ABSTRACT

Micro, Small and Medium business units (MSMEs) still use Manual Material Handling (MMH) in various activities. Clothing Line X based in Bandung is a local brand that transfers raw materials manually without any tools. Due to the limited confection area, sewing production is on the 1st floor, and the cutting process is on the 2nd floor. This condition requires workers to transport and carry material from the 1st floor to the 2nd floor with a load of 25 kg repeatedly, and it causes workers to complain of pain in the legs, neck, hands, shoulders, and knees caused by poor working posture. The existing work posture was analyzed using the REBA assessment tool with a final score of 11, which stated that the posture had a high level of risk, thus requiring changes. Furthermore, an assessment towards recommended weight limit applied the NIOSH Lifting Equation noted that the carried load is already past the recommended weight limit. So the change needed is the substitution of the raw material transportation method from manual transportation to transportation with the help of tools, namely material handling equipment (MHE).

Therefore, this study aims to produce a design for transportation aids that can facilitate moving by workers. The Nigel Cross rational product design method is used as a design guideline to obtain the most optimal alternative concept with systematic design stages. User needs and design opportunities are identified in the first stage of the design process, Identifying Opportunities. Clarifying Objectives arranged the design objectives to identify the functions and the design's constraints to support the Establishing Function stage. The performance specifications are determined based on the design objectives in the Setting Requirement stage. The technical characteristics must satisfy the criteria limit identified in the Determining Characteristics stage. Generating Alternatives stage generated the combinations of alternative solutions with the help of morphological charts. Then, the concept screening and concept scoring were then applied to select the alternative solution in the Evaluating Alternatives stage. Technical calculations related to the MHE mechanism will be considered at the final stage of this method, namely improving details.

The result of the design phase using the rational method is a lifting tool that adapts Karakuri technology. This tool utilizes gravity and a pulley mechanism so that the material can be lifted as far as 2,6 meters mechanically with the compressive force provided by the worker. The maximum height of the double lever component is set up to 154,6 cm and a minimum height of 84,8 cm from the ground. In addition, a steel plate is equipped on the table lifter component to hold the material.

Based on the REBA calculation, the working posture after a change has a medium level of risk before pressing the lever and a low level of risk when pressing the lever. Compared to the load previously borne by employees, the minimal input force required to transport raw materials is much lighter. A simple process changed the transport process that previously had to be carried on the shoulder by simply pressing a lever. So with the design of this tool, it can be said that it can facilitate employees' work.

Keyword: MMH, REBA, MHE, Karakuri, Rational Method