

International Symposium on Robotics and Intelligent Sensors 2012 (IRIS 2012)

Work Measurement For Process Improvement In The Car Seat Polyurethane Injection Manufacturing Line

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Abstract

A case study research was conducted at a local car seat polyurethane (p/u) injection manufacturing company by extensively exploiting the work study methods and techniques during the on-site studies. Two fundamental approaches in work study namely method study and work measurement offer a systematic and organized steps in the research studies. The work measurement has been widely used as a method for measuring actual working time via its several techniques i.e time study. This paper discusses on the application of the work measurement technique in establishing a benchmark time for producing the car seat p/u injection line of the case study subject. Appropriate formats used for data organization are presented.

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Keywords: work study, work measurement, time study, manufacturing process

1. Introduction

The market and technology trends in automotive industries nowadays undergo relatively fast and sometimes drastic changes. New materials and new production engineering processes and techniques will continuously be introduced. Such introductions require improvements in production systems and its processes. It is crucial that manufacturers respond to such changes by continually improving and increasing their technology levels and capabilities in order to keep up with market trends and remain competitive. Nevertheless, before any improvements could be done one must measure and evaluate its present operation using the available and well established techniques that could fulfill their primary objectives [1].

There are many improvement methods available for manufacturing operations. Example of such methods are, Total Preventive Maintenance (TPM), Total Quality Management (TQM), Japanese approach of systematic housekeeping 5S, Continuous Improvement (Kaizen), benchmarking, Theory of Constraints (TOC), Business Process Re-engineering (BPR), and BPR including kaizen - called business process improvement (BPI) as well as Organization Development (OD). All these methods have a similar fundamental aim, which is to improve operations [2]. In a separate study, Brown discusses on the role of work study in TQM and deliberately explained its relationship in term of approach and method for assessing the effective use of human and other resources [3]. Work study divides into two complementary areas; method study and work measurement. Method study is concerned with the reduction of the work content of a job or operation, while work measurement is mostly concerned with the investigation and reduction of any ineffective time associated with it [4]. Work measurement is an important contributor to the planning and control of an operation, and offers a useful basis on which to evaluate alternative ways of delivering work [5]. Time study is one of the oldest techniques in work measurement and it is

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concerned with direct observation of work while it is being performed [6–9]. The work study method is gaining its popularity lately and this is clearly evidence in the research done by the researchers [10] until [15].

This paper presents work measurement studies to evaluate the actual working time at car seat p/u injection manufacturing line. Time study technique was adopted to collate data during the on-site study. Benchmark time is established and the process improvement activities can be initiated based on the research outcomes.

2. Methods

2.1. Work Measurement Techniques

According to the British Standard number 11003, BS 3138 (1992), work measurement is “The application of techniques designed to establish the time for a qualified worker to carry out a task at a defined rate of working”. This definition is therefore in-agreement with the goal of this research study which is to establish the benchmark time through time study technique. There are four principal techniques of conducting the work measurement: (1) time study; (2) sampling technique; (3) pre-determine time standards and (4) standard data [4, 7]. In the same study Baines, explains that the basic procedure, irrespective of the particular measuring technique being used, consists of three stages: In this case, the measuring technique applied is a time study technique [7].

- **Analysis**
Before any measurement commences, the work to be measured is analyzed and broken down into measurable elements which are suitable for the time study technique.
- **Data collection/measurement**
The measurement stage is the application of the time study technique in obtaining the real-life working data (quantitative) for each element that was established earlier. At this stage, in addition to the time study data, a descriptive and qualitative data such as the nature of the work as well as the conditions under which it is performed was also recorded. Thus the data collated will consist of real-time data or quantitative data which is recorded based on the observed time study data and others are historical data or qualitative data taken from the prior record; e.g. in-house production record.
- **Synthesis**
The synthesis stage is the point at which where all the elements and the recorded observed time study are pooled together in correct sequence with the correct frequency of cycle time to produce the time for complete job.

2.2. Benchmark Time

The benchmarking process was carried out by comparing the synthesized time study data against the present production cycle time, which was obtained from the present daily production output target. This daily production output data is taken from the in-house production data record. From here, the benchmark time for the purpose of process improvement activities was established.

3. Case Study

The case study subject is a small and medium scale industries category in Malaysia. It is a rapidly growing p/u based company that molding flexible foams for automotive applications such as front and rear seats (car seats) and floor pan insulation (for sound insulation or acoustic purposes). In this research studies, the investigation only focused on the car seats products and its production line. Figure 1(a) and Figure 1(b) illustrate the present layout and the top view schematic layout of the car seat line at the case study area respectively. The complete molded parts names are listed in Table 1.

Previously, the company produced three car seats models namely, Spectra, Sonata and Elantra. Due to increase in demand and its present manual production line condition, only the Spectra model can be produced for its client instead of all the three models originally. The client had withdrawn the other two models (Sonata and Elantra) because the company could not fulfill the demand. In order to meet the client's increasing demand, the company has to improve the present

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