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# Productivity Improvement in a Manufacturing Industry

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***ABSTRACT—*** *This paper deals with the improvement of productivity of a multi product manufacturing industry. The authors identified the obstacles which make the improvement in the productivity of a Manufacturing Industry as infeasible. The authors instructed some suggestions with IE tools and techniques for removing those obstacles.*

***Keywords***— *Productivity, Batch production, Work sampling, Time study, Cause and Effect Diagram*

## I. INTRODUCTION

In order to compete with competitors, an organisation should have a strong competitive advantage. Feasible areas for improving competitiveness are cost, quality, productivity. Improvement in Cost and Quality can be achieved only up to a certain level whereas in Productivity, continuous improvement is possible.

High productivity provides several benefits. At the macroeconomic level, productivity improves a country's living standards because more goods and services are produced at better prices, inflation and interest rates tend to be stable, and gross domestic product (GDP) tends to be high. At the microeconomic level, high productivity can increase people's real income and improve their ability to purchase goods and services, enjoy leisure activities, access better housing and education, and contribute to social and environmental programs.

For businesses, productivity growth is important because they are in a better position to provide products and services to customers, which can lead to higher profits. Highly productive companies can also better meet their obligations to suppliers, workers, shareholders, and governments (payment of taxes and compliance with regulations), while maintaining competitiveness or improving their competitiveness in the marketplace

## II. MANUFACTURING INDUSTRY

There are plenty of productivity improvement techniques which are applicable to mass production Industries. Whereas a few techniques are available for Batch production Industries. In this paper, the author deals with the productivity improvement in a small scale Multi-Product Manufacturing (Batch Production) Industry.

## III. IMPROVEMENT AREAS

The obstacles to productivity improvement present in the industry are found by simple manual observation and IE tools. And the possible improvements are suggested.

The possible areas for improvement are identified and the improvement techniques had been selected. Those areas are as follows

a. Labour productivity
b. Plant Layout and space utilisation
c. Work Standards

## IV. METHODOLOGY

Each area of improvement is studied thoroughly and thus the techniques to be applied are identified.

### *A.* Work Sampling

The work sampling study should be conducted to know the occurrence of proportion of labour working activity. The work elements and number of observation are decided before conducting the study. The observations are taken at random intervals. With the results of this study we can spot out the critical area which will help improve the labour productivity.

*B.* Material flow and space utilization

The layout dimensions are measured and the layout is drawn as per the appropriate scale. The processes and flow of materials around the plant are observed. The current flow of materials is indicated on the layout drawn. Then the possible alternatives are found using brainstorming.

*C.* Time study

The time study for all products in Batch production industries is a more time consuming process. Moreover the benefits are less. Thus the authors considered only the frequent order products. The processes of products are divided into smaller work elements. The time study experiment is conducted on each work elements to calculate the normal time of each work element. The number of observation is decided based on the need.

| **Date :** **Observer :** | **Plant:** | | | | **Total Observation** | |
|---|---|---|---|---|---|---|
| Total number of labours | Observation rounds | | | | | |
| | | | | .. | | |
| Man working | | | | | | |
| Man not working - machine breakdown | | | | | | |
| - material not available | | | | | | |
| - Idle | | | | | | |

1) Screen sheets: This product have shearing, punching, bending, welding, painting and packing processes as the work elements.

2) Mesh-door: This product have shearing, CNC-punching, grinding, welding, painting and packing processes as the work elements.

3) Elevator parts: This product have shearing, CNC-punching, grinding, welding, painting and packing processes as the work elements.

TABLE-I
Work sampling data collection format

| | | |
|---|---|---|
| Grand Total | | |

*D.* Assumptions and Considerations Made

1. For work sampling:

$n = (Z^2q)/(K^2P)$ Where

K – Desired accuracy (usually 15%)

P - Estimated proportion of occurrence of the activity

Z – Standard Normal Deviate

= 2 for 95% & 3 for 99% confidence level

take Z=2 ; K=5%

From the preliminary study and observation

p=93%=0.93; q=7%=0.07

∴ No of observations n = 120

Non work element to be studied

- Machine breakdown
- Material is not available
- Idle

Finding Number of Observation Rounds(R),

w = no of labours working on particular day

No of observation rounds R = n / w

2. For Layout study:

Thickness of materials is considered for material categorization i.e specifying low or high thickness material. The minimum possible flow of material inside a plant is considered.

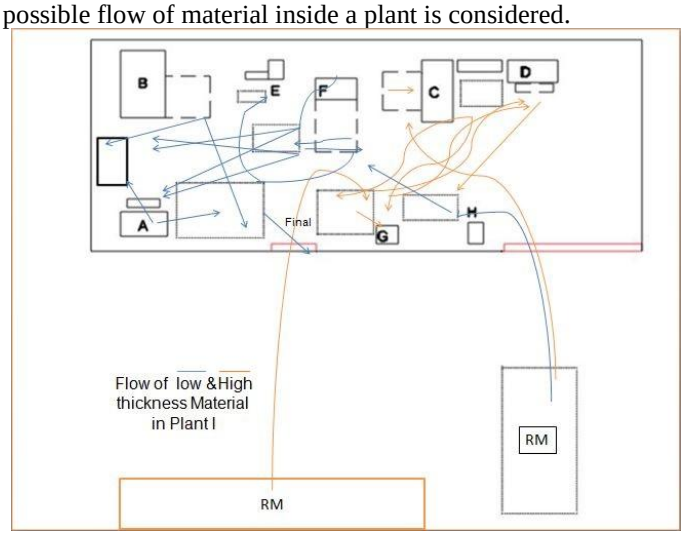


Fig. 1 Material flow in Proposed Layout

3. For time study:

Only the frequent order products are considered for the study.

## V. CAUSE AND EFFECT DIAGRAM

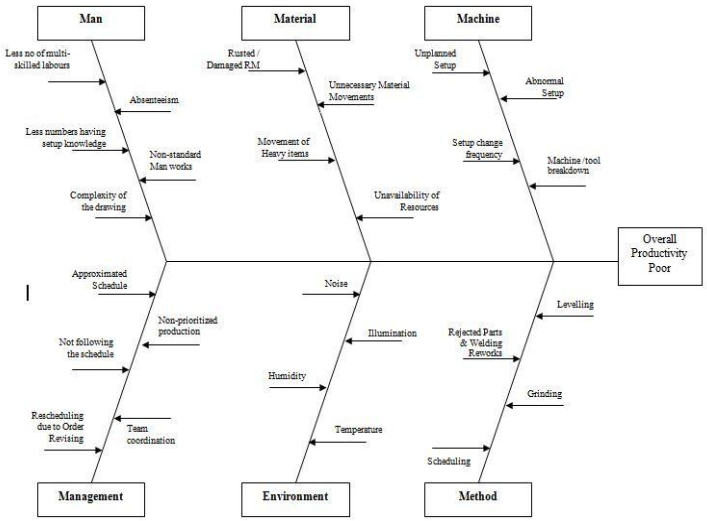


Fig.2 Cause and Effect Diagram for Poor Productivity(Overall)

Cause and Effect Analysis gives you a useful way of doing this. This diagram-based technique, which combines Brainstorming with a type of Mind Map, pushes you to consider all possible causes of a problem, rather than just the ones that are most obvious.

The technique uses a diagram-based approach for thinking through all of the possible causes of a problem. This helps you to carry out a thorough analysis of the situation.

There are four steps to using Cause and Effect Analysis.

- Identify the problem.
- Work out the major factors involved.
- Identify possible causes and construct the diagram.
- Analyze the diagram.

The authors applied this analysis for finding out the route cause for the poor productivity of the considered industry.

## VI. CONCLUSIONS

In general, high productivity can increase people's real income and improve their ability to purchase goods and services, enjoy leisure activities, access better housing and education, and contribute to social and environmental programs. Thus the productivity improvement is essential for any Industry. From the results of work sampling study, the area for improvement has been found. By conducting the layout study, the possible alternative layouts have been constructed. Work standards are established for frequent order products using time study. The results derived from these studies will help us to improve productivity of the considered Industry.

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