Optimization of Overall Efficiency using Facilities Planning in ROPP Cap Making Industry

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Abstract

Facilities Planning refers to the design, layout and placement of facilities such as machinery, equipment, people, tools, storage areas etc. within a physical spatial environment in a way that allows the fastest material flow at the best possible cost while trying to achieve the lowest amount of material handling from the raw material stage to the finished good stage, thereby reducing bottlenecks, idle time and increasing the efficiency & use of equipment, manpower, space and time. The industry criteria of managing changes from process based layout to product based layout. The primary aim of our project is to study the manufacturing facility at Indus Metal Packaging in Peenya, Bangalore and use facilities planning methods such as - Immer’s method which can be applied to any layout problem & involves a structured step by step procedure to create layout solutions, in order to optimize the overall efficiency of the manufacturing process and facility. 

Keywords: Immer principle, facility planning, process and product layout

I. INTRODUCTION

Indus Metal Packaging is a Manufacturing company that was founded by MR. KAMATH IN 1996 in KSSIDC Industrial estate, 2nd STAGE PEENYA.

Indus Metal Packaging is a high volume manufacturer of aluminium roll on pilfers proof caps (a.k.a ROPP caps) and supply to large number of customers in the South Indian market sector who use these caps for their products such as liquor bottles, medicine bottles, disinfectant bottles, etc.

Indus Metal Packaging has been in business for over two decades and has been a big player in manufacturing of caps in the local market. They have static production as they produce products throughout the year.

The plant at Peenya currently produces roughly 8.5 Lakh caps a day and runs for about 10 hours a day with 10-12 workers.

II. PROBLEM STATEMENT

A Manufacturing facility can perform at its highest level only when all of its inefficiencies and wastages are removed or minimized.

Here at Indus Metal Packaging we had observed inefficiencies with respect to the flow of materials & goods due to the layout of the manufacturing facility which has been the result of inadequate foresight in planning at the early stages. The need to change from process based layout to product based layout.

Hence we must thoroughly study the manufacturing facility & manufacturing processes and use an appropriate plan of action to eliminate any inefficiencies or wastages in order to improve the overall efficiency/productivity and in turn increase the profits of the company.

III. METHODOLOGY

The methods used in order to achieving improved productivity are:

– Immers method of facility planning
IV. IMMER’S METHOD OF FACILITIES PLANNING

The methodology used in proposing a new layout is based on Immer’s principle of material flow.[2] It states the conversion of material flow lines to machine flow lines.

The Immer’s is used mostly in most product based layout as the volume produced is exponentially large. The method brings continuity and effective use of the layout to maximize the production at hand. The key factors in achieving Immer’s is by time management and maximum utilization of the machine true production capabilities. This optimizes the plant layout to produce more caps by reducing inefficiency caused by time.[2]

V. THE PRODUCTION FLOW

The raw material obtained in the industry is printed aluminium sheets. The aluminium sheets are then cut by shearing machine. The cut aluminium sheets are then feed to the power press machine which is accompanied by the roller that moves when the sheet is feed in to the power press machine. The cap is then put in the machine where the grooves are placed. This stage is called the pilfering stage. This stage is grooves are placed on the cap to remove also on the top. After this stage is done the next stage to be proceeded is the wadding stage where the propylene plastic is placed as the water tight and the liquid does not leave the bottle. The bottle cap is kept in count while leaving the production chain by a sensor.
VI. THE OLD LAYOUT

![Pre-existing Factory Layout](image1)

Fig. 2: The Old Layout

The pre-existing layout is a process type of layout where the manufacturing machines are placed together or the same type of machine are clubbed together to produce the same type of material. This process layout planning of grouping was stressed too much and therefore had a negative impact on the number of units produced. This loss of production was mainly due to the travelling time from one machine to another because they were placed in groups hence transferring the caps from one machine to another in bins and batches was one of the greatest problems this layout faced as their growing demands were not meet. Hence longer work hours were in order to meet those demands put stress on the workers and compensation for over time.

VII. THE NEW LAYOUT

![New Proposed Factory Layout](image2)

Fig. 3: The New Layout

The proposed layout is a product based layout which emphasizes on the production. The proposed layout is based on Immer’s principle of factory layout. It states the conversion of material flow lines to machine flow lines. He proposes that a good plant layout is by placing the right equipment coupled with the right method in the right place to permit the processing of the product unit in the most efficient manner through the shortest possible distance and shortest possible time. The products produced are much faster with the reduction material movement through emphasis on time and distance. This reduces the stress on the workers and increases the production to meet the future demands of the market.
VIII. SIMULATION ANALYSIS

The simulation analysis can give the ideal situation where the system can run and takes time about the material flow in each division.

A. The Old Layout Simulation

Fig. 4: The old layout simulation
The production of caps from the old plant layout was 8,64,000 caps with the total number of 10 working hours. By estimation after implementation an increase of 20% in production that results in roughly 10,80,000 caps in the same working hours.

**IX. TIME STUDY**

We needed this information in order to optimize the overall efficiency and get rid of any wastages or inefficiencies that the manufacturing facility may have had from the old layout. The time taken from power press to the groover and groover to the sealer was saved which constantly moved every 15mins to produce 9000 caps.
A. Individual Production Line Time Study

THE SHEETS ARE PLACED HERE.

TRANSPORTATION TIME = 15 SECS

SHEETS = 450 SHEETS PER HOUR
1 SHEET = 2 COMPARTMENTS 85 CAPS EACH
50 SHEETS = 5 MIN

TRANSPORTATION TIME = 25 SECS

PRODUCED = 700 CAPS PER MIN
TIME TAKEN = 4 MINS

TRANSPORTATION TIME = 30 SECS
(ELIMINATED IN THE NEW LAYOUT)

CAPS PRODUCED = 610 CAPS/MIN
TIME TAKEN = 4 MIN

TRANSPORTATION TIME = 30 SECS
(ELIMINATED IN THE NEW LAYOUT)

CAPS PRODUCED = 1400 CAPS PER MIN
TIME TAKEN = 90 SECS

Fig. 6: Individual Production Line Time Study
B. Data Collection:

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<tr>
<th>Days</th>
<th>Products Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tr>
<tr>
<td>2</td>
<td>1011896</td>
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<tr>
<td>3</td>
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<td>1012226</td>
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<tr>
<td>15</td>
<td>1010551</td>
</tr>
</tbody>
</table>

Fig. 7: Days Vs Products Produced

The pilot study showed us an improvement of 17% over the old layout as displayed in the data above, which was very close to our estimate of 20%.

The loss of that 3% can be attributed to machine breakdowns, power failures and other minor inefficiencies. The linear trend shows that reaching high demands is easier in the new layout without much effort.

Nevertheless the management was pleased with the results of the pilot study and decided to permanently implement the layout we had designed.

X. RESULTS

The new layout showed us a production value of approximately 10,80,000 caps per day over a 15 day period.

After observing and analyzing the production values over each of these 15 days it can be seen that there is an average of a 17% increase in the amount of production when we use the new improved layout.

Taking this into consideration the management of the plant has agreed to permanently implement the NEW IMPROVED LAYOUT as it increases their profits and their capability to meet higher demand.
REFERENCES