Work Study in Assembly Process Based on MOST Integrating With Lean Ergonomics

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ABSTRACT – This paper focused on work measurement using Basic MOST for activity in the cushion and front back jointing and airbag installation approach by lean ergonomics thinking. This paper highlighted on cushion assembly process activities by using MOST and investigates to minimisation of fatigue among the employees in the manufacturing line. Productivity and efficiency is the objective which is to be accomplished for any product manufacturing system in the assembly process. All this initiated which provided detailed information of assembly activities using RULA in CATIA software.

1. INTRODUCTION

Lean ergonomics is the integration principles process that leads to successful on lean thinking on employee's health and safety [1]. It can lead the organisation in achieving and maintaining high levels of employee's performance and productivity [2]. In contrary with ergonomics, MOST is a work measurement technique developed by H. B. Maynard that is already introduced into a wide variety of industries [3]. Uniquely, MOST were designed to be significantly quicker than other work measurement techniques [4]. Using MOST as well as to identify the presence of ergonomics risk on employees' in the assembly process. Although MOST can suggest and determine the better requirements, plans and work schedule, ergonomics also being considered in this study. Therefore, it is to produce job designations that are compatible with the suggested MOST time cycle but also safer for an employee in terms of ergonomics by using Rapid Upper Limb Assessment (RULA) analysis based on the critical body parts working condition on prolonged standing. It began by defining job design and discussing the early work that was a main key point in shaping the direction of research on this topic. The research method is as the guideline to clarify the way to get the information on the study. Moving towards a discussion of the state of current research and theory on a combination of MOST and ergonomics instead of the time and postural effect. Finally, this article is to conclude with some ideas for future research.

2. RESEARCH METHOD

This study use literature studies to clarify the gap in between the theories of job design and MOST in motion time study and also integrated to ergonomics risk study in an assembly process during the MOST step. The software used is Computer Aided Three-dimensional Interactive Application (CATIA) that is equipped with RULA analysis for motion study on ergonomics based on the MOST in the assembly process as shown in Figure 1.

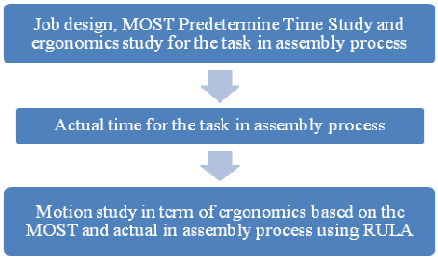

Figure 1 Job design research method

3. RESULTS AND DISCUSSIONS

Activity in Cushion and Front Back Jointing and Airbag Installation

2.1 Walk to rack cushion RH to place on a pallet into MOST Code

The activities are in the cushion and front back jointing and airbag installation. The operator walks 1 - 2 step to rack cushion RH and return to station and place on a pallet to the cushion. Figure 2 illustrates the operator place on a pallet to the cushion with step sequence model "General Move Sequence Model". A6 because the location of the rack needs operator walk 1-2 steps. B16 is assigned to the Body Motion parameter "Stand and Bend Motion" the operators need to reach the cushion on the rack. Operators continuously get part from rack and place on a pallet (G3- collects). The operator walks 1-2 steps from the rack back to the station (A6) and this parameter P0 is recognized as a pickup, the placement occurs in a later method step. The operator then back (returns) to the workplace, which is 0, steps away because it's within reach movement (A0). The time to perform this activity is converting to TMU then converts to the second:

A6 B6 G3 A6 B16 P0 A0
(6+6+3+6+16+0+0) x 10 = 370 TMU
150 x 0.036 = 13.3 second

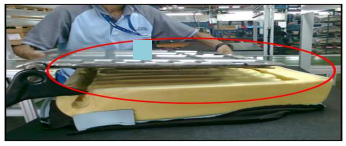

Figure 2 Operator place on a pallet to the cushion

2.2 Ergonomics Risk Analysis Using RULA

The result present for the right and left hand involved. It set up with the intermittent because the step not repeated and statics and only imitate posture. This results also compared by using NERPA worksheet to shows both analysis is got the same result with the 2kg of metal sheet as a load. This worksheet attempts to explain the NERPA method in detail by showing step 4 an ergonomic task assessment. The approach of the method begins with the principle of maintaining the original A, B, and C tables of the RULA method. In this manner, the final results of the method may be identifiable with the RULA method, facilitating the acceptance and understanding of the results in assembly process areas of manufacturing where RULA has already been used. In this step, for both analyses in CATIA software and NERPA, the method does not use modifications to assess the legs but presents changes for the arms, neck, trunk, and wrists. Using this both style of analysis, the resulting score is 3 which means need to investigate further for the best ergonomics results to prevent MSD risk.

2.3 NIOSH RULA Scoring

The RULA was designed for easy use without the need for an advanced degree in ergonomics or expensive equipment. Using RULA based on CATIA software and NERPA worksheet, the evaluation will assign a score for each of the following body regions on the upper arm, lower arm, wrist, neck, trunk, and legs (not included in this study). After the data for each region is collected and scored, Table 1 shows the generating a single score that represents the level of MSD risk then used to compile the risk factor variables. From the CATIA and NERPA results above, the final score for the ergonomics assessment is 3 that need to investigate further for the result to get better ergonomics assessment result. Based on NIOSH RULA scoring shows low risk and change may be needed. Therefore, working posture in the MOST study above need to change may be to get better results on the working posture and style in step 4 to prevent MSD risk.

Table 1 NIOSH RULA scoring

Score	Level of MSD Risk
1	Negligible risk, no action required
2-3	Low risk, change may be needed
4-7	Medium risk, further investigation, change soon
8-10	High risk, investigate and implement change
11+	Very high risk, implement change

4. CONCLUSIONS

In general, MOST approaches want to eliminate waste based on time on the job, but ergonomics approach for the employee's needs based on human factor on body motion. In this case study, the MOST result shows the timing in cushion assembly part, and the RULA analysis on CATIA software show the ergonomics result for the process. The final result saying that investigate further for better posture in ergonomics result to prevent MSD risk. NIOSH RULA Scoring supported the result that the postures are at low risk and change may be needed.

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APPENDIX

Table 2 General Move activity sequence model for ABGABPA

Index	A=Action Distance	B=Body Motion	G=Gain Control	P= Placement
0	Close≤5cm (2in.)			Hold, Toss
1	Within reach (but >2in.)		Grasp light object using 1 or 2 hand	Lay aside Loose fit
3	1 0r 2 steps	Bend and arise with 50% occurrence	Grasp heavy object or obstructed, or interlocked	Adjustment, light pressure, double placement
6	3 or 4 steps	Bend and arise with 100% occurrence		Position with care, or precision, or heavy pressure
10	5, 6 or 7 steps	Sit or stand		
16	8, 9 or 10 steps	Through the door, or climb on or off, or stand and bend, or bend and sit		