

CHAPTER I

INTRODUCTION



The only way a business can grow and increase its profitability is by increasing its productivity.

Productivity improvement refers to the increase in output per resources put into that activity. The resources include land, building, material, machine, tool and labor. For labor intensive manufacturing company, productivity often refers to the increase in output of finished goods divided by total work-hour or number of workers employed.

When a company designs jobs and other elements of the operation system, it establishes the employees' work activities. The time required to perform different activities is important for several reasons. Work measurement is the application of techniques to determine the time necessary for a qualified worker to perform a particular task. The time that a job is expected to take is expressed as a standard time, work standard. Standard time is useful for several purposes. Time standards allow a company to determine the labor cost for the product. They provide an objective means of evaluating worker's level of performance rather than basing it on personal assumptions or biases. After a time standard has been established for a job, it is possible to determine and evaluate the improvement in productivity caused by changes in equipment or work procedures. Motion study is used to analyze a given method and to help develop an efficient work. Motion study is the careful analysis of various body motions employed in doing a job. It is to eliminate or reduce ineffective movements, and to facilitate and speed effective movements. With

motion study, the job is performed more easily and the rate of output is, therefore, increased.

Delays may occur on job through no fault of the operator. A company should incorporate unavoidable time delays in standards. But time for avoidable delays should not be included in a standard.

The total amount of work to be performed on a production line must be broken into tasks and the tasks assigned to work stations, so the work is performed in feasible sequence within a acceptable cycle time. The cycle time for a line is determined by summation time required at all work stations. Work can not flow through the line any faster than it can pass through the slowest stage (bottleneck). If one work station has a great deal more work than others, assign some of this work to stations with less work so that there are no bottlenecks in the line. Line balancing involves selecting the appropriate combination of work tasks to be performed at each work station so that the work is performed in a feasible sequence and approximately equal amounts of time are required at each of the work station. the objective is to minimize the required labor input and facility investment for a given amount of output.

1.1 Background of Seagate Technology Company

Seagate Technology Company operates in a single industry segment by designing, manufacturing and marketing products for storage, retrieval and management of data on computer and data communications systems. These products include disc drives and disc drive components, tape drives and software. The company designs, manufactures and markets a broad line of rigid magnetic disc drives and disc drives components for use in computer systems ranging from notebook computers and desktop personal computers to workstations and supercomputers as well as in multimedia applications such as

digital video and video-on-demand. Seagate today is a multi-billion dollar company with diversified sales to over 500 companies worldwide. It has shipped over 25 million disc drives since its inception. Teparuk plant is a division of Seagate Company that its product is HGA (Head Gimbal Assembly). It can produce more than half million HGAs per day. Due to product technology has changed all the time, research and development team efforts transform technical breakthroughs into a growing line of products with increased capacities and smaller sizes. Therefore Seagate has been adopting MR head instead of inductive head.

1.2 Statement of Problems

The Company's disc and tape drive products are the basis of any information solution. Seagate continues to lead the industry with advanced storage products as result of substantial commitment to research and development. And to help maintain its leadership role in world wide storage market, Seagate continues to develop significant engineering and manufacturing capabilities, establish key cross licensing agreements, expand global operations to meet world demand, and make key investments in anticipation of future needs. For those in the storage industry, the world is always changing. And the pace of change is significant. Given the competitive nature of this industry, technology and product development are always advancing at increasing rates. This intense competition serves two beneficial purposes. First, end users continually benefit from the increased performance,, capacity and reliability of products which allow technology to expand into new markets and users to address their ever-expanding computing needs. Second, and as important, this competition determines which companies have the right strategies for long term growth and success. As mentioned above, Research and development efforts

transform technical breakthroughs into a growing of products with increased capacities and smaller-sizes hard disc drives. And Seagate Company has been adopting Magneto-Resistive (MR) head instead of inductive head to serve the requirements. Although MR head can increase capability of the products but meanwhile MR head HGAs are more complex than inductive head. It is more difficult for HGA assembly process. It needs additional operations to complete assembly MR HGAs.

With limited space and labor per cell the output of MR head production had been lower than that of inductive head, it results in cell capacity decreasing. And MR head also need to be tested at electrical testers with more electrical parameters. That means some assembly lines will be converted to electrical test line.

From the reasons mentioned above, HGA manufacturing may not have enough space to produce HGA to support customer demands in the future. Furthermore, they need to spend more costs for completing the products. Reducing cost in manufacturing process will allow the company to compete with its competitors in term of price.

1.3 Objectives of the Study

This objectives of this study is to apply Industrial Engineering techniques and Engineering Management to HGA manufacturing to :-

1. Develop HGA manufacturing process on Ultra4 Product.
2. Improve cell capacity of HGA manufacturing from 10,500 HGAs to 11,500 HGAs loading per cell per day.
3. Reduce costs per unit in term of man-hour and facilities because this study is to try to focus on process improvement and avoid adding stations of some operations in manufacturing line.

1.4 Scope of study

1. The study will be performed in HGA manufacturing process in part of assembly process line of Ultra4 product including front line which is assembly process and back end line which is concerned with mechanical inspection.

2. This does not involve in capacity improvement in part of electrical test line.

3. The study will be performed at the critical operations of HGA assembly that are the bottle-neck operations.

4. Some improvement plans, however, need to study the side effect of their changes to other manufacturing processes besides HGA manufacturing process such as HSA process or Disc Drive process.

1.5 Expected Benefits

1. Increase cell capacity to support customer demands with same number of operators and same space while maintain quality of product in terms of both mechanical performance and test performance.

2. Utilize current man-power to support cell capacity increasing.

3. Reduce cost per unit to compete with its competitors and get more chance to make more profits.

4. Set up standard of cell capacity improvement for implement to other products or new products because HGA processes of each product are similar. It is easy to apply new standards to each others.

5. For indirect benefit of this study, Seagate can reduce cost per unit in term of labor cost and space utilization

1.6 Methodology of the Study

Method engineering is applied to HGA manufacturing process improvement because it is a systematic procedure to develop a work center, to produce a product. Method engineering¹ are frequently used synonymously as operation analysis or work simplification. Method engineering entails analysis work at two different times during the history of a product. Firstly, method engineering is applied in the stage of designing and developing the various work centers where the products will be produced. Secondly, the work centers will be restudied to find the better way to produce the product or/and improve the quality. In this case it is referring to a technique for increasing the capacity of HGA manufacturing in term of production per unit of time and consequently, reducing the unit cost. This procedure is outlined below ;

1. Select the project. Typically, projects selected represent either new products or existing products that have a high cost of manufacture and a low profit. In this case Ultra4 HGA is selected for improvement. Also, products that currently experience difficulty in maintaining quality and are having problems meeting competition are logical methods engineering projects.

2. Get the facts. Assemble all the important facts relating to the product or service. These include drawings and specifications, quantity requirements, delivery requirements, and projections about the anticipated life of the product or service.

3. Present the facts. Once all important information has been acquired, record it in an orderly form for study and analysis. The development of process charts at this point is very helpful.

¹Benjamin W. Neibel, Motion and Time

4. Make an analysis. Utilize the primary approaches to operations analysis and the principles of motion study to decide which alternative will produce the best product or service, These primary approaches include : purpose of operation, design of part, tolerances and specifications, material handling, plant layout, and principle of motion economy.

5. Develop the ideal method. Select the best procedure for each operation, inspection, and transportation by considering the various constraints associated with each alternative.

6. Presenting the method. Explain the proposed method in detail to those responsible for its operation and maintenance.

7. Install the method. Consider all details of the work center to assure that the proposed method will provide the results anticipated.

8. Develop a job analysis. Make a job analysis of the installed method to assure the operator or operators are adequately selected, trained, and rewarded.

9. Establish time standards. Establish a fair and equitable standard for the installed method.

10. Follow up the new method. At regular intervals, make an audit of the installed method to determine if the anticipated productivity and quality is being realized, if costs were correctly projected, and if further improvements can be made.

Motion and Time Study

Motion and Time study is the most important role in improving the manufacturing processes.

Both visual motion study and micromotion study are used to analyze a given method and to help develop an efficient work center. Motion study is the careful analysis of various body motions employed in doing a job. Its purpose is to eliminate or reduce ineffective movements, and to facilitate and speed

effective movements. Through motion study, the job is performed more easily and the rate of output is increased.

Time study is often referred to a work measurement. It involves the technique of establishing an allowed time standard to perform a given task, based on measurement of the work content of the prescribed method, with allowance for fatigue and for personal and unavoidable delays. The standard time for a given operation is the time required for an average, fully qualified, trained operator working at a normal pace, to perform the operation. Standard time is the sum of the allowed time for all of the individual elements comprised by the time study.

1.7 Literature Survey

Thanawan Usavapaiboon, 1992.

The thesis mentions capacity planning and increase of productivity on five major products in factory producing ride-on toy and steel furniture. This study is to measure the standard time and improve work method to reduce waste time in current process. And this study is to re-layout to reduce transported time and to reduce defect from transportation. From improve work method, it can reduce process time and defects in factory.

Thongmorr Puengpai ,1991.

The thesis presents studying a small air conditioner factory in Thailand and knowledge application of Industrial Engineering to be guidance in productivity improvement of the same type of factory. From studying, the main problems that affect to manufacturing performance are management, plant layout, process, store, and line balancing. After implement

Asa Kimhachan, 1992.

The thesis mentions about an application of the MTM-2 System to the Production of read and Write Heads of Hard Disc Drives. This case study is to apply MTM-2 system to the production of read and write heads of hard disc drives which is labor intensive. This system is to measure the standard working time instead of stopwatch and to reduce loss in process. The purpose of study is to reduce change of standard time and maximize the capacity. During study, video camera is other tool for analysis. The standard time from MTM-2 is tested under 95% confidential interval by comparing to the standard time from stopwatch under same conditions.

The result from study from MTM-2 shows repeated values which is different from standard time from stopwatch. And it is practical in use. Besides the suitable man-power can be arranged to various capacity levels. And it can maximize the target of manufacturing capacity under given conditions.

Anan Watcharanutat, 1992.

The thesis presents a manufacturing cost comparison between manual and semi-automation operations for read and write heads in Hard Disc Drive industry. This research is concerned the comparison between manual and semi-automation operations for read and write heads in hard disc drive industry. Its purpose is to study manufacturing cost, the percentage of defect, and capacity between both manufacturing processes. Cost per unit is used to compare the performance in term of cost between both processes. From research, cost per unit of semi-automation operation is 17.61 bahts lower than manual. Cost per unit of semi-automation operation is 140.28 bahts while manual is 157.89 bahts. The

percentage of defect from semi-automation operation is lower than manual of 8.04%. Hour Per Unit (HPU) is used to measure the performance of process in term of capacity. From study, find that HPU from semi-automation operation is only 0.0634 while HPU from manual operation is 0.1355.

James B. Dilworth, 1993.

The book introduces the operations function and discusses how operation is related to the overall company strategy and presents some other preliminary concepts. The book also discusses planning and controlling the operations function and how the operations function is designed to support this goal.

Benjamin W. niebel, 1993.

The book presents the tools that are the keys to productivity improvement in any business, industry or service organization. They include methods, time study, and wage payment. Operation analysis is to study all productive and nonproductive elements of an operation to improve them. Method engineering is concerned with devising methods to increase productivity per unit of time and reduce unit costs while maintaining or improving quality.

Dr. Surender Kumar, 1997.

The book provides the overview of some of the main subject areas in industrial engineering such as methods engineering, work measurement, statistical method and operations research.