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SYSTEMATIC LAYOUT PLANNING: A Review of Improvement in Approach to Pulse Processing Mills

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Abstract – Due to increased globalization and constant technological improvements and other competitive pressures, the organizations have to increase the pace of change to adapt to new situations. The objective of this research is to study the existing plant layout of a Pulse Processing Mills. and to design an improved plant layout using SLP (Systematic Layout Planning) to increase its productivity. Analysis of the existing plant layout was made by studying aspects like flow of materials, activity relationships and space requirements. New plant layout alternatives were designed and compared to the existing layout. The implementation of new plant layout finally selected showed a significant decrease in the distance of material and work flow travel and resulted in increasing the productivity of the a Pulse Processing Mills.

Key Words: Activity Relationship Chart, Flow analysis, Facility layout, Plant layout, Systematic Layout Planning.

1. INTRODUCTION

Plant layout refers to the arrangement of physical facilities such as machinery, equipment, furniture etc. within the plant building in such a manner so as to have quickest flow of material at the lowest cost and with the least amount of handling in processing the product from the raw material storage to finish product dispatched.

1.1 Systematic Layout Planning

Systematic Layout Planning is a technique established by Richard Muther (1961). It is a step-by-step planning procedure allowing users to identify, visualize, and rate the various activities, relationships, and alternatives involved in a layout project based on input data, flow of materials, activity of relationships and relationship diagrams.

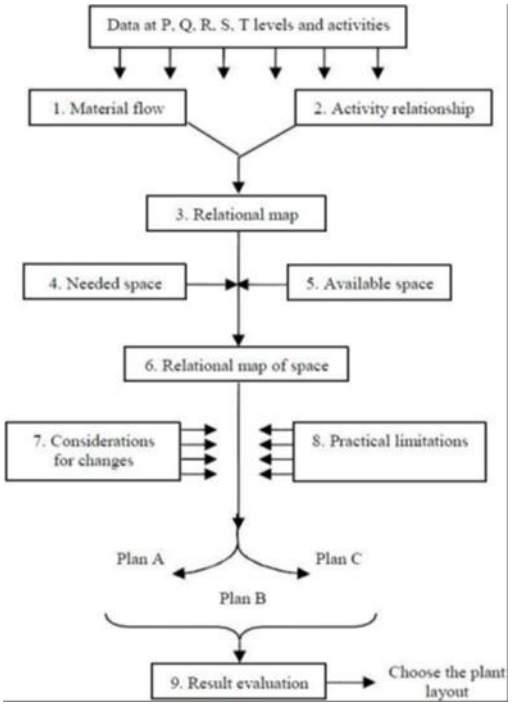

Fig. (1) Procedure of SLP

India is the largest producer and consumer of pulses in the world. However, pulses production has been stagnant at between 11 and 14 million tons over the last two decades. Per capita pulses consumption over the years has come down from 61gm/day in 1951 to 30 gm/day in 2008. This paper analyses the status of pulses production technology, constraints in cultivation of pulses and the possibilities of increasing production. Therefore, capacity of inventory will become a critical issue in the supply chain of pulse production .At every stage of pulse production. The extent of loss depend on various factors is shown below fig. (2).

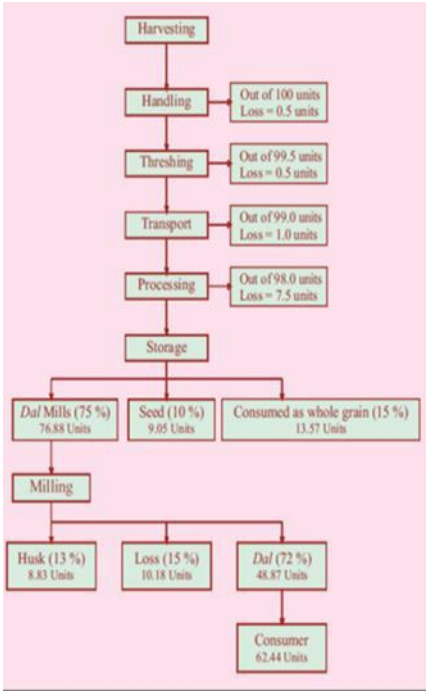

Fig. (2) Post-harvest profile of Pulse

2. OBJECTIVES OF THE WORK

The aim of this paper is to minimizing workloads and workers on the production line while meeting a required output.

The aims and objectives of the present study are as follows:-

- To reduce production cost and improve productivity.
- Improve the layout in order to improve the productivity.
- For designing of new working method, it is modification of work design to improve the efficiency of workers.
- By improving the Flow of pulse from each workstation to another from preventing the pulse from damage.
- Identification, analysis and methods of measuring productivity.
- Determining machine productivity for increasing productivity.
- To identify the location of bottleneck and eliminate them.
- Minimizing the losses during pulse production.
- It provides Safety in the movement of materials and personnel workflow.
- Minimum movement of people, material and resources.

3. LITERATURE REVIEW

Vishal Bhawsar [2016] focuses on implementing the systematic plant layout (SLP) of Heavy steel Industry for improving productivity. The existing plant could not be able to provide appreciable efficiency and productivity due to large time spent on travelling the coils and its loading and unloading. The improved plant layout significantly decrease the distance travelled by the coil for major operation and time required to transfer coil from rolling mills to skin pass.

Shubham Barnwal [2016] deals with the obstacles occur in engine reconditioning process due to prolonged movements, several cross movements and time-consuming activities. Alternate layouts can be generated using systematic layout planning improve the performance of production line such as decrease bottleneck rate, minimize material handling cost, reduces idle time, raise the efficiency and utilization of labour, equipment and space. The implementation of proposed model will help in the increase of production rate by 28%, the production time per bus came down by 3.34% and total distance travelled by material came down by 14%.

S.S. Gnanavel [2015] looks layout design in Cellular manufacturing Systems (CMS) and it has been simulated and verified in assembly line. The implementation of new layout has been considered as successful because it can increase productivity by 10% by evaluating work stations and work methodologies and concluded with the reduction in total operating cycle time, higher alertness among operators, and better distribution of workshop in the group and yield higher productivity.

Orville Sutari [2014] reports a case study on the existing plant layout of a nacelle production unit and to design a lean plant layout using SLP (Systematic Layout Planning) to increase its productivity. The study based on flow of materials, activity relationships and space requirements. Hence, in the optimized layout, the total distance reduced in the manufacturing of one set of nacelle and nose cone is 339.05 m. the SLP showed that optimized plant layout were able to reduce the wastes due motion and transportation which increasing the productivity of the plant.

Mohamed Farook K.S [2014] looks for the improvement of productivity of a multi-product manufacturing industry. After analyses possible areas for improvement such as Labour productivity, Plant Layout and space utilization and Work Standards. From the study of improvement areas, work sampling study implies for better area for improvement, the selection of best possible alternative layouts and Work standards are established for frequent order products using time study method.

Md. Riyad Hossain [2014] focus on on-going production process layout of jute industry based on the systematic layout planning pattern theory (SLP) for increased productivity. The study includes operation flow process chart, flow of material

and activity relationship chart and new plant layout has been generated as compared with the present plant layout. After analyzing the existing layout it is shown that for a production of 100kg yarn total material handling costs are 1829.25BDT while it is reduced to1120.5BDT for the modified layout. Implementation of newly developed layout can save 38.75% of total handling costs.

C. S. Avinash [2014] conducted Comparative economic efficiency of modern and traditional redgram processing mills by analyzing the business ratios, Break-Even ratio, and financial feasibility ratio like NPV, BCR and IRR techniques. Data are collected by questionnaire by personal interviews of Dal Millers and records maintained by Dal Millers. The benefit cost ratio worked to be 1.13 for modern dal mills and 1.06 for traditional dal mills. The internal rate of returns is as high at 33.22 per cent in modern dal mills compared to traditional dal mills (16.48%). The quantity of output required to achieve break–even point were 10,863 quintals in modern and 9,136 quintals of output (dal) in traditional dal indicating both were running under profitable lines. It was found that investment in modern dal mills was economically more profitable than that of traditional dal mills.

Rajbir Bhatti [2014] deals with the plant layout of "TIRUPATI FLOUR MILL INDUSTRIES" to eliminate obstructions in material flow and to obtain maximum productivity of employee as well as plant. The existing plant spread over 3620.65 ft2 areas out of available 5610 ft2. By analysis problems in existing plant layout and their possibilities of improvement in plant. A improved plant layout has been design by reducing unwanted motion of work pieces, duplicate motions ,unused space etc. this improved plant layout can increased its production by 20% to 30%, without a noticeable investment and using maximum area of 5353.6 ft2.

Udita Saini [2013] explore the theoretical link between six sigma and lean production and discuss two organizations recognized methodologies evolved at Motorola, GE, Toyota, and Ford, GE, General Motors, Xerox etc. which define the meaning and basic principles of Process Improvement Techniques. The integrated study serves to improve processes, eliminate product and process defects and to reduce cycle times and accelerate processes.

N. V. Shende [2013] reports a Case Study of PKV Mini Dal Mill. They study about Technology adoption and their impact on formers. The study revealed that, the amount of Rs. 33750 was the average capital investment in PKV mini Dal mill along with accessories. Farmers having PKV mini dal mill was more interested in adopting knowledge to avoid high investment in storing the raw material Thus Rs. 279.93 was estimated as a net retuned per quintal. However the annual net income from PKV mini Dal mill was estimated to be Rs. 85378. It About 56 percent of the farmers lack the availability of skill labour and 36 per cent dal mill owner facing the problem of technical knowledge about operating of machinery. Hence there is a need to conduct the training program about operating of PKV Mini Dal Mill through leaf let.

C. R. Shah [2013] deals with production as a cylinder. The existing process results long distance and that means a waste in time and energy, resulting in high cost. The new plant layout has been designed and compared with the present plant layout. The SLP method showed that new plant layout significantly decrease the distance of material flow from raw material storage to packing department reduced by 41 m results in increased production.

Chandra Shekhar Tak [2012] deals with the application of the SLP (System Layout Planning) method for establishing an efficient layout of Rajasthan Steel Industries (RSI) Chittorgarh. Existing plant could not able to provide sufficient space to locates individual operations in separate areas. By identify, visualize, and rate the various activities, relationships, and alternatives involved in a layout project. The optimal solution of the productive system's layout is selected by analyzing three possible identified alternatives.

Natthapong Nanthasamroeng [2012] studies about systematic plant layout for germinated brown rice mill in community enterprise under GMP and ISO22000 requirements. The study based on PQRST analysis, flow analysis, activities relationship analysis, determining relationship diagram, developing layout alternatives, and layout evaluation. The result of improvement could decrease material handling distance from 47 meters to 8.83 meters or 81.21% reduction.

Peter Jerkrot [2011] develops and tests a model for re-layout planning for the heavy steel industry. The study has been conducted to change the material flow in the Rolling operation. The model consists of different tools that were used to gather and systemize a sufficient amount of data. The production capacity could be increased by 7% through a change in layout. More than 1% could be cut-off from uptime of billet and grinder. 134 min/day of traverse operator time would also be saved.

W. Wiyaratn [2010] reports a case study on equipments and tools in iron manufacturing and study based on the systematic layout planning pattern theory (SLP) for increased productivity. The study described present plant layout such as operation process chart, flow of material and activity relationship chart has been investigated. The new plant layout has been designed and compared with the present plant layout. The SLP method showed that new plant layout improves the process flow and help to increase space in industries and significantly decrease the distance of material flow from billet cutting process until keeping in ware house.

B Sanjeeva Reddy [2006] deals with various traditional methods to avoid loss during storage of Pulse grain due to insects and pests. They introduced some scientific principle to improve the process by using chemicals, fumigation methods in storage and heavy machinery for pulse milling

and provide soap stone, waste oil and synthetic colors to impart shinning appearance to final product.

4. SUMMARY OF LITERATURE SURVEY

layout planning have been presented in Table 1

The summary research done by experts in systematic ascending order of year

Table 1: Summary of the developments in systematic layout planning based on literature survey

Reference No.	Author Name [Year]	Investigated Problem Type
1	Vishal Bhawsar [2016]	Systematic Plant Layout (SLP)
2	Shubham Barnwal [2016]	Systematic Plant Layout (SLP)
3	S.S. Gnanavel [2015]	Cellular Manufacturing Systems (CMS)
4	Orville Sutari [2014]	Systematic Plant Layout (SLP)
5	Mohamed Farook K.S [2014]	Productivity Improvement
6	Md. Riyad Hossain [2014]	Systematic plant layout (SLP)
7	C. S. Avinash [2014]	modern and traditional processing mills
8	Rajbir Bhatti [2014]	Tirupati Flour Mill Industries
9	Udita Saini [2013]	Process Improvement Techniques
10	N. V. Shende [2013]	A Case Study Of PKV Mini Dal Mill
11	C. R. Shah [2013]	Systematic Plant Layout (SLP)
12	Chandra Shekhar Tak [2012]	Systematic Plant Layout (SLP)
13	Natthapong Nanthasamroeng [2012]	Systematic Plant Layout (SLP)
14	Peter Jerkrot [2011]	Systematic Plant Layout (SLP)
15	Wiyaratn[2010]	Systematic Plant Layout (SLP)
16	B Sanjeeva Reddy [2006]	Technical Knowledge on Pulse processing

5. CONCLUSIONS

From the study of Systematic Plant Layout (SLP), it is found that SLP are procedural approach technique where the position of various departments are altered with various others based studied in the literature survey.

The problem of existing layout is large comparative distance between several departments that's forced to travel long distance and impedes the smooth material flow and leads to higher cost.

A procedural approach for minimize material handing distance.

Evaluation of various alternatives of plant layout to improve the plant efficiency.

It minimizes the material handling as well as combining with other operations when possible, eliminates unnecessary and expensive movements.

The study serves to improve processes, eliminate product and process defects and to reduce cycle times and accelerate processes.

Labour has to be organized in production process by SLP, so that they know exactly how many workers required at a given time as well as type of work to be performed by them.

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