

ACCOUNTABILITY: A ROBUST METHOD TO INCREASING PRODUCTIVITY

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Abstract: *This study has been undertaken to investigate the various methods that can be implemented in order to increase the productivity with the existing system of production but with the introduction of accountability. Productivity describes various measures of the efficiency of production. Where as in general sense, accountability is answerability, liability, and the expectation of account-giving. If this factor is not considered then the company will be dealing with wastage of time by the workers due to lack of constant record maintenance. Thus production output is low and hence the profit will ultimately reflect on their wages. This leads to the low morale of the workers and thus their efficiency reduces. The manufacturer can then discuss the process with other relevant employees and get their feedback on where waste is occurring, and what you could do to reduce it. Despite, process control and parameter optimization and adequate supervision accuracy, it is often seen that the weekly productivity can be increased but it is reduced due to negligence and not implementing full efforts of the workers, which causes a considerable lost to the manufacturer and also limiting the number of export consignments. The finished products are held for accounting for the productivity, the process is generally done by approximation of no of pieces extracted based on the weight per batch. But the individual machine accountability and hence the efficiency of the worker could not be acquired on statistical format. For these reason, there is a need for innovative technologies for considering the accountably of each machine and hence the worker working on it, such as counting of the number of products as it is manufactured. In this study, we propose a smart technology which includes any kind of mechanical counter attached to the system framework based on real-time accounting of manufacturing in no of pieces extracted on daily/weekly basis. Hence there is substantial increase in the productivity by implementing smart way of accountability.*

Keywords – *accountability, answerability, efficiency, mechanical counter, production output.*

I. INTRODUCTION

The general aspects of the manufacturing industry are to have the minimization of waste. Waste arising in production processes can have a significant effect on profitability. The challenge is to reduce this waste without reducing the effectiveness of the process. Some typical problems include the excessive consumption of energy and raw materials, losses in the production process itself due to lack of individuality, rejection at the inspection stage, and rejection when the customer is using the end product. To know where waste is arising, you need to have a detailed understanding of the process. Appointment of a production manager to produce a flowchart of the operation. Here we are dealing with wastage of time by the workers due to lack of constant record maintenance and at times if it is maintained it cannot be trusted. This leads to the low moral of the workers and thus their efficiency reduces. The manufacturer can then discuss the process with other relevant employees and get their feedback on where waste is occurring, and what you could do to reduce it without hurting their esteem.

Despite, process control and parameter optimization and adequate supervision accuracy, it is often seen that the weekly productivity can be increased but it is reduced due to negligence and not implementing full efforts of the workers, which causes a considerable lost to the manufacturer and also limiting the number of export consignments. The finished products are held for accounting for the productivity, the process is generally done by approximation of no of pieces extracted based on the weight per batch. But the individual machine accountability and hence the efficiency of the worker could not be acquired on statistical format.

There is a need to find new methods and techniques to improvise and hence increase the productivity. Productivity describes various measures of the efficiency of production. A productivity measure is expressed as the ratio of output to inputs used in a production process, i.e. output per unit of input. Productivity is a crucial factor in production performance of firms and nations. Increasing national productivity can raise living standards because more real income improves people's ability to purchase goods and services, enjoy leisure, improve housing and education and contribute to social and environmental programs. Productivity growth also helps businesses to be more profitable for these reason, there is a need for innovative technologies for considering the accountably of each machine and hence the worker working on it, such as counting of the number of products as it is manufactured. In this paper, we propose a smart technology which includes counting devices attached to the system framework based on real-time accounting of manufacturing in no of pieces extracted on daily/weekly basis. Hence addition, of a quality control system to the existing machines and equipments to different possible framework of the system will lead to a considerable increase in the productivity.

Aim of this study is to find an appropriate method for the conversion of wasteful use of labor into appropriate method to account them into their responsibility and thus increase in the productivity quickly by least changes in the set up and plant layout for minimization of cost which directly reflects to profit of the company.

II. LITERATURE REVIEW

Liviu Dorin Pop et al, 2017, the study shows that it is essential to enhance production effectiveness as its possibility to successfully solve production tasks that are constantly changing and becoming more complex due to efficient use is now limited. One of the main parameters determining production efficiency is productivity. There are no a single opinion and methodical approaches to efficiency evaluating in the environment of the multiproduct production. Traditionally, productivity is considered only as a measure of efficiency of the timing budget use of the equipment being a part of the production system. The present research demonstrates the necessity to understand productivity as efficiency criteria for use of manufacturing resources of all types, as well as include correspondences for evaluating it. Research results can be useful for improving methods of technological designing during preparation of metal processing production.

Laura Florez et al, 2017, research to increase labor productivity by collecting detailed information on the workers productivity and the factors that influence productivity. Quantitative factors such as hours, activities, and tasks are often measured on site and are used to estimate productivity and determine times of construction. However, there may be qualitative factors such as personality that may also need to be measured on site because it can have a profound impact on the productivity of a crew. This paper proposes better estimate of productivity. An instrument to measure and quantify personality is proposed to determine the compatibility of the workers in a crew. Analysis principles are applied to share similar compatibility and productivity that will determine, to give its average productivity. To illustrate how the function is used to predict the productivity of a crew, this paper presents an example in which times of productivity are determined using the personal compatibility between the workers in the crew.

Aynur Kazaz et al, 2016, gives a broad view of labor productivity has a significant impact on time, cost, and quality of a construction project. Especially the competitive environment of the construction industry forces construction companies to increase their labor productivity values in order to keep their positions in the industry. In the academic literature, there are many studies that investigated these factors and their relationships with the labor productivity. In these studies, the factors were categorized under different groups and ranked according to their importance levels. However, in most of these studies, both the standard deviation among these factors under the same group and the mean value of each group were neglected. The aim of the current study is to re-evaluate the factors under the same groups by considering their standard deviations point of view. A questionnaire survey was then applied to craft workers to obtain the necessary data which was analyzed by meaningful technique. The results revealed that, although the ranking of the factors remained the same, their importance levels have changed.

A.I. Kondakov , 2016, this paper presents and discusses a research applied to an industrial group in aboard and the inception of a labor productivity improvement program for maintenance. The research focuses on the development of a methodology to assess the labor productivity of industrial maintenance projects. In the methodology we propose the work sampling tool in order to identify the main factors that affecting labor productivity as well as we proposes apply lean thinking to improvement labor productivity. However the need for improvement due to constant change of scenarios where the activity develops has been detected.

Martin Melichar et al, 2014, here the increasing demands on productivity of measurement and control processes deal with high demands on speed, reliability and repeatability of all the preparatory steps that precede the measurement itself. These activities are still productivity needed and the productivity effect is multiplied by a technological downtime carrying them considerable economic impact, direct value added product. This title deals with these issues.

III. OBJECTIVES

Objective of this case study is to determine which appropriate method to make the accountability by counting the exact units produced by each individual and the machine allotted to them. We need to implement such a technology which will be more suitable and quick for the company to start so that we can apply that process for betterment of the company productivity. The analysis is divided into two main parts. The first section of this study is to find a appropriate place to place the counters and the second section would be to place the counter with minimum chance in the existing setup.

After a final place decided for the counting device to be installed and the results found from both the study we will compare the highest accountability given by which particular method and then search if any requirement required in the existing setup. As a part of the study for paper research a new concept of accountability is considered we increase the chances to almost double the production.

IV. DATA COLLECTION

As labor productivity has a significant impact on time, cost and quality. Especially the competitive environment of the production industry to increase their labor productivity values in order to keep their positions in the industry. Due to this, identification and evaluation of factors that affect the labor productivity becomes a issue that leads to crucial outputs. Now we need to have systems and methods for managing employee accountability and performance that will include and involve an application facility including employee data, project management data related to a project within an industry including employee evaluation and performance data, accountability data, and said production management data. The present system relates to systems and methods used to manage employees within an organization and, more particularly, to manage employee accountability for assigned tasks against related performance objectives this will lead to increase efficiency of the labor and the production.

Labor productivity has a big impact on the profitability of construction projects and hence, this topic has attracted the attention of many researchers. Although, there are numerous studies which investigate the factors affecting labor productivity, in most of them the factors were not grouped under different factor groups. In the studies, in which the factors were categorized, the dispersion of the factors within a group was usually neglected.

The convention method includes the approximating counting of the batch produced by the weight if the batch. This is done by calculation of weighting a single unit piece at first then, actually weighing the batch then subtracting the weight of the packaging material. But let us consider a mechanical counter to be placed at different accessible and feasible paces. Here the performance measured will involved elements, hardware, measurement technique, etc each have important role in checking for the accountability of products made in production. Product quality is one of the necessary concerns in the industrial activity and the interest in quality is required is same in all countries have set an objective to increase productivity by keeping in mind the standard of quality.

V. RESEARCH METHODOLOGY

In this study we will consider mechanical counters to have the accountability. We will see for possible places to be placed for the mechanical counters on the frame work in the production systems. The mechanical counters are digital counters built using mechanical components. Long before electronics became common, mechanical devices were used to count events. They typically consist of a series of disks mounted on an axle, with the digits zero through nine marked on their edge. The right most disk moves one increment with each event. Each disk except the left-most has a protrusion that, after the completion of one revolution, moves the next disk to the left one increment. Such counters were used as odometers for bicycles and cars and in tape recorders and fuel dispensers and to control manufacturing processes. Mechanical counters can be made into electromechanical counters that count electrical impulses, by adding a small solenoid.

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Case I: Implementing the triggering of the counters manually

As and when the operator makes a product on the machine he will himself trigger the counter and hence noting the production made by him. And finally accounting his daily and cumulative weekly report to the supervisor. Hence considering the efficiency and the individual output. This will be considered for the accountability and the standard set value for the machine and the individual to check for the accuracy and the efficiency. With implementation of systematic ergonomics in the working process it removes risk factors that lead to waste of productive time and human injuries and allows for improved human performance and productivity. An ergonomically implanted process counter should be designed so that it can be a key contributor to the efficiency. For the setup the best ergonomic solutions will often improve productivity. By designing a job to allow for good posture, less exertion, fewer motions and better heights and reaches, the workstation becomes more efficient to implement the hand counters.

Figure 1: Hand Counter

**Case II: Implementing of the counters to Foot Pedal of M/C**

In this approach as and when the worker will operate the foot pedal during motion of the machine then the counter attached to it will make a note of the count and hence at the completion of a particular type of product its count can be easily assessed. As the required amount of batch is delivered then the operator makes its account by tapping the foot lever shown in figure 3 which is connected to the mechanical counter or the electrical counter thus triggering the counter and making a count. While implementing the foot pedal for the counter it is important for design engineers to place the pedal according to the working position of the operator so that the operator does not have to stress himself physically to have any problem interrupting his core basic job, thus defining a natural foot position "V" when viewed from above. If the feet are placed parallel on the pedals, this no longer corresponds to the natural position of the feet and knee issues can be the result.



Figure 2: Counter on Foot Pedal

Case III: Implementing of the counters to Operating Machine

A counter will be attached to the operating machine like cutting, rollers, pneumatic machine, reciprocating machine, rotating machine, CNC machines, lifting and transportation devices in their respective department. So as and when a motion is made in the machine a counter will be triggered and the denotation of the count of unit will be recorded. Machines can consist of a power source that generate forces and movement, a system of mechanisms that shape the output forces and movement, a controller with that compare the output to a the actuator input and an interface to an operator consisting of levers, switches, and displays. So as and when the motion of the machine is detected it will either trigger the sensor to the counter or directly trigger the counter for the mechanical counter. Depending upon the usability and the function of the machine and its contribution to the output of the system it will trigger the counter depending upon its motion that can be rotary, reciprocating, oscillating, cam shaft, etc.



Figure 3: Counter attached to machine parts

Case IV: Implementing of the counters to Hand Lever of M/C

In this approach as and when the worker will operate the hand lever during motion of the machine then the counter attached to it will make a note of the count and hence at the completion of a particular type of product its count can be easily assessed. As the required amount of batch is delivered then the operator makes its account by pressing the hand lever shown in figure 4 which is connected to the mechanical counter or the electrical counter thus triggering the counter and making a count. While implementing the hand lever for the counter it is important for design engineers to place the pedal according to the working position of the operator so that the operator does not have to stress himself physically to have any problem interrupting his core basic job, thus defining a comfortable position. If the cables connected to the hand lever will be tightened then the hand will be experiencing the stress in the hand and lower arm leading to fatigue health issues can be the result.

Figure 4: Counter attached to the hand lever

**VI. RESULTS AND DISCUSSION**

The results of implementing the Mechanical counters for accountability are as follows:

Case I: Implementing the triggering of the counters manually

Increasing employees' physical activity can create a healthier workforce, increase employees productivity, and decrease employees risk of developing costly and debilitating chronic diseases. Employees who are physically active have lower healthcare costs, require fewer sick leaves, and are more productive at work. Studies have shown that assigning unrated or unproductive jobs to the works could lead to their moral down and also a drastic effect on the efficiency output. Here in this study report we found that the overall time increased considerably for the works to do the same job. Hence instead of increasing the productivity there was a drop of the productivity graph.

Case II: Implementing of the counters to Foot Pedal of M/C

The action of pressing the foot pedal attached to an extra mechanical device as compared to a foot pedal without it is more, which leads to stress on the worker. Stress is commonly defined as a perceived imbalance between the demands made on people and their resources or ability to cope with those demands. There is a substantial amount of research on work-related stress. It was also noted that the workers had to apply more force in order to trigger the counter hence used more physical power. Thus lead to frequent breaks during work and hence a decline in the productivity graph.

Case III: Implementing of the counters to Operating Machine

The counter attached to machine installed with its motion will lead to use of the mechanical energy of the machine which can be of motion that can be rotary, reciprocating, oscillating, cam shaft, etc. we need to set the speed of the machine and the pulsing of the counter so that there will be no loss of energy the system will default into pulse mode. The motion is main criteria for determined of the servo-driven controlling the feed to the counter. Here the action of foot pedal is solely transfer to the machine. Hence the energy required by the counter to be triggered is extracted from the exposed moving part hence no loss in the worker efficiency also the operation time did not increase. Hence there was a drastic increase in the production rate.

Case IV: Implementing of the counters to Hand Lever of M/C

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more force in order to trigger the counter hence used more physical power. Thus lead to frequent breaks during work and hence a decline in the productivity graph. Also a cause of discomfort to the workers.

VII. FUTURE SCOPE

In the paper study, the production process begins with determining of the area to be assigned for accountability by the mechanical counter. The detailed study of each possible case gave its merits and demerits. But the one with successful application of the mechanical counter for the accountability also gave a rise in the productivity of the industry. Improvement in properties like individual worker performance, also a rise of responsibility amongst workers was seen. Following important conclusions can be drawn from the results of the case study:

1. Reduction in time of manual accounting
2. Manufacture cycle time required to have a vision for unit capacity.
3. Installation of cheap but effective method.
4. More increase in efficiency of the workers
5. Increase in productivity over a gradual period
6. Assignments of self targets by the works.

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