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**Upaya Minimasi Waste Pada Proses Produksi Kain Batik Kombinasi Tulis CNC Dan Cap Manual Menggunakan
Pendekatan Lean Manufacturing (Studi Kasus: Batik Butimo, Yogyakarta)**
Timothy Jonathan Cristian Silalahi, Ir. Andi Sudiarso, S.T., M.T., M.Sc., Ph.D., IPM., ASEAN Eng.
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INTISARI

Batik Butimo merupakan IKM batik di Yogyakarta yang menggabungkan proses *klowong* berbasis *Computer Numerical Control* (CNC) dengan pengecapan manual dalam sistem *make to order* sehingga berpotensi menimbulkan *waste* pada aliran produksi. Penelitian ini bertujuan mengidentifikasi *waste*, mengklasifikasikan aktivitas menjadi *value added* (VA), *necessary non-value added* (NNVA), dan *non-value added* (NVA), menganalisis akar penyebab *waste* prioritas, menentukan alternatif perbaikan, dan mengestimasi potensi perbaikannya.

Penelitian menggunakan *Current State Value Stream Mapping* (CVSM), *seven waste*, diagram Pareto, *Value Stream Analysis Tools* (VALSAT), *Process Activity Mapping* (PAM), *fishbone diagram*, *Simple Additive Weighting* (SAW) dengan pembobotan *Rank Order Centroid* (ROC), dan *Future State Value Stream Mapping* (FVSM). Empat dari tujuh jenis *waste* teridentifikasi, dengan *waiting* (52,79%) dan *defect* (28,53%) sebagai *waste* prioritas dengan kontribusi kumulatif 81,32%. Dari 49 aktivitas, 70,97% waktu tergolong VA, 12,90% NNVA, dan 16,14% NVA. Operator pengecapan memiliki kapasitas terendah (4,94 kain per hari), sedangkan *finishing* bukan *bottleneck* meskipun memiliki waktu NVA terbesar. Akar penyebabnya berkaitan dengan metode kerja yang belum terstandar, pengendalian peralatan yang terbatas, dan belum adanya pengukuran proses yang objektif.

SAW menempatkan sistem *first in, first out* (FIFO) dan penanda visual pada prioritas pertama (0,9722), diikuti *checklist* pemeriksaan hasil cap (0,9231). Setelah waktu aktivitas baru diperhitungkan, hasil FVSM menunjukkan bahwa penerapan seluruh alternatif secara bertahap berpotensi menurunkan waktu produksi sebesar 8,03% dan meningkatkan *Value Added Ratio* (VAR) dari 70,97% menjadi 77,16%.

Kata kunci: *lean manufacturing*; *seven waste*; *Value Stream Mapping* (VSM); *Process Activity Mapping* (PAM); *Simple Additive Weighting* (SAW); batik kombinasi tulis CNC dan cap manual

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ABSTRACT

Batik Butimo is a small and medium-sized batik enterprise in Yogyakarta that combines CNC-based klowong with manual stamping in a make-to-order system. Differences between the two processes may create waste in the production flow. This study aims to identify waste, classify activities as value-added (VA), necessary non-value-added (NNVA), or non-value-added (NVA), analyze the root causes of priority waste, rank improvement alternatives, and estimate their potential effect.

The study used Current State Value Stream Mapping, the seven wastes, Pareto analysis, Value Stream Analysis Tools, Process Activity Mapping, a fishbone diagram, Simple Additive Weighting (SAW) with Rank Order Centroid (ROC) weighting, and Future State Value Stream Mapping (FVSM). Four of the seven waste categories were identified, with waiting (52.79%) and defects (28.53%) as priority waste, accounting for 81.32% combined. Across 49 activities, VA accounted for 70.97% of production time, NNVA for 12.90%, and NVA for 16.14%. The stamping operator had the lowest capacity (4.94 pieces of fabric per day), while finishing was not a bottleneck despite having the largest NVA time. The main causes were unstandardized work methods, limited equipment control, and a lack of objective process measurement.

Of the four improvement alternatives ranked with SAW, a first-in, first-out (FIFO) system with visual markers ranked first (0.9722), followed by a checklist for inspecting stamped fabric (0.9231). After accounting for new activities, the FVSM estimates that phased implementation of all four alternatives could reduce production time by 8.03% and raise the value-added ratio from 70.97% to 77.16%.

Keywords: *lean manufacturing; seven waste; Value Stream Mapping (VSM); Process Activity Mapping (PAM); Simple Additive Weighting (SAW); CNC-drawn and hand-stamped combination batik*