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SPC Implementation in Pharmaceutical Industry for Material Flow Management

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SPC Implementation in Pharmaceutical Industry for Material Flow Management

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Abstract – In this paper we have done practical analysis and improvement of manufacturing process, transportation and work layout of a pharmaceutical company carried out with the help of a Method study tool. The pharmaceutical company is considered with manufacturing tablets. Analysis gives the effect of plant layout on distance travelled and sequencing of machines. The tablet production section is considered for analysis. The investigation also aims to find out and eliminate the bottlenecks in operation. Our proposed modification in plant layout has been drawn in by the industry which has optimized their material flow and minimized the distance travelled by two third of the past course of action. Introduction of one new mixer is found to significantly increase in quality of the product. It resulted in improvement of the productivity.

Keywords – Work Study, SPC, Analysis, Material Flow Management, Productivity.

I. INTRODUCTION

Every organization tries to achieve best quality production in the minimum possible time. The time required to manufacture the tablet depends upon manufacturing procedure, which involves, list time and don't cause fatigue to the worker. The pharmaceutical company, HOD Laboratories Ltd., situated at Ratlam (Madhya Pradesh) is considered with manufacturing of Chloroquine phosphate tablets ip (h-quine). The main aim of this work is to improve the productivity of the industry. The application of work study in tablet manufacturing is to investigate the work done in the tablet manufacturing plant and it aims at finding the best and most suitable and efficient way of using resources i.e. men, material, machine, money.

II. LITERATURE REVIEW

It is important in a tablet-pressing process that all ingredients be dry, powdered, and of uniform grain size as much as possible. The main guideline in manufacture is to ensure that the appropriate amount of active ingredient is equal in each tablet so ingredients should be well mixed. Compressed tablets are exerted to great pressure in order to compact the material. If a sufficiently homogenous mix of the components cannot be obtained with simple mixing, the ingredients must be granulated prior to compression to assure an even distribution of the active compound in the final tablet. Two basic techniques are used to prepare powders for granulation

into a tablet: wet granulation and dry granulation. Powders that can be mixed well and therefore do not require granulation can be compressed in to tablet through Direct Compression. Here the mixing process complete within 15 min and after that material moves from Mixer to Dryer, which are 1.5 meter far from the Mixer. In the existing method of the tablet section, the raw material moves from raw material store to the Blender, which is 11 meter far from the raw material store. In the Blender the blending process complete within 15 minute and after that the material moves from Blender to Mixer, which is 1.5 meter from the Blender.

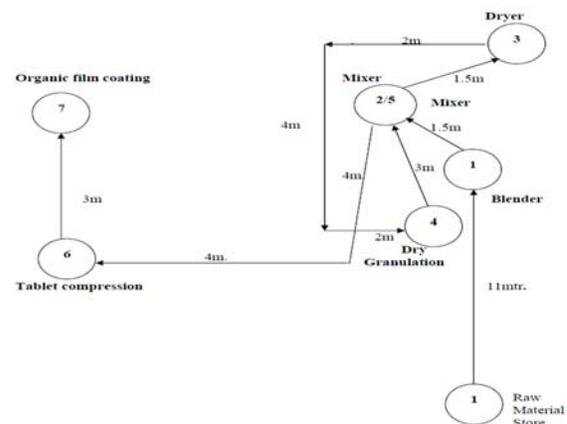


Fig. 1 : Material Flow Layout.

Now, the Drying process completes in Dryer within 2 hours and after that the material moves from Dryer to Dry Granulation which is 8 meters far from the Dryer.

Here Granulation process complete within 15 minutes and after that the material again move to the Mixer, which is 3 meters far from the Dry Granulation.

The mixing process completes in Mixer within 15 minutes and after that materials move from Mixer to the Tablet Compression, which is 8 meters from the Mixer.

Here the Compression process completes within 15 minutes and after that the materials move from Tablet Compression to the Organic Film Coating, which is 03 meters far from the tablet compression. This completes the manufacturing of a tablet.

Tablet Section		Dryer	Packing Mat. Store
Capsule Filling Area	Liquid Manu. Area		
Capsule Manufacturing Area	Liquid bottle filling		Raw Mat. Store
	Sealing		
Strip packing Area	Liquid labeling & Packing Box		
	Batch over Printing box		
Blister Packing area	Changing room		Finished Goods Store
Administrative Block	Quality control		
	Lab.		

Fig. 2 : Existing Plant Layout of H.O.D Lab Ltd.

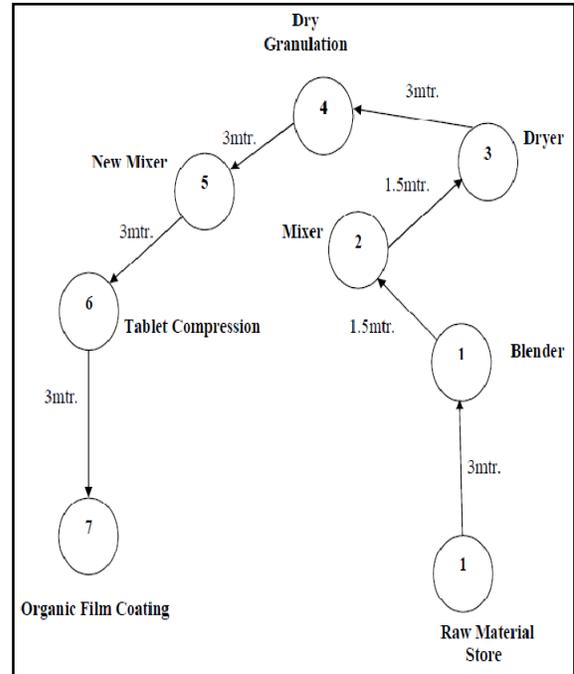


Fig. 3 : Flow Process Chart–Material Type Tablet Process

III. OBJECTIVES

The objectives behind the investigation are to increase quality and productivity of a tablet manufacturing process by:

- To find out and eliminate the bottlenecks.
- To improve the plant layout.
- To improve the material flow and minimize the distance travelled.

IV. METHODOLOGY

Here two mixer use in the place of one mixer of the same capacity and also reduced the distance moved by the material. In the existing process only one mixer is use and the bottleneck problem is occur due to the twice of flow of material in the mixer, and the distance moving long.

Fig 4 is the proposed method, which eliminates all the difficulties, which is, occurs in the existing process. In this method the raw material moves from the raw material store to the Blender, which is 5 meter far from the Raw Material Store.

In the Blender the blending process complete within 15min, and after that the material moves from Blender to Mixer, which is 1.5 meter away from the Blender.

Flow process chart		Summary			
ACTIVITY	Present	Proposed	Saving		
Operation O	8				
Transport ⇒	9				
Delay D	3				
Inspection □	3				
Storage ∇	1				
Distance (m)	61				

Description	Qty.	Distance (mtr)	Time	Symbol					
				O	⇒	D	□	∇	
Stored in raw material store									
Raw material picked up		11							
Blend in blender									
Transport to mixture		1.5							
Material mixing									
Transport to dryer		1.5							
Material drying									
Transport to dry granulation		8							
Material dry granulation									
Material inspected (for final mixing)									
Material transport to final mixing		3							
Awaiting for final mixing									
Final mixing									
Transport to compression		8							
Tablet compression									
Inspection									
Transport to coating		3							
Coating									
Awaiting transport									
Transport to packing		15							
Strip packing									
Inspection & awaiting									
To storage		10							

Fig. 4 : Proposed Flow Diagram of Tablet Section

Here the mixing process complete within 15 minute and after that material moves from Mixer to Dryer, which is 1.5meter away from the Mixer.

Now the material move from Dryer to Dry granulation, which is 3 meter far from the dryer. Here Granulation process complete within 15min and after that material move from dries Granulation to new mixer, which is 3 meter far from the Dry Granulation.

Here again the mixing process complete within 15 minute and after that material moves from New Mixer to Tablet

Compressor is 3 meter far from the New Mixer. Here the Compression process complete within 15 minute and after that material move from Tablet Compression to the Organic Film Coating, which is 3meter far from the tablet compression. This is the end of proposed method of manufacture of the tablet.

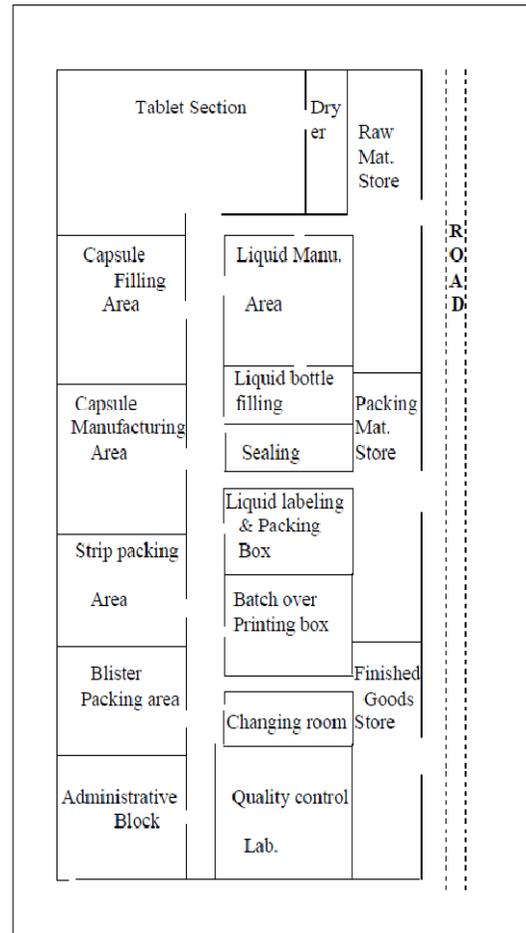


Fig. 5 : Recommended Plant Layout, H.O.D Lab Ltd.

V. SCOPE FOR FUTURE WORK

Modification in layout of machines results in elimination of unproductive movement of worker and line balancing of machines results in increase in production capacity of plant these modifications yields in low production cost i.e. economical manufacturing of product.

An application of work study in tablet manufacturing is to investigate the work done in the tablet manufacturing plant and it aims at finding the best and most suitable and efficient way of using resources i.e. men, material, machine, money the present studies involve the operation analysis and the effect of plant layout and line balancing on the production and cost of the product. Capacity of tablet compression machine is seventy-five thousands per hour.

In existing set up it's only 1/3 Fig.7 capacity i.e. twenty-five thousands per hours is being used. It may be considered for future work.

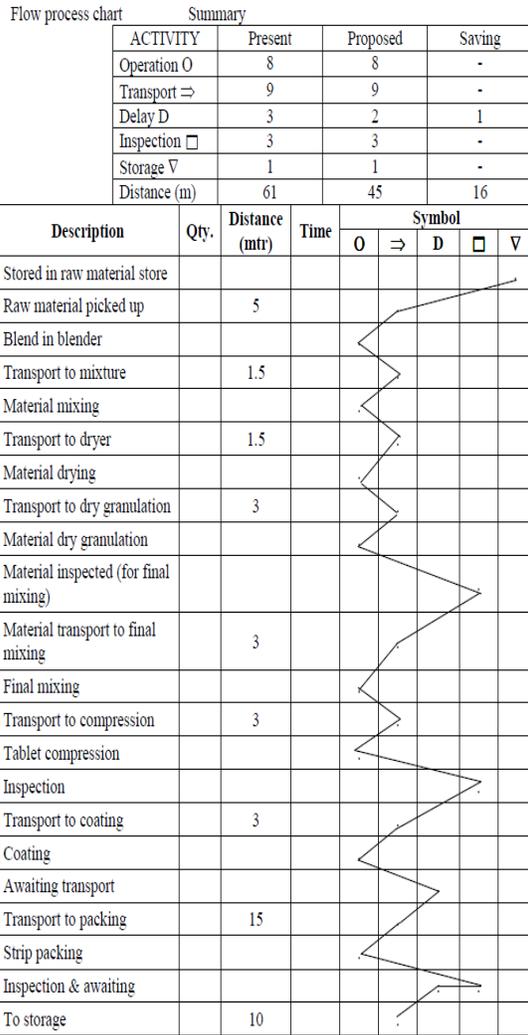


Fig. 6 : Flow Process Chart–Material Type Tablet Process

By implementing our recommendations it would go up to fifty thousand per hour. But its capacity is not still exhausted.

VI. CONCLUSION

Installation of one additional mixer would result in increase of production capacity. The MRP of product is 0.75Rs. per tablet and production cost is 0.25 Rs. per tablet. How much company get is not exactly known because company doesn't disclose it. But one can understand this profit percentage can be reasoned for the cost of a mixer. Change in plant layout reduced the distance, in existing layout distance traveled is 61 meter and it is reduced to 45 with recommended layout i.e. reduction in floor transportation is 16 meter. In the existing set up manpower remains idle for half of their working hours. By making the change in machine layout and installing one additional mixer this idle time would be eliminated and production would be nearly two fold.

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