

ABSTRAK

Produksi kain motif batik merupakan aktivitas industri tekstil yang berpotensi menimbulkan dampak lingkungan akibat penggunaan bahan baku, bahan kimia, energi, serta menghasilkan limbah cair dari proses produksi. Penelitian ini bertujuan untuk mengidentifikasi dampak lingkungan dan mengevaluasi tingkat eco-efficiency pada produksi kain motif batik menggunakan metode Life Cycle Assessment (LCA). Analisis dilakukan dengan pendekatan gate-to-gate mulai dari persiapan bahan hingga proses finishing. Hasil analisis menunjukkan bahwa dampak lingkungan terbesar berasal dari konsumsi air, penggunaan bahan kimia, dan limbah cair proses pencucian kain. Usulan perbaikan dilakukan melalui penerapan sistem partial water replacement dan pemanfaatan kembali air hasil filtrasi. Hasil penelitian menunjukkan bahwa skenario perbaikan mampu menurunkan nilai eco-cost dari Rp1.407,85 menjadi Rp103,41 per batch atau sebesar 92,65%. Nilai Eco-efficiency Index (EEI) meningkat dari 5,4551 menjadi 73,8913, nilai Eco-Cost Value Ratio (EVR) menurun dari 0,1833 menjadi 0,01353, serta nilai Eco-Efficiency Ratio (EER) meningkat dari 81,6686% menjadi 98,6467%. Hasil tersebut menunjukkan bahwa strategi efisiensi sumber daya dan pengelolaan limbah mampu meningkatkan kinerja eco-efficiency pada produksi kain motif batik.

Kata kunci: *Green Manufacturing, Life Cycle Assessment, Eco-efficiency, Eco-cost, Batik Printing*

ABSTRACT

[Title: Design Improvement of Eco-efficiency Using Life Cycle Assessment in Batik Printing Production]

Batik printing production has the potential to generate environmental impacts due to the use of raw materials, chemicals, energy, and wastewater generation during production processes. This study aims to identify environmental impacts and evaluate the eco-efficiency performance of batik patterned fabric production using the Life Cycle Assessment (LCA) method. The analysis was conducted using a gate-to-gate approach from material preparation to finishing processes. The results indicate that the major environmental impacts originate from water consumption, chemical usage, and wastewater generation from fabric washing. An improvement scenario was proposed through a partial water replacement system and reuse of filtered water. The results show that the proposed improvement reduced the eco-cost value from Rp1,407.85 to Rp103.41 per batch, representing a 92.65% reduction. The EEI increased from 5.4551 to 73.8913, while EVR decreased from 0.1833 to 0.01353 and EER increased from 81.6686% to 98.6467%. These results demonstrate that resource efficiency and waste management strategies can improve the eco-efficiency performance of batik printing production.

Keywords: *Green Manufacturing, Life Cycle Assessment, Eco-efficiency, Eco-cost, Batik Printing*