Study on Workstation of Composite Mold using RULA Analysis

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ABSTRACT – This paper presents an ergonomic investigation towards worker posture activities in composite mold using Rapid Upper Limb Assessment (RULA) analysis. Environment of the mold was setup using CATIA V6 by referring to the actual environment and it is then analyzed using RULA to obtain the posture of workers in different point in mold. An optimization process is done subject to initial data obtained and it is analyzed using RULA analysis to obtain final score that is aimed to achieve action level 3 up to level 1. As a result, the redesign of workstation is optimized ergonomically based in the final score.

1. INTRODUCTION

The common research question arise from the survey in the production line. Ergonomics is the applied science of designing and developing equipment like a workstation layout and work strategies that best suit and protect the human body. The goal of ergonomics is to minimize RULA score that will show what awkward posture Derived from the Greek words ergo (work) and nomos (natural laws), ergonomics literally means the laws of work. Ergonomics defined by Fernandez [1]. Engineering ergonomic scan provide recommendations on how to set up a work space. While this approach plays a significant role in determining design and furnishings in the office, it is limited by its exclusive focus on the physical mechanics of work [2].

2. METHODOLOGY

Rapid Upper Limb Assessment (RULA) is a quick observation method of posture analysis. This tool requires no specific equipment in providing a quick assessment of the postures of the neck, trunk and upper limbs along with muscle function and the external loads experienced by the body. This analysis is form employing a scale score ranging between 1 and 7 and a particular colour coding system [2].

RULA analysis is used to analyse many facets of manikin posture based on a combination of automatically detected variables and user data [3]. For this study, manikin's body are adjusted according data anthropometry that taken at the production line. Table 1 shows the RULA action level and its description. The score is given as number scale from lowest score 1 to highest score 7. Each action level has its own descriptions which explain about what are the consequences if the analysis meets the allocated score.

Table 1 RULA scoring and descriptions [3]

Action Level	RULA Score	Description
1	1 – 2	The person is working in the best posture with no risk of injury from their work posture
2	3 – 4	The Person is working in a posture that could present some risk of injury from their work posture, and this score most likely us the result of one part of the body being in a deviated and awkward position
3	5 – 6	The person is working in a poor posture with a risk of injury from their work posture, and the reasons for this need to be investigated and changed in the near future to prevent an injury
4	7+	The person is working in the work posture with an immediate risk of injury from their work posture, and the reasons for this need to be investigated and changed immediately to prevent an injury

3. RESULTS AND DISCUSSION

There is a few design changed in the workstation to get better RULA score. There is a few design changed at the workstation to get better RULA score such as put the adjustable platform across on the mould, increase the

height of the mould and it can be adjustable and add table of materials on the top of platform. All the worker posture was obtaining from actual worker posture and analysed in CATIA V6. There have 5 worker postures that analysed in CATIA. Table 2 shows the RULA score at the workstation

Table 2 original design for RULA score according to their 5 postures of manikin.

Posture	RULA Score
Bending downward on the platform stairs	5
Bending downward on the top platform	5
Squarting on the mold	7
Bending to the right side on the mold	6
Standing inclined on the mold	4

Based on the position squatting on the mold, the final score value is 7 as shown in figure 1 which wrist twist, Wrist and arm, trunk, neck and leg are the main contributors for this score and this means the person is working in a posture that could present some risk of injury form their work posture. This score most likely the person is working in the work posture with an immediate risk of injury from their work posture. Hence, this should need to be investigated and changed immediately to prevent an injury [3].

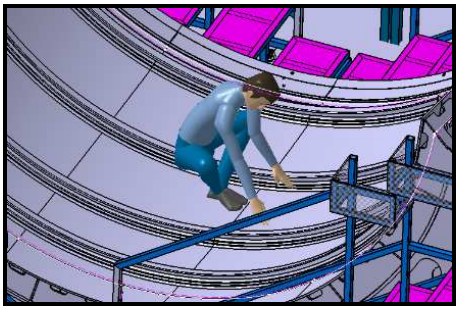

Figure 1 Posture Squarting on the mold

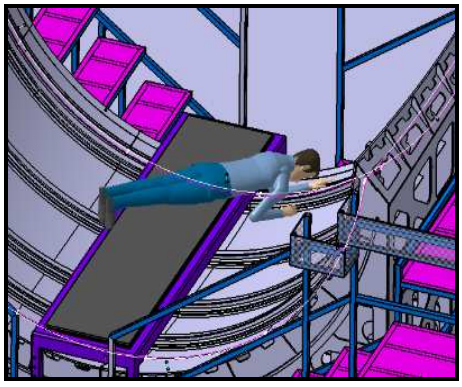

Figure 2 Example adjustable platform added in the workstation

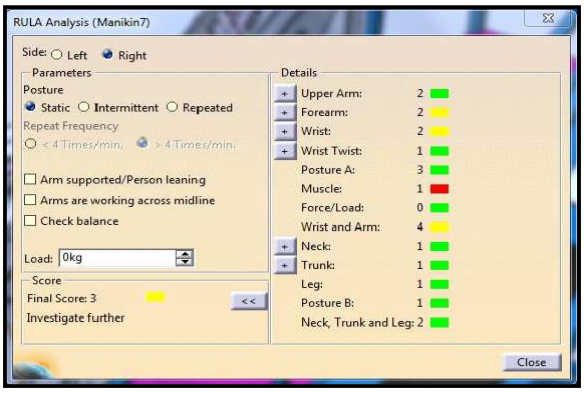

Figure 2 Example RULA analysis for adjustable platform added in workstation

After put adjustable platform in the mold as shown in figure 2, the final score has achieved lower score from original score as shown in Table 2. In the table 2 indicates that posture in redesign is acceptable but some posture presents some risk of injury from their work posture, and this score most likely us the result of one part of the body being in a deviated and awkward position. Regarding result is showed in figure 2 redesigned process (optimization), the redesign put the adjustable platform across on the mold so that worker whole body is fully supported.

4. CONCLUSION

The proposed design was developed using CATIA V6 and then it is analyzed ergonomically using the RULA analysis to obtain the final score. By using RULA analysis, the adjustable platform across on the mold is proposed with reduction of final score from 7 to 3. This indicates that the worker is working in the best posture with minimal risk of injury.

5. ACKNOWLEDGEMENT

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