



Workshop layout optimization based on SLP

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Abstract: This study will use SLP technology to analyze and improve the layout of a company's sofa processing workshop. In the first step, the production process and material flow of the workshop are analyzed and determined, and it is found that the production system has problems such as repeated material handling, detours of logistics lines, and complicated logistics operation processes. The second step is to use the relationship diagram between logistics and operation units. After appropriate adjustments, on the premise of ensuring that they can adapt to product processing, process flow, etc., the material handling distance is shortened, the handling time is reduced, and the layout is more reasonable. The logistics operation is smoother, and the purpose of improving the economic efficiency of the entire production system is achieved. Finally, according to the specific conditions of the workshop, two sets of optimized layout plans were determined and the weighted factor method was used to evaluate the plans to determine the best layout plan.

Keywords: SLP, Operating unit correlation diagram, production logistics, logistics costs.

1. Introduction

The analysis of the layout of workshop facilities is a technology that combines economic, technological and environmental protection elements. The excellent layout of workshop floor facilities can improve the production efficiency of the enterprise, reduce the cost of material handling, and improve the competitiveness of the enterprise. If the enterprise's production capacity cannot meet the market demand with the increase of market share, it is necessary to re-plan the workshop. Layout optimization design.

As the main executor of the production activities of the manufacturing enterprise, the workshop is the most basic product physicochemical unit in the manufacturing system. Its work capacity and system production methods are closely related to the

manufacturing technology used, and will directly affect product development. Cycle time, manufacturability, product production cost and product quality. As the large-scale production model is replaced by a multi-variety, small-batch production model, manufacturing companies need to make business changes. Increasing the flexibility of production management, at the same time, the user's requirements for products have gradually changed from the number of products to the requirements for product delivery time, product quality, cost and comprehensive strength of after-sales service, which requires enterprises to constantly tap the production potential. On the one hand, enterprises can build factories and increase workshops, on the other hand, they can optimize and renovate existing factories, improve efficiency to reduce costs, quickly meet market demand, and meet customer service needs to improve the economic efficiency of enterprises.

2. Company and research product profile

Take the sofa production workshop of Chengdu Mingzhu Household No. 10 Factory as an example. This factory mainly produces sofas, because the factory will carry out strategic upgrading and will improve the sofa production workshop. According to the technological process of the sofa produced by the enterprise and the required raw materials, a BOM table for the production of the sofa is produced, as shown in Table 1.

Table 1 Sofa BOM

level	name	Quantity
0	sofa	1
1	Inner frame	1
1	Leather case	1
1	Liner	1
1	Connections and feet	6
2	Leather	1
2	Fabric	1
2	timber	1

3. Current facility layout

The current layout of the workshop is drawn by measurement as shown in Figure 1. The total logistics handling distance of a single product is 355m, and the handling and waiting time is 835s.

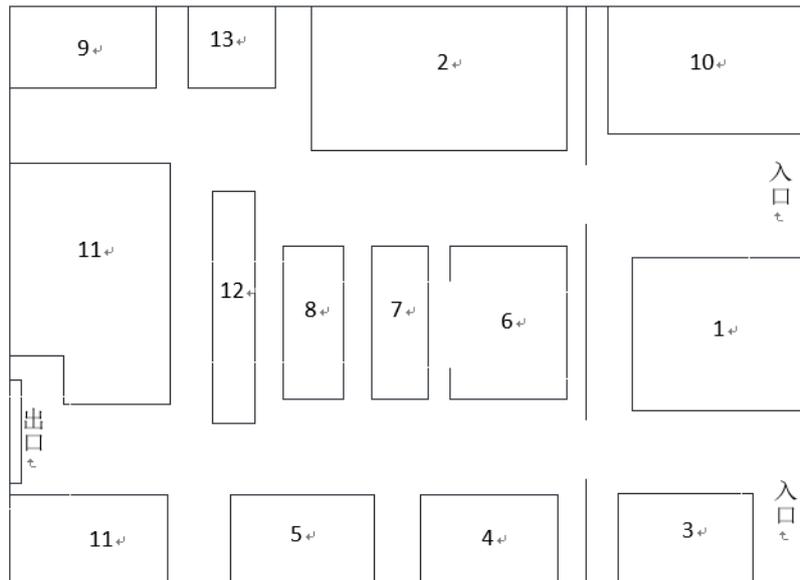


Fig. 1 Current layout

4. Analysis of problems in workshop

After investigation and interview, workshop logistics routes cross frequently, and there will be logistics congestion or even short circuit during production. A large amount of waste material is generated during the production of the station to block the channel, which increases the logistics route, wastes time, increases the logistics burden, reduces production efficiency, and increases production costs.

In addition, the layout does not consider the interaction between the stations. For example, the carpentry cutting area and the car cutting area are too close, resulting in a large amount of dust generated during the wood cutting to pollute the leather and cloth. This leads to increased cleaning operations and unnecessary waste of time.

5. Correlation analysis of operation unit area

Combining the occupation area of each operation unit and its spatial geometry on the position correlation map of the operation unit, the area correlation map of the operation unit is obtained. In this process, first of all, it is necessary to determine the actual floor area and shape of each operating unit. The basic floor area of the operating unit is determined by factors such as the floor space of the equipment, the logistics mode and its channels, and the venue for personnel activities.

The drawing steps of the unit-area correlation diagram are as follows:

Once you have the floor area and shape of the work unit, you can draw a correlation diagram of the work unit area on coordinate paper.

(1) Choose the appropriate drawing scale. The general ratio is 1: 100, 1: 500, 1: 1000, 1: 2000, 1: 5000, and the drawing unit is meter (m) or millimeter (mm).

(2) Input the position-related map of the work unit on the coordinate paper. In order to

facilitate the arrangement of the work unit, the symbols of each work unit should be arranged separately to leave as much space as possible. In order to make the layout more concise, it is only necessary to draw the related levels such as A, E, and X connections that are closely related.

(3) Arrange the operation units on the chart in order from the largest to the smallest according to the score of the comprehensive proximity degree. When drawing, draw the unit geometry with the unit symbol as the center. In general, the work unit is rectangular, and a variety of layout schemes can be obtained by rotating the shape at a certain angle. If there is insufficient reserved space, the position of the work unit can be adjusted appropriately, but it must be ensured that the adjusted position cannot contradict the requirements of the position-related map of the work unit.

(4) After multiple adjustments and redrawing of the work unit area correlation diagram, a more effective work unit area correlation diagram is obtained.

It is necessary to adjust the correlation diagram of the work unit area.

The operation unit area correlation map is directly evolved from the position correlation map, which is a theoretical and ideal layout plan. We must adjust and revise it to get a feasible layout plan. In addition to the five basic elements of product, output, process, operation unit and time that we must consider here, we should also consider the impact of other factors on the layout plan. From the perspective of the SLP method, these factors can be divided into two categories: correction factors and actual conditional constraints.

Combined with the actual situation of the workshop, the correction factors are mainly: material handling methods, analysis of the impact of material handling methods on the layout plan mainly from the types of handling equipment, the basic mode of handling system and the classification of transport units (boxes, trays, etc.)

The actual conditions include the construction cost, workshop area, utilization of the existing conditions in the workshop, policies and regulations.

6. Conclusion

Whether the production operation unit can obtain the maximum economic benefits is not only related to factors such as operation management, production tools, technical methods, and personnel capabilities, but also has a great relationship with the design of facility layout. This should be given sufficient attention. Scientific and reasonable facility layout is the basis for the efficient operation of the production system. It provides a good technical support for each link of the production management system, makes the logistics and human flow of the production system more orderly, improves the effective output of the workshop, and reduces the production process. Unnecessary waste.

This paper uses the SLP method to analyze the layout of workshop production facilities of a furniture manufacturing enterprise. Based on the analysis of the BOM structure relationship and process of the workshop products, the operation units are divided, and the logistics and non-logistics relationships between the operation units are analyzed. According to the logistics intensity and non-logistics intensity of each operation unit, the comprehensive mutual relationship and comprehensive proximity between the operation units are finally obtained, and two sets of feasible schemes are proposed. The weighted factor method is used for analysis and calculation comparison, and finally the two sets of feasible schemes are evaluated, and the best scheme is selected to achieve the purpose of improving production efficiency. After the improvement, the logistics route has been greatly shortened, the phenomenon of logistics route crossing has been reduced a lot, and the logistics efficiency and feasibility have been greatly improved. The mutual interference between workshops has been greatly improved, and the working environment of employees has been greatly improved.

This thesis research mainly completed the following aspects of work:

- (1) Based on the concept, content, classification and design methods of the workshop layout, combined with practical examples to illustrate the design process of the workshop layout.
- (2) The system layout design (SLP) mode is introduced in detail, the specific design steps of the analysis method are given, and the theoretical part is introduced for the evaluation of the workshop layout.
- (3) Taking Pearl Home Furnishing sofa production workshop as an example, a comprehensive analysis of the workshop is carried out in the system layout design (SLP) mode, and finally a variety of improvement plans are proposed according to the actual situation, so that the workshop improvement has a flexible choice.
- (4) Comprehensive evaluation of various improvement programs, select the best program, and use the best program as the improvement program of the workshop, so that the program can improve the production capacity of the workshop and have practical operation.

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