

ABSTRAK

UMKM White Mango merupakan industri garmen yang berfokus pada produksi *underwear* pria jenis *brief* dan *boxer*. Permasalahan utama yang dihadapi oleh perusahaan pada rantai produksi adalah tingginya proporsi cacat produk (*waste defect*) dan penumpukan barang setengah jadi atau *Work in Process* (*waste waiting*). Umumnya, pelaksanaan proses produksi dinilai belum optimal karena tingkat kecacatan produk mencapai 12,3% dengan total 2.609 produk cacat dari 21.216 produksi selama periode November 2025 hingga Januari 2026. Selain itu, terdapat kendala penumpukan WIP akibat ketidakseimbangan beban kerja antar stasiun yang memperpanjang waktu tunggu produksi. Oleh karena itu, penelitian ini bertujuan untuk mengidentifikasi dan meminimasi *waste* dominan pada proses produksi *underwear* guna meningkatkan kualitas dan efisiensi waktu siklus menggunakan metode *Lean Six Sigma* dan *Fuzzy Failure Mode and Effect Analysis* (Fuzzy FMEA).

Pendekatan masalah pada penelitian ini diselesaikan dengan tahapan *Define, Measure, Analyze, Improve, dan Control* (DMAIC). Identifikasi *waste* dominan dilakukan menggunakan *Waste Assessment Model* (WAM) dan *Value Stream Analysis Tools* (VALSAT). Hasil pengukuran kinerja awal menunjukkan *waste* dominan berupa *defect* (27,20%) dan *waiting* (18,25%), dengan nilai *Defect per Million Opportunities* (DPMO) sebesar 17.567,60 pada level sigma 3,61, serta *Process Cycle Efficiency* (PCE) sebesar 11,14% dengan *lead time* mencapai 399,82 menit. Penentuan akar masalah dan prioritas perbaikan dianalisis menggunakan algoritma *Fuzzy FMEA* dengan bantuan perangkat lunak MATLAB untuk mendapatkan nilai *Fuzzy Risk Priority Number* (FRPN) yang paling kritis.

Hasil penelitian menunjukkan bahwa usulan perbaikan yang diberikan mampu memberikan performansi yang lebih optimal dibandingkan dengan kondisi awal perusahaan. Implementasi perbaikan berupa perubahan sistem pengupahan menjadi borongan yang diiringi penerapan *Quality Control* (QC) *in-line*, pemberian peringatan visual pada area *cutting*, serta penambahan tenaga kerja di stasiun *kansai* pinggang dan *packing* berhasil mengeliminasi pemborosan. Hasil tersebut berimplikasi pada penurunan persentase produk cacat sebesar 5,6% dan peningkatan level sigma menjadi 3,84. Dari segi efisiensi waktu, *lead time* produksi berhasil diturunkan secara drastis menjadi 55,22 menit sehingga *Process Cycle Efficiency* (PCE) meningkat menjadi 81%. Oleh karena itu, penelitian yang dilakukan telah berkontribusi pada perbaikan sistem produksi perusahaan dalam meminimasi produk cacat dan menyeimbangkan aliran lini produksi.

Kata Kunci: *Lean Six Sigma, Fuzzy FMEA, Waste, Defect, Waiting.*

ABSTRACT

UMKM White Mango is a garment industry focusing on the production of men's underwear, specifically briefs and boxers. The main problems faced by the company on the production floor are the high proportion of product defects (defect waste) and the accumulation of Work in Process (waiting waste). Generally, the implementation of the production process is considered suboptimal as the product defect rate reached 12.3%, with a total of 2,609 defective products out of 21,216 total production during the period of November 2025 to January 2026. Furthermore, there is an obstacle of WIP accumulation due to unbalanced workloads between work stations, which prolongs the production waiting time. Therefore, this research aims to identify and minimize the dominant waste in the underwear production process to improve quality and cycle time efficiency using the Lean Six Sigma and Fuzzy Failure Mode and Effect Analysis (Fuzzy FMEA) methods.

The problem-solving approach in this research is completed through the Define, Measure, Analyze, Improve, and Control (DMAIC) stages. Dominant waste identification was conducted using the Waste Assessment Model (WAM) and Value Stream Analysis Tools (VALSAT). The initial performance measurement results showed that the dominant wastes were defects (27.20%) and waiting (18.25%), with a Defect per Million Opportunities (DPMO) value of 17,567.60 at a sigma level of 3.61, as well as a Process Cycle Efficiency (PCE) of 11.14% with a lead time reaching 399.82 minutes. The determination of root causes and improvement priorities was analyzed using the Fuzzy FMEA algorithm with the help of MATLAB software to obtain the most critical Fuzzy Risk Priority Number (FRPN) values.

The research results indicate that the proposed improvements provide more optimal performance compared to the company's initial conditions. The implementation of improvements, which includes changing the wage system to a piece-rate system accompanied by the application of in-line Quality Control (QC), providing visual warnings in the cutting area, and adding manpower at the kansai waist and packing stations, successfully eliminated the wastes. These results imply a 5.6% decrease in the percentage of defective products and an increase in the sigma level to 3.84. In terms of time efficiency, the production lead time was drastically reduced to 55.22 minutes, so that the Process Cycle Efficiency (PCE) increased to 81%. Therefore, the conducted research has contributed to improving the company's production system by minimizing defective products and balancing the production line flow.

Keywords: *Lean Six Sigma, Fuzzy FMEA, Waste, Defect, Waiting.*