

ABSTRACT

PT XYZ is facing an increase in broken kernel defects in Palm Kernel Oil (PKO) production which consistently exceeds the 15% tolerance limit during the 2021–2023 period. The root of the problem lies in the inefficiency of the nut grading process, where nuts get stuck in the sieving holes of the nut grading drum machine which causes a mix of nut sizes in the nut hopper and triggers kernel damage during cracking in the ripple mill. To overcome this, this research designed an integrated automatic cleaning tool using a combination of DMAI (Define – Measure – Analyze – Improve) approaches from the Six Sigma and Quality Function Deployment (QFD) frameworks. The Define stage identifies CTQ (Critical to Quality) through production flow mapping, while Measure reveals low process capabilities (sigma value is 3.50) using a P control chart. Analyze the root of the problem using a fishbone diagram and 5 Why's that highlighting the main causes of the problem. Improvement solutions (Improve) are developed through QFD by translating stakeholder needs into four need statements (simple design, ease of maintenance, corrosion resistance, reduced nut spillage) which are prioritized in the House of Quality (HOQ). The result is a roller-based tool design (Stainless Steel 304) measuring 8 cm in diameter and 455 cm long with a block-shaped divider measuring $452 \times 5 \times 25$ cm, which is verified to meet all technical specifications and is validated by stakeholders.

Keywords : *Six Sigma*, DMAI, *Defect*, *Nut Grading*, QFD