

ABSTRAK

Ruang lingkup penelitian meliputi proses pengiriman bahan baku, mixing, pembentukan, proofing, pemanggangan, penggorengan, dan pengemasan. Analisis dampak lingkungan dilakukan menggunakan perangkat lunak SimaPro 9.0 dengan metode *ReCiPe Endpoint (H)*. Hasil penelitian menunjukkan bahwa tahap penggorengan merupakan penyumbang dampak lingkungan terbesar dengan nilai 1,1 Pt pada kategori *human health*. Dampak tersebut disebabkan oleh penggunaan LPG sebesar 30 kg per hari untuk memproduksi sekitar 8.000 roti yang menghasilkan emisi sebesar 89,5389 kg CO₂, 0,19866 kg CH₄, dan 0,0376035 kg N₂O, serta menghasilkan limbah minyak jelantah sebanyak 11 liter per hari. Sebagai upaya perbaikan diusulkan penerapan *high efficiency burner* dan *wind shield* pada proses penggorengan untuk meningkatkan efisiensi energi dan mengurangi kehilangan panas. Hasil analisis LCC menunjukkan bahwa usulan perbaikan memerlukan investasi awal sebesar Rp3.008.487 dan mampu menghasilkan penghematan biaya energi sebesar Rp89.328 per siklus produksi dengan *payback period* sebesar 33,68 siklus produksi. Selain itu penelitian juga membandingkan alternatif kemasan yang lebih ramah lingkungan yaitu plastik *polypropylene*, kertas *kraft food grade* dan plastik *biodegradable* untuk mendukung pengurangan dampak lingkungan pada tahap pengemasan.

Kata kunci: *Life Cycle Assessment, Life Cycle Costing, UMKM roti, dampak lingkungan, Responsible Consumption and Production.*

ABSTRACT

The scope of the study includes raw material delivery, mixing, shaping, proofing, baking, frying, and packaging. The environmental impact analysis was conducted using SimaPro 9.0 software with the ReCiPe Endpoint (H) method. The results showed that the frying stage contributed the largest environmental impact, with a value of 1.1 Pt in the human health category. This impact is caused by the use of 30 kg of LPG per day to produce approximately 8,000 loaves of bread, resulting in emissions of 89.5389 kg CO₂, 0.19866 kg CH₄, and 0.0376035 kg N₂O, as well as the generation of 11 liters of used cooking oil waste per day. As an improvement effort, it is proposed to implement a high-efficiency burner and wind shield in the frying process to increase energy efficiency and reduce heat loss. The results of the LCC analysis show that the proposed improvement requires an initial investment of IDR 3,008,487 and is able to generate energy cost savings of IDR 89,328 per production cycle with a payback period of 33.68 production cycles. In addition, the study also compares more environmentally friendly packaging alternatives, namely polypropylene plastic, food-grade kraft paper and biodegradable plastic to support the reduction of environmental impacts at the packaging stage.

Keywords: *Life Cycle Assessment, Life Cycle Costing, bakery MSMEs, environmental impact, Responsible Consumption and Production.*