ISSN: 2688-9323

Layout Optimization of M Company based on SLP

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Abstract

The optimization of the layout of the production workshop has always been one of the important issues facing enterprises. An excellent layout of the production workshop can greatly reduce costs, save time and improve production efficiency. This article mainly aims at the current situation of irrational layout of facilities in domestic small and medium-sized enterprise workshops and failure to combine theoretical methods with practical applications. This paper proposes to improve the layout through the SLP method, analyze and verify it, and obtain the most suitable plan for the company's actual production.

Keywords

SLP; Layout Optimization; Layout of the Production Workshop.

1. Introduction

According to the development of heavy industry in China, the development scale of most old heavy industry companies significantly restricts their development potential due to the limitations of development factors, especially in the layout of workshops[1]. Since the 1960s, the initial proposal of SLP theory has provided important data support for the reasonability and clarity of the workshop layout of enterprises. In dealing with the workshop layout problem, the method can accurately use data to combine the logistics and Non-logistics analysis[2].

Company M is a sporting goods manufacturer in southern China, mainly arrow shafts, fishing gear and other sporting goods, etc. At the beginning of company M's development, the number and varieties of products produced were also limited, so when arranging production facilities, it was mainly based on past experience, and did not seek the guidance of relevant facility layout theory, and the layout of the entire production facility is relatively unscientific.

With the expansion of the enterprise, the output and variety of products have been increasing, and the production workshops and facilities have also been expanded little by little on the original basis. The waste caused by the unreasonable layout becomes more and more obvious, which seriously affects the production efficiency. Therefore, this article adopts the SLP method to rearrange the current production facilities.

2. Materials and Methods

2.1. Division of Job Function Area

According to the different functions of each area of the factory workshop, it is divided into raw material area, temporary storage area, production area, quality inspection area, packaging area, semi-finished product area, finished product warehouse, and service area.

Tally area: sorting and storing goods; Raw material area: the area used for stacking raw materials in the factory workshop; Sorting area: sorting various production raw materials and semi-finished products; Production area: The most important part of the entire production; Quality inspection area: an area that specializes in spot-checking the quality of the produced products to determine whether they meet the quality requirements of the product; Packaging area: The area where qualified products are assembled, stickers, and boxes are the end of the entire production process; Semi-finished products area: used for stacking semi-finished products in the production workshop; Garbage area: processing production line waste; Service area: This area includes offices, communication rooms, and production model rooms. Responsible for making plans and communicating with the production line.

After investigating and collecting workshop data, record the area of each work area and plot the data into the following Table 1.

Table 1. Area table of each work area

Number	Position	Area (m^2)
1	Tally area	600
2	Raw material area	500
3	Sorting area	500
4	Production area	500
5	Quality inspection area	600
6	Packing area	800
7	Semi-finished products area	500
8	Garbage area	400
9	Service area	500

2.2. Logistics Analysis

First, carry out statistical analysis on the existing data, determine the logistics objects and material flow in the workshop, quantify the indicators in the operation process and draw the logistics intensity from to Table 2, which more intuitively reflects the logistics relationship between each operation unit.

According to the different logistics intensity, the grade is divided, and A, E, I, O, U are used to represent the ultra-high logistics intensity, the higher logistics intensity, the greater logistics intensity, the general logistics intensity, and the negligible logistics intensity. Among them, A accounts for 40% of the material flow; E accounts for 20% of the material flow; O accounts for 10% of the material flow; and the U station accounts for 0% of the material flow. Use this to draw a logistics-related relationship diagram, see Figure 1.

Table 2. Logistics from to table

	1	2	3	4	5	6	7	8	9
1		1000	4200	1000					
2	1000						1200		
3	4200				200	320	2200		
4	1000				60	300	2000		
5			200	60			140		
6			320	300				120	
7		1200	2200	2000	140				
8						120			
9									

ISSN: 2688-9323

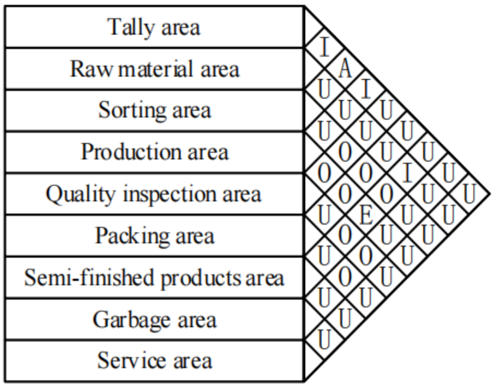

Figure 1. Logistics related graphs

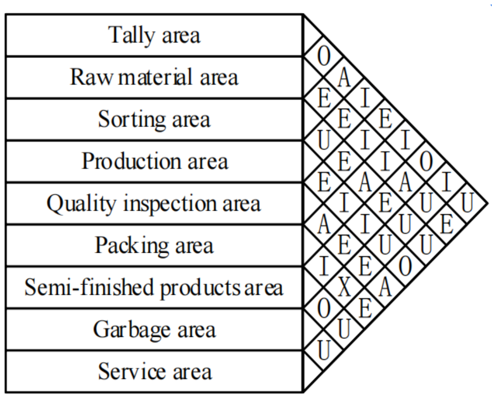

Figure 2. Non-logistics related graphs

2.3. Non-logistics Correlation Analysis

The logistics relationship of the working area can be reflected by the logistics from to the table and the logistics intensity. Non-logistics relationships are improved by quantitative analysis [3] The closeness of the Non-logistics relationship can be evaluated according to the following items: work station continuity; safety and environmental protection; personnel communication and contact ;public facilities ;public use Site; Supervision and management; Material temporary storage; Production service, Non-logistics relationship analysis is mainly arranged according to the closeness of the relationship between each operating unit. Currently, the closeness of the relationship between operating units is divided into 6 levels, A, E, I, O, U, X, see Figure 2.

2.4. Comprehensive Correlation Analysis

In most factories, there are both logistics and Non-logistics relationships between operating units. The mutual relationship between the two operating units should include logistics and Non-logistics relationships.

The operating unit comprehensively analyzes the correlation to determine the weight of the logistics relationship and the Non-logistics relationship. Generally speaking, the weights are 3:1 or 2:1, 1:1, 1:2, and 1:3. In this paper, the weighted value is 2:1, A=4, E=3, I=2, O=1, U=0, X=-1, and each degree of closeness is quantified. Then calculate the quantified value between the two operation units.

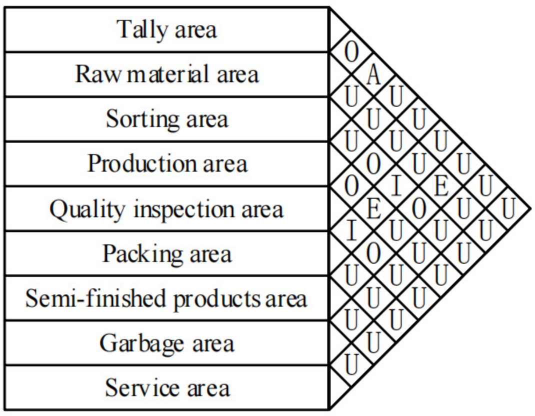

Figure 3. Unit comprehensive correlation graphs

Set the two operation units to be calculated as i, j, the value of their comprehensive mutual relationship is TRij, the quantified value of logistics relationship is LRij, and the quantified value of the close degree of Non-logistics relationship Is NRij, then TRij=m×LRij+n×NRij. Finally, it is divided into comprehensive mutual relationship levels.

ISSN: 2688-9323

When merging the relationship between logistics and Non-logistics, the combined level of any first-level logistics relationship and X-level logistics relationship level should not exceed O level. For some operation units that are not desired to be close, it can be set to XX Level, which means that you must never approach. and then draw the unit comprehensive correlation Figure 3.

2.5. Program Evaluation

Use the weighted factor comparison method to evaluate the layout plan, refer to the SLP method to divide the evaluation level of each factor, each level will be assigned a score to indicate the degree of influence of the factor on the plan, and at the same time choose the layout plan according to different factors A weighted value is set up for the importance of the impact, as shown in the Table 3, to comprehensively evaluate the multiple feasible layout schemes obtained after adjustment, and then select the optimal scheme.

Table 3. Factor Evaluation Form

Considerations	Weight	Evaluation grade
Work efficiency	0.4	A (4)
Space utilization	0.2	E (3)
safety	0.1	I (2)
Flexible space planning	0.2	E (3)
Reduce cargo loss	0.1	I (2)

3. Results

Considering the above factors, finally get the layout plan, and draw the layout diagram, as shown in the Figure 4:

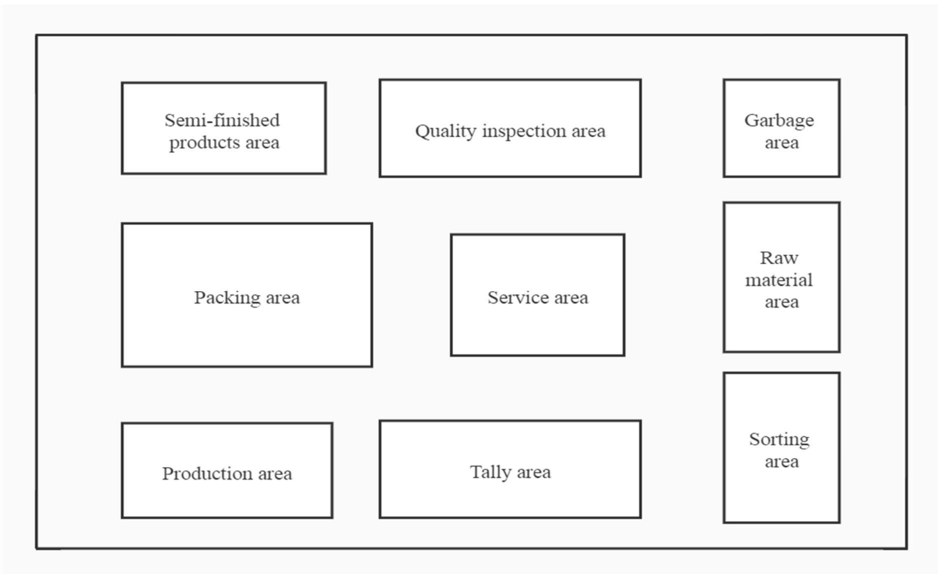

Figure 4. Layout optimization diagram

4. Conclusion

This article uses SLP method to optimize the layout of M company, which greatly improves the company's waste of time in the production process, saves costs, and improves production efficiency. However, the SLP method has the disadvantages of insufficient flexibility and insufficient accuracy. In addition, the final weighting factor comparison method is too

ISSN: 2688-9323

subjective and prone to deviation. Due to the limited personal ability, the improvement of SLP method still needs further research.

Acknowledgments

During my study, my teachers and classmates have given great help in my life, and have given me support when I have difficulties. Here, I sincerely express my gratitude to them.

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