A Study of labour productivity in large scale engineering industries through Automation

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Abstract

Low productivity of workers is the most significant factor behind delivery slippages in manufacturing industries. As manufacturing is a laborer predominant industrial sector, this thesis focuses on worker output and their efficiency in the manufacturing sector. It covers the definitions of productivity, efficiency of the workers, its perspectives and the factors influencing the productivity. Objective of this thesis is to find out how the productivity of workers in a manufacturing industry is affected. The essential significance of this review is in identifying the key variables influencing efficiency of laborers in a manufacturing industry with special emphasis in machine tool industry.

Keywords:- Productivity, labour, small, medium and large manufacturing, automation, etc.

I. Introduction

Construction is the world's largest and most challenging industry. Human resource today has a strategic role for productivity increase of any organization, and this makes it superior in the industrial competition. With the effective and optimum uses of it, all the advantages supplied by the productivity growth can be obtained. Construction is a key sector of the national economy for countries all around the world, as traditionally it took up a big portion in nation's total employment and its significant contribution to a nation's revenue as a whole. However, until today, construction industries are still facing number of problems regarding the low productivity.

1.2. What Is Labour Productivity?

Productivity can be defined in many ways. In construction, productivity is usually taken to mean labour productivity, that is, units of work placed or produced per man-hour. The inverse of labour productivity, man-hours per unit (unit rate), is also commonly used.

Productivity is the ratio of output to all or some of the resources used to produce that output. Output can be homogenous or heterogeneous. Resources comprise: labour, capital, energy, raw materials, etc.

$$\textbf{Productivity} = \frac{Output}{Labour\ Cost} \qquad (1)$$

Or

$$\textbf{Productivity} = \frac{Output}{Work\ Hour} \qquad (2)$$

Horner and **Talhouni** stated "A popular concept in the USA, and increasingly in the UK, is the concept of earned hours. It relies on the establishment of a set of standard outputs or norms" for each unit operation. Thus, a number of earned hours are associated with each unit of work completed."

Productivity may then be defined as the ratio of earned to actual hours. The problem with this concept is in establishing reliable norms, for setting standards. It also depends on the method used to measure productivity, and on the extent to which account is taken of all the factors which affect it. At the project site, contractors are often interested in labor productivity. It can be defined in one of the

In general, productivity signifies the measurement of how well an individual entity uses its resources to produce outputs from inputs. Moving beyond this general notion, a glance at the productivity literature and its various applications quickly reveals that there is neither a consensus as to the meaning nor a universally accepted measure of productivity. Attempts at productivity measurement have focused on the individual, the firm, selected industrial sectors, and even entire economies. The intensity of debate over appropriate

measurement methods appears to increase with the complexity of the economic organization under analysis.

There are however, a number of different productivity measures that are commonly used. Choosing between them usually depends on the purpose of the productivity measurement and the availability of data.

Productivity measures can broadly be placed into two categories. Single factor, or partial, productivity measures relate a particular measure of output to a single measure of input, such as labour or capital. Multi-factor or total productivity measures (MFP) relate a particular measure of output to a group of inputs, or total inputs used. Productivity measures can also be distinguished by whether they rely on a particular measure of gross output or on a value-added concept that attempts to capture the movement of output. The most frequently used MFP measures, capital-labor MFP relies on a value-added concept of output while capital labor- energy materials MFP relies on a particular measure of gross output.

Production: In simple terms, 'Production' is the process of manufacturing or fabricating or producing certain type of goods, semi-finished or finished, input being basic raw material or semi-finished products or sub-assemblies. Production is a measure of output only and not a measure of efficiency of the organization.

Biggest and most challenging task faced today by any organization is "PRODUCTIVITY". It is the measure of the combined efficiency or integrated efficiency of employees, machines and other devices and equipment, nature of raw material inputs, performance of the management, efficiency of the whole production system. Productivity can be computed and expressed as the ratio of average acceptable output per period by the total costs incurred through various resources (Labor, Input material, consumables, power utilized, capital, energy, material, personnel) consumed in that period. It is nothing but a measure of efficiency of the integrated system consisting of resources like Money, Men, Materials, Machines (4 Ms of an industry) and time etc.

Peter F Drucker said "Productivity means a balance between all factors of production that will give the maximum output with the smallest effort." According to European Productivity Council, "Productivity is an attitude of mind. It is a mentality of progress of the constant improvement of that which exists. It is certainty of being able to do better than yesterday and continuously. It is constant adoption of economic and social life to changing conditions. It is continual effort to apply new techniques and methods. It is faith in human progress. International Labour Organization has defined Productivity as "the ratio between the volume of output as measured by production and the corresponding volume of labour input. Japanese holistic view is "Productivity is a comprehensive holistic phenomenon encompassing all elements required to improve products / services (output)".

The term 'Productivity' has to be understood differently from the term 'Efficiency'. Efficiency is a narrower concept about the performance level of a single element. Productivity is defined in a much broader sense. Adding more unnecessary work is not exactly productive. Productivity is a measure of effectiveness of a production system. Producing right type of products of right quality (as per the design requirements) is what is expected from the term productivity. Productivity is a product of rate of production and the quality of outputs and therefore it is rather outcome-oriented than output-oriented.

Partial Productivity: When only one variety of inputs is considered for the measurement of productivity, then it is often referred as "Partial Productivity". For example, measurement in no of pieces of shirts produced from a fixed length of a cloth piece. In an organization, worker hours, materials or power used per unit of production are typical examples of partial productivity.

Multi Factor Productivity: Productivity

measures that consider more than one variable or factors are termed as "Multi Factor Productivity (MFP)".

Total Factor Productivity: Productivity which is the measure of all the variables or factors influencing the production process (Men, Machines, Material and Money or capital employed, energy charges, overhead charges etc.) is termed as "Total Factor Productivity (TFP)". Ratio of the total output of a chemical factory with respect to the installed capacity of the plant which considers all the inputs is the typical example of MFP.

$$MFP=\frac{\text{Output}}{\text{Men+Machine+Material+Capital Energy Charges \& others}} \quad (3)$$

Profitability: Profitability of any system or organization hint at how efficient the organization utilizes its resources and assets to produce the outputs. Productivity of different elements in the system ultimately decides the profitability of any organization. Output and profitability of different organizations in the Nation decides the progress of the Nation which is very significant for its global status. For progress of the Nation what is most required is the highest productivity of different organizations engaged in production or service industry. But the astonishing factor is that there is not a single organization which does not face the problem regarding productivity since the factors affecting productivity are of confronting nature and large in number. Low productivity leads to reduced profitability of the organization, cumulative effect of which is the retarded growth of the Nation. In the whole system or organization, there are a number of factors which decides the productivity of workers. For any organization, leave alone its growth, even its survival is dependent on the productivity of its workers. As such the most critical problem that any industrial organization shall address is how to identify the reasons behind the low productivity of its workers and what are the steps required to improve the same so as to improve the profitability of the whole organization.

Employee or Worker Productivity: "Employee Productivity" or "Worker Productivity" is the efficiency at which he or she or a group of workers produces the required outputs at the specified quality acceptance level using the specified inputs made available to him for production. Most predominant factor behind success or failure of any organization is the productivity of its workforce and as such employee productivity is an important consideration for any enterprise. "Worker Productivity" is a measure of several economic indicators, because it proposes a continuous measure of economic growth and living standards within an economy.

Measure of Worker Productivity: Productivity can be computed in terms of the output of the employee during a specific period of time. For example, number of units produced per hour or the time required for completing the specified task with respect to the output expected or the time estimated and projected. An extension of this evaluation is the Standard hours earned or produced. The time estimated by the planners for every job is specified and intimated through job cards of every allocation of job. On completion of the job the standard hour earned is accounted against the respective employee and the total standard hours produced or earned by the particular employee for every pre- determined interval, say per week or per month, are computed. "Productivity" of the worker is then evaluated as the ratio of standard hours earned to the actual duty hours that the worker was present to perform the assigned tasks.

$$\text{Worker Productivity} = \frac{\text{Output per unit of time}}{\text{Estimated Output per Unit of time}} \quad (4)$$

Or

$$\text{Worker Productivity} = \frac{\text{Time taken for a specified}}{\text{Estimated time for the specified work}}$$

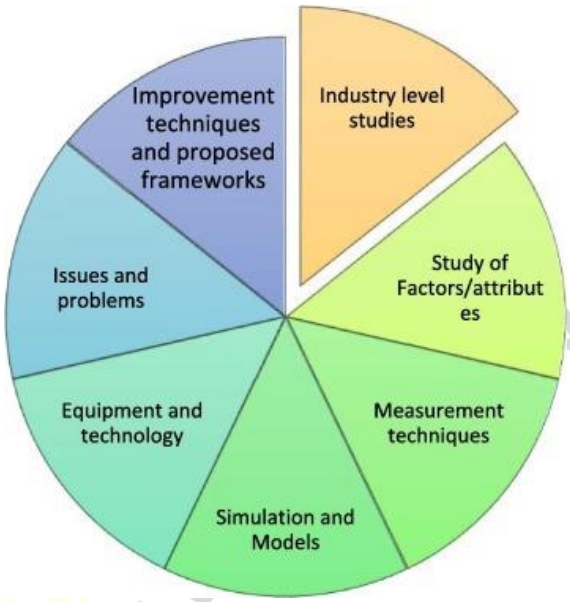

Fig. 1 Evaluation of studies in labour Productivity

1.3 Various Factors Affecting Labour Productivity

Identification and evaluation of factors affecting labour construction productivity have become a critical issue facing project managers for a long time in order to increase productivity in construction. Understanding critical factors affecting productivity of both positive and negative can be used to prepare a strategy to reduce inefficiencies and to improve the effectiveness of project performance.

Knowledge and understanding of the various factors affecting construction labour productivity is needed to determine the focus of the necessary steps in an effort to reduce project cost overrun and project completion delay, thereby increasing productivity and overall project performance.

Based on the study & survey, Factors affecting construction labour productivity have been identified and are grouped into 15 categories according to their characteristics, namely

(1) Design factors
(2) Execution plan factors
(3) Material factors
(4) Equipment factors
(5) Labour factors
(6) Health and safety factors
(7) Supervision factors
(8) Working time factors
(9) Project factors
(10) Quality factors
(11) Financial factors
(12) Leadership and coordination factors
(13) Organization factors
(14) Owner/consultant factors
(15) External factors

1.4 The top ten factors that affect the small and medium company

(1) Lack of material
(2) Labour strikes
(3) Delay in arrival of materials
(4) Financial difficulties of the owner
(5) Unclear instruction to labourer and high absentissm of labours
(6) Bad weather (e.g. rain, heat, etc.)
(7) Non discipline labour and use of alcohol and drugs
(8) No supervision method, design changes, repairs and repetition of work, and bad resources management
(9) Bad supervisors absentissm and far away from location of material storage
(10) Bad leadership

1.5 The top ten factors that affect large companies

(1) Unclear instruction to labourer
(2) Delay in arrival of materials
(3) Lack of material and financial difficulties of the owner
(4) There is no definite schedule
(5) Low supervisor‟ s capability/incompetence supervisors
(6) No supervision method, lack of equipment, and high absenteeism of labours
(7) Supervisors absenteeism, frequent damage of equipment's, and labour strikes
(8) Design changes
(9) Incomplete drawing and inspection delay
(10) Poor communication in site and inaccurate design.

2. Literature Review

In today's world of advanced technology, business has become more diversified and too competitive in securing its own market share. Moreover, with the introduction of alternative product by competitors, it has become even much more challenging to keep track with consumers' behaviour as they make choices in a fragile manner. As a result, all business oriented people are trying to find out the ways and means to exploit consumer needs with an extreme pressure of satisfying the customer demand. But failure in satisfying the customer demand is not very uncommon in the manufacturing industries, which may happen due to the diversified reasons including the resource allocation and utilization problems. In the context of the resource allocation and assessment of the manpower requirement can be made from two perspectives - the manpower employed to carry out a particular task is often surplus than the requirements, sometimes there is a shortage of manpower in meeting the target production quantity. Another concern is the resource utilization level which largely depends on the way work is done and the tool is used. In both cases, the resource allocation and utilization directly or indirectly affect the profitability of a business as more wages for extra labor or high penalty for late deliveries need to be paid by the manufacturer. Thus measure has to be taken in order to sustain the competitiveness of a business in the market and at the same time try to achieve higher yield in profitability based on enhancement of productivity. In this competitive manufacturing arena, inside most of the mass production industries, the lean manufacturing philosophy is widely accepted as it helps to satisfy the customer demand on time by allocating the limited resources and maximizing their utilization. But establishing a lean manufacturing environment is not an easy task as the companies need to identify and eliminate all the possible wastes from their production lines. In a typical manufacturing industry, the waste can be identified in the form of defects, rework, setup, inventory, waiting and transport, etc. As any kind of waste brings losses to the company, hence the lean manufacturing philosophy that identifies, and eliminates the wastes inside a production system by prescribing the way of utilizing the resources can bring the competitive advantages to the companies by improving their productivity. As a part of the way of implementing lean manufacturing philosophy, the work and time measurement techniques help the manufacturer to increase the productivity by defining the proper working method and standard time, the way of maximizing the resource utilizations and helping to distribute the work load among the workstations etc.

One of the most common methods used inside the industries for determining the standard activity time is the Methods Time Measurement (MTM), developed in 1948 for dividing the operations into basic motions (Genaidy et al., 1989). The detailed nature of MTM leads to a number of drawbacks such us the tediousness of the work, the handling of a huge amount of detailed data during their application, and etc. Though a number of methods other than MTM also proposed in the literature, most of them suffer from the same problems as stated (Genaidy et al. 1989, Genaidy et al. 1990, Ma et al. 2010). To overcome these drawbacks Maynard in 1960 proposed the concept of Maynard Operation Sequence Technique (MOST) in literature. The MOST can be defined as a way of analyzing the operations or sub- operations performing through several methods, steps and sequences, etc. in terms of time. In other words, it is a predetermined motion time method that aims to define the standard time of performing the work.

3. Object of the study

It may be observed that the need for this study arises from more than one reason.

(i) An increased use of technology in production.

(ii) Labour turnover arising from normal separations due to death or physical incapacity, for accidents, disease, superannuation, voluntary retirement, promotion within the organization and change of occupation or job.

(iii) Need for additional hands to cope with an increased production of goods and Services.

(iv) Old employees need refresher training to enable them to keep abreast of the changing methods, techniques and use of sophisticated tools and equipment.

4. Research Methodology

By analyzing the undertaken case study, several problems have been identified including the improper capacity planning. Moreover, due to the absence of pre-defined standard time, working methods and lack of practice of advanced tools i.e. unplanned walking distance, material wastages and imbalance in the material flow and manual screwing etc. the non-value added activities were increased and affected the whole assembly line. Hence, the competitive advantages in the undertaken assembly line can be brought into system by the proper use and selection of tools, balancing work flow and optimizing layout. Inclusion of hand tool can help the operator by reducing their effort to perform the tasks as well as the completion time. In addition, the modifications in the methodology and standardized the time of the works lead to create a well-balanced line and eliminate the non-value added activities as well as completion time.

5. Result and Discussion

It was decided to restrict the study to the permanent full-time employees of few CPSEs engaged in manufacturing sector. The principle was that permanent employees would have acquired sufficient amount of experience in the organization and would have come across many factors which had affected the productivity of workers.

Accordingly a number of discussions were held with employees and officers of a Rail coach factory and another leading Machine Tool factory having its factories at 5 different states. The spectrum covered was workers, direct workers and indirect workers, supervisors in manufacturing and assembly shops, executives in supporting departments like Planning, Design etc. Based on the personal interviews, different influencing factors affecting productivity of Improving manufacturability is an important point to be considered while designing a product or a component. A systematic approach to product design "Design for Manufacturability and Assembly (DFMA)" is a powerful tool to facilitate easy manufacturing and reduced cost of production. DFMA software identifies various concepts of design that would ensure the above requirements. It is reported that Texas Instruments could reduce assembly time for an infrared sighting mechanism from 2 hours to less than half an hour. IBM is another organization to take advantage of DFMA and has brought down the assembly time for its printers from half an hour to 3 minutes. Design for Assembly (DFA) is another strategy adopted for bringing down the varieties of components/standard parts in a product and to simplify and standardize the assembly methods thereby increasing the productivity. Modular design is another concept, a peculiar approach towards standardization in which assemblies are subdivided into modules which can be easily replaced or interchanged. Modular concepts facilitate to diagnose and remedy a problem easily and quickly, thereby ensuring productivity.

Process plans*:* Workers and supervisors in plant have highlighted the cases of lack of clarity in process sheets provided to them such as absence of stage drawings, inefficient methods, lack of perceiving the requirements of special tools, jigs and fixtures etc. Stage drawings for at least critical operations would enable the operators to understand the process layouts in a better way.

Process Planning is the process of deciding in advance the type of raw material and various operations to be performed in sequence for converting the selected raw material from its initial form to the final component

Conforming to the design specifications as per the drawing provided. The output document is generally known as process sheet or process layout or operation layout or Route sheet etc. Different factors considered by process planning engineers are size and shape of the final components, design accuracy requirements like tolerance on dimensions and surface finish, batch quantity of production, estimated value of the finished product, required date of completion (RDC), available manufacturing facilities in the plant, conditions of machines and other equipment etc. In process layouts, the work centre and proposed machines in which the operations are planned, different steps for machining, optimum cutting parameters to be set on machines, and the tooling requirements are usually specified. If required stage drawing is also included in the process layout. In few factories process planning is performed manually, in some other units Computer Aided Process Planning (CAPP) is adopted.

Available machines & other equipment and their condition*:* Shop personnel are often constrained to produce components utilizing the available machines in their shop under their respective control. The conditions of machines may not produce the required accuracy and other features as per the design specifications. Machines may not perform with the parameters recommended in the process sheet. Non availability of standard work holing devices is another problem faced by them.

Scheduling*:* Scheduling is the process of prioritizing different jobs and optimizing the production resources according to the priority of jobs. Effective scheduling of jobs in a manufacturing plant is essential for ensuring the availability of right component in right time in assembly. In assembly the same is about ensuring right people at right place on right time performing right task thereby ensuring that the product is assembled in least time reducing idling of various resources. During the observation it has been noticed that productivity of the production shops were getting affected due to inefficient and non-logical scheduling.

(1) Both Cast iron and steel jobs being scheduled in the same machine without considering the machining requirements of the two different types of material.

(2) Roughing jobs and finishing jobs which call for accurate machining being scheduled without considering the capability of the operators and machines.

(3) Jobs scheduled without ensuring the availability of special tooling's (Jigs and Fixtures)

(4) Jobs being scheduled without considering the priority of requirements in the assembly shop.

Technology updation and automation*:* In a production shop new technology means introduction of CNC controlled machines provided with automated tool changer (ATC), automated pallet changer (APC), and automated in process gauging system and other sensing devices, automated guided vehicles (AGV), Robotics etc.

Monitoring and controlling of the entire process with the support of central computer, usage of ERP system is integrated automation. Automation reduces the manual intervention in production, eliminates repetitive tasks, reduces cost of production; result in increased output of better quality, leading to improved productivity of the whole organization. Automation also provides sufficient data of the machines and other process factors which enables the organization to analyze the factors affecting the productivity.

It was observed that the organization under study has only few CNC controlled machines in their production shop which is one of the main factors behind their low productivity.

Working environment*:* Working environment has a direct impact on employee productivity and

morale in any organization. In north India, workers keep away from work spot during winter seasons due to low temperature. So also during summer conditions. In south India absenteeism is heavy during rainy seasons. Better temperature conditions, improved air circulation and quality, providing enough lighting, reduced noise level, availability of drinking water, providing tea and snacks in shop floor, etc. create a better harmonious working environment. This will motivate the employees to work harder and more effectively which can lead to improved productivity of the organization. It is an accepted fact that if the workers are kept happy and healthy, they will perform better.

Standard time estimated*:* Standard time estimated by the planning personnel as indicated against the respective operations is the first thing which motivates or demotivates the workers to take up the work. There were many cases wherein the time indicated does not match with the reality. This has definitely affected the productivity of the workers.

Non availability of right material: In manufacturing industries batch production is the system adopted. In this system if there is a delay in making the material available for few components, it can delay the whole production process even if the material is available for all other components. Another problem observed was that in few cases material provided was not as recommended in the process layout. Oversize material if issued can definitely affect the productivity. Similarly material of inferior quality like high hardness had also affected the productivity of workers.

In assembly shops non-availability of bought out items has totally halted the assembly progress of machines and coaches. Scarcity of working capital was the most critical factor for the shortage of items, said the planning personnel. Inefficiency in materials planning and inventory control also had contributed to the problem.

Non conformities in quality of the bought out items including raw material have caused a lot of inconvenience and loss of production hours in both manufacturing and assembly shops of all the factories under study.

Non availability of standard tooling's*:* Workers are provided with few standards cutting tools and measuring instruments against tokens. They store these items in their cupboards. Sometimes they may require additional standard toolings and other devices for specific components which they have to collect from the tool counters. It was learnt that many times workers have to return without getting the required items and they would book 'idle' job card under "NO TOOL". This has affected the productivity of workers to the extent of 2% in the organization as a whole.

Non availability of jigs and fixtures*:* Requirement of special tooling's like jigs and fixtures are identified by the process planning personnel and indicated in the process sheet. There were many cases observed during the study that these recommended tooling's were not made available. This will necessitates change of machines or number of setups or splitting the operations or it may lead to rejections of machined components. All these had led to low productivity of workers.

Inspection delay*:* There are two stages of inspection, one after every operation and the other after the component is claimed as completed as per the drawing and submitted for inspection. Sometimes inspection had to be carried out on machine itself before the job is unloaded. Non availability of proper measuring devices, non-availability or heavy load on inspection personnel etc. Any delay that occurs during the work in process can definitely lead to loss of time affecting the productivity of the workers. There were many cases came to the attention during the study.

Assembly problems*:* Even after total inspection and acceptance of components against the design specifications, there were cases of components returned from assembly due to mismatching of components in assembly. Reasons for the same

could be dimensional variations and also unscientific way of incorporating design alterations. This calls for unexpected and unaccounted reworks of finished components which may lead to low productivity of the manufacturing shops and workers. In few organizations there is a system of granting extra special time in the job card for such alterations. This is at the cost of total manufacturing capacity of the plant.

Workers related issues: Absenteeism among employees is the main cause for reduction or underutilization of the plant capacity. Absenteeism results not only in loss of plant capacity, but it also causes delay in completion of projects and consequent effects. Absenteeism also leads to disturbance in scheduling there by affecting productivity. Low efficiency of certain workers, their mental and physical health, non-resolving individual worker's issues at the plant level, their day to day family problems etc. also do affect the productivity of the plant.

Their health condition is another factor. Medically unfit employees continue to be in the rolls which affect the productivity of the section. Lack of training is another significant contributing factor towards low productivity.

Lack of supervisory support: During the discussion few machine operators were raising the complaints that their supervisors were not very effective in solving technical and section related problems. Supervision is not just overseeing and managing employees in the workplace. Supervisors are primarily responsible for the productivity of workers under their control. Supervisors shall possess strong working knowledge of the jobs. Supervision if to be effective shall include problem solving, fast decision making, planning and organising materials and papers for production, co-ordination with other departments and meeting management and solving workers related problems, training new employees and ensuring conformance to personnel policies and other internal regulations.

Working hours: In different manufacturing units of the organization under study, the shift timings were different. In few units the timings were A shift – 5.30 am to 1.30 pm followed by B and C shifts of 8 hours each. In some other units the timings were A shift – 8.00 am to 4.00 pm followed by B and C shifts. On an analysis of shift wise performance records of different units it was learnt that productivity was more in units where shift timings were A shift – 5.30 am to 1.30 pm. In the other factory it was 7 am to 3 pm which was more convenient to most of the workers. Productivity was also high. Regarding acceptance of shift timings, discussions were held with different trade unions of different units. It was noticed that shift timings of 7 am- 3 pm, 3 to 11, and 11 to 8 were preferred where most of the workers were staying in company provided quarters.

HR & IR related matters: During an interaction with office bearers of recognized trade unions of all the 5 manufacturing units, it was noticed that there were a number of HR & IR related issues which were disturbing the minds of the workers. Delay in payment of regular wages and other financial benefits, promotion related issues, other personal oriented issues were there.

Hence, to increase the line efficiency as well as the production rate of the undertaken case study, the MOST technique is implemented for identifying the bottlenecks and NVA added activities of the production line as well as setting time standard. On the basis of the MOST analysis, some of the scopes of improvement in the studied assembly line for the rear window of a typical car have been identified and possible solutions of incorporating the advanced resources are proposed accordingly. The whole research methodology is arranged in two different sections namely:

(1) Bottleneck identifications and

(2) Defining the scope of improvements.

Conclusion

The groups of factors which are highly effective are: supervision, material, execution plan, and design.

Moreover, for large companies, equipment factors have also highly effective. While in small and medium companies, owner/consultant factors also need special attention because it has high effect too. Research findings also show that health and safety factors has not been a concern of small, medium companies and has some effect, while in large companies are better, although not as major concern and has average effect. Practically it is difficult task to all to improve labour productivity upto 100%. But if you have properly control on above factors, productivity can be improved up to large extent.

To meet and beat the buyer's lead time, machine automation has no alternate. In our country, the order quantity is increasing day by day but the lead time and price of the product are decreasing. So, it's high time to introduce and implement lean manufacturing and machine automation as well. In this part we want to summarize our work and also point out our findings; we implement different automation in five operations in this work these are-i. Auto disposer to attach zipper with single ply, Auto thread cutter in waist belt attachment, iii. Auto mouth cutter in waist belt mouth cut, Auto hem cutter in hem cutting for distortion effect, v. auto pocket hem folding for back pocket hem joining. All these effort increase the productivity by reducing the cycle time and ultimately saves huge cost in respect of by reducing SMV and operator. Our findings are:

- Sewing SMV reduces to produce primark short pant from 20.32 to 18.05.
- The number of operators is reduced from 70 to 62 after adding automation.
- Line productivity increases from 72.57% to 72.78% after adopting automation.

-The effect of automation is also considered in terms of productivity in SMV wise simple existing technology and locally available equipment. Our main focus is to increasing the productivity by existing technique and parts without purchasing a full automatic machine and Manpower wise. The productivity in terms of SMV is increased from 73.81 to 83.1 which is about 12.6% and in respect of manpower, the productivity reaches from 21.42 to 24.19 which is also about 12.93%. Thereby we can conclude that there is a remarkable improvement in cost and productivity by introducing very It is evident that to sustain in this competitive industrial environment, a company needs to reduce.

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