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Perancangan Welding Fixture untuk Proses Pengelasan Komponen Grain Housing Mesin Panen Padi
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INTISARI

Proses pengelasan komponen *grain housing* pada mesin panen padi memerlukan ketepatan posisi dan kestabilan komponen selama proses berlangsung. Pengelasan secara manual berpotensi menyebabkan ketidaktepatan posisi dan ketidakkonsistenan hasil pengelasan. Oleh karena itu, diperlukan *welding fixture* sebagai alat bantu untuk menjaga posisi dan kestabilan komponen selama proses pengelasan. Penelitian ini bertujuan untuk merancang *welding fixture* pada proses pengelasan komponen *grain housing* serta menganalisis kemampuan komponen *welding fixture* dalam menahan beban kerja.

Metode yang digunakan meliputi identifikasi masalah, studi literatur, penyusunan konsep perancangan, perhitungan teknik, pemodelan menggunakan SolidWorks, dan evaluasi desain. Perancangan dilakukan dengan mempertimbangkan sistem *locating*, *clamping*, dan kestabilan benda kerja. Analisis pembebanan dilakukan berdasarkan massa komponen *grain housing* untuk menentukan distribusi beban dan luas penampang minimum pin berdasarkan tegangan geser yang diizinkan. Selanjutnya, analisis *Finite Element Analysis* (FEA) dilakukan untuk mengetahui tegangan *von Mises*, deformasi, dan *safety factor*.

Hasil penelitian berupa rancangan *welding fixture* untuk menahan dan memposisikan komponen *grain housing* selama proses pengelasan. Massa komponen sebesar 22,45 kg menghasilkan gaya berat sebesar 220,2345 N. Luas penampang aktual pin lebih besar dibandingkan luas penampang minimum yang diperlukan. Hasil FEA menunjukkan tegangan *von Mises* maksimum sebesar 43,594 MPa, deformasi maksimum sebesar 0,11286 mm, dan *safety factor* minimum sebesar 1,9773. Berdasarkan hasil tersebut, rancangan *welding fixture* memenuhi kriteria kekuatan terhadap beban kerja yang diberikan.

Kata Kunci: *welding fixture, grain housing, Finite Element Analysis*

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ABSTRACT

The welding process of grain housing components in combine harvesters requires accurate positioning and stability of the components during the process. Manual welding may cause positioning inaccuracies and inconsistent welding results. Therefore, a welding fixture is required to assist in maintaining the position and stability of the components during welding. This study aims to design a welding fixture for the welding process of grain housing components and analyze the ability of its components to withstand the applied working load.

The method consisted of problem identification, literature study, design concept development, engineering calculations, modeling using SolidWorks, and design evaluation. The welding fixture was designed by considering the locating, clamping, and workpiece stability systems. Load analysis was performed based on the mass of the grain housing component to determine load distribution and the minimum cross-sectional area of the pins based on the allowable shear stress. Furthermore, Finite Element Analysis (FEA) was conducted to determine the von Mises stress, deformation, and safety factor.

The results produced a welding fixture design for supporting and positioning the grain housing component during welding. The component mass of 22,45 kg resulted in a gravitational force of 220,2345 N. The actual cross-sectional area of the pins was greater than the required minimum area. The FEA results showed a maximum von Mises stress of 43,594 MPa, a maximum deformation of 0,11286 mm, and a minimum safety factor of 1,9773. Based on these results, the designed welding fixture meets the strength criteria under the applied working load.

Keywords: *welding fixture, grain housing, Finite Element Analysis*