International Journal of Advanced Engineering and Technology 2(1) (2026) 38-50

IJAETech

International Journal of Advanced Engineering and Technology

OPEN ACCESS

Journal homepage: https://ijaetech.org/index.php/ijaetech

Design and Weldment Static Simulation Analysis of a Peanut Threshing Machine Frame Using Solidworks

Aji Abdillah Kharisma[1], Sandy Suryady[2], Abdul Muchlis[3]
Mechanical Engineering, Gunadarma University, Indonesia
*Correspondence: E-mail: abdillah.kharisma@gmail.com

ABSTRACT

Peanut threshing is an important post-harvest process that affects work efficiency, processing time, and product quality, particularly for small-scale agricultural production. Manual threshing requires considerable labor and time, making the development of a mechanical peanut threshing machine necessary to support post-harvest mechanization. This study aims to design and analyze the frame of a peanut threshing machine using weldment static simulation in Solidworks. The frame was designed using a hollow square profile measuring 35 mm × 35 mm with a thickness of 2 mm. The analysis was conducted using a static simulation approach based on Finite Element Analysis to evaluate displacement, von Mises stress, and safety factor under a total component load of 210 N. In addition, the required number of E6013 electrodes for the Shielded Metal Arc Welding process was calculated. The simulation results showed that the maximum displacement was 0.0309 mm, while the maximum von Mises stress was 0.145 MPa. The safety factor result indicated that the frame design was structurally safe under the applied static load. The electrode requirement calculation showed that 17 E6013 electrode rods were needed for the welding process. These results indicate that the designed frame is feasible for fabrication and can support the main components of the peanut threshing machine with low deformation and stress. This study contributes to the development of a safer and more efficient peanut threshing machine frame for small-scale post-harvest mechanization.

ARTICLE INFO

Article History:
Submitted/Received 05 Jul 2026
First Revised 15 Jul 2026
Accepted 18 Jul 2026
Publication Date 20 Jul 2026

Keyword:
peanut threshing machine; frame design; weldment static simulation; Solidworks; finite element analysis; SMAW.

1. INTRODUCTION

Peanut (Arachis hypogaea L.) is one of the important agricultural commodities with considerable economic value, particularly as a food source, industrial raw material, animal feed component, and vegetable oil crop. In post-harvest handling, peanut processing requires proper treatment to maintain pod quality and reduce product losses. One of the critical post-harvest stages is threshing, which refers to the separation of peanut pods from the plant after harvesting. In many small-scale farming practices, this process is still performed manually, although manual threshing requires substantial labor, considerable processing time, and relatively low working capacity.

Based on the thesis used as the primary source of this study, manual peanut threshing has the advantage of maintaining pod quality because the pods are less likely to break. However, the method requires a large number of workers and a long processing time. The thesis states that manual peanut threshing requires approximately 41 man-days per hectare, with a working capacity of only about 2–4 kg of pods per hour per person. In addition, peanut threshing should be carried out immediately after harvesting, particularly when the pod moisture content is around 20–24%, in order to maintain the quality of the harvested product.

The limitations of manual threshing indicate the need for appropriate post-harvest mechanization technology. The development of peanut threshing machines is expected to improve work efficiency, reduce dependence on manual labor, shorten processing time, and support better post-harvest handling. Iqbal, Suhardi, and Nirisnawati (2018) explained that post-harvest losses are closely related to the performance of agricultural machinery, particularly in the threshing process. Their study also showed that machine rotation speed affects working capacity and product damage, meaning that machine design must consider not only productivity but also operational safety and product quality.

Previous research on peanut threshing machines has demonstrated that simple mechanical systems remain relevant for small-scale farmers and local agricultural processing. Ihsan et al. (2020) designed a semi-mechanical vertical peanut threshing machine and showed that machine development can support the improvement of post-harvest efficiency. However, the design of a threshing machine should not only focus on the threshing mechanism, but also on the structural strength of the frame. The frame is a major component that supports the motor, shaft, pulley, bearing, inlet, outlet, and other machine elements. Therefore, an inadequate frame design may lead to excessive deformation, component misalignment, vibration problems, or even structural failure during operation.

In machine design, the frame functions as the main supporting structure that carries the overall load of the machine components. A strong and stable frame is required to ensure that the machine operates safely and reliably. Faujiyah and Sidik (2020) emphasized that machine frame design must consider strength, rigidity, dimensional suitability, and the ability to support all working components. For this reason, structural analysis is an important stage before the fabrication process, especially for agricultural machines that operate under repeated loading and vibration conditions.

Welded joints also play an essential role in the strength and safety of machine frame structures. Shielded Metal Arc Welding (SMAW) is widely used in frame fabrication because it is simple, economical, flexible, and suitable for low-carbon steel construction. Nevertheless, the quality of welded joints is influenced by several factors, including electrode type, welding current, welding speed, weld bead size, and operator skill. Mohruni and Kembaren (2013) reported that variations in welding speed and current using E6013 electrodes affect hardness, tensile strength, and the microstructure of low-carbon steel. Similarly, Nugroho and Setiawan (2018) found that welding current variations influence the tensile strength and hardness of ASTM A36 carbon steel welded joints.

To improve the reliability of the design before fabrication, structural analysis can be performed using the finite element method through computer-aided engineering software. SOLIDWORKS Simulation is one of the tools commonly used to analyze stress, displacement, and safety factor in mechanical components and frame structures. This approach allows

DOI: https://doi.org/10.63956/ijaetech.v2i1.58
e-ISSN: 3089-767X; p-ISSN:3089-8439

designers to predict the structural response of a machine frame under specific loading conditions before the prototype is physically manufactured. Prasetiyo and Sekarjati (2022), for example, applied finite element simulation to analyze the frame of a power weeder machine by evaluating von Mises stress, deformation, and safety factor.

Based on these considerations, the present study focuses on the design and weldment static simulation analysis of a peanut threshing machine frame using SOLIDWORKS. The analysis is directed at evaluating the structural strength of the frame based on von Mises stress, displacement, and safety factor. In addition, this study also estimates the required amount of E6013 electrode for the SMAW process used in the frame fabrication. The results of this study are expected to contribute to the development of a safer, more efficient, and technically feasible peanut threshing machine frame, while also supporting the application of simulation-based design in small-scale agricultural machinery development.

2. METHODS

Research Design

This study employed an engineering design method and numerical simulation based on Finite Element Analysis using SOLIDWORKS software. The object analyzed in this study was the frame of a peanut threshing machine designed using a hollow square profile measuring 35 mm × 35 mm with a thickness of 2 mm. The analysis was conducted to evaluate the structural strength of the frame under the load of the main machine components, particularly based on von Mises stress, displacement, and safety factor parameters.

The research stages began with the preparation of hardware and software, identification of design requirements, frame modeling, material selection, application of welded joints or weld beads, determination of boundary conditions, load application, meshing process, static simulation, and analysis of simulation results. In addition to structural analysis, this study also calculated the required amount of E6013 electrodes used in the Shielded Metal Arc Welding (SMAW) process for manufacturing the peanut threshing machine frame.

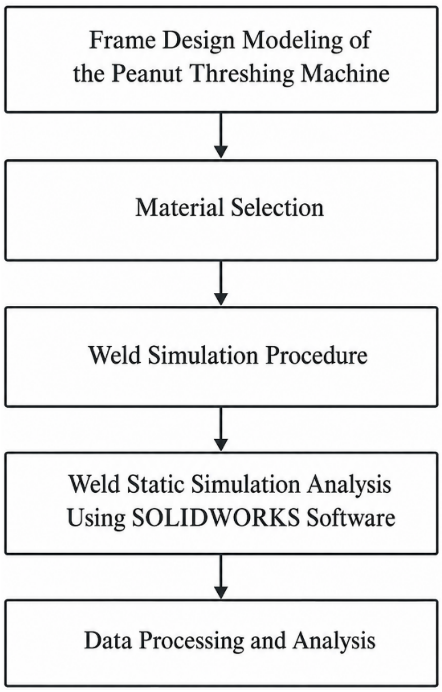

Figure 1. Research flowchart

DOI: https://doi.org/10.63956/ijaetech.v2i1.58
e-ISSN: 3089-767X; p-ISSN:3089-8439

Research Object and Material

The object of this research was the frame of a peanut threshing machine, which functions as the main supporting structure for all machine components. The frame was designed to support several main components, including the inlet, outlet, pulley, shaft, 17-inch spoked wheel rim, bushing, flange bearing, and AC motor. The total mass supported by the frame was 21,000 grams, equivalent to a load of 210 N.

The frame material used in this study was a square hollow steel profile measuring 35 mm × 35 mm with a thickness of 2 mm. During the simulation stage, the frame material was defined through the Edit Material feature in SOLIDWORKS based on the material properties available in the software database. Material selection was carried out to ensure that the frame had sufficient strength and stiffness to withstand the working load of the machine.

Figure 2. Hollow profile used as the frame material

Frame Model Design

The frame model was designed using SOLIDWORKS software. The initial design stage was carried out through the sketching process to create the basic frame geometry in two-dimensional and three-dimensional views. After the basic frame pattern was completed, a hollow profile measuring 35 mm × 35 mm × 2 mm was applied using the Structural Member feature in the Weldment menu. This feature was used so that the frame could be modeled as an interconnected structural member system.

The frame model was then completed with several supporting elements, such as gussets and weld beads. Gussets were used to reinforce the joints between frame members, while weld beads were used to model welded joints at the structural connection points. The weld bead size used in this design was 3 mm. The welded joints were designed using the SMAW method with E6013 electrodes.

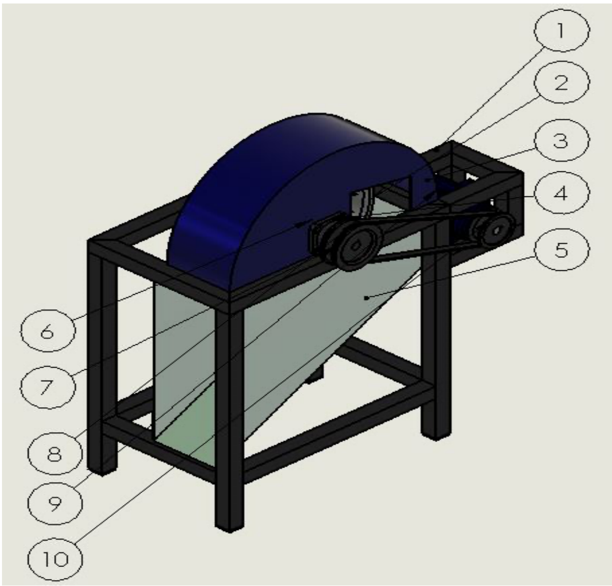

Figure 3. Design model of the peanut threshing machine

DOI: https://doi.org/10.63956/ijaetech.v2i1.58
e-ISSN: 3089-767X; p-ISSN:3089-8439

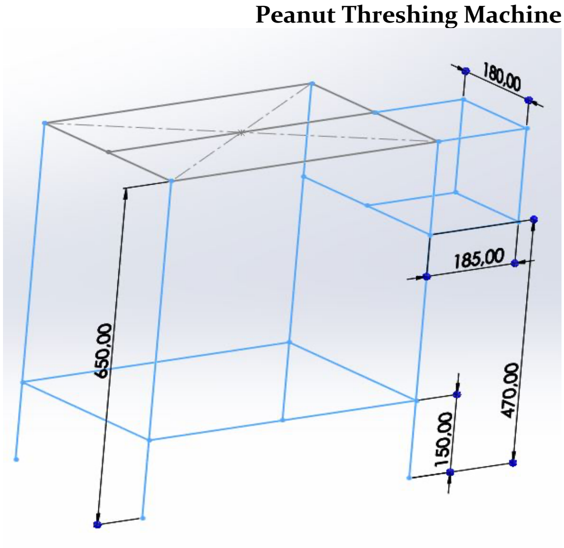

Figure 4. Three-dimensional design of the peanut threshing machine frame

Preparation of Static Simulation

The static simulation was performed using the Static Simulation feature in SOLIDWORKS. Before running the simulation, the frame model was first assigned a material according to the available material data. After that, a static analysis type was selected to determine the structural response of the frame under a stationary load.

The next stage was the determination of boundary conditions or fixture geometry. The parts of the frame assumed to function as fixed supports were selected at the lower frame or leg area. These boundary conditions were applied to represent the condition of the frame when supporting the machine components during operation. After the supports were defined, an external load was applied to the area of the frame that received the load from the machine components. The total load applied was 210 N, corresponding to the total component mass of 21 kg.

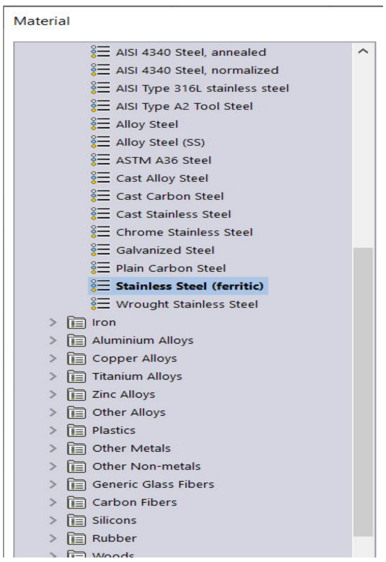

Figure 5. Frame material selection in SOLIDWORKS

Meshing Process and Running Simulation

After the material, supports, and loads were defined, the next stage was the meshing process. This process aimed to divide the frame model into smaller elements so that numerical calculations could be performed by the software. Mesh quality significantly affects the accuracy of simulation results because a better element division allows a more detailed observation of the structural response.

After the meshing process was completed, the simulation was executed using the Run This Study command. The simulation results were then analyzed based on three main parameters: displacement, von Mises stress, and safety factor. Displacement was used to determine the amount of structural deflection caused by the applied load. Von Mises stress was used to identify the maximum stress distribution on the frame, while the safety factor was used to evaluate the safety level of the design against possible structural failure.

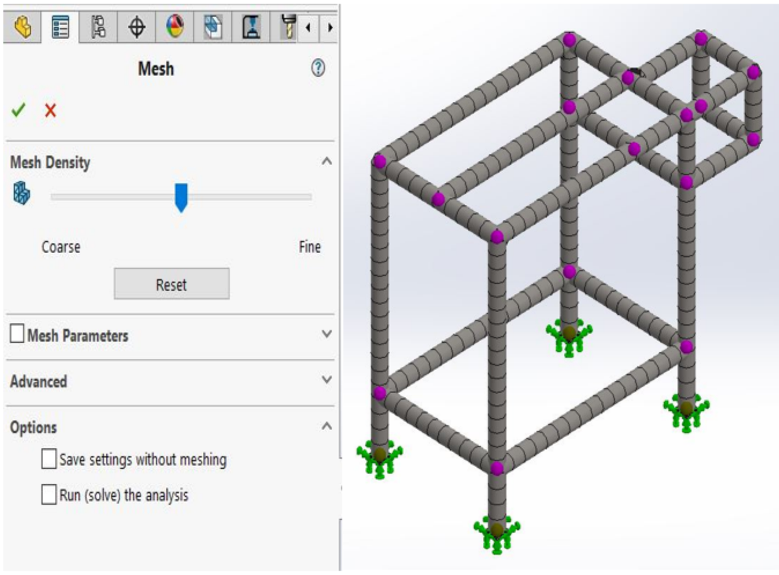

Figure 6. Meshing process on the frame model

Simulation Analysis Parameters

The main parameters analyzed in this study included displacement, von Mises stress, and safety factor. Displacement indicates the amount of deformation or deflection that occurs in the frame after receiving the applied load. A small displacement value indicates that the frame has good structural stiffness. Von Mises stress was used to evaluate the equivalent stress generated in the structure due to loading. This stress value was then compared with the material capacity to determine whether the design remained within a safe condition.

The safety factor was used as an indicator of structural feasibility. The higher the safety factor value, the greater the frame's ability to withstand the working load. By using these three parameters, the frame design could be evaluated comprehensively before proceeding to the fabrication stage. This approach helps reduce the risk of structural failure, minimize prototype manufacturing costs, and accelerate the development process of the peanut threshing machine.

Calculation of Electrode Requirements

In addition to the simulation analysis, this study also calculated the required amount of E6013 electrodes for the frame welding process. The calculation was conducted based on weld surface area, weld volume, total weld volume, weld metal weight, and deposition efficiency. The weld bead size used was 3 mm, while the welding process applied was SMAW.

The weld surface area was calculated using the triangular area approach because the weld cross-section was assumed to have a triangular shape. After the weld area was obtained, the weld volume was calculated by multiplying the weld cross-sectional area by the weld

DOI: https://doi.org/10.63956/ijaetech.v2i1.58
e-ISSN: 3089-767X; p-ISSN:3089-8439

length. The total weld volume was then used to determine the weld metal weight based on the material density. Finally, the electrode requirement was calculated by considering the deposition efficiency value of the E6013 electrode.

Table 1. Current specifications based on electrode type and diameter

Diameter		Electrode Type and Amperage Used					
mm	inch	Electrode Type					
		E 6010	E 6014	E 7018	E 7024	E 7027	E 7028
2.5	3/32	–	80–125	70–100	–	–	–
3.2	1/8	80–120	110–160	115–165	125–185	125–185	140–190
4	3/32	120–160	150–210	150–220	160–240	160–240	180–250
5	3/16	150–200	200–275	200–275	210–300	210–300	230–250
5.5	7/32	–	260–340	360–430	250–350	250–350	275–365
6.3	1/4	–	330–415	315–400	300–420	300–420	335–430
8	5/16	–	90–500	375–470	–	–	–

Table 2. Welding process deposition efficiency

Welding Process	% Deposition Efficiency
SAW	99%
GMAW (98% Ar, 2% O2)	98%
GMAW (75% Ar, 25% CO2)	96%
GMAW (99.99% CO2)	93%
Metal Core Wire	93%
FCAW (Gas-Shielded)	86%
FCAW (Self-Shielded)	78%
SMAW (Length 300 mm)	59%
SMAW (Length 350 mm)	62%
SMAW (Length 450 mm)	66%

Note:
For the SMAW process, the discarded electrode remainder is 5 cm per rod.

3. RESULTS

Loading Results of Components on the Frame

Static analysis of the peanut threshing machine frame was carried out by first determining the total mass of the components supported by the frame. The components that load the frame consist of the inlet, outlet, big pulley, shaft, 17-inch spoked wheel rim, bushing, flange bearing, small pulley, and AC motor. Based on the design data, the total mass of all components is 21,000 grams, equivalent to 21 kg. This load was then converted into a force of 210 N to be used as the applied load in the static simulation process using SOLIDWORKS.

Table 3. Mass of peanut threshing machine components

Component	Description	Mass (Grams)
inlet	1060 alloy	7875
outlet	1060 alloy	907,28
Big pulley	Gray cast iron	2248,32

DOI: https://doi.org/10.63956/ijaetech.v2i1.58
e-ISSN: 3089-767X; p-ISSN:3089-8439

Component	Description	Mass (Grams)
poros	Ductile iron	615,83
Velg jari-jari ring 17 inch	7050-T73510	1459,55
Bushing	Alumunium bronze	105
Flange bearing	Gray cast iron	810,1
Small pulley	Gray cast iron	1141
Motor AC	Gray cast iron	5838
		Total: 21000

The largest load comes from the inlet component with a mass of 7,875 grams, followed by the AC motor with a mass of 5,838 grams, and the big pulley with a mass of 2,248.32 grams. These three components are important parts that influence load distribution on the frame. Therefore, the placement of components on the frame must be carefully considered to prevent excessive load concentration at a particular point.

Displacement Results on the Frame

The simulation results show that the maximum displacement value on the peanut threshing machine frame is 0.0309 mm, while the minimum displacement is 1.00×10^{-30} mm. The maximum displacement occurs in the frame section that directly receives the load from the machine components, particularly in the main component mounting area. Meanwhile, the minimum displacement occurs at the frame legs, which function as fixed supports.

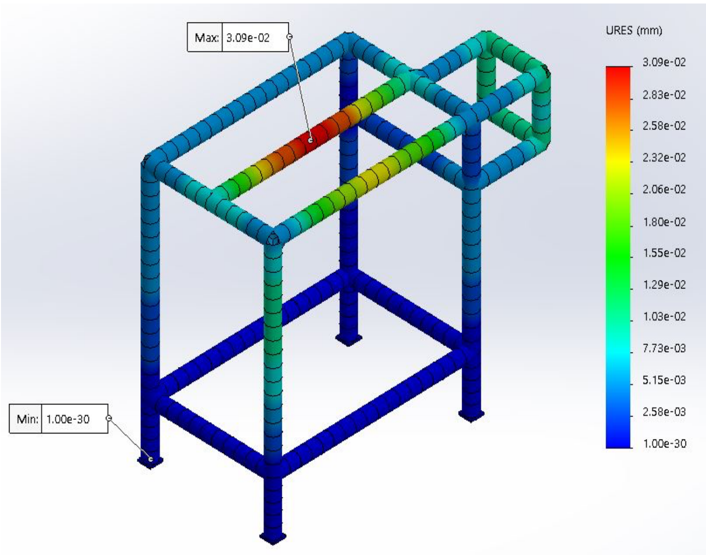

Figure 7. Total displacement results on the frame

The displacement value of 0.0309 mm indicates that the deformation occurring in the frame is relatively very small. This indicates that the frame structure has good stiffness in receiving a static load of 210 N. The small deformation also shows that the frame design does not experience significant shape changes when supporting the load of the peanut threshing machine components.

Von Mises Stress Results on the Frame

DOI: https://doi.org/10.63956/ijaetech.v2i1.58
e-ISSN: 3089-767X; p-ISSN:3089-8439

The stress simulation results show that the maximum stress value, or equivalent von Mises stress, occurring on the frame is 0.145 MPa. The maximum stress is concentrated in the supporting section of the main components of the peanut threshing machine. This area receives a greater load than other parts because it functions as the support point for several working components of the machine.

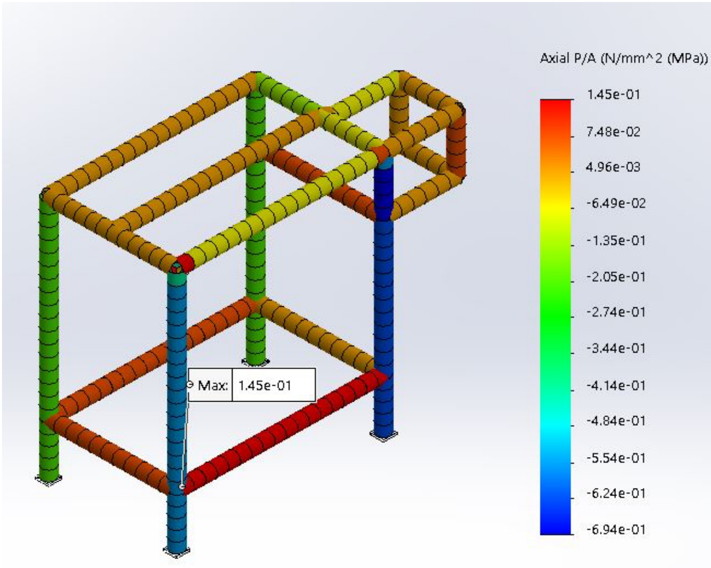

Figure 8. Von Mises stress results on the frame

In addition to the simulation results, manual stress calculation was also performed, resulting in a value of 0.09375 MPa. The difference between the simulation result and the manual calculation is still acceptable because the simulation considers geometric distribution, supports, loading, and model characteristics in greater detail. Meanwhile, manual calculation generally uses a simplified approach based on cross-sectional area and the applied load.

Safety Factor Results

The safety factor is used to determine the safety level of the structure against possible failure due to the working load. Based on the final analysis results in the manuscript, the minimum safety factor value is stated as 10. This value indicates that the frame has a high safety level against the applied static load. The greater the safety factor, the greater the ability of the structure to withstand the load before reaching a critical or failure condition.

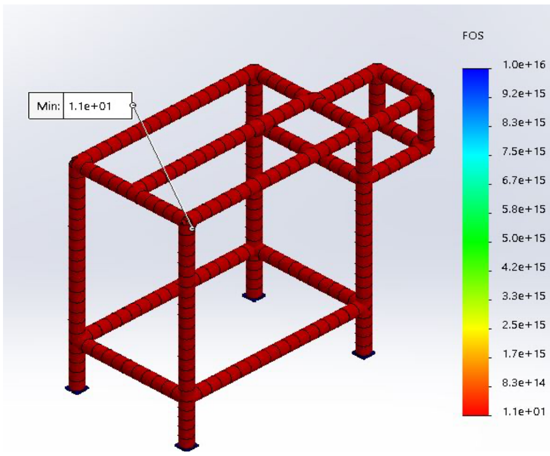

Figure 9. Safety factor results on the frame

DOI: https://doi.org/10.63956/ijaetech.v2i1.58
e-ISSN: 3089-767X; p-ISSN:3089-8439

With this safety factor value, the peanut threshing machine frame can be categorized as safe for use under static loading conditions. This result also supports the displacement and von Mises stress findings, which show that the frame does not experience excessive deformation or stress.

Results of Electrode Requirement Calculation

The electrode requirement calculation was conducted to determine the number of E6013 electrodes needed for the welding process of the peanut threshing machine frame. The welding process used was SMAW with a weld bead size of 3 mm. Based on the calculation, the weld surface area was 4.5 mm². The weld volume for a welding length of 119.5 mm was 537.75 mm³, equivalent to 53.77 cm³. Furthermore, the total weld volume for four joints was 2,151 mm³, equivalent to 215.1 cm³.

The required weld metal weight was obtained by multiplying the total weld volume by the density of structural steel, which is 7.85 g/cm³. The calculation result shows that the weld metal weight is 1,688.5 grams or 1.685 kg. With the deposition efficiency value of the E6013 electrode at 62%, the required welding rod weight is 368 grams. If 1 kg of E6013 electrodes contains 46 electrode rods, then the weight of one electrode is 21.7 grams. Based on this calculation, the number of electrodes required is 16.96 rods, which is rounded up to 17 E6013 electrode rods.

Table 6. Recapitulation of E6013 electrode requirement calculation results

Parameter	Value
Weld bead size	3 mm
Weld surface area	4.5 mm²
Weld volume	537.75 mm³ / 53.77 cm³
Total weld volume	2,151 mm³ / 215.1 cm³
Weld metal weight	1,688.5 grams / 1.685 kg
Deposition efficiency	62%
Required welding rod weight	368 grams
Weight of one E6013 electrode	21.7 grams
Number of electrodes	17 rods

4. DISCUSSION

The static analysis results show that the peanut threshing machine frame has a good structural response to the component load of 210 N. The maximum displacement value of 0.0309 mm indicates that the deformation occurring in the frame is very small. This condition shows that the 35 mm × 35 mm × 2 mm hollow profile used in the design is able to provide adequate structural stiffness. Low deformation is essential because the frame functions as the main support for the machine components. If the deformation is too large, the positions of components such as the shaft, pulley, bearing, and motor may shift, potentially causing misalignment or disruption in the transmission system.

DOI: https://doi.org/10.63956/ijaetech.v2i1.58
e-ISSN: 3089-767X; p-ISSN:3089-8439

The greater displacement distribution in the component mounting area indicates that this section is a critical area that directly receives the applied load. This is reasonable because several main components of the machine are placed on the upper or middle part of the frame. Meanwhile, the frame legs show minimum displacement because they function as fixed supports. Based on these results, the frame design can be considered to have good stability under static loading conditions.

From the stress aspect, the simulation results show that the maximum von Mises stress is 0.145 MPa. This value is relatively low for a metal frame structure, indicating that the applied load has not caused critical stress in the material. The maximum stress is concentrated in the supporting area of the main components. This area requires attention during the fabrication process because it is the section that receives the highest load. Therefore, the quality of welded joints in the supporting area must be maintained to prevent welding defects such as porosity, cracks, slag inclusion, or undercut.

The comparison between the simulation results and manual calculation shows a difference in stress values. The simulation result shows a maximum stress of 0.145 MPa, while the manual calculation produces a value of 0.09375 MPa. This difference may occur because the manual calculation uses a simplified approach, whereas the SOLIDWORKS simulation considers structural geometry, support positions, loading areas, and stress distribution throughout the entire model. Therefore, the simulation results provide a more detailed representation of stress distribution than the manual calculation.

The minimum safety factor used in this discussion is 10, in accordance with the value stated in the abstract and conclusion of the thesis. This value indicates that the frame design is in a safe category under the analyzed static load. A high safety factor shows that the working stress is far below the material strength limit. This supports the displacement and von Mises stress results, both of which indicate that the frame design does not experience excessive deformation or stress.

However, a safety factor that is too high can also be used as a design evaluation consideration. In engineering design, a high safety factor does indicate structural safety, but it may also indicate that the design still has potential for optimization in terms of material weight, production cost, and material efficiency. Therefore, for future development, optimization of the frame profile dimensions or the selection of alternative materials can be carried out so that the design remains safe while becoming more economical and lightweight.

In terms of welding, the calculation results show that 17 E6013 electrode rods are required to manufacture the frame. This number was obtained from the calculation of weld surface area, weld volume, weld metal weight, deposition efficiency, and electrode weight per rod. This result is important because it can be used as an initial reference in the frame fabrication process. Estimating electrode requirements helps designers determine welding material needs more efficiently and reduces the risk of material shortages during manufacturing.

The use of E6013 electrodes in the SMAW process is considered suitable for the frame construction of the peanut threshing machine because this electrode is commonly used for low-carbon steel welding and light structural applications. However, successful welding is not only determined by the number of electrodes, but also by process parameters such as welding current, welding speed, welding position, material surface cleanliness, and operator skill. Therefore, the fabrication process must follow proper welding procedures to ensure that the resulting joints have good quality and are able to maintain the structural strength of the frame.

DOI: https://doi.org/10.63956/ijaetech.v2i1.58
e-ISSN: 3089-767X; p-ISSN:3089-8439

Overall, the research results show that the peanut threshing machine frame design analyzed using SOLIDWORKS is feasible based on displacement, von Mises stress, and safety factor parameters. The frame is able to support the main component load with very small deformation and low stress. In addition, the electrode requirement calculation provides an overview of the welding material required during the fabrication stage. Therefore, this design can serve as a basis for developing a peanut threshing machine that is more efficient, safe, and suitable for small-scale post-harvest mechanization needs.

5. CONCLUSION

This study concludes that the design of the peanut threshing machine frame analyzed using SOLIDWORKS through static simulation is structurally feasible and safe under the applied component load. The frame was designed using a hollow profile measuring 35 mm × 35 mm × 2 mm and was subjected to a total load of 210 N from the main machine components. The simulation results showed a maximum displacement of 0.0309 mm and a maximum von Mises stress of 0.145 MPa, indicating that the frame experienced very small deformation and low stress under static loading conditions.

The safety factor result indicates that the frame design has a high level of structural safety. This finding shows that the selected frame geometry and material are capable of supporting the main components of the peanut threshing machine without excessive deformation or critical stress concentration. In addition, the comparison between simulation and manual calculation confirms that the simulation provides a more detailed representation of stress distribution, especially because it considers the geometry, support conditions, and loading areas of the overall frame structure.

The electrode requirement calculation showed that 17 E6013 electrode rods are required for the SMAW welding process of the frame. This result provides a practical reference for the fabrication stage, particularly in estimating welding material needs. Overall, this study contributes to the development of a safer and more efficient peanut threshing machine frame for small-scale post-harvest mechanization. Future research is recommended to include dynamic loading analysis, vibration testing, experimental validation, and design optimization to reduce material weight and production cost while maintaining structural safety.

6. REFERENCES

Faujiyah, F., & Sidik, N. (2020). Perancangan rangka mesin pencacah cipuk (aci kerupuk). *Jurnal TEDC, 14*(1), 29–34.

Ficki, M. A., Kardiman, K., & Fauji, N. (2022). Simulasi beban rangka pada mesin penggiling sekam padi menggunakan perangkat lunak. *Rotor, 15*(2), 44–52. https://doi.org/10.19184/rotor.v15i2.32447

Furqani, I., Arief, R. K., & Muchlisinalahuddin, M. (2022). Analisis kekuatan rangka mesin perontok padi menggunakan SolidWorks 2019. *Jurnal Engine: Energi, Manufaktur, dan Material, 6*(2), 42–49. https://doi.org/10.30588/jeemm.v6i2.1201

Hadiyyatullah, M. N., Mufarida, N. A., & Kosjoko, K. (2026). Analisis pengaruh variasi arus pengelasan dan pola gerakan elektroda terhadap kekuatan tarik sambungan las SMAW pada baja ST-37. *Jurnal Ilmiah Teknik Mesin, Elektro dan Komputer, 6*(1), 186–201. https://doi.org/10.51903/juritek.v6i1.6996

Ihsan, A. M., Ariyandi, Z., Wisaputra, S., Zulnadi, Z., Amrizal, A., Herdian, F., Nurtam, M. R., Batubara, F. Y., & Defrian, A. (2020). Rancang bangun alat perontok kacang tanah

(*Arachis hypogaea* L.) semi mekanis tipe vertikal. *Agroteknika, 3*(1), 55–66. https://doi.org/10.32530/agroteknika.v3i1.61

Iqbal, I., Suhardi, S., & Nirisnawati, S. A. (2018). Uji unjuk kerja alat dan mesin perontok multiguna. *Jurnal Ilmiah Rekayasa Pertanian dan Biosistem, 6*(1), 12–16. https://doi.org/10.29303/jrpb.v6i1.73

Kharisma, A. A., & Marsaoly, M. E. (2021). Analisis kegagalan pada rangka mesin perontok padi kapasitas 1 ton/jam menggunakan metode Von Misses. *Jurnal Rekayasa Mesin, 20*(2), 13–18. https://doi.org/10.36706/jrm.v20i2.64

Manurung, R. D. N., Budiarto, U., & Yudo, H. (2021). Analisa kekuatan tarik dan impak hasil las SMAW (*Shielded Metal Arc Welding*) pada baja ASTM A36 dengan variasi polaritas dan besar arus pengelasan. *Jurnal Teknik Perkapalan, 9*(4). https://ejournal3.undip.ac.id/index.php/naval/article/view/31514

Nugroho, E. A. (2023). Desain dan analisis rangka mesin pencacah limbah plastik menggunakan software SolidWorks. *Jurnal Ilmiah Multidisiplin, 2*(2), 119–124. https://doi.org/10.56127/jukim.v2i02.860

Pamungkas, D., Hastuti, S., & Taufik, I. (2024). Strength analysis of SMAW welding butt joint on ST-37 material with variation of electrode and welding speed. *Elemen: Jurnal Teknik Mesin, 11*(1), 29–35. https://doi.org/10.34128/je.v11i1.277

Prasetiyo, A. B., & Sekarjati, K. A. (2022). Finite element simulation of power weeder machine frame. *Indonesian Journal of Computing, Engineering, and Design (IJoCED), 4*(2), 25–34. https://doi.org/10.35806/ijoced.v4i2.291

Rohman, F., Mardiyana, D., Ridha, F., & Damodar, S. K. (2023). Structural analysis of waste separation machine frame using FEA method. *International Journal Engineering and Applied Technology (IJEAT), 6*(1), 10–17. https://doi.org/10.52005/ijeat.v6i1.80

Soolany, C., Abdillah, Y. I., & Suwarto, S. (2025). Analisis kekuatan rangka mesin pengupas kulit ari kacang tanah tipe roller tunggal dengan evaluasi material berstandar food grade menggunakan simulasi SolidWorks. *Majalah Ilmiah Momentum, 21*(1), 16–20. https://doi.org/10.36499/jim.v21i1.12199

Suryady, S., & Nugroho, E. A. (2022). Simulasi faktor keamanan dan pembebanan statik rangka pada turbin angin Savonius. *Jurnal Ilmiah Multidisiplin, 1*(2), 42–48. https://doi.org/10.56127/jukim.v1i2.94

Suryady, S., & Sapto, A. D. (2023). Proses rancangan rangka oven batu bara pada PT. X. *Jurnal Ilmiah Teknik, 2*(2), 97–106. https://doi.org/10.56127/juit.v2i2.788