

Analisis Beban Kerja Mental pada Aktivitas Operator Produksi Kemasan Plastik Menggunakan Metode Modified Cooper Harper

Oleh:

Sandika Wira Prastiono

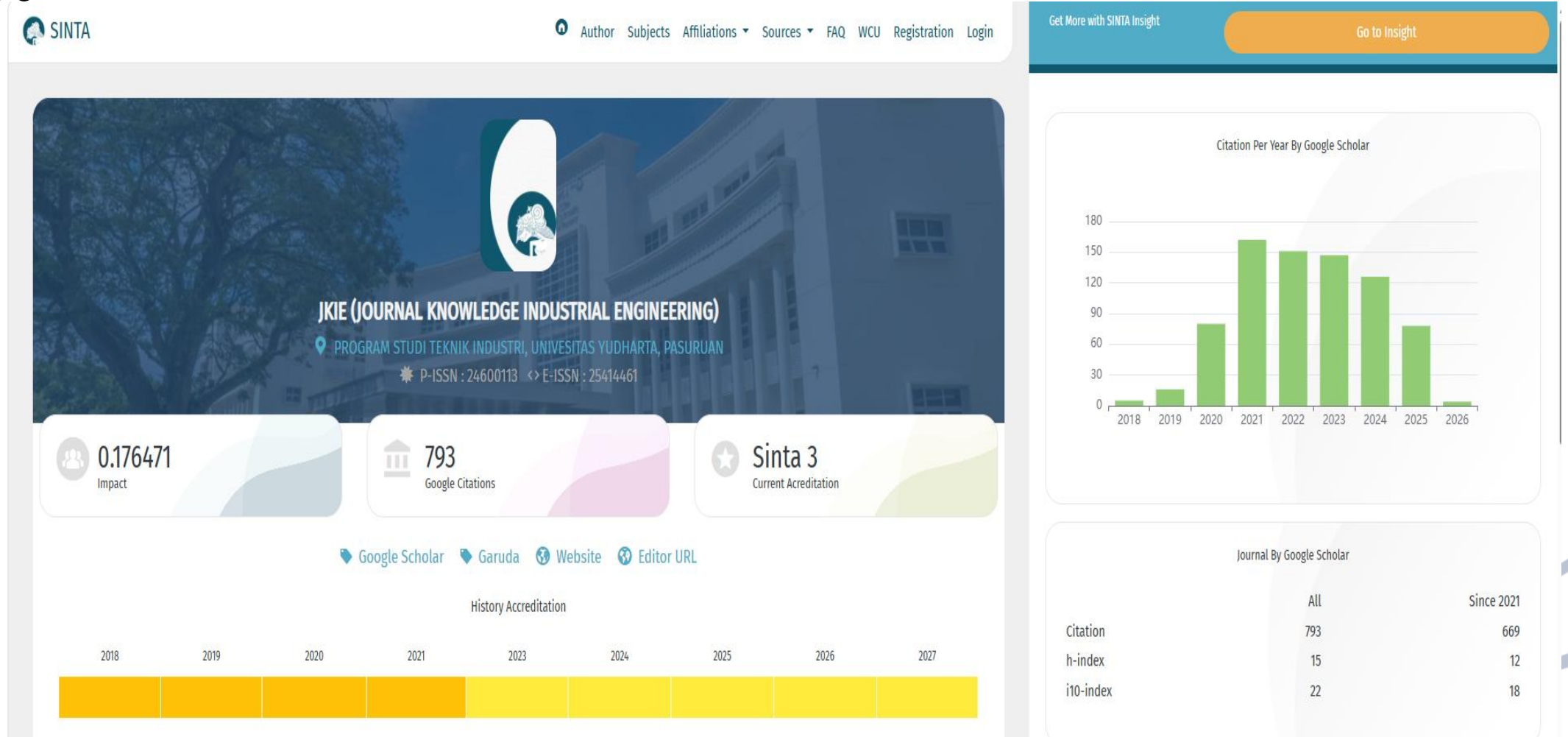
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Progam Studi Teknik Industri
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Analysis of Mental Workload in Plastic Packaging Production Operators Act

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Abstract *

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UD Restu Jaya is a manufacturing enterprise producing plastic packaging from polypropylene (PP) and polyethylene (PE) materials. Across the production line, operators carry out distinct task assignments, which leads to varying levels of mental strain among individual workers. Unmanaged cognitive stress during production can impair operator concentration, task accuracy, and overall operational efficiency. This study evaluated the mental workload of production operators using the Modified Cooper Harper (MCH) approach. Primary data were gathered through direct workplace observation, interviews, and questionnaire feedback from field operators. Data analysis revealed that blowing machine setup scored 8.31, blowing machine troubleshooting reached 8.44, and cutting machine setup recorded 8.06, placing all three tasks in the overload category. In contrast, the majority of remaining operations fell within the optimal load range, while machine startup, product weighing, and packing were categorized as underload. Based on these results, management should focus on high-strain tasks to improve production efficiency, enhance operator performance, and maintain long-term product quality.

3. Isi Abstrak

Title *

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1. Introduction

Fundamentally, production is an activity aimed at increasing the utility of goods or services to satisfy daily human needs. Within this process, the role of labor is essential. In plastic manufacturing, the production sequence involves several key phases, notably blowing and mixing. The blowing phase processes raw materials into plastic pellets, whereas mixing involves blending and stirring these pellets together (Raja et al., 2023). One manufacturer operating in this sector is UD Restu Jaya, a firm specializing in PP and PE plastic packaging established in 1998. The company manufactures various sizes of plastic bags for crackers, snacks, sugar, and other daily necessities, while also offering custom screen-printing services based on client requests. During operations, management sets specific production targets for each operator. These performance targets directly affect the workload carried by

operator, leading to various consequences. Ultimately, these aspects can be considered as a foundation for developing targeted operational improvements that enhance operator output, optimize overall plant productivity, and maintain consistent product standards.

2. Literature Review

2.1 Ergonomi

As a field of study, ergonomics addresses the complex relationships between individuals and their working surroundings. Its core objective centers on tailoring task structures, machinery, and workspace setups to align with human physical and mental boundaries, fostering a work environment that is safe, comfortable, and productive. Furthermore, ergonomics highlights optimal physical

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Please strengthen the research gap and clearly state the novelty of this study. Explain how this research differs from previous MCH-based studies and highlight its specific scientific contribution.

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The literature review should be strengthened by presenting the state of the art, previous MCH applications, and comparisons with related workload assessment methods to establish a stronger theoretical foundation.

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7.1 Catatan Reviewer

were drawn and recommendations were proposed to support the company in evaluating and improving working conditions, enhancing product quality and productivity, and reducing the mental workload experienced by production operators (Daffa & Pitoyo, 2023).

Modified Cooper Harper (MCH) Measurement Procedure

Mental workload was measured using the Modified Cooper Harper (MCH) method through a series of systematic stages, including the identification of work activities, direct observation, questionnaire distribution, and data analysis to obtain the average mental workload score for each production activity (Prayoga Dwi Firmansyah & Boy Isma Putra, 2024).

$$\text{Average weight} = \frac{\text{Number of reviews}}{\text{number of respondents}} \dots\dots\dots (1)$$

Source. (Prayoga Dwi Firmansyah & Boy Isma Putra, 2024)

Classification of Mental Workload Levels

Score classification in the Modified Cooper Harper (MCH) method is used to determine mental workload levels based on operators' subjective evaluations of their daily tasks. Determining weights and assessing mental workload through the MCH method involves the following steps (Pramestari et al., 2022):

1. Workload weighting is assigned based on task specifications and complexity, divided into four percentage ranges:

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Please provide the complete MCH calculation procedure, including the missing equation, explanation of variables, and the steps from the respondent rating to the final workload classification.

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Please clarify and justify the relationship between the 1–10 MCH rating scale, the percentage/weight conversion, and the Underload, Optimal Load, and Overload classifications. A clear conversion table and supporting reference are recommended

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Yuni Asturi	6	6	9	6	6	3	3
Ernawati	5	5	8	5	4	5	2
Yuliana	4	4	7	4	3	4	2
Total	101	81	145	91	87	45	40

In Table 3, questionnaire feedback from 18 cutting and packing operators also demonstrated score variations across task activities. Mounting rolls onto cutting machines scored 101, measuring product dimensions per orders scored 84, setting up cutting machines reached 145, operating machines



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Please recheck all questionnaire totals, average scores, percentage conversions, and workload classifications. Some values should be verified for consistency between the raw data, table totals, narrative explanations, and subsequent results.



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Catatan Reviewer

other activities. These findings can be used by the company as a reference to determine which work activities need improvement first based on actual conditions in the production process. The company can improve the work system by providing additional training for operators, preparing clearer work instructions, and adjusting task distribution, especially for activities that require high concentration and quick decision-making. These improvements are expected to help operators deal with production problems more effectively, reduce excessive mental workload, minimize work errors, and support better production performance.

5. Conclusion

This study successfully evaluated operator mental workload using the Modified Cooper-Harper (MCH) framework at UD Restu Jaya, establishing a direct link between specific task characteristics and cognitive strain. The empirical results reveal that while routine production activities remain within the optimal load zone and minor steps fall into underload, three critical tasks induce severe mental overload: initial blowing machine setup, blowing machine troubleshooting, and cutting machine setup. High cognitive pressure during these specific tasks stems from continuous operator vigilance, complex parameter adjustments, and rapid decision-making required under tight operational limits.

Practically, these findings demonstrate that targeted operational changes rather than generic supervision are essential to sustain factory performance and worker well-being. Management must directly address high-strain tasks by implementing specialized setup training programs, executing preventive maintenance on blowing units, scheduling brief cognitive rest breaks, and balancing technical task assignments during peak demand. Executing these focused interventions will alleviate operator mental fatigue, minimize calibration errors, optimize overall shop-floor workflow, and effectively keep product defect rates below the targeted 5% threshold. Ultimately, this study provides a practical framework for small-to-medium manufacturing enterprises to balance cognitive demands with operational quality.

Acknowledgements (if any)

The authors would like to express their gratitude to Universitas Muhammadiyah Sidoarjo for providing academic support during this research. The authors also thank UD Restu Jaya for granting permission and support during the data collection process, as well as all production operators who participated in this study.

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The conclusion should more explicitly answer the research objective, summarize the key findings, and emphasize the practical implications of the study.

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sandi Yesterday
We have thoroughly revised the Conclusion section to explicitly address the primary research objective, summarize the core findings regarding operator workload distribution, and emphasize the practical implications for industrial workload management and quality control

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Dear Author(s),

Title : Analysis of Mental Workload in Plastic Packaging Production Operators Activities Using the Modified Cooperr Harper Method

Authors : 1. sandika wira prastiono
2. Boy Isma Putra

Affiliations : Department of Industrial Engineering, Universitas Muhammadiyah Sidoarjo, Indonesia

I am pleased to inform you that after peer review your paper has been accepted for publication in JKIE (Journal Knowledge Industrial Engineering). The Paper is at the proof setting stage and will be published on Agustus 2026, vol. 13 issue 2, at JKIE (Journal Knowledge Industrial Engineering).

Pasuruan, 29 July 2026
Best regards

M. Imron Mas'ud, ST., MT
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