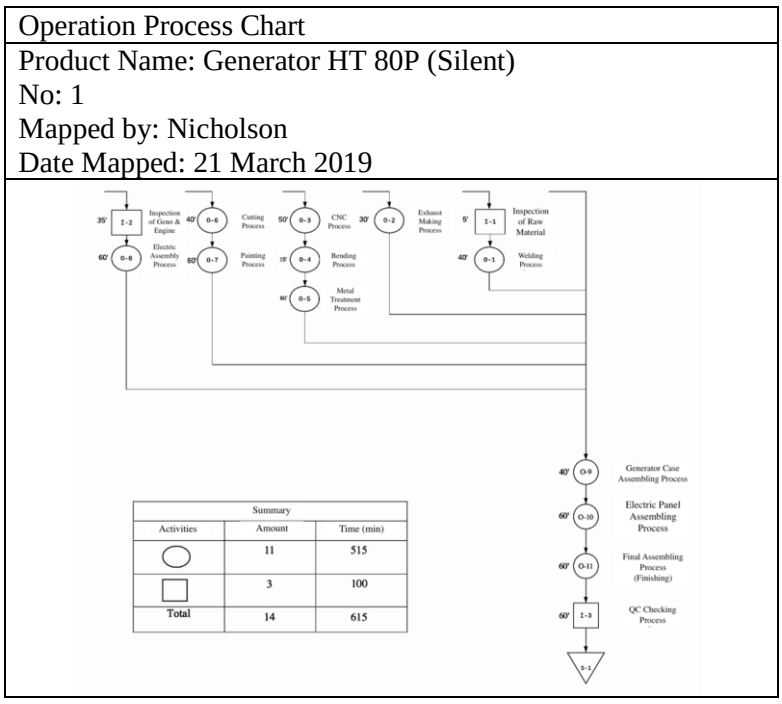

Figure 2. OPC Manufacture of Generator HT 80P

3.3. Multi Product Process Chart (MPPC)

Multiproduct process chart (MPPC) is the picture of a simple production process for making products from the beginning of the material to the end products based on the analysis of material handling and the occurrence of backflow [6]. Figure 3 shows the Multi Product Process Chart of generator set HT 80 P.

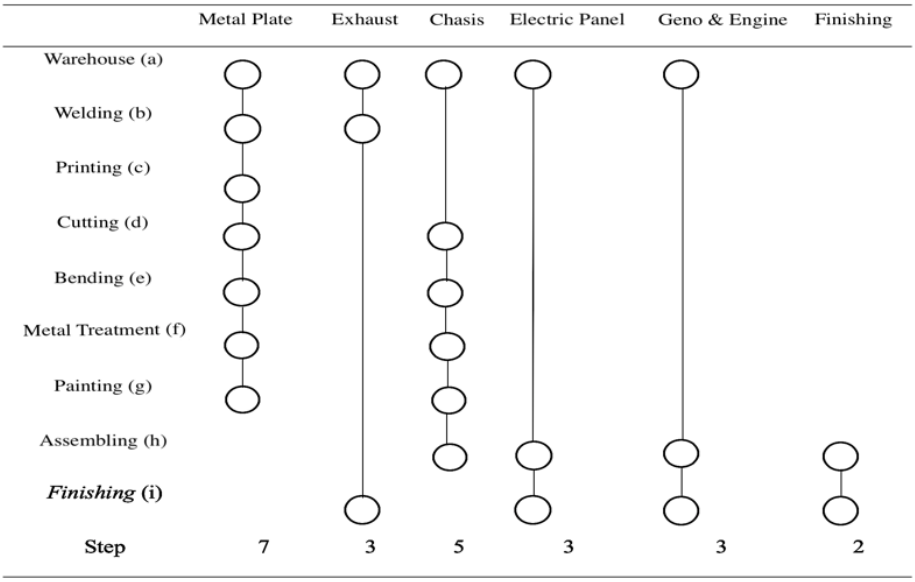

Figure 3. MPPC Generator HT 80 P

3.4. Activity Relationship Chart (ARC)

ARC is a simple method or technique in designing facility layout based on the degree of activity relations that are often stated in "qualitative" research and tends to be considered on subjective techniques from each facility or department [6]. Figure 4 shows the Activity Relationship Chart of PT Hartekprima Listrindo.

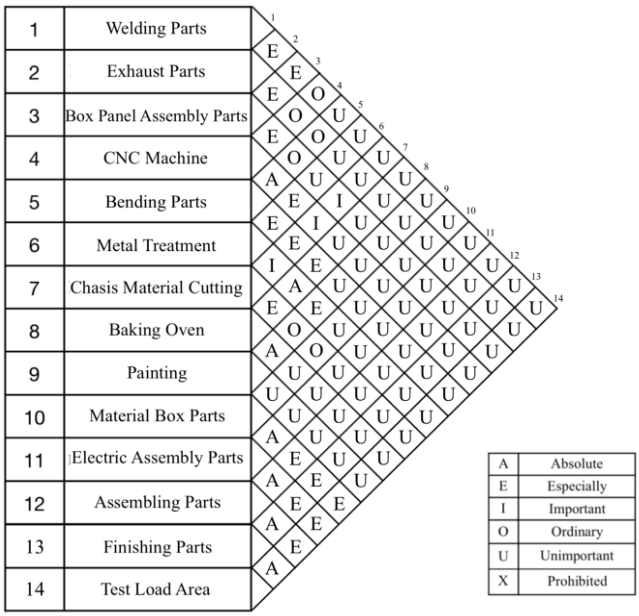

Figure 4. Activity Relationship Chart (ARC)

3.5. Activity Relationship Diagram (ARD)

Activity Relationship Diagram basically explains the relationship among material flow patterns, their location and each supporting department of the production [7]. Figure 5 shows Activity Relationship Diagram of alternative layout 1 and Activity Relationship Diagram alternative 2.

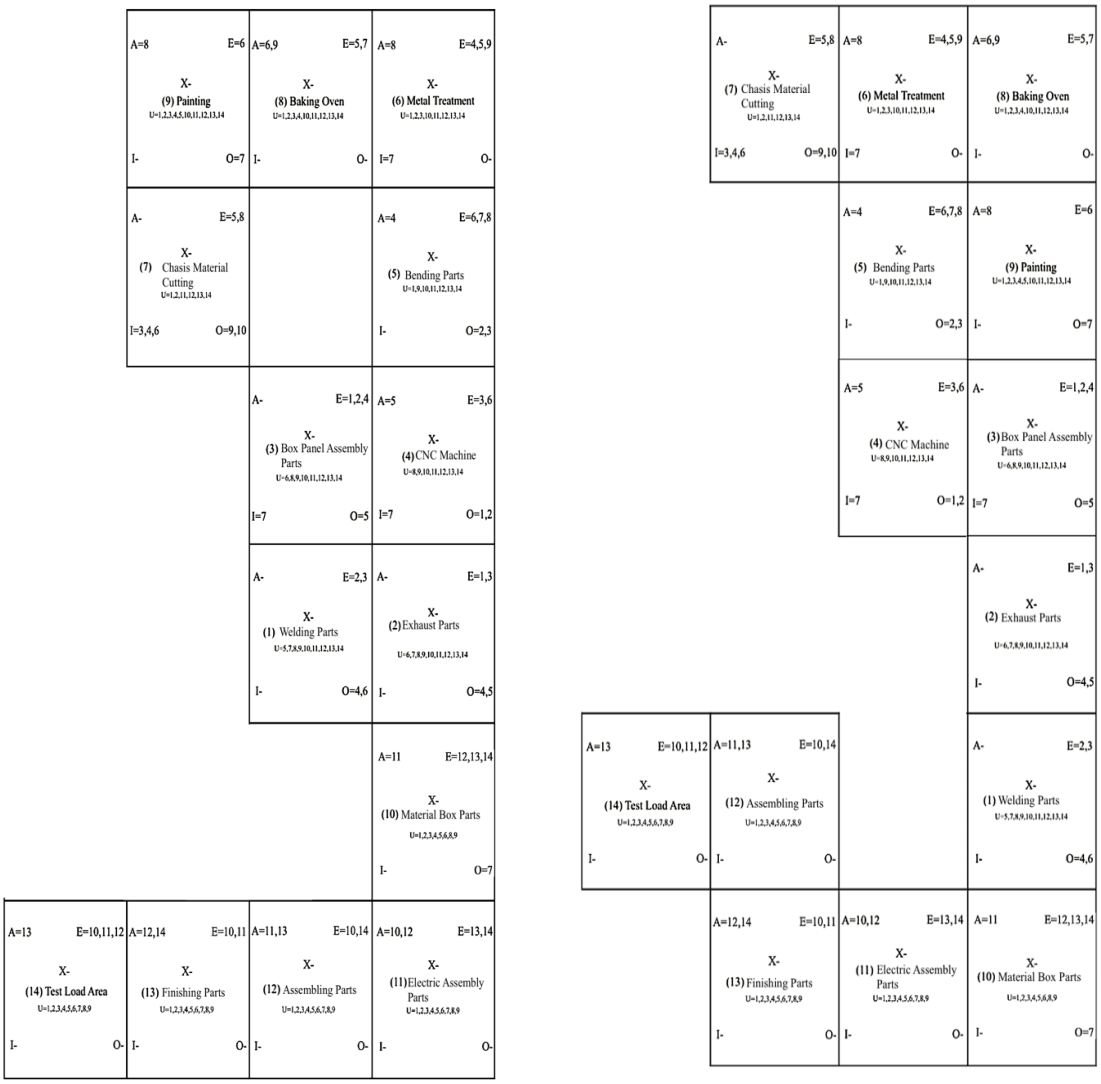

Figure 5. ARD Alternative layout 1 (left) and ARD Alternative layout 2 (right)

3.6. Area Allocation Diagram (AAD)

Area Allocation Diagrams (AAD) shows templates globally, the information only shows the placement of area, while complete visualization images can be seen in the final template/layout which is the final result of analyzing and planning factory layout [8]. Below is AAD which is based on the ARD that was designed in the section 4.5. Figure 6 shows the alternative AAD layout 1 and alternative AAD layout 2.

Remarks in Figure 7: 1 = Welding Parts, 2 = Exhaust Parts, 3 = Box Panel Assembly Parts, 4 = CNC Machine, 5 = Bending Parts, 6 = Metal Treatment, 7 = Chasis Material Cutting, 8 = Baking Oven, 9 = Painting, 10 = Material Box Parts, 11 = Electric Asembly Parts, 12 = Assembling Parts, 13 = Finishing Parts, 14 = Test Load Area.

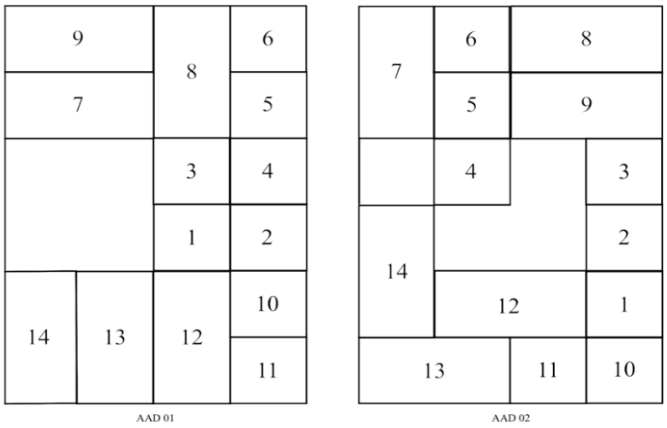

Figure 6. Alternative AAD layout 1 and Alternative AAD layout 2

3.7. Alternative Layout Designs

Alternative selection is based on the distance of material transportation and the placement of spaces for each part of production. The new lay out which is based on alternative layouts that have been chosen, alternative layout 1 and alternative layout 2, show different placements to the initial layout of the factory. The Figure 7 shows the initial layout of process flow.

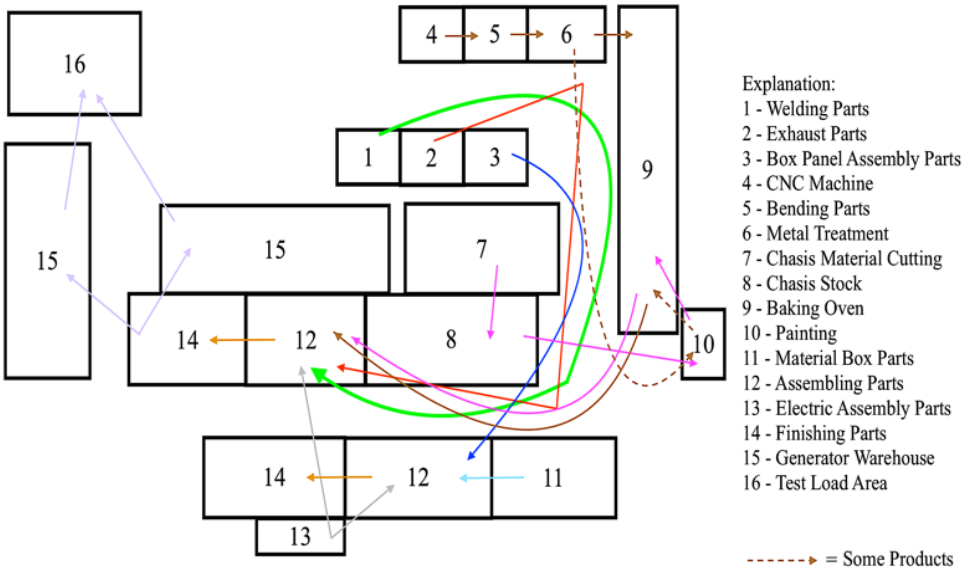

Figure 7. Initial Layout Flow Process

Therefore, the Alternative layout 1 and Alternative layout 2 process can be made by using the steps from the previous section. Figure 8 shows the flow production process of alternative layout 1 and layout 2.

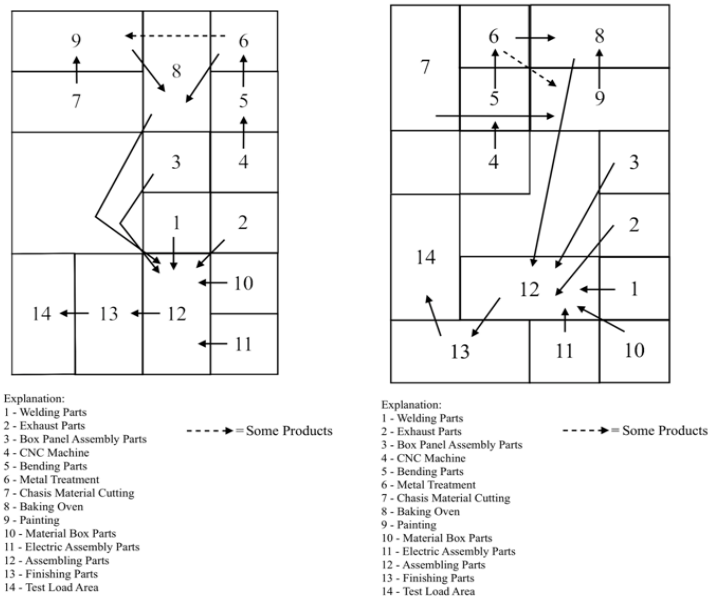

Figure 8. Flow Process Layout Alternative 1 (left) and Layout Alternative 2 (right)

Designing new layout for the new factory of PT Hartekprima Listrindo based on the method and techniques produced 2 alternative layouts. The alternative layouts are produced based on the production flow, which can reduce the distance of the excessive transportation and efficient movement. The results of the alternative layouts selected which has better movement and minimize distance. Figure 9 shows the selected alternative layout results.

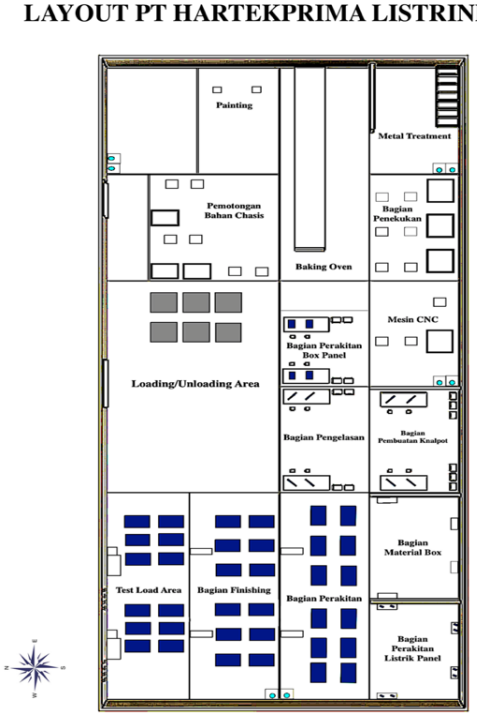

Figure 9. Selected Alternative Layout

4. CONCLUSION

The research's result at PT Hartekprima Listrindo shows the following conclusion:

This research applied the Systematic Layout Planning (SLP) method that result the better alternative layouts with ARC, ARD and AAD techniques. The recommendation of this research found 2 alternative layouts, alternative layout 1 and alternative layout 2. The best layout chosen is alternative 1 which has only 1 intersecting part and relatively short displacement distance, compared to alternative layout 2 which has 2 intersecting parts.

5. REFERENCES

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