

ABSTRAK

Operator maintenance mesin *ring frame* di PT. XYZ melakukan aktivitas *cleaning* dengan postur jongkok dan membungkuk dalam waktu yang lama. Kondisi ini berisiko menyebabkan risiko *musculoskeletal disorders* (MSDs). Oleh karena itu diperlukan perancangan fasilitas kerja yang sesuai dengan prinsip ergonomi.

Penelitian ini bertujuan mengidentifikasi tingkat risiko cedera kerja, merancang alat bantu ergonomi, serta mengevaluasi efektivitas alat bantu yang diusulkan. Metode yang digunakan adalah *Rapid Upper Limb Assessment* (RULA), *Job Strain Index* (JSI), *Nordic Body Map* (NBM), antropometri, dan uji Wilcoxon. Analisis RULA dan JSI digunakan untuk menilai tingkat risiko cedera, sedangkan antropometri digunakan sebagai dasar perancangan alat bantu. Hasil analisis awal menunjukkan skor RULA sebesar 7 dan nilai JSI sebesar 11,25 yang mengindikasikan risiko *musculoskeletal disorders* (MSDs) yang tinggi. Berdasarkan data antropometri, dirancang alat bantu kursi mobile untuk aktivitas *cleaning* mesin *ring frame*.

Hasil evaluasi menunjukkan skor RULA menurun menjadi 4 dan nilai JSI menjadi 5,06. Penggunaan alat bantu juga menurunkan waktu *cleaning* mesin *ring frame* dari 132.70 menit menjadi 82.92 menit. Penurunan risiko *musculoskeletal disorders* (MSDs) didukung hasil uji Wilcoxon dengan nilai signifikansi 0,012 ($<0,05$). Hasil tersebut menunjukkan bahwa penerapan ergonomi melalui rancangan berbasis antropometri mampu memperbaiki postur kerja, mengurangi risiko cedera, dan meningkatkan efisiensi kerja operator. Penelitian ini juga mendukung pencapaian SDGs poin 9 yaitu *Industry, Innovation and Infrastructure*, melalui upaya peningkatan keandalan melalui peralatan industri. SDGs poin 3 *Good Health and Well-Being* berfokus pada pengurangan risiko *Musculoskeletal disorders* (MSDs) melalui perbaikan postur kerja dan penerapan ergonomi. Hal ini mendukung target SDG 3 dalam meningkatkan kesehatan dan kesejahteraan pekerja.

Kata Kunci: Ergonomi, *Rapid Upper Limb Assessment* (RULA), *Job Strain Index* (JSI), Antropometri, *Musculoskeletal disorders* (MSDs), Mesin Ring Frame.

ABSTRACT

Ring frame machine maintenance operators at PT XYZ perform cleaning activities in a squatting and bent posture for prolonged periods. This condition poses a high risk of developing Musculoskeletal disorders (MSDs). Therefore, it is necessary to design a work facility that complies with ergonomic principles.

This study aims to identify the level of occupational injury risk, design an ergonomic assistive device, and evaluate the effectiveness of the proposed tool. The methods employed include Rapid Upper Limb Assessment (RULA), Job Strain Index (JSI), Nordic Body Map (NBM), anthropometric analysis, and the Wilcoxon test. RULA and JSI analyses were used to assess the level of injury risk, while anthropometric data served as the basis for designing the assistive device. The initial analysis showed a RULA score of 7 and a JSI value of 11.25, indicating a high risk of Musculoskeletal disorders (MSDs). Based on anthropometric measurements, a mobile chair was designed to support ring frame machine cleaning activities.

The evaluation results showed that the RULA score decreased to 4 and the JSI value decreased to 5.06. The use of the assistive device also reduced the ring frame machine cleaning time from 132.70 minutes to 82.92 minutes. The reduction in MSD risk was supported by the Wilcoxon test results, which yielded a significance value of 0.012 (< 0.05). These findings indicate that the implementation of ergonomics through an anthropometry-based design can improve working posture, reduce injury risk, and enhance operator work efficiency. This study also supports the achievement of Sustainable Development Goal (SDG) 9: Industry, Innovation and Infrastructure through efforts to improve industrial reliability by developing innovative work equipment. In addition, it contributes to SDG 3: Good Health and Well-Being, which focuses on reducing the risk of Musculoskeletal disorders (MSDs) through improved working postures and the application of ergonomic principles, thereby promoting workers' health and well-being.

Keywords: *Ergonomics, Rapid Upper Limb Assessment (RULA), Job Strain Index (JSI), Anthropometri, Musculoskeletal disorders (MSDs), Ring frame Machine.*