

ABSTRAK

ANALISIS KEKUATAN MATA PISAU PENGUPAS SERABUT KELAPA MENGUNAKAN METODE *FINITE ELEMENT ANALYSIS (FEA)*

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(2026: xv + 41 Halaman, 14 Gambar, 3 Tabel, 5 Lampiran)

Pengupasan serabut kelapa merupakan salah satu tahapan pascapanen yang membutuhkan mata pisau dengan kekuatan dan keamanan yang memadai. Selama proses pengupasan, mata pisau menerima beban operasional yang dapat menimbulkan tegangan dan deformasi serta memengaruhi tingkat keamanannya. Penelitian ini bertujuan untuk menganalisis distribusi tegangan Von Mises, deformasi (*displacement*), dan faktor keamanan (*safety factor*) pada mata pisau pengupas serabut kelapa berdasarkan variasi kondisi kelapa. Penelitian dilakukan menggunakan metode *Finite Element Analysis (FEA)* melalui simulasi *Static Structural Analysis* dengan perangkat lunak Autodesk Inventor Professional. Simulasi dilakukan pada tiga kondisi kelapa, yaitu kering, lembab, dan basah, dengan gaya pengupasan masing-masing sebesar 150 N, 120 N, dan 140 N. Hasil simulasi menunjukkan bahwa pada kondisi kelapa kering diperoleh tegangan Von Mises maksimum sebesar 8,911 MPa, *displacement* maksimum sebesar 0,0004479 mm, dan faktor keamanan minimum sebesar 2,806. Pada kondisi kelapa basah, tegangan Von Mises maksimum sebesar 8,644 MPa, *displacement* maksimum sebesar 0,0004353 mm, dan faktor keamanan minimum sebesar 2,892. Sementara itu, pada kondisi kelapa lembab diperoleh tegangan Von Mises maksimum sebesar 4,210 MPa, *displacement* maksimum sebesar 0,0002594 mm, dan faktor keamanan minimum sebesar 5,939. Berdasarkan hasil tersebut, kondisi kelapa kering menghasilkan tegangan dan deformasi tertinggi serta faktor keamanan terendah, sedangkan kondisi kelapa lembab menghasilkan respons tegangan dan deformasi terendah serta faktor keamanan tertinggi. Secara keseluruhan, hasil simulasi menunjukkan bahwa mata pisau masih mampu menahan pembebanan pada ketiga kondisi kelapa yang dianalisis, dengan nilai faktor keamanan minimum sebesar 2,806. Hasil penelitian ini dapat digunakan sebagai dasar evaluasi kekuatan dan keamanan mata pisau pengupas serabut kelapa berdasarkan pendekatan simulasi numerik.

Kata Kunci: mata pisau pengupas serabut kelapa, *Finite Element Analysis*, tegangan Von Mises, deformasi, faktor keamanan.

ABSTRACT

ANALYSIS OF THE STRENGTH OF COCONUT FIBER PEELING KNIFE BLADES USING THE FINITEELEMENT ANALYSIS (FEA) METHOD

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Husk removal from coconuts is a post-harvest stage that requires a blade with sufficient strength and safety. During the husking process, the blade is subjected to operational loads that can induce stress and deformation, thereby affecting its safety. This study aims to analyze the Von Mises stress distribution, displacement (deformation), and safety factor of a coconut-husking blade under various coconut conditions. The research was conducted using the Finite Element Analysis (FEA) method through a Static Structural Analysis simulation in Autodesk Inventor Professional software. Simulations were performed for three coconut conditions—dry, moist, and wet—with corresponding husking forces of 150 N, 120 N, and 140 N, respectively. The simulation results indicate that for dry coconuts, the maximum Von Mises stress is 8.911 MPa, the maximum displacement is 0.0004479 mm, and the minimum safety factor is 2.806. For wet coconuts, the maximum Von Mises stress is 8.644 MPa, the maximum displacement is 0.0004353 mm, and the minimum safety factor is 2.892. Meanwhile, for moist coconuts, the maximum Von Mises stress is 4.210 MPa, the maximum displacement is 0.0002594 mm, and the minimum safety factor is 5.939. Based on these findings, the dry coconut condition results in the highest stress and deformation, as well as the lowest safety factor, whereas the moist coconut condition yields the lowest stress and deformation response, along with the highest safety factor. Overall, the simulation results demonstrate that the blade remains capable of withstanding the loads under all three analyzed coconut conditions, with a minimum safety factor of 2.806. The results of this study can be used as a basis for evaluating the strength and safety of coconut fiber-peeling blades, based on a numerical simulation approach.

Keywords : coconut husk peeling blade, Finite Element Analysis, Von Mises stress, deformation, factor of safety.