

Optimization Of A Plant Layout For The Forklift Movement For A Coffee Plant

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ABSTRACT

The Well-organized layout and effective use of assets; manpower, equipment and space will have a positive attitude to wards manufacturing companies' production. A case study was performed at a Mysore coffee factory and this paper presents the conclusions and recommendations for an improved plant layout and materials handling method. Inherent issues inside the production system were established by using questionnaires and available documents from the company. It ranged from crisscrossing stream patterns, undocumented production schedules and poorly organized packaging and handling of materials. An alternative approach has been proposed to accomplish a novel system mapping method for the layout, usable space and machinery handling materials. Results from the evaluation of the selected model showed that streamlined nature of the plant layout increased overall productivity.

Keywords

Materials Handling, Optimization, Plant Layout, Process Mapping.

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Introduction

Study of plant layout is an engineering analysis that is used to examine various physical configurations for a manufacturing plant. This is also known as Facilities Planning and Layout Design. For the success of every manufacturing plant, the ability to design and operate manufacturing facilities that can adapt rapidly and efficiently to changing technological and consumer requirements is becoming ever more important. In the face of shorter product life cycles, higher product diversity, increasingly dynamic demand, and shorter delivery times, a single line of manufacturing facilities can no longer be cost effective. In short; industries must be able to demonstrate high levels of versatility and robustness following significant changes in their operating requirements [1].

Method study

Method study is conducted essentially to simplify the work or working methods to achieve higher efficiency. Performing the appropriate task with desired goal of reducing resource consumption is often desirable. The method study includes the following steps and is shown in Fig 1.



Fig 1: Method study steps

Current layout of coffee plant:

Fig 2 shows the layout diagram of typical coffee warehouse under study. In the layout the entire area is divided into many partitions viz. The blue color area shows the STORAGE PLACE for raw materials, semi-finished goods, finished goods and bulk product of coffee. The grey color portion shows the FORKLIFT MOVEMENT AREA. Here the forklift machine which runs within the warehouse area at the designed path that means forklift movement area. The yellow color portion shows the MAN MOVEMENT AREA, Where the workers of the warehouse can walk around for different operations. The green color shows the area where the green coffee products operation takes place. Further the layout shows the warehouse office to manage entire warehouse operations, beverage areas and coffee packing areas. Outside the warehouse area a truck lay bay is there where trucks or Lorries come and park there for loading and unloading operations.

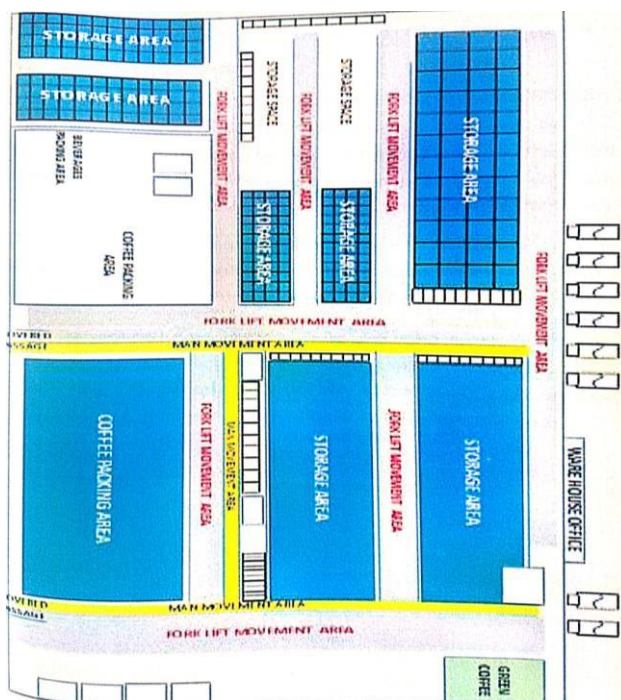


Fig 2: present layout of the plant

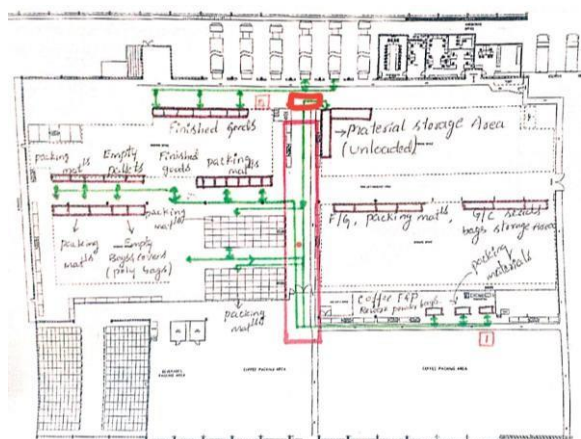


Fig 3: Rough sketch of Forklift movement in warehouse area (1,2, 3 &4)

As per the study and the observation at warehouse coffee plant, it is observed that there is no danger sign or marking at the loading place of forklift so that it leads to overtopping of forklift. Further there is no barricade system in the pedestrian path way while the forklift takes turning to reach storage area. So, that it lead the forklift to the pedestrian path which may cause accidents. The red lines indicates the inside of the path way. In the inside of the storage due to improper placing of materials leads to blockage of forklift movement path which may causes increasing in the travelling time and excess energy consumed for the movement of the forklift in an alternative path way. The purple line indicates the blockage of path by materials. Meanwhile due to blockage of materials at storage unit movement of forklift for other unit of warehouse viz, packing area and also the charging area all the forklifts uses

the same single line path way so it may leads to forklift collisions.

It is also observed that only line marking for pedestrian path way and forklift movement path way are marked at the warehouse but nowhere safety precautions, guidelines, emergency operations, further barricading, danger sign are not kept at the crossings.

In this company it is observed that only one forklift machine operates all the activities of packing and filling unit of warehouse. It shows that one forklift machine cant efficiently operate in all the operations viz. movement of packing area, production line, bulk storage, storage area, finished goods storage unit, semi-finished goods unit etc.

In this stage the idle time of forklift of this area is less as compared to green coffee unit forklift machine so that idle time of green coffee unit forklift machine can be utilized in this unit for the operations. So, efficiency of the work can be increased to certain extent.

The fig 3: shows the forklift movements of the storage area, dispatched area etc. In this unit there are four forklifts are used for the operations.

The green line is marked in the layout plan is the path way movement of forklift machine from one place to another place. Initially, forklift receives raw materials from the outside which is unloaded manually and then loaded to forklift and forklift carries the materials and dumped to storage area. From the storage area the products which are ready for deliver i.e. finished goods is automatically loaded to forklift machine by itself then moved to dispatch unit and dumped their. At the same time forklift supplies packing materials and keeping empty bins in the respective storage places. Suppose if the supplied materials are returned by the retailers or customers shall be received at the warehouses and loaded manually to forklift which carries to respective place for quality check. In this unit it is observed that, four forklift machines utilized in this section and two forklift machines from the other units take movement on the same path way of the forklift movement at the time of receiving raw materials and loading to forklift machine, At the same time during unloading the finished goods to dispatch section may causes collision of forklift machines The red line marked in the portion of the layout also shows the accident zone for the forklift machines, due to non-providing barricading pedestrian path.

It is very difficult for the forklift drivers and man movement in their path way movements where no safety precautions viz. barricading, sign boards, danger lights so it leads to an accident [2].

Safety Risks Involved

1. Material storage in the path of forklift movement which tends to forklift movement inside the Pedestrian path way.
2. Material storage in the path of man movement which tends to man movement outside the Pedestrian path way which may cause Accidents.
3. Many forklift movements in a same path way which may result in conflicts b/w forklifts.

4. Maximum movements involved in loading & unloading area there is a chance of conflicts b/w Man, Materials & Forklifts.
5. No standard storage of materials
6. No Particular work cycle for the Forklift working in the Ware House.

Ware House Proposed Layout (Coffee Plant)-Suggested On 05-05-2016

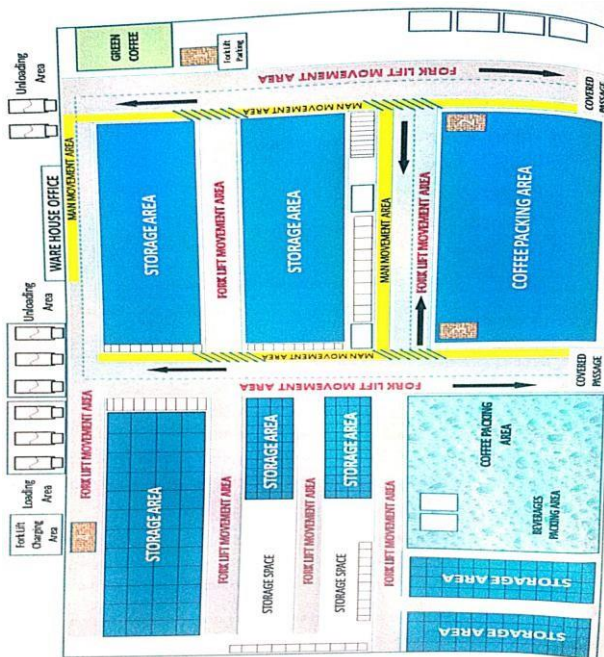


Fig 4: shows the optimized layout plan

The optimized layout plan is shown in Fig.4. The charging room must be identified at one end of the warehouse where forklift machines charging can be done. The shipper can be stacked in closed to the packing line itself to provide single access for every packing line (storing only) and permanent barricade to avoid man movement [3].

After the detailed study and daily observations of warehouse coffee plant area, it is necessary to implement some of the safety measures wherever required in the warehouse to implement the overall efficiency of the work and also avoid the accidents and also due to the proper path way movement of forklift the number of forklift machines can be minimized [4].

In the diagram the zebra crossing over the pedestrian path at the junction points must be provided, instead of single lane path way movement of forklift make it two lane path way movement for the forklift machines which completely avoid the head on collision of forklifts machines.

Due to improper parking of forklifts leads to accidents and time killing for the movement it suggested minimum number of parking area of the forklift machines at the designated locations of the warehouse (here 4 number of parking area are suggested).

Suggestions For Improvements

1. Materials should not be stored inside the path of forklift movement.
2. Materials should not be storage inside the pedestrian path way.
 - Implement of Chain Barricading system which will Avoid the
 - Storage of materials inside the Pathway. □ The man movement outside the Pathway. □ Forklift movement Inside the Pathway.
3. Separate Lane for To & Fro of the forklift Movement.
4. The storage method of each Material should be Standardized & Separate Allocation should be made for each material[5].
Finished goods, Packing Materials, Co-Packing Materials, Semi-finished Goods, Rework Materials
5. Providing Weekly Safety training & monthly Evaluation for the operators for prolong period
6. Always Stop, Look & Go Proceed in all Zebra Crossings, Blind Corners & Intersections.
 - Standard Layout for the Parking of each Forklift as to be Implemented
 - Check List for the Forklift as to done for the each shift.
 - Speed of the Forklift should be Below 8kmh • 3 kmph Speed Limit Near Pedestrians.

Conclusion:

To achieve safety standard, the important requirement include important factors ease of transport, flexible storage spaces and proper sizing of the warehouse, proper forklift operating rules, regulations and standards, efficient work cycle. It is also vital to guarantee the safety of the stored goods and in doing so; it Will ensure the safety of shop floor workers, which in turn creates a good image among the customer.

It was observed that warehouse area of coffee plants were prone to accidents. It was observed that the monthly accident rate was usually from 10 to 15%. The accidents occurred in these areas because of improper storage of material in the storage area so that the chances of placing the some products in the forklift path way, chances of forklift movement inside the man movement path way. By modifying the layout suitably and incorporating suggestions the accident rate as come down to 2 to 3% per month.

After the detailed study of existing warehouse forklift movement it is proposed to increase the size of the forklift machine with the same capacity as available now. It helps to accommodate more number of pallets i.e. increases the volume utilization it reduces the travelling time and number of forklift utilization. In turn increases the efficiency of the forklift machine with less cost.

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