



CHAPTER I

INTRODUCTION

Problem Identification

Inspection of quality is increasingly important in industry due to the tightened quality demands of both product responsibility and high competition in world-wide market. It is a part of the production process that makes sure that faults are not distributed to, and also the part of the quality control functions. The inspection task is composed of search and decision-making components. It is estimated as a cognitive task requiring a high vigilant process, since the inspector has to interpret the incoming information and make decisions if a target is present. By its nature, it possesses all the characteristics of a monotonous, continuing repetitive and boring activity. This may affect the inspection performance and increased mental and postural fatigue.

The properties of repetition and monotony in inspection tasks lead to the use of automatic or machine-paced operation. When man and machines are linked together, they have to adjust their strategies and rates of work to each other. Often man must adapt its strategies and behavior to the machine and not in the other way. However, to coordinate with inanimate objects, such as machine, makes worker feels difficult to modify his or her activity due to the imposing demands of the machine. Therefore, the matching between man and machine is very important matter to be considered. The performance of machine usually remains uniform in all the shifts while the performance of the man working with machine varies during the shifts with various conditions and rhythms of alertness, fatigue, etc. To get an effective work output, the idea of rest breaks during work is proposed to allow the recovery of work load by work performance from a psycho-physical decreasing level.

Visual task requires a well-coordinated system of hands, eyes and brain. High repetitive nature of the visual work increases

- a. visual fatigue,
- b. mental fatigue in processing incoming data,
- c. reaction time as a sign of dysfunction of the psycho motoric system,

d. physical fatigue, since the work is done in a permanent sitting posture, static muscle load of the upper limbs, neck and shoulders must be taken into account as well, and

e. subjectively experienced feelings of annoyance and fatigue.

In this study, the ergonomic principle was employed to study cognitive conditions of inspectors as affected by work and organizational factors. In knowing the significance of contributing factors influencing the inspection task, the study could result in recommendations for a work improvement program.

Objectives

The objectives of this study were as follows:

1. Study responses of workers who perform an inspection task of electronic parts and investigate correlation between workers fatigue and inspection performance,
2. Compare cumulative mental fatigue signs of workers between two shifts and paced-condition with two types of rest allowances,
3. Develop fatigue evaluation criteria which include work stress in real work situation.

Scope

This study attempts to measure the degree of mental fatigue caused by the continuous undertaking of the inspection task. For mental fatigue, both objective and subjective methods of measurement were used on workers two times a day, before and after working. The objective methods were 1) critical flicker fusion frequency, 2) reaction time, 3) measurement of work output, and 4) measurement of sleeping hours on the day before testing. For the subjective method, a self-scaling questionnaire was used to assess the subjective feelings. The results from the above measurement would be analyzed by using a computerized statistical package. The fuzzy set theory would be applied to determine the significant effects of the contributing factors to mental fatigue levels. The technique of electromyography (EMG) was also used to identify the existence of neck and shoulder fatigue due to prolonged sitting. It was done during working time of a day. Heart rate may also be an effective way to measure physical and mental fatigue. To detect mental disturbance, signal of heart potentials should show a decreasing time between

each beat ("R" to "R" peak). Therefore, a full Electrocardiographic signal is necessary, which is not practical in field studies. However, heart rate may be an indicator of general fatigue.

Methods and Procedures

Three subjects participated in this study. The following methods were used to assess mental fatigue during work:

1. Measuring subjective frequency of flicker fusion of the eyes
2. Measuring reaction time of light and sound stimuli
3. Recording subjective feeling of fatigue in bi-polar self-scaling questionnaire

To get more details about physical and mental fatigue, one subject was used as volunteer. The measurements were done at the beginning and the end of week as follows:

1. Measuring electromyography (EMG) of trapezius muscle
2. Measuring heart rate during work.

Expected Benefits

The benefits expected from the study are:

1. The results will be employed as the basic guide line for a work-rest schedule of the inspection task. This deals with microscope work and sitting posture, and can be used for microscope work and sitting posture, and can be used for other tasks that have similar workload. The aim of such a guide line is decrease faults and increase efficiency in the long run.

2. This study will be advantageous to the management in considering or re-considering the use of machine-paced operation instead of self-paced operation for an inspection task or to redesign the total work system.

3. This study will promote the application of fuzzy methodology in ergonomic field of research.

4. This study will promote further research activities in field ergonomic research in electronics plant.