Optimization of Enterprise Supply Chain System Based on Computer Simulation Technology

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Abstract. The production logistics is the unique of the factory enterprise which makes the product, it is synchronous with the production, and the production process is carried out in a certain workshop scope. Therefore, the layout design of the logistics system is a prerequisite for the advantages and disadvantages of logistics system. The layout of the workshop layout design determines the production logistics, production logistics is reasonable, smooth, not too much cross and move back to the enterprise efficiency is very important. The good and bad of the layout design of an enterprise's workshop not only determines the running status of the logistics system, but also is one of the key factors to achieve the high efficiency. The Pudong Shanghai Zhenhua Port Machinery Co., Ltd. reducer manufacturing workshop as the object of empirical study, through the layout of the workshop, production process and the logistics situation of study and application of enterprise logistics system analysis theory and method of optimization, of workshop facilities and logistics to re layout design, the logistics more reasonable, improve work efficiency, and the application of efactory software on the system before and after optimization modeling and analysis, and further comparative analysis of the results, thus proving the effectiveness of the optimization scheme.

1. Introduction
With the intensification of modern market competition, competition between enterprises began to develop in the direction of time and customer demand. At the same time to meet customer needs, while maintaining a lower production cost and short delivery period is the key to the enterprise in the competition Naka Torikatsu. Both in the social and economic system or in the enterprise production system, to the transportation, handling, and storage logistics representatives are an indispensable link, and is one of the key part of the system is running, the profit potential is more and more big, is regarded as by reducing resource consumption and provided high human qualities to increase the profit of "the third profit source". The so-called logistics refers to the physical flow of goods from the supply to the receiving area. According to the actual needs, the basic functions of transportation, transportation, storage, storage, packaging, loading and unloading, circulation processing and logistics information processing and other basic functions to achieve the organic combination. According to the different range of logistics [1], logistics is divided into social logistics macro logistics and enterprise logistics micro logistics, the former mainly includes the enterprise to the social distribution logistics, purchasing logistics, recycling logistics, waste logistics and so on. Usually accompanied by business flow occurred. Enterprise logistics refers to the processing, inspection, transportation, storage, packaging, loading and unloading of logistics activities, which are formed by the production or activity within the scope of enterprise management.
2. An overview of logistics system

2.1. Enterprise production logistics

The logistics activities in the field of social economy are everywhere, according to the object of logistics, the purpose is different, the scope is different, forming the different type of logistics. Such as the logistics of our country Wang Zhitai to take the following logistics as follows: macro logistics and micro logistics, international logistics and regional logistics, General Logistics and special logistics, social logistics and enterprise logistics and so on. Enterprise logistics is a research on logistics related activities from the point of view of enterprise [2]. Enterprise logistics process consists of three stages, that is, from the raw material flow into the enterprise, enterprise production process in time and space in the flow of materials, products from the enterprise “flow” to the customer. Therefore, it can be divided into three kinds of typical logistics activities of enterprise supply logistics, enterprise production logistics and enterprise sales logistics. This design mainly studies the enterprise production logistics, so it is necessary to carry on the detailed introduction to the enterprise production logistics. Enterprise production logistics refers to the logistics activities in the process of production. Logistics enterprises in the production process generally for raw materials, spare parts, accessories, such as from the warehouse enterprises or enterprise portal began to enter the production line of the beginning of the end, further with the production and processing of a link connected another link to "flow", in the process of "flow", itself is processed, the size, shape and relative position and performance change[3], and also produce some waste, more than expected, until the production processing end, "flow" to the finished product warehouse will complete the process of enterprise production and logistics. The sketch map of enterprise production logistics is shown in Figure 1:

![Figure 1. Distribution of enterprise logistics.](image-url)

2.2. Production system and logistics system

Any production system is designed to meet the needs of the society for a certain product. Production system in order to make products, must occupy a certain amount of production space, with a certain number of processing equipment, so as to have the conditions in accordance with the manufacturing process of the raw materials processed into semi-finished products, and even finished. The direct purpose of manufacturing activities is to make products, which is the most important part of the production system. Manufacturing enterprises in the processing equipment or processing unit position are generally fixed[4], occupied in the factory of production space and location of each are not identical, and product demand is diverse, in order to ensure the continuous production and processing, the processed material must be dependent in handling and transport equipment from a processing location to another processing locations and material between the processing points in motion is the logistics activities. According to the above analysis, processing and logistics activities are the two main pillars
of the production system. Through the logistics activities of the raw materials in the production system, and it in turn between the processing flow, and gradually form a semi-finished products, finished until the factory. No processing, the production system will lose the meaning of the existence of no logistics, production system will lose their lives, but also will lose the conditions to continue to exist. Enterprise logistics is a necessary condition for continuous production process. Enterprise is a product of social production, is bound to have some processing program, the processing procedure is composed of some processing equipment or processing point of, the processing equipment such as machine tools or machining points such as the workshop in the respective production space into islanded distribution, raw materials between the processing according to the technological process does not stop circulation, gradually processed into semi-finished products[5], finished products, the circulation of the material forming the production logistics. In order to get raw materials and output from the community, and the supply of logistics and sales logistics, etc., these are the components of enterprise logistics. Therefore, the stability of enterprise logistics and continuous production process is necessary to continue to carry out the necessary conditions. No logistics, no production activities, plant processing equipment and facilities have become worthless, like ruins, can be said that the logistics is the lifeline of the enterprise. Good logistics system can reduce transportation cost and storage and packaging costs, improve the efficiency of logistics operations, which directly to reduce costs can shorten the production cycle and delivery time, improve the capital turnover ability, enhance the enterprise competition ability. Reasonable design layout, optimization of logistics system can maximize reduce traffic, reduce liquidity occupation, reduce costs, shorten the production cycle, improve enterprise efficiency, greatly reduce the workload, reduce the use of labor, reduce the labor intensity of the workers. The schematic diagram of enterprise mobile logistics is shown in Figure 2:

![Figure 2. Sketch map of enterprise mobile logistics.](image)

2.3. Logistics system and workshop layout
For manufacturing, logistics system is to organize according to the production process, production logistics is unique to the products of the factories and enterprises in the manufacturing, it and production is synchronized, and the production process is carried out in a workshop. Therefore, the layout design of the logistics system is a prerequisite for the advantages and disadvantages of logistics system. The layout of the workshop layout design determines the production logistics [6], production logistics is reasonable, smooth, not too much cross and move back to the enterprise efficiency is very important. The good and bad of the layout design of an enterprise's workshop not only determines the running status of the logistics system, but also is one of the key factors to achieve the high efficiency. The rationalization of production logistics has great influence on the production order and production cost of the factory. Under the condition of modern market and technology, the fixed asset investment cycle is getting shorter and shorter. In some developed countries, the factory area needs to be re adjusted. Good production logistics system for the production process is stable and ensure the smooth flow of product, shorten the production cycle. Compression inventory, equipment load equalization and rational planning, production logistics management and control. Good logistics plays a very important role in
improving the overall efficiency of enterprises. Realization ways of enterprise logistics rationalization is in many aspects, such as various production facilities in the production of space reasonable layout reasonable inventory control to reduce the cost of raw materials, guarantee the supply, to reduce the flow of funds to achieve balanced production reasonable arrangement and use of machinery, logistics improve the logistics information system. But the space layout planning and design of all kinds of facilities of production system and service system is the precondition of logistics rationalization [7]. Enterprise logistics shop layout as shown in figure 3:

![Enterprise Logistics Workshop Layout](image)

**Figure 3. Enterprise Logistics Workshop Layout.**

2.4. *Introduction of auxiliary software used in the system*

As FactoryCAD makes the layout of the establishment, modification and visualization more easily and quickly, in the actual construction or modification of the factory before the design process can be identified in the design flaws and problems, and to remove. Repeat use of layout data in other related applications can save time and allow you to evaluate more designs and make layout information more valuable. Overall, reducing the number of final changes and making the plant more access to production can provide significant financial benefits. Factorycad, you can than using the traditional CAD 2D drawing more quickly to establish 3D model. With the smart object technology, storage file size to smaller than the 2D drawing files, so it can avoid usually and construction of plant model related data size and performance problems [8]. FactoryCAD allows engineers to establish a complete 3D model, to provide more information than 2D graphics, to assist in the design process which previously found the potential of the layout problem. Because these layout models can be used directly in the visual, material flow and separate event simulation program, they can save a lot of time. FactoryCAD to strengthen AutoCAD and Architectural Desktop AutoDesk products, to provide the representative of the plant equipment and resources of the intelligent object library, in order to provide a complete factory design solutions. Each object has a 2D and 3D view screen, also contains the main performance factors. Then, you can from the layout of factorycad capture this data and layout parameters. Through the simulation data of factorycad exchange (SDX) input format making simulation tools. In the same way, you can get the cost factor from the FactoryCAD for the purpose of estimating. For devices that are not represented in the FactoryCAD library, the object builder lets the user create a lightweight argument object model. FactoryCAD needs to be paired with AutoCAD or Architectural AutoDesk Desktop. Software schematic diagram shown in figure 4:
3. System design and optimization

3.1. Optimization of facility layout in processing workshop

Optimization of facility layout is refers to according to the goal of enterprise management and the guiding principle of production, in the space has been recognized. According to the raw materials accepted the manufacture of parts and products, packaging products, delivery of the whole process, and strive to the most appropriate distribution and the most effective combination of personnel, equipment and materials needed for space, in order to obtain the maximum economic benefits. Facility layout, including the general layout of the plant and workshop layout, the layout of the facility layout of the manufacturing plant is carried out in this paper. It should solve each production section [9], support services, storage facilities operating units between the mutual position. At the same time, also should address the material handling process. For the existing facility layout, we can use the name of the original component to partition the work unit or make a new division. From the production area corresponding to each of the above, we can divide the whole production workshop into three sections: the production workshop of reduction box, the gear shaft production workshop and gear production workshop. These three plate in the machine tool equipment due to a number of more or less, according to the actual situation can set aside the manufacturing workshop area shipped to north of the three workshops as deceleration box production workshop, to the south of the transverse a semi workshop as gear output shaft production workshop, also transverse a semi workshop as gear production workshop. When the plate material is cutting machine or after cutting machine is completed, the next task is the assembly, inspection, testing and tempering stress. These work respectively in assembly area and dry welding completed. In actual operation, because of the assembly area and drying welding area are located in the gearbox manufacturing workshop of two partitions, so easily lead to results of moving away and handling time is too long, the more important is easy to cause the transportation route intersection congestion situation, so that arrange two workstations is unreasonable. Taking into account the assembly, inspection and testing the work of coherence, therefore, should be the baking to weld assembly district six sets of assembly platform moved near the welding machine, taking into account the assembly process in the other two before, in order to does not cause material handling route in the round-trip, temporary decided to put several assembly platform to the machine on the right. Field survey and found that paint Polish zone has a forging press, the forging press is mainly responsible for after the assembling parts do not meet the required size box of the forging process, let the body assembled to meet the prescribed requirements. For other production process is almost independent [10], coupled with the daily use rate than any other machine tool equipment, is not very high. Therefore, in order to make the processing workshop for the effective operation of the space can be fully utilized and need to will the forging machine assembly area to put together, leaving was originally occupied the space, more convenient in the future facility layout work. On the task a scribe area in addition to three times of lines on the body,
for gear shaft is also the need for a lineation work, therefore, to consider configuring a frame crossed platform for the gearbox and the gear output shaft crossed every step. This will be more effective to meet the needs of high yield, not because of the delay and the entire production of stagnation. Three dimensional schematic diagram of the system is shown in Figure 5:

Figure 5. Three dimensional schematic diagram of system optimization.

3.2. System workshop modeling analysis
If a job at a particular time arrived at the shop and found that the group of machines are all busy, the job is in the set of machines is discharged into a FIFO rule queue, if the day before did not complete the task, the second day continue processing. A process is a second-order Erlangian distribution of random variables, the average value depending on job category and machine group finish on a particular machine. Assumed in the workshop daily to keep continuous working conditions, to simulate 365 8 hour working day calculated for each product in the queue average total wait time and job aggregate mean waiting time groups and machine team queue average number of jobs, average utilization rate and the average waiting time, and try to improve. The default capacity of the previous Buffer from 1000 to 100 and 10, the output gradually reduced, the unit's blocking rate rose sharply, after 10 to, blocking rate to more than 90%. Although the capacity of the BUFFER was applied to the limit, but there is a very serious blockage, the substance is not effectively applied BUFFER. According to the method in different environments and different workpiece need multi process production workshop production efficiency raise many different, again a few I personally think method: try to avoid work fatigue, improve work quality; process[11], harmonious and smooth, reduce the working hours of each workpiece; pay attention to the change of the working enthusiasm of the good workers so that they actively work. The modeling process is shown in Figure 6, 7, 8.

Figure 6. Display characteristics of each entity element.
3.3. System development environment
The so-called facilities layout is defined in the selected area of facilities, reasonable arrangements for the arrangement of the internal organization of each production operation units and auxiliary facilities of relative position and area, equipment to constitute a line with the requirements of the enterprise production and management of organic whole. Facility layout is reasonable, for the production and operating activities of enterprises have an important influence, which affects enterprise's production and operating cost, staff working environment, material transport processes and enterprise resilience. Enterprise facilities layout must be selected according to the address of the topography, the composition of each part of the enterprise to determine the position of the plane or in space and according to the process of the material determined internal mode of transport and transport routes. According to this step, we know that to carry out the facility layout, we must first determine the composition of internal production units, as well as the specialized form of production units within the use of. Layout problem is to put some of the objects according to certain requirements[12], reasonably placed within a specified space; or is said to a specified space planning into a combination of a number of small space, then the in the small space reasonable placed some of the objects. Layout issues involved in almost all industries, including the production of mechanical products workshop, logistics enterprise facilities layout, transport terminals, air ports, food and beverage production workshop, library layout, etc.. Layout problems in the form of a wide variety, from the layout of the dimension to be divided into one dimensional layout, two-dimensional layout and three-dimensional layout. From the layout of the object shape, layout problem can be divided into regular objects (generally refers to rectangular, triangular and circular, etc.) and irregular objects of the layout of the problem. Early layout problem research mainly focused on the theoretical study and practical application of the layout of specifications and shapes of the objects, rules of two-dimensional layout is in a certain plane as far as possible layout of rectangular object design, and problem solving and optimization of cutting, 3D layout in the automotive and material flow transportation aspects are mainly embodied in chassis assembly, the loading of the goods, warehouse and other aspects of research and application. Over the past few decades, workshop equipment layout has been an interdisciplinary research topic, the development process of equipment...
layout includes both scientific factors and the human body function and artistic factors and so on. Recent research, this topic has been a great concern of operations research and management workers, it is an optimization problem, in the premise of meeting certain performance indicators, the optimization of the device layout program.

4. Conclusion
Through the above analysis can be seen, the application of logistics system analysis method and computer simulation of the enterprise logistics system for analysis and layout design, is a very effective method, due to the logistics throughout in the production of the whole process. It can not only improve the enterprise logistics system, and also improves the overall level of the enterprise. Scheme through computer simulation, the results show that the relationship between improved workstation is more reasonable, material handling route have obvious relationship, greatly reduces the gear box manufacturing department handling cost that reduces the production costs of enterprises, to improve the overall efficiency of enterprises. The re design of the workshop layout scheme can not be separated from the participation of the people, especially the participation of workers in the production line. A plan based on a good logistics system must be the result of the combination of the design personnel's intelligence and computer technology. Today, mankind has entered the era of electronics and information, with the wide application of computer, production process automation, flexible and advanced management mode is the key technology to improve the competitiveness of enterprises.

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