

established Work Study methodology in a real-life manufacturing environment.

1.1 Why Work Study?

Many developments in the Production and Operations Management field have taken place in the past decade. Technology has brought about new ways of doing things and made many significant changes in the methods of operation in both the factory and in the office. Despite these changes, there are some basic principles that remain the same. For example in the field of Work Study where the core concepts of mapping the process and making time measurements will remain the same as work will continue to be made up of several process steps or tasks that takes time to complete. The new advancement in technology helps enhance and facilitate the Work Study methods rather than changing its concept e.g. the development of information systems can be harnessed as a powerful supplement tool to help in collecting real-time data and analysing them quickly.

The main objective of Work Study is to improve the productivity of the company by identifying and eliminating non-value added tasks and improving the process efficiency. Work Study is probably the cheapest and most practical method a company can use to help improve its processes. Work Study as defined by the International Labour Office (ILO) is as follows.

“Work Study is the systematic examination of the methods of carrying on activities so as to improve the effective use of resources and to set up standards of performance for the activities being carried out.”

Work Study aims at examining the way an activity is being carried out, simplifying or modifying the method of operation to reduce unnecessary or excess work, or the wasteful use of resources and setting up a time standard for performing that activity. Some characteristics of Work Study, which makes it a very attractive and valuable tool to use, are listed below:

1. It helps raise productivity by simply reorganising the work, a method that normally involves little or no capital expenditure on facilities and equipment.
2. It is systematic and ensures no factor affecting the efficiency of an operation is overlooked, whether in analysing the original practices or in developing the new, and that all the facts about that operations are available.
3. It is the most accurate means of setting standards of performance, to allow for effective planning and control of production.
4. It can contribute to the improvement of safety and working conditions by identifying hazardous operations and developing safer methods.
5. The savings resulting from properly applied Work Study start at once and continue as long as the operation continues in the improved form.
6. It is a tool that can be applied everywhere. It can be used with success wherever work is done or plant is operated, not only in manufacturing shops but also in offices, stores, laboratories and service industries such as wholesale and retail distribution and restaurants, and even on farms.
7. It is relatively cheap and easy to apply.
8. It is one of the most effective tools to address the issue of inefficiencies in any organisations. In investigating one set of problems, the weaknesses of all the other functions affecting them will be exposed.

More will be elaborated about Work Study in Chapter 3.

1.2 Background of the Problem

Motorola Malaysia Sendirian Berhad was established in 1972 and specialises in the assembly and test of semiconductors. This factory has about 4500 employees, majority of which are operators running on shifts. The production volume is approximately 5 million units per week. Recently in September 2000, the company did a major restructuring of its Test Operations resulting in the consolidation of the 3 test back-end processes into a new operation called End-Of-Line (EOL) Operations.

The EOL operations receive electrically tested good materials from the test operations and perform visual mechanical inspection and final packing on the materials for shipping. One of the main process steps in this operation is the QA Out-going Final Inspection (QA OFI) Gate to ensure products are packed and labelled properly and administratively good before shipment.

The current QA support is not able to cope with the rate of production output ever since the EOL area was consolidated. Backlogs build up quite frequently and overtime coverage has to be arranged especially during month-end closing. Improving the efficiency and effectiveness of the QA function is critical to ensure lower costs and yet maintaining the level of quality expected. The consolidation of the 3 Test End-of-Line operations into one single EOL operation also leads to the combination of all the QA manufacturing support functions at the new EOL operation. Theoretically such consolidation should improve utilisation of resources. However, on the contrary, the EOL QA support process were experiencing bottlenecks and the QA specialists were complaining about overload of work despite the

slowing down of loading in materials in the past few months. This was due to the standardisation of some inspection criteria to the stricter ones in order to maintain the same level of quality to the customers.

The EOL QA specialist's job also have the tendency to increase as time goes on when new criteria are added to the existing tasks. As with most tasks, the job gets bigger and usually the older tasks that were not necessary, remained as there were no systematic way to review the job content and ensuring that the workers only do what is really essential.

1.3 Introduction of the Project

This project has the objective of improving the EOL QA OFI Gate process step using the systematic method recommended in the Work Study methodology. This will serve as the basis of recommending the use of such method to improve other processes in the company. It will also help establish the current work standard that is not available at the moment. This is especially necessary for a job that has been changed dramatically with the introductions of new technologies. As mentioned above, there are jobs that kept increasing in size and it could have reached a point where the employees just could not cope with it anymore without relieving them of other unnecessary tasks.

1.4 The Packing and Labelling Process at the EOL Operations

This is a simple but yet very manual process where bar code labels are being printed and pasted on the required containers and then sealed or strapped ready for shipment. The bar code labels have 4 bar coded fields that must be checked for accuracy and legibility/readability before being

allowed to ship. Although the production packing operators have the responsibility to ensure that they do their jobs right, there are many errors being made due to the manual nature of the work. The labels produced for each lot average to about 120 and the operator has to peel and paste each of these labels onto each individual container and ensuring the right product is placed inside the containers. The most common errors are swapped labels, wrong date code and wrong quantity.

Majority of the products are packed inside a sealed bag to protect it from moisture exposure. A sealing machine is used to seal the bags one at a time. The bags are then placed inside a cardboard box for shipment. Both the bags and the cardboard boxes need to be pasted with a bar code label each for identification purposes. There were many administrative errors related to bar code labels and packing that hit the customers in the mid-1990s.

Customers who received these administrative errors were very annoyed and thus the top management came up with a “zero administrative quality” goal across all the factories around the world. QA specialists were utilised to perform a 100% OFI check to ensure all products are packed and labelled correctly before being shipped. This used to be done manually by naked eye inspection until 2 years ago when the engineers came up with a scanning tool to help scan and verify the bar code labels.

1.5 Background Literature

There are many ways to improve a process. Process improvement is a day to day activity in the life of Process Engineers in most companies especially those involved in manufacturing. Many process improvement

approaches has been designed and used throughout the years. Countless researches have been conducted but most of them are usually not well published. Most works are usually kept within an organisation. In the search for back ground literature for this topic, only a few papers were found related to this topic. Below are some examples of related studies that are applicable for the above problem.

J. Lee and S. Unnikrishnan (1998) wrote a paper on planning quality inspection operations in multistage manufacturing systems with inspection errors. According to this paper, the management of resources dedicated for the appraisal of critical product quality attributes is a matter of increasing importance in multistage manufacturing systems. An interesting quality planning problem lies in the operational implementation of a quality inspection policy to select specific locations and machines for inspection activities. In this research, a mathematical model is developed for solving the inspection allocation and assignment problems in a multistage manufacturing system.

The multistage system here considered process part types with distinctive machine visitation sequences, and inspections can be performed on one of the several inspection stations with possible inspection errors. The computational process shows that as the problem size increases the number of inspection allocation possibilities and the computer system memory required becomes prohibitively large. Thus, three heuristic solution methods have been developed and are found to be effective in arriving at a near optimal solution with considerable savings in computational effort when compared with the optimisation method based on complete enumeration. The heuristic solution methods are further compared with each other to

determine their relative strength and weakness. A computer simulation is conducted to evaluate the methods developed.

Breaking the Constraint to World-Class Performance (Dettmer, 1998) is another interesting book which talks about the theory of constraints (TOC) in detail and how various organisations can adopt this theory to improve their businesses. TOC might be described as the application of the scientific method to the challenges of managing complex organisations. Specific tools are described and the step by step approach to analysing a system is discussed in detail.

There are very few recent books available touching on this topic of time study or work sampling. Many were dated in the 1940s and 1960s. Introduction to Work Study (Kanawaty, 1992) is one recent book edited in the 1990s detailing the methods of Work Study with some examples of current business environment. This forms the main reference used to conduct this project paper and is described in more detail in Chapter 2. This is the most practical and suitable method to address the problem at hand since the problem is mainly work method related.