

AN EMPIRICAL ANALYSIS OF THE FACTORS AFFECTING THE SEWING EFFICIENCY OF OPERATORS IN AMBASSADOR GARMENT FACTORY, ETHIOPIA

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ABSTRACT

This paper represents the investigation of the causes of different problems of production through a surveying in Ambassador Garment manufacturing industries in Ethiopia. The study focused on finding a way to measure sewing efficiency, operators, identifying problem areas in Ambassador Garment industry, in a floor is generally measured by using conventional ratios such as number of garments per machine and per operator. Pointing out common stop-causes, procedures for information exchange, optimized setup, reduction of downtime, stop-frequency, line balance system, management, and the overall integration between each operation stage were implemented and evaluated for further investigating Cause of poor sewing efficiency of operators in AGF and its improvement technique. Besides this paper represents some mitigation ways and a proposed production line to tackle these problems that will help the top management and also improve the efficiency of the production. The focal limitation against the higher sewing efficiency is the difference in individual capacity which is the mode of improper line balancing and bottle neck process. This paper is based on an effective layout model where to success upon the bottleneck prevention process through benchmark capacity and led us to use balancing process using two separate concept of manufacturing processes- progressive buddle line and Traditional system both together. The research shows that this balanced layout model has increased the efficiency by 2.125% (56.85%) and labor productivity by (58.975 %).

KEYWORDS: Labour Productivity, Efficiency, Layout, Performance.

1. INTRODUCTION

The apparel industry is one of the oldest, largest and among the most global industries being primarily concerned with the, design and production of clothing and their supply. One of the main challenges of today's apparel manufacturing industry is to be efficient and contribute to high effectiveness, i.e. customer

satisfaction. The operator work efficiency in the process production is needed in the factory or company. Because operator work efficiency greatly affect the output produced by workers. But it also affects the working efficiency of several factors, such as production costs, production time, and place of production. Where the higher level of efficiency of an operator, the shorter time required in a production, and the less cost incurred in the process production.

The term "efficient" is very much confused and misused with the term "effective". In general, efficiency is a measurable concept, quantitatively determined by the ratio of output to input. "Effectiveness", is a relatively vague, non-quantitative concept, mainly concerned with achieving objectives. In several of these cases, efficiency can be expressed as a result as percentage of what ideally could be expected, hence with 100% as ideal case. This does not always apply, not even in all cases where efficiency can be assigned a numerical value, e.g. not for specific impulse.

Working efficiency greatly benefits the company if the shorter time and lower production costs and output many produced and quality. Calculation of the efficiency of an operator can provide many benefits to the company not only in addition the cost and time but also the resulting product will be quality. For workers working efficiency is also greatly affects the process of their work as they facilitate the work and speed up their work. In the article above has been explained how the calculation of the efficiency of an operator so that it can be applied within the company to produce the level of an operator of high efficiency. But the effectiveness of an operator is also required so that not only efficiency.

It is often used with the specific purpose of relaying the capability of a specific application of effort to produce a specific outcome effectively with a minimum amount or quantity of waste, expense, or unnecessary effort. "Efficiency" has widely varying meanings in different disciplines. A simple way of distinguishing between efficiency and effectiveness is the saying; all businesses should try to operate efficiently. However, this is particularly important for a growing business. In many markets, a business needs to be at least as efficient as its main competitors in order to be able to compete and survive in the long-term. A more efficient business will produce lower cost goods than competitors and may generate more profit possibly at lower prices. Increasing efficiency will also boost the capacity of a business, assuming there is no change in the number of inputs employed. The capacity of a firm refers to how much a business can produce during a specific period of time.

Some things we can do to increase productivity in garment industry especially in sewing area determines the overall capacity of the organization.

Specific objectives

- To indicate the direction to improve operators sewing efficiency and performance to increase productivity.

- To identify the global standard level of sewing efficiency and performance of operates in the factory.
- To make relevant endorsements in order to improve the efficiency and performance of ambassador garment factory
- To indicate how examining and analyzing the productivity of a sewing room and changing of the working methods can increase the sewing efficiency of operators and product quality.
- Setting the right sitting posture of the operator by adjusting the height of the chair enables operator to work more effectively.

2.2. Over View of the Research

2.2.1. Skill Matrix of Operator Efficiency

People with this job traditionally operate a few specific types of high-speed production machines; they may operate any machine in a plant manufacturing environment. The most common machines they operate include specialized machine such as SNLS, 3/4/5threds over lock, binding machine ,button setting and button hole setting and automated cutting machine .

Another distinction in this general job category is the difference between a machine operator and a machinist. A machinist is typically much more highly-skilled on maintenance and has expertise in operating many types of machining tools and performing intricate operations. Fine-tuning the machine equipment can normally be quickly performed, and work is not usually significantly delayed.

Skill Matrix is a chart or a database where operator's past performances on various operations are recorded in a systematic way for the future reference. In a skill matrix operator performance is recorded in efficiency percentage. Skill matrix is also called as skill inventory of the operators. Skill matrix is updated on a regular interval. Or after completion of each style operator's current performance (efficiency %) updated on the database (for manually developed skill matrix)

2.2.2. Skill Matrix: Effective Tool to Boost Productivity

RN Narkhedkar, Vishnu Dhorugade and Mehendra J Sonavane reveal the preparation of skill matrix and its efficient use in the garment industry for allocation of operators to give maximum productivity resulting in maximum gross profit. Operator's Skill Inventory is the database which maintains the record of each operator, who can do what type of operation and at what rating. It is very important to keep this database updated as over the time, operator acquire skills for most of the new operations as well as improve performance in existing operations.

2.2.3. Ways to Increase Sewing Operator Efficiency

The purpose of increasing operator efficiency is to reduce lab our cost per unit but how one can improve operator efficiency to increase operator efficiency.

1. Develop operator's sewing skills through training on the job. Train them on good movements, correct material handling and better method of performing a job.
2. Motivate operators by providing incentive based on their performance (efficiency level).
3. Assign operators to the tasks on what they are skilled. If they are given operations on which operator is low skilled, they will work on less efficiency. If you don't have alternative skilled operator for a job, train your existing operator first (point no. 1) to develop his/her skill level.
4. Improve work methods where possible by motion study and motion analysis. Eliminate excess motion from the existing working method.
5. Don't forget to design a good workstation layout based on operation requirement. Reduce excess reach. A good presentation of work is also important.
6. Supply work continuously to operators. While an operator is assigned a work with less work content and he/she had idle time, give him/her one more job.
7. Eliminate unnecessary of interruption by supervisors, quality checkers and others things like defective pieces is supplied to operators.

By applying and adopting above means you can improve your operator's stitching efficiency from the existing efficiency level on the specific jobs. But to see the improvement you have to measure operator's existing efficiency and current efficiency

2.2.4. Improved Time Management

Poor time keeping, operators starting late, taking extra time during breaks, finishing early and taking longer to restart a machine than they should is a typical scenario in many manufacturing companies. Even if this is only arriving at the machine 5 minutes late, starting up 5 minutes later, taking an extra 10 minutes over lunchtime and then finishing 10 minutes early it amounts to 30 minutes in an 8 hour shift equivalent to 6.25%. Without continuous monitoring in place this is often much longer. And this is per machine, if you have 20 machines you are losing 10 man hours per shift

2.2.5. Improving Motivation of Operators

2.2.5.1. Staff Motivation

Firstly, the data collected by the system can be used to keep staff informed of their performance against target production rates either using the keypad terminals or large shop floor displays. Goal setting and competition between work groups or Cells can significantly improve motion and output. Secondly, the awareness that production is being monitored and the understanding that computers can't lie often have a refreshing effect on staff behavioural patterns and bad practices that may have been formed over time. In

some cases dramatic improvements in productivity have been recorded before systems have been fully installed, simply from improving operator efficiency.

2.2.6. Machine Downtime Reduction

Reducing machine down time has an instant beneficial effect on manufacturing production efficiency and output. However, without accurate information on the true amount and causes of downtime it can be difficult to identify how it can be reduced.

2.7. Function of Production Plan for Efficiency of Operator in Work Place

Determining capacity of the factory and capacity of the individual sewing lines in terms of how many pieces (product specific) factory can make in a certain time period with existing machines capacity.

- Order booking based on factory capacity for different types of products
- Allocating of styles to the lines
- Determining production lead time for each orders (styles)
- Process scheduling
- Production execution and monitoring

2.8. Sewing Line Layout

How much area required will depend on number of total workstations in the line. As per common sewing workstation space 3.5 X 3.5 square feet is needed per machine. Considering sewing line is made of two rows of machine, center table (2 feet wide) and walking space (2X4 feet) both sides of the line. More than these you need to place check point at the end of each sections with small table (3X4 feet) and space for manual work –such as marking and pressing. Marking and pressing job can be done outside of the line but still you need space for that.

Also need space for loading table and garment checking table at the end of the line (both are optional). Excluding loading table space, checking table space and inline checkpoint and manual work area total space required is width = $(3.5 \times 2 + 2 + 4 \times 1 \text{ or } 2) = 13$ feet to 17 feet and length = $3.5 \times 23 \text{ machines} = 80.5$ feet. If you like to add tables for manual work and checking garment components add their space to calculate total length of the line. Finally calculate total area for your shirt line multiplying length by line width, i.e. 13×80.5 square feet.

Improving efficiency is an essential part of any successful manufacturing operation. Businesses must consistently control and improve manufacturing efficiency to remain competitive. Eliminating waste, building quality into your production process, optimizing your material planning and implementing systems of continuous improvement are key practices to improving manufacturing efficiency. Although

measurements and methods for improving efficiency vary from industry to industry, the essential process remains the same.

Fig 1: Example of a good workstation layout has been shown



3.0 DATA ANALYSIS AND INTERPRETATION

3.1. Organizational Structure

The questionnaire response indicates that the existing organizational structure have suitable working environment for workers. The company ranks amongst Ethiopia's largest companies. Its three decade journey, The Company is mainly engaged in the production of quality suits, coats/blazers and trousers. From observation, those with short years of establishment and mostly privatized industries have organizational structure in which general managers (owners) does the administration and marketing/sales work together. Customers in the world today are looking modern, stylish and fashionable products. Besides departments such as information technology and legal are missing which are important to be world class competitive in the current global market.

Even if the company produces all these products, the products are not offer modern, stylish and fashionable suits. That means the range of volume of their production concentrated areas are formal wears like, office wears, graduation and wedding suits.

3.2. Factory Sewing Operator Efficiency

According to our observation and experimental analysis result, the factory over all operational breaks down of sewing floor production sequence and mode of transportation of each piece was not well organized. This is because of lack of garment professional expert in the factory. Even if there was efficient machines needed in the company, work flow of each pieces of a garment and machines idle without work and operators do not

be devoted fully at their duties, means some helpers carry out their works only to get their month salary and others were the main problems observed. This is one of the problems observed that can affect the sewing efficiency of operators and the overall productivity of the factory. Having high efficiency is very beneficial for an industry. One of the benefits is related to the internal capacity of the factory itself. When the efficiency is high, it means that all resources such as labor, raw material, machines, and space are well-utilized. After bottle neck has identified the incremental or efficiency achievement rate are calculated with the bases of global average standard allowable Time (SAM) =101 for suit product. This is based on garment professional point of view or as a garment industry science and regulation. Based on this, number of sewing operators reduced from 199 to 191 with capacity 54307.055 in minutes respectively and improving of SAM to the reference of conventional standard (the range of SAM=70 to 135). This is carried out in experimental analyses of time study measurement in our duration of 18 days and the finding result of SAM on the current sewing floor of the factory is 100.55.

3.3Line Layout and Workflow

Line size is generally large comprising of 40- 50 people. Line layout is poor, helper and ironing stations are often placed outside the lines. The operators are not placed in a proper sequence resulting in improper workflow and unnecessary. After applying the balancing technique considering experience operators in the line than adding personal fatigue and machine allowance 10%and20% allowances, capacity, one production line is selected from the sewing floor. One garment order is chosen for trousers and coats which were started in that line, knowing total amount of out per day, describe the operational break down based on the previous company floor operational break down than check the verification between our final result and factory efficiency. Two important attributes have been considered, one is possible standard method for each process and another is considerable time in between the input has been fed to the time study took to record the actual individual capacity of each worker. We have recorded the time to make each process for each and every worker to find out the number of operator and helper, type of machines, basic and standard pitch time + allowance $191/100.55=1.89$ and individual capacity. To find out the (standard allowable minute) S.A.M value 100.55, process wise capacity has been calculated, in addition to that we have calculated the target, benchmark capacity, theoretical manpower, actual capacity line graph, labor productivity and line efficiency. Line has been balanced considering the bottleneck and balancing process where the balancing process has shared the excess time after the benchmark production in the bottleneck process. After balancing, manpower has been proposed and final capacity of each worker has been reallocated.

3.3.1. Clippers

The factory except one had operators working with huge scissors. Many operators trim pieces of fabric from garment panels that do not fit properly. If garment parts don't fit this indicates two possible problems: The

garments have been poorly cut; or the patterns are wrong. It is essential that this activity is eliminated; operators should not be allowed to trim garment parts under any circumstances.

3.3.2. Status of Work-study Department

The work study departments in factories 5 and 7 are operational but ineffective. Different functions in a factory were analyzed to show improved productivity in a group.

3.3.3. Management

Properly constructed and professionally run training courses are essential, although many of the managers have considerable work experience. This is not enough to move the industry where it needs to go; companies must review their management structures and the people they have in place. Management techniques are changing constantly. Are the managers fit to cope with the demands that are now being expected? If the answer is no, then you must embark on a serious move to change this.

3.4. Observations and Interviews

Furthermore from direct interview, it is understood that actual training programs existing at this garment industry is not sufficient, and it is observed that the trainings are focused mostly on garment production workers even that is not enough and less trainings focus is given for other personnel's such as line supervisors, production managers and general managers rather than the sewing operators and the training is carried out once or twice in the duration of three years.

3.5. Result of interview questionnaires of administrations and sewing operators

It is obvious that well organized management system, modernized strategies, new technology communication system among each operation stages and comfortable work environments are the base for any factory to achieve its pre planned goal and to be competitive in the global manufacturing industries. To perform this essential work experience of managers and professional work force to the specific field of work or well experienced and skilled labor of the management members is very crucial.

If there is the lack of this in the manufacturing industry, it is too difficult to achieve the manufacturing capacity. even if the company's management members we observed are well experienced and the working environment is suitable, and even if the factory uses progressive bundling and local manufacturing system, lack of cured communication system, shortage of on job training, complain of month salary among the employees, and lack of well documented efficiency of employees are the main problems observed from the factory.

Properly constructed and professionally run training courses, creating comfortable work environments, incentive payments according to the employee's efficiency, additional bonuses, and continues on job trainings are the only solutions to improve the problems from the grass root.

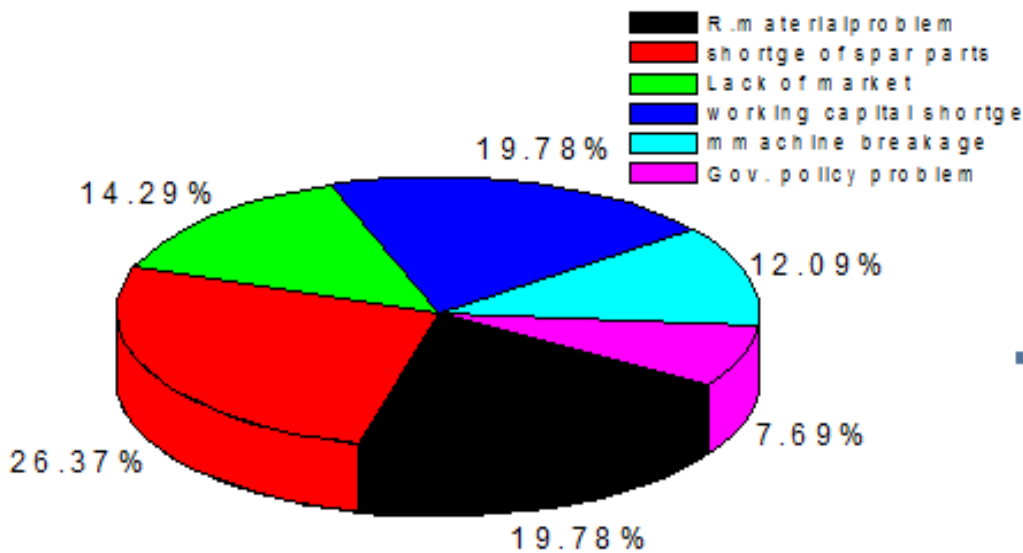
The cured communication between the top managements and the sewing room operators in the garment industry is the other point to be paid attention to improve the efficiency of operators and the overall production capacity of the factory. As the sewing operator are the crucial running forces of the garment manufacturing industry, the punctuality of the operators and continues supervision throughout the work environments are the other points to be applicable in the factory. This encourages and motivates the operators and the best way of the company to improve its manufacturing capacity.

The interviews showed that work procedures for operators are standardized in a written form. The work standards are quite general, which means that most of the detailed procedures are practical knowledge which is spread verbally. The execution of tasks differs a bit from individual to individual, but it also depends on experience level. The ways operators communicate are not standardized in written form, and it varies from discussing with operators at other machines about current quality issues and other problems to not communicating at all.

Most of the manual work at the machine consists of filling up raw material, supervising, maintaining, cleaning and administration. If the machine is running without any stops or other problems, the operators are busy most of the time with filling-up raw material and supervising the machine. Once there are stops and other problems, the work can be stressful to the operators. The machine efficiency is the limiting factor in the production flow, not the continuous manual work. However, the pauses that operators take, causing shutdown of the machine, reduces the machine efficiency

Observations showed that operators attempts to fix problems themselves during the work shifts. If the problems are larger, the operators inform the mechanics. The mechanics often solve problems by “firefighting”, and when a problem is fixed they leave the machine. Therefore it is a desire among the operators that mechanics assist the operators until the machine is fully stable after a stoppage. It is not unusual that the team leader of the shift is unaware of the problems at other machines, meaning that information will not reach all concerned employees. Interviews revealed that there is an unsaid competition among the operators, which means that knowledge of how to reach a higher result is kept from the colleagues to some degree. One of the factors that can affect sewing efficiency of operators and the overall productivity is determination of resources and using them in effective manner. The result indicates that lack of preventive maintenance is one of the reasons for failure of sewing efficiency of operators. In addition the reasons for the company to not achieve fully operational capacity of operator’s efficiency are Raw material shortage, Shortage of spare parts, Lack of market, Working capital shortage, Machinery breakage, and Governmental rules and regulations. The values given for each from the respondents is indicated in the following graph.

Fig: 2 Problem of Maintenance



4.0. Conclusion

From this research it can be concluded that flexibility and day to day revising of the manufacturing system leads to the better efficiency as progressive bundling system which used straight line changed in to U- shape manufacturing system and achieved minimization of sewing operators and garment pieces transportation. In addition as one operator can perform two identical tasks at the same time, different tasks of garment pieces are merged together to reduce idle number of operators and then number of operators reduced from 199 to 191.

Simultaneously sewing efficiency of operators is improved by 2.125% that means increased from 56.85% to 58.975%, besides to this per day production rate of the factory increased by 49 garments. This means the 5 days production capacity of the factory was 2455 suits and then increased to 2700 suits.

Based on the conventional standard of SAM (70 to 135) and 101 for basic suite product, relatively 8 workers work time of $492.695(8 \times 10.055) = 39632.38$ minutes is saved.

In another way, it can be concluded that sewing efficiency of operators and the overall productivity of the factory mostly characterized by raw material shortage, lack of continuous training for operators to the specific operation technique, and others.

In addition, we concluded that cured communication between the top managements and the sewing room operators in the garment industry is the other point that can affect sewing efficiency of operators. As the sewing operator are the crucial running forces of the garment manufacturing industry, lack of punctuality of the operators and lack of continues supervision throughout the work environments are the other points that greatly can affect the production capacity of the factory. Because of the poor administration system lack of

documented operators according to their efficiency and lack of incentives payment to encourage the operators and uncomfortable work environments are the other problems achieved through this research.

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