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Analysis of Pauss 7 Hp Diesel Fuel Motor Frame for Engine Performance Practicum Material Using Solidwork 2019

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Abstrac

In this final project, the author will carry out the design of engine performance practical testing equipment using a 7 hp Pauss-type diesel motor. In designing this tool, it is first necessary to make a design in order to know how high the strength of the frame can withstand at the loading point, namely the weight of the fixed load; of course, it is necessary to design the frame, make tools, and make tests and measurements.Testing the strength of the frame on the diesel motor engine frame. The next step is working on the design with the planned shape. Based on the results of the simulation of engine performance equipment using calculations in the SolidWorks application, the desired results were received in accordance with the values, stresses, displacements, and safety factors. This study was able to develop a frame for an engine power test device with a diesel engine and was successfully implemented as a study used in engine power practice. The analysis obtained is as follows: Stress with a yield strength value of $2.22x10^{2}$ N/m, a displacement value of $6.711x10^{-2}$ mm so that it is obtained from the simulation results, the frame can accept the load, and factor safety gets a safety value of 45, so it can be said that this frame design is suitable for use.

Keywords: Engine performance test equipment, SolidWorks simulation, optimal design, frame strength

INTRODUCTION

At present, diesel engine cars, especially those with good development. Diesel engine O-Bike consumption is more economical than gasoline engines, so the use of diesel engines is currently also increasing [1]. Internal combustion engine is a kind of propulsion engine widely used all over the world. Especially for transportation vehicles. When the energy changes, the combustion/chemical reaction changes to increase the pressure. The increase in pressure is used to move the piston, which turns into mechanical energy [2].

Meanwhile, disc brake systems in automobiles have become a popular choice because disc brakes have more flexible performance in terms of performance transmission placement compared to other brakes [3]. However, the impact of load on diesel engine power with a disc brake system on a motorcycle requires more research. A. The first test was conducted by Mangad with the title "Design of Prony Brake Dynamometer for Wireless Measurement of Motor Power. The results used in this study are intended to measure the rotational speed code used. Data collection is controlled by a microcontroller, which also performs data processing and transmission. This test showed that the accuracy of the load measurement reached 98.1% and the accuracy of the speed measurement was up to 99.9%. The maximum distance for wireless data transmission is 16 m [4]. The second study of Buda Setiadi with the title Design of Prony Brake Model Dynamometer for Electric Motor Test Equipment from the study, we received the design and implementation of the prony brake from the motorcycle blade with more load safety and safety in the working temperature of the motor. [5]

In this final project, the authors designed a 7 HP diesel fuel motor engine performance test equipment design and rotation on the shaft that can be used with energy [6].

Torque by means of connecting the disc brake (disc brake) pressed by a lever box. The specified load creates another torque. The test was carried out with the installation of a 7-PS diesel engine, and then tests were carried out with the strength of the frame.

The researcher's goal is to determine the performance of the motor frame using the motor introduced by diesel using SolidWorks software calculations to achieve the right results and values, tension, shift, and safety. Factors have achieved the framework.

RESEARCH METHOD

The use of scientific methods is the FEA (Finite Element Analysis) method. The method in analyzing the strength of the diesel motor engine frame for this engine performance practicum material aims to determine the stress, displacement, and safety factor on the engine frame. This process is carried out from literature studies by determining the source of related problems in the field, followed by designing this engine frame. This research uses ASTM A36 steel frame material, in designing a structure, it must be in accordance with the durability of the material that can withstand the work of the machine. In addition, the strength of the frame can be used as a comparison. Using ASTM A36 steel, because it is structural steel and has ductile, vibration-resistant, tough properties. The stages of this research can be seen in **Fig. 1.** Meanwhile, the diesel testing scheme can be seen in **Fig. 2**.

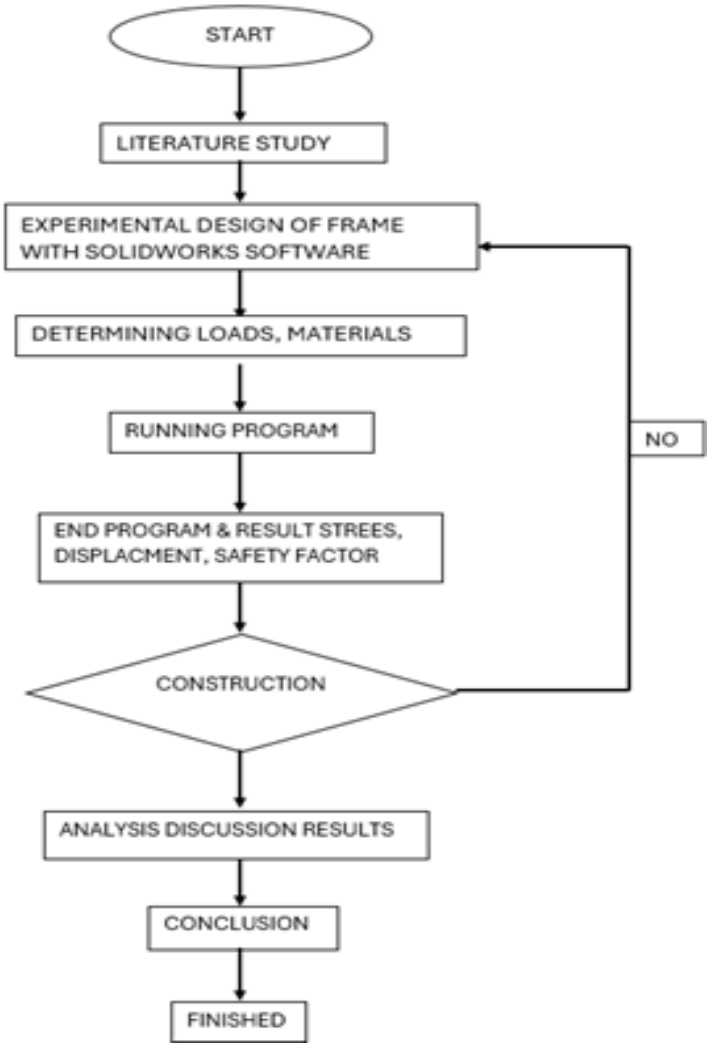

Fig. 1. Chart Research Method

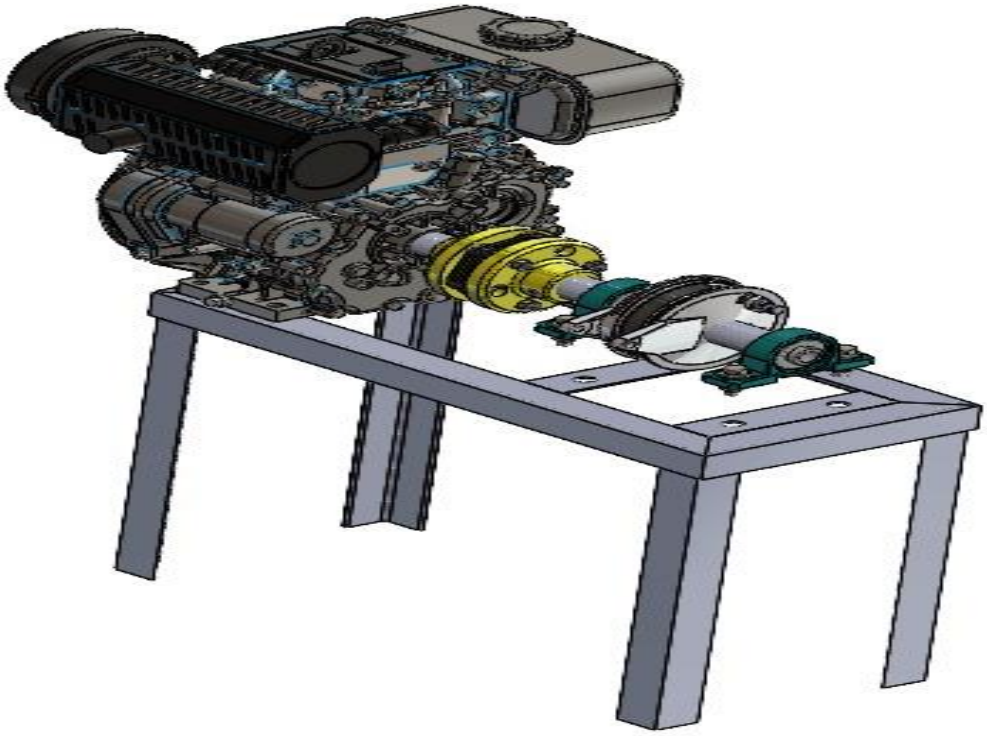

Fig. 2. Diesel fuel motor frame engine performance practicum material

Table 1. Research tools used

Tools	Usage	Accuracy
Vernier caliper	To measure the frame diameter	0,02 mm
Welding Machine	To connect the parts to the frame	-
Laptop	To perform simulations on the frame	-

Steps for testing:

1. Create a 3D drawing of the machine frame in solidwarok software.
2. Entering material data in solidwork in the form of ASTM 36.
3. Perform Fixture.
4. Determining the External load.
5. Performing Mesh.
6. Run the static simulation process.

RESULTS AND DISCUSSION

In this chapter, we will analyze the diesel motor frame for engine performance practicum materials. The process uses the solidwork simulation method in order to know how much strength the frame has been designed.

1. MACHINE DESIGN SPECIFICATIONS

The dimensional data in the design is as follows **Tabel 2.**

Table 2 specifications

Specifications	
Frame lenght	645 mm
Frame width	280 mm
Frame height	520 mm
Angle steel profile	30 x 30 x 30 mm
Frame material	ASTM A 36 steel L profile

1. STRESS ANALYSIS

The simulation results used involve static analysis in SolidWorks, which is useful for evaluating the structural response of the frame created in SolidWorks when subjected to static loads. Static analysis is an important process in design to ensure that the designed frame or component functions safely and properly under the pressure of the applied load. [7]

2. DISPLACEMENT

Displacement is performed to understand the movement or deformation of the frame under applied stress. This analysis is important to ensure that the deformations remain within the specified limits and do not cause functional issues in the design. [8]

3. SAFETY OF FACTOR

This safety factor analysis is used to see the feasibility of the frame against the engine design. This analysis is to determine whether the frame is resistant to engine vibration [9],[10].

4. DISCUSSION

The frame design can be seen in **Fig. 3.**

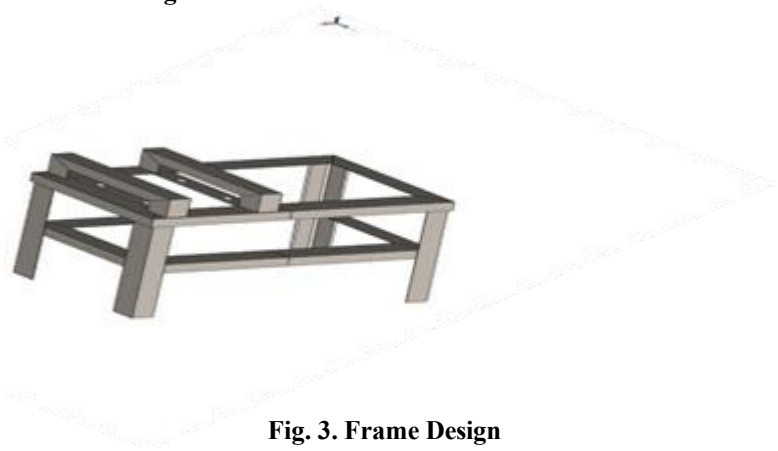

Fig. 3. Frame Design

Based on the results of the analysis carried out in SolidWorks software, three simulation results were obtained. The following are the results of the machine frame stress analysis using SolidWorks 2019 software. The stress analysis is the stress of the frame; the maximum stress analysis value is equivalent to the yield strength of the material. If the value exceeds the yield strength, the frame design is declared unfit for use.

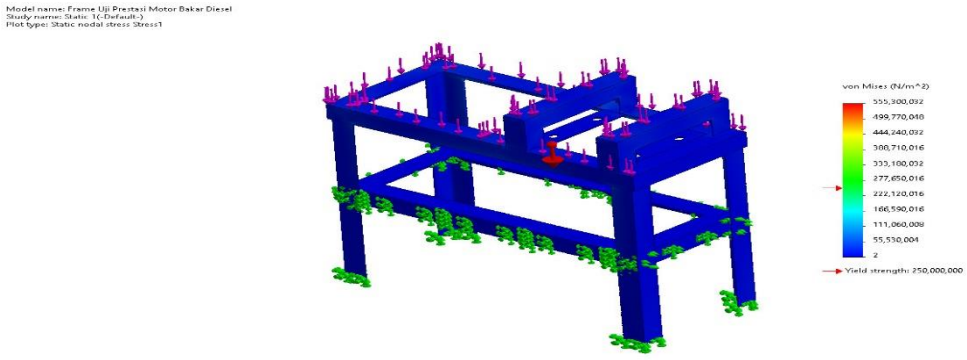

Fig. 4. Stress Analysis ASTM A36

Fig. 4. The results of the stress analysis simulation using ASTM A36 L profile steel material show that the machine frame is able to withstand a material load of 25 kg because the results of the simulation do not exceed the yield strength value with the highest value of $2.22x10^2$ N/m²; it can be concluded that the machine frame is safe to use.

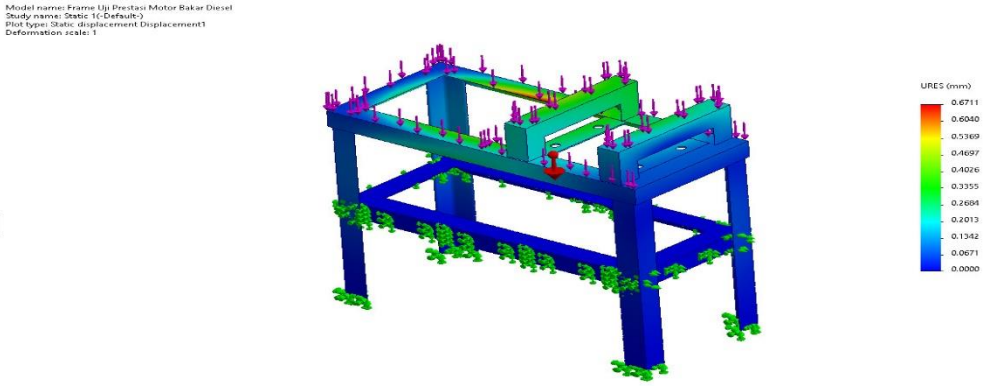

Fig. 5. Displacements

Fig. 5. A36 material above, it shows the safe displacement value due to the maximum number of $6.711x10^{-2}$ mm. This analysis explains that the maximum displacement can be seen in the red section while the minimum displacement can be seen in the blue section. The safety factor is a factor used to determine the safety level of a frame, and the level of safety value starts from 2-stroke. The safety factor must pass the value of 2; then the frame can be said to be safe.

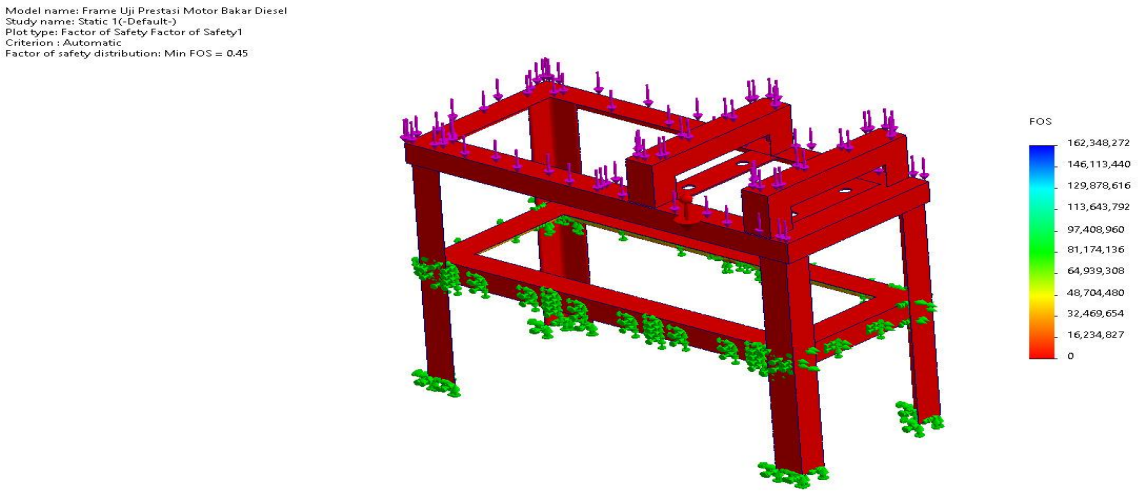

Fig. 6. Factor safety

Fig. 6. In the simulation results, the safety factor obtained a value of 45, which means that the design of the diesel motor frame for engine performance practicum materials using ASTM A36 steel is safe to use.

CONCLUSIONS

The results of the simulation of the strength of the diesel motor frame for engine performance practicum materials using ASTM A36 material using SolidWorks software obtained the following results:

The diesel motor frame for engine performance practicum materials is designed and analyzed using SolidWorks software, with the results obtained that this engine frame is safe to use. Stress analysis on the frame obtained results that indicate that the frame using ASTM A36 material is safe to use, with a yield strength value of $2.22x10^{2}$ N/m. Displacement on the diesel motor frame for engine performance practicum materials shows satisfactory results; it can be concluded that the maximum stress on the frame using ASTM A36 material is $6.711x10^{-2}$ mm so that it is obtained from the simulation results the frame can accept the load. Factor Safety on the diesel motor frame for engine performance practicum materials using ASTM A36 steel gets a safety value of 45, so it can be said that this frame design is feasible to use.

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