

Productivity Improvement Techniques for Casting

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Abstract: The objective of this research is to improve productivity for small and medium scale casting industry. This research focused on the company, which produce different metallic components by various casting processes. This research used changes in; flow of material movement for better utilization of plant area for improves the productivity. Effective material handling system to reduce the time required to material movement within plant. Good ergonomics for efficient & effective performance of labour. Objectives towards accomplished this study is to identify problems in the casting industry and improved it in terms of reduction in production time, number of manual process and back flow of materials by proposing an efficient plant layout and design of components used for loading of material used in casting process. This research used systematic plant layout technique, concept of semi automation in casting process, material handling system ergonomics, rework reduction methods.

Field of research:-Ergonomics, Material movement, Semi-automation, and Material handling.

I. INTRODUCTION

In the present day there is a maximum production of metallic components is done by casting process. Casting is one of the economical effective methods for production of different components by casting. Casting provides good strength and reliability of components. There are various casting processes such as centrifugal casting, Induction casting, Die casting, Investment die casting, sand casting, permanent mould casting, etc. Out of them sand casting is the best method for produces components. There are generally two casting processes existing in casting companies. These are sand casting & induction casting. Die casting is specially use for aluminum parts and induction casting is use for all types of metallic components. Productivity is a measure of the rate at which outputs produced per unit of input. It is calculated as the ratio of the amount of outputs produced to the amount of inputs used. Productivity measures are used at the level of firms, industries.

Productivity can be expressed as a physical measure (for example, number of parts produced per employee), a monetary measure (for example, thousands of rupees of output per hour worked), In principle, inputs can be broadly defined to cover people's time, their skills, land, raw materials, machinery and equipment, energy (for example, electricity) and so on. But, most commonly, inputs are defined in terms of:

- ❖ labour
- ❖ Capital

Productivity is an ability to produce a good or service. More specifically, productivity is the measure of how effectively resources are managed to complete timely objectives as stated in terms of quantity. Productivity is useful as a relative measure of actual output of production compared to the actual input of resources, measured across time or against common entities. As output increases for a given input, or as the amount of input reduced for a constant level of output, an increase in productivity occurs. As we all know that

all the company always want to improve their productivity continually by solving the highly occurred problem which directly affect to the productivity. So company wants to produce more output by effectively utilizing the available resources and company's owner want to same. Biggest problem which are associated such as, back flow of material, material handling problem, ergonomics, storage problem , ineffective layout, etc.

II. OBJECTIVES

The main objectives of productivity improvement are as follow

1. To achieve high productivity by better utilization of resources.
2. Reduce of back flow of material.
3. Avoiding delay in delivery time.
4. Reduced processing time
5. To reduce the worker fatigue-by effective & efficient work plan, Easy material handling systems.
6. Less waste of time and materials.

LITERATURE REVIEW

According to Prof. DR S.M. sane, promod p. shewale, Manmath S. shete, they are working on "Improvement in plant layout using systematic layout planning for increased productivity". According to them the research is to study about plant layout of compressor manufacturing based company on the systematic layout planning pattern theory (SLP) for increased productivity. In them research, amount of equipments and tools in compressor production are studied. The detailed study of the 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 significantly decrease the distance of material flow from stores until dispatch. The research describes original plant layout & proposed new plant lay out. By this it was found that there was more time required during manufacturing. According to these,

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the researchers would like to analyze the methods to overcome the problems and improve the plant layout. The basic industrial layout planning is applied to systematic layout planning (SLP) method in which showed steps of plant design from input data and activities to evaluation of plant layout. This method provides the new plant layout that improves the process flow through the plant, and help to increase space in industries, and effective utilization of resources for improving productivity.

2.1 Productivity

Productivity is a measure of the rate at which outputs of goods and services are produced per unit of input (labour, capital, raw materials, etc). It is calculated as the ratio of the amount of outputs produced to some measure of the amount of inputs used. Improving productivity can have connotations of economizing on the use of inputs — for example, adopting efficient production processes that minimize waste. Equally, improving productivity can have connotations of yielding more output — for example, using resources in activities or with technologies that generate more output.

$$\text{Productivity} = \frac{\text{Output}}{\text{Inputs}}$$

The basic objective behind productivity measurement

- 1) To study performance of a system over time.
- 2) To know comparison of different systems for a given condition.
- 3) To compare the actual productivity of a system with planned productivity of system.

Problem Identification

Manual Process

At starting situation in the casting company whole process is done manually. There is no semi or fully automation used for effective and efficient production. Manual process required skill workers. The manual processes required more time in doing works.

Problem of Storage

There is a problem of storage of semi finished and finished goods as well as material cut from parts (Riser, gating system etc.) in to the existing plant area. There is no proper storage space were semi finished & finished goods are stored. There is no specified & selective place were semi & finished parts stored properly.

Ergonomics Problem

Here considered environmental temperature conditions. In general there is no problem of rising temperature exists but at the time of metal pouring temperature is increased 50° and more than. So working efficiency of worker is reduced. as well as improper placement cutting machine and grinding machines may trouble for worker during the working.

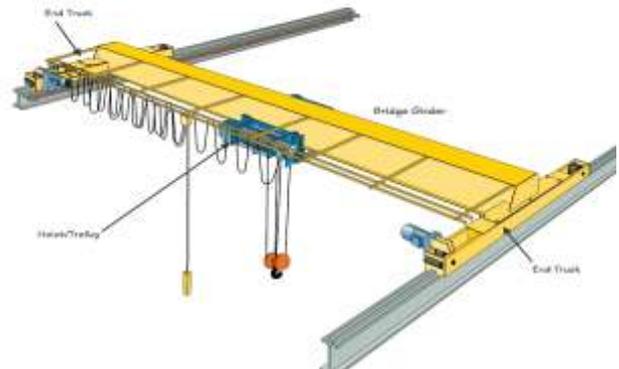
Material Handling Problem

The main problem of material handling is exists in the company. There is the problem of equipment handling, material are required to move from one place to another, so man power & more time both are consumed.

Methodology to overcome problems

Concept generation of semi automatic machine:-Sand filling is done automatically which reduce the time during the mould box preparation with less worker fatigue and with minimum possible time.

Concept generation of small material handling equipment:- For heavy equipment and machines handling over head crane should be installed by using this crane the parts or components which having more weight are easily handle.



For handling different material at a time cutting area the small boxes with different material code (colour) as shown need to place in order to avoid mixing of material. And it is easy to move that material with the help of crane within the plant at very small time duration.

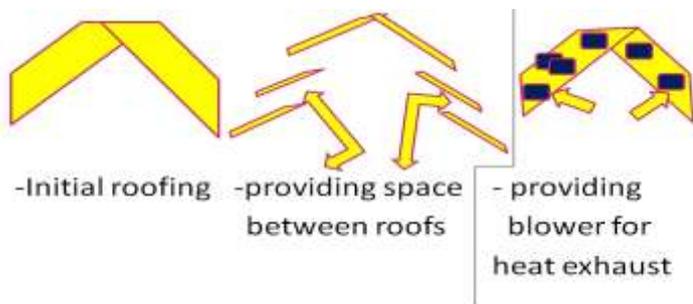


To move the material within plant use of trolleys reduce the worker fatigue with easy handling with minimum time duration.



Ergonomics:-

As discussed above problems the problem of higher temperature exists at the time of pouring. So by providing proper roofing condition there is possibility of temperature reduction. Here provides alternate solutions for roofing condition. This shows below.



The height of cutting and grinding machine is proper so that worker can work continuously without any trouble and effectively. As shown

CONCLUSION

• By using small mechanization like conveyor system, automatic sand filling mechanism, small boxes for material handling or storage, material handling trolleys, and effective ergonomics solving problems such as

1 Time reduction to mould box preparation.

2. Reduction in man power

• By implementing above solutions in plant Solved problems:-

1) Material movement within plant.

2) Material handling with less trouble or worker fatigue.

. Ergonomics also affecting workers efficiency of doing work, by changing roofing temperature is reduced. -solving problems:

1)5° temperature reduction after providing 5 blowers or (self propelled fan), up to 10 blowers, temperature reduction is possible.

2) Workers doing work with good effort.“By providing trolleys and boxes for material handling problems solves:-

1) Time reduction for material movement from cutting machine to furnace.

2) Ease of transportation of material or parts with the help of trolleys within plant.

3) Work force reduction.

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