Improving the layout to enhance the process flow in small batches Weight Control Laboratory

Claudio Rodrigues Pereira
UNINOVE
Milton Vieira Junior *mvieirajr@uninove.br*
UNINOVE

Abstract

The organization and positioning of inventory in a manufacturing facility, as well as the uncontrolled flow of employees and bad use of space, have costs and end up putting the dynamics of the production system at risk. The study of the physical arrangement of a plant can get the best combination of material, equipment and labor, work and serve as an alternative for improving these factors. Among the areas that face this kind of problem is a weighing control laboratory of small lots located within the industrial plant of a company's Fragrances segment, which has a characteristic productive arrangement and that has fixed equipment, however without the complexity of movement. Through the application of systematic layout planning (SLP) and the use of tools like Excel, this paper found that an improvement in the arrangement of the physical space and improving the process flow of this facility showed good results and seems very promising, saving energy and reducing the distance traveled by the workers.

Keywords: layout; fragrances manufacture; materials flow

Introduction

Companies which currently intend to remain competitive should always seek improvements to achieve excellence in quality through the improvement of its processes and products, and also always target the reduction of production costs by improving production efficiency and rationalization of production resources.

Thus, the development of production makes that organizations have to evolve and develop organizational and operational improvements, constantly reviewing procedures and management approach as well as the processes and products in an attempt to tailor them to the needs of market. Corrêa; Corrêa (2007) say that the location of an operation affects both their ability to compete as other internal and external aspects.

In locations for the manufacture, there are people, machines, equipment, and also raw materials located at certain points that allow various activities are conducted. However, there is often an excess of movement of people and movement of raw materials, semi-

finished and finished products, causing many disorders and increasing the risk of breakage and accidents, as well as costs and production time.
Through an appropriate physical arrangement, the company or facility can achieve greater economy and productivity, based on the willingness of the instruments of labor and through the use of improved equipment, and also the human factor assigned in the system.
According to Krajewski and Ritzman (apud SCARDINI, 2008), the physical arrangement planners are always looking for alternatives with target materials, products, processes, information and people to better distribute the work processes and achieve optimum plant performance.
Among the numerous industrial activities involving these variables, there is the production of small batches (up to 3 kg) of industrial samples. It is an operation that has been quite defendant for both the care routines in the commercial area, as in technical areas such as lab application, marketing and also the area of design and development. The final product (semi-finished or finished) is composed of several ingredients (average 47 different materials are required to make one batch).
For not make use of heavy equipment, making handling easier, and present a sequential batch production, would be a task without much apparent physical difficulties present a proposal regarding the physical layout of your facility. The facility lost with poor distribution of materials and sub-utilization of employees.
Therefore, this article aims to present a proposal to improve the physical arrangement and enhancement of the process flow.

Fundamentals of Layout

In order to design a new physical arrangement, it is necessary to seek the understanding of the production system that is used in the company in question to determine what problems should be placed as priorities to be addressed in the new system to be developed.
When activities are physically arranged so that there is excessive movement of materials, information or customers, the sequencing process is a matter to be considered. (SLACK et al, 2008). Planning in advance the physical arrangement of a plant or factory installed properly, you can make all activities are integrated in a coherent way, allowing a logical sequence, avoiding the generation of waste, as well as providing and facilitating possible future changes. In general, one can say that the goal of a physical arrangement is to minimize the total cost of flows, satisfying a set of constraints specified by the manufacturing process.
Strong indicators for the process of change in the layout of a business or manufacturing facility are stocks, including stocks in process, finished goods, raw materials, the positioning of machines, equipment and operators, the form of work of operators, and a study of the quantitative data that will support the design of new physical arrangement of focused production system.
To get good results in the deployment of new layouts that aim at optimization of industrial companies or plants you need to make the best combination of material,

equipment and labor, work in the space available. It is also prudent to achieve integration of all factors affecting the physical arrangement, ensuring that the study will be part of the industrial site plan and integrate all production resources in a logical and orderly set.

Slack et al (2008) say it is important to get the correct layout of the process, because of the cost, difficulty and breaks to make any change. There are four types of physical arrangements:

a) Positional arrangement or fixed position - this type of layout the product being worked remains fixed while the workers and tools move in their environment, and is characterized by the existence of small variety of products in small quantities. This occurs in situations where the entire production process takes place in a restricted area such as in the case of craft production, shipbuilding, aircraft and large equipment.

b) Functional or process arrangement - In this type of layout resources are organized according to the functions they perform and their common needs, such as feature exists a wide variety of products in small quantities.

c) Linear or products arrangement - this type layout are arranged the equipment according to the processing sequence, which facilitates process control and minimizes the material handling, the material passes through the operations and there is a single product manufactured in large quantities.

d) Cell arrangement - this type of layout work in process is targeted for operation where several stages of processing occur. The cell concentrates all necessary resources for this and can have your equipment organized by product or process. With cell seeks to confine the flow (movement of materials) to a specific area, thereby reducing the negative effects of intense flows over long distances.

Layout development

For Muther (1986), problems are related to the physical arrangement of three basic elements: product (P), quantity (Q) and route (R). This is due to the fact that physical facilities are arranged in an industry in order to enable the production of certain types of products determined by a certain amount, and as best as possible, that is, lower cost, higher quality etc.

Harding (1992) argues that to develop a layout design is necessary to follow five stages:

- Information gathering - consists in knowing some characteristics of the organization, employees , raw materials , equipment and processes used .

- Planning solutions - phase where they studied the likely shape changes , which are raised as to the possible solutions to the identified physical interventions and projected improvements to be observed .
- Critique of Planning - phase changes occur, it would be the adaptation phase or the settling time . The deployment or change of a physical arrangement requires time for acceptance by the people involved, then this stage critical analysis of planning has the dual purpose of making the transition is facilitated through the understandings and also enable the improvement of planning developed.
- Implementation - this phase are to provide necessary physical arrangement changes , including machinery, divisions , elevations , determining points of water and energy , lighting, signs , accident prevention and claims equipment , etc. .

Control of results - this is the last stage where they are raised all the data necessary for the performance of the sectors so that adjustments are necessary when adopted.

According to Oliverio (1985) to achieve the objectives of plant layout is necessary to fulfill six general principles:

- Principle of integration - it is to dispose the equipment and machinery in a harmonic way. A plant is composed of several mini units interconnected in series in a sequence, thus being a failure in any part of the mini units, affects the entire unit;
- Principle of minimum distance - the movement of work in process does not add value to the product. This principle versa in an effort to reduce to the minimum possible material movement, seeking to reduce costs;
- Principle of obedience to the flow of operations - referred to the materials, equipment, people, as the motion of a continuous flow, in compliance with the manufacturing process;
- Principle of the use of three dimensions - this principle is the concern of the occupation of spaces. Therefore, considering the volume of the objects, area air circulation spaces of movement and operation, maintenance spaces for volume, safety, etc.;
- Principle of satisfaction and safety - concerns the satisfaction and comfort those provided by a well-developed physical arrangement. Worrying about the environment conducive for developing manufacturing activities safely and pleasant. Relational factors are the principle that the color, lighting, temperature, noise, cleanliness, odor, etc.;

- Principle of flexibility - it is the need to provide product change, change in front of machines and technological innovations, changing methods and working system.

Based on the teachings herein, a study for adaptation and improvement of a physical arrangement was made. The work was developed in an industry trying to identify its remaining deficiencies in the product in order to develop proposals for improvements that meet the rational and efficient use of productive resources.

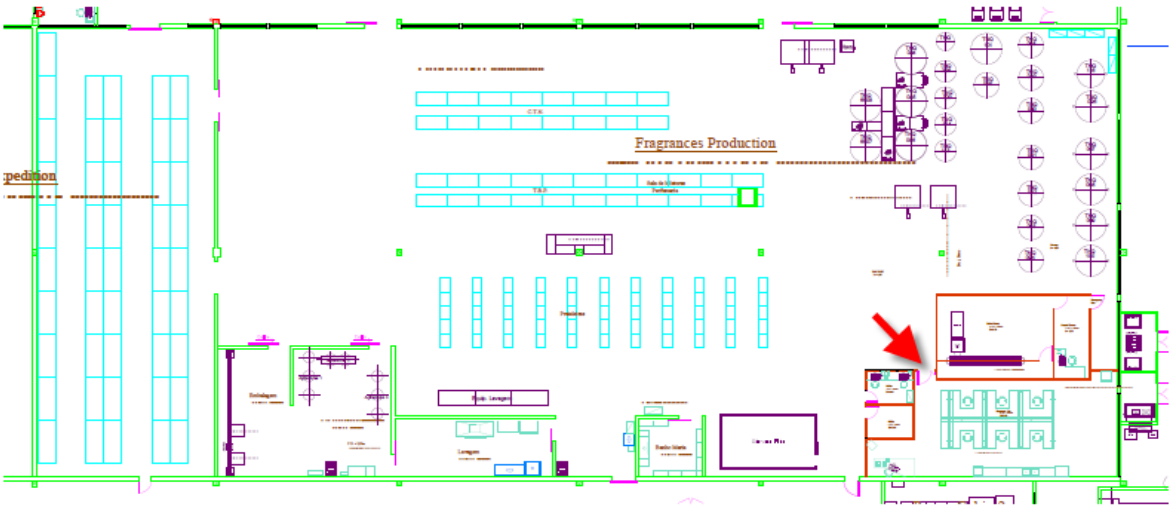
Case Study

The case study has been developed in one Swiss multinational company that is the world's largest producer of perfumes and fragrances.

In the course of time and development, the company began to diversify its production by introducing new products and prospecting new customers. In this scenario, the expansion plan envisaged the restructuring of its plant facilities: the first and only manufacturer of Fragrances in Brazil in the city of São Paulo / SP. This expansion contemplated various structural and infrastructure actions on the site which also involved the Laboratory Weighing Small object of this study.

The plant that houses the lab weighing small batches company covers an area of 1807 m^2 (Figure 1) and comprises the areas of production, inventory replenishment of raw materials, packaging or filling and weighing of small laboratory batches.

FIGURE 1 – Laboratory of Smal Batches Wheighting located inside of the industrial plant.



According to reports of the production managers, the laboratory is presented as a problem, since the volume of production cannot meet the needs of the demand. This fact makes the industry has to keep producing activity in its full capacity, as it is a place where the regime is working 8 hours per day, it is necessary operations in extraordinary times, including in weekends which represents a considerable increase in the amount of personnel expenses at the end of the month. The objectives presented have been:

1 - to obtain a better use of space and cost reduction offsets and the flow of employees;

2 – to reduce the stock level of materials on site;

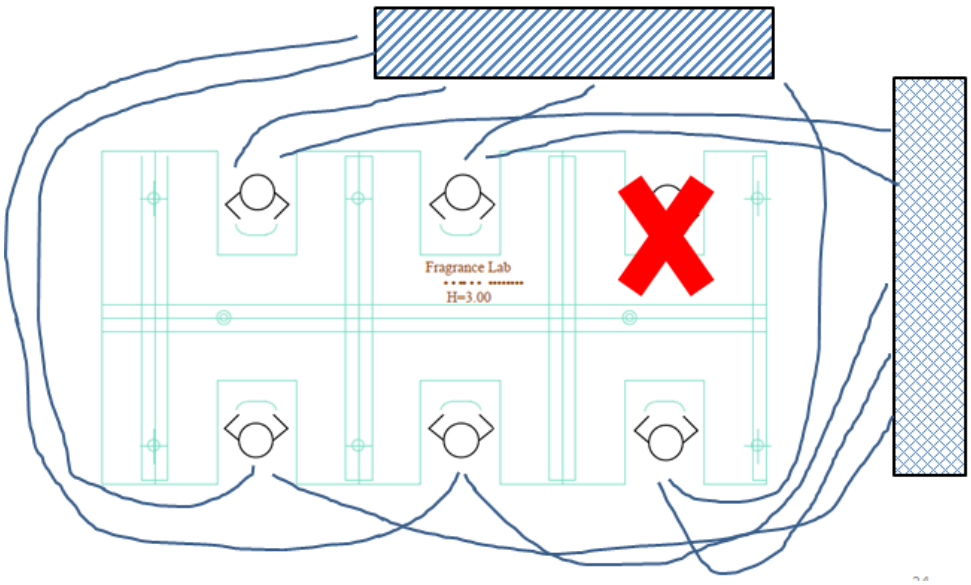
3 – to improve the flow of information;

4 – to generate increased productivity, thereby optimizing the processes conducted in area.

By observing the process flow was realized the existence of events that deserve more attention:

- First, in the production area is the existence of a large movement of materials in process, where raw materials are found stored in bottles of 50, 100 and 200 ml which are deposited in the immediate vicinity, to workstations, the scope of hands of operators.
- Second, there is a disordered flow of movement of personnel which often brings the creation of operations without any added value. However this fact is necessary to meet the current rational process that addresses the need for high inventory to meet the demand (Figure 2).

FIGURE 2 – Former Layout and Process Flow.



The existence of the facts stated above losses to the process characterized by excessive and unnecessary movement of materials and personnel, and the fact of having to wait for process equipment.

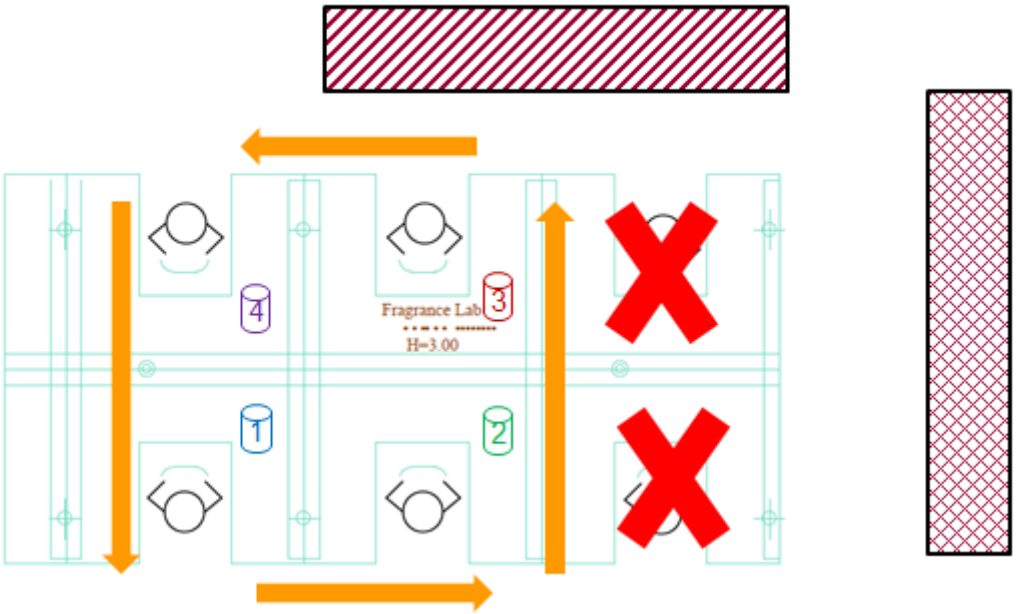
Considering a superficial analysis, the facts point some distortions that attest towards the need to carry out a detailed study on the layout or physical arrangement and also on the process flow.

To solve the main problem represented by the area that would be the bottleneck of the main alternative (considering the conditions do not change the resources available nor make relevant investments) would improve the flow of processes and evaluation of current physical arrangement of the local. That would be the scope of the action to serve as reinforcement in production volume; however this solution has impacts that must be properly analyzed.

A simple planning study of facility layout and process flow would be an alternative with greatly reduced cost, and provide a discussion of all alternatives before being effectively implemented.

The new facility layout proposed is presented with the following provision, as illustrated in Figure 3.

FIGURE 3 - Current Layout and Process Flow



The study of the flow of an industrial process plant area or equivalent (such as the Laboratory Weighing towards small batches) seeks primarily to verify and quantify the best use of available space towards that by reducing the distance, minimizing the

displacement operators minimizing the incidence and course of transport of materials, with minimum investment reduce the area required for productive activity, thereby increasing the capacity is shown as a direct consequence vital to reduce the need for investments and thus provide resource availability place to meet the current and future demands.

The new proposed configuration incorporates a simple solution to address the problem of growing demand, and partly solve the problem of shortage of capacity and eliminate the need to generate stocks of materials in process.

Closing remarks

Solutions available to the Production Engineering, as the study of the facility layout and process flow, represent a low cost alternative able to solve the problems of manufacture and, on the other hand, also increase the competitiveness by providing cost reduction operational and productivity gains.

This work is the result of applying the acquired knowledge to the discipline Overview of Production Systems, translated as one of the tools that compose the Industrial Engineering. These tools are necessary to achieve operating income of the productive environment whether for manufacturing or service.

This work contributed positively to make a feasible and low cost can bring significant gains for the proposed company.

References

CORRÊA, Henrique L.; CORRÊA, Carlos Alberto. Administração de Produção e Operações: Manufatura e Serviços - Uma Abordagem Estratégica. São Paulo: Atlas, 2007.

MUTHER, Richard. Planejamento do Layout: Sistema SLP. São Paulo: Edgard Blucher, 1986.

OLIVERIO, José Luiz. Projeto de Fábrica: Produtos processos e instalações industriais. São Paulo: IBLC, 1985.

SLACK, N. et al. Gerenciamento de Operações e de Processos. 2. ed. São Paulo: BOOKMAN, 2008, 552p.

SCARDINI, R. M. et al. Análise do arranjo físico em uma unidade de triagem de materiais: um estudo de caso: In: SIMPÓSIO DE ENGENHARIA DE PRODUÇÃO, 15, 2008, Bauru. UFV, 2008. P. 1-11.