Static Loading Analysis on Universal Joint Using Solidworks

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Abstract. This static loading analysis introduction training aims to analyze parts universal joints to the tensile test as an effort to accelerate the improvement of vocational teachers' abilities. In the introduction to analysis training this time using software CAD/CAM ie solidworks which is one software CAD/ CAM which is widely used in the manufacturing industry in terms of designing or analyzing a product design. The training method is carried out by first installing solidworks software to computer equipment, secondly making parts from universal joints, third assembling from parts that have been made, fourth doing drawing 2D from part and assembly that have been made, the five static loading analyzes of universal joint parts with tensile test. Election software this is based on its advantages such as easy to learn, widely used in industry, and can be used as a reference for studying software another. As a result of this training, it is hoped that the teachers of SMK Turen Malang will be able to make part3D models and 2D working drawings.

Keywords: Analysis, Universal Joints, Teacher, Solidworks

1. Introduction

The learning process in SMK directs students to have skills and insights about the business world or the industrial world. Focusing on one of the learnings in SMK, namely-based learning Computer Aided Design (CAD) in the subject of Manufacturing Drawing Engineering in the mechanical engineering expertise program, machining engineering expertise package, the ongoing learning has not yet led students to enter the world of work. [1]

The software used as a tool for technical drawing and analysis is SOLIDWORKS, a 3D Mechanical CAD Program developed by Dassault Systèmes SOLIDWORKS Corp. This software offers 3D tools that can create, simulate, publish, and organize data. Solidworks is one of the most widely used CAD applications in the manufacturing and automotive industries in terms of product design. Solidworks provides a complete 3D solution that can translate ideas into reality, push design boundaries, and achieve desired goals. [2]

A universal joint is a joint or coupling in a rigid rod that allows the rod to bend in any direction and is usually used as part of a shaft that transmits rotary motion.[3] Set at 900 each other, connected by cross shafts. Universal joints are suitable for transmitting torque and rotational motion starting with one shaft then to the next when the axes are tilted to each other by several angles which may continuously differ under working conditions. [4]

Universal joints differ in their material composition, hub type and application. Steel is the most commonly used material, either in the form of stainless or alloyed with other metals to handle greater

torques and temperatures. Plastics and thermoplastics are often used as part of developing universal joints, as these provide corrosion resistance and do not conduct electricity. [5]

2. Methodology

The method used in community service activities carried out at SMK Turen Malang, East Java, is soidworks software training for teachers and provides an understanding of the tools and features in Solidworks [6] The benefits of this training are to accelerate the improvement of the competence of regional vocational high school teachers who are still lacking in opportunities and to get skill upgrades.

Tabel 1 Part Universal Joint

Part	Amount
Yoke	2
Bushing	4
Swivel	1
Pin	4

Community service activities begin with the installation of Solidworks and then continue with an explanation of the material modules in the form of module presentations that include:
1. Explain about makinguniversal joint parts.
2. Explain about the assembly of the parts that have been made.
3. Explaining about drawing, namely making 2-dimensional drawings or technical drawings
4. Explain about the introduction of static loading analysis simulation [7]

3. Result and Discussion

After making each part, the assembly process of the yoke, bushing, swivel, and pin can be seen in Figure 1.
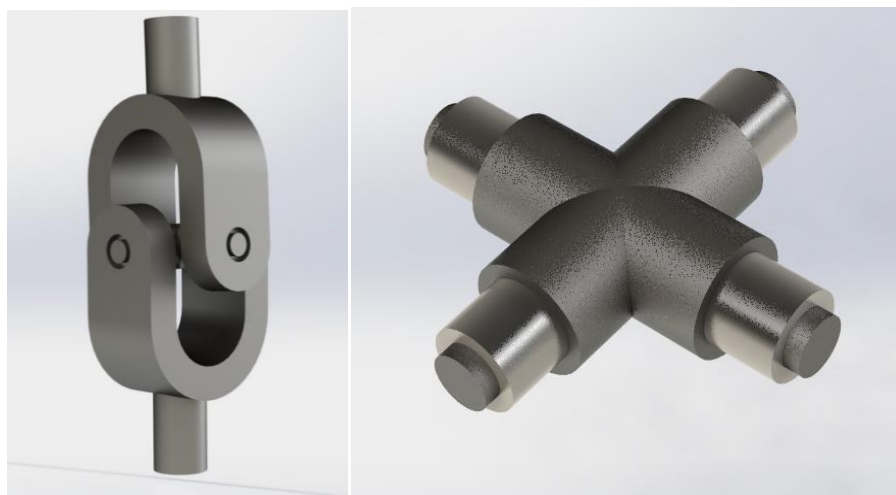

Figure 1 Universal Joint Assembly and Assembly Bushing, Swivel

Then after the assembly is done, the simulation process of static loading analysis is carried out. The material used in the universal connection is Alloy Stainless Steel with a value of Yield Strength 6,204. The test carried out is a tensile test with a stress of 12 N, the stress value is obtained (stress) the largest

is 9.779 N/m^2 which is located in the middle of the swivel. Meanwhile, the smallest stress value is 3.045 N/m^2 which is located in the yoke.[8]
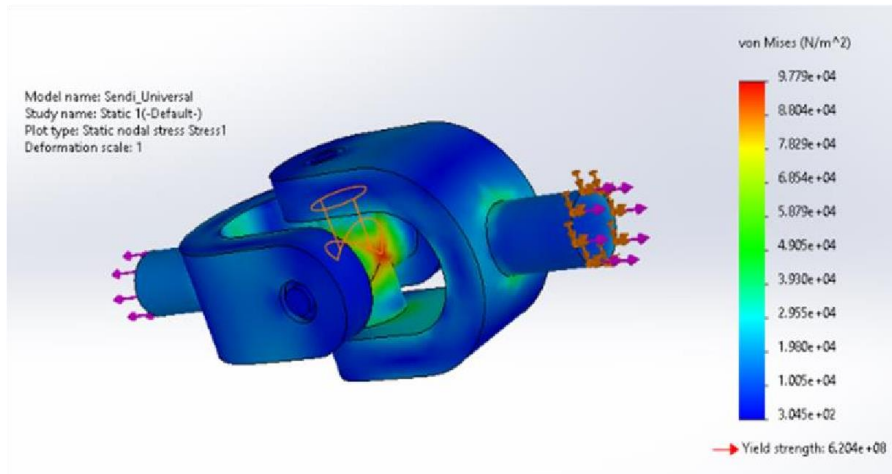
Figure 2 Universal Joint Stress Static Analysis
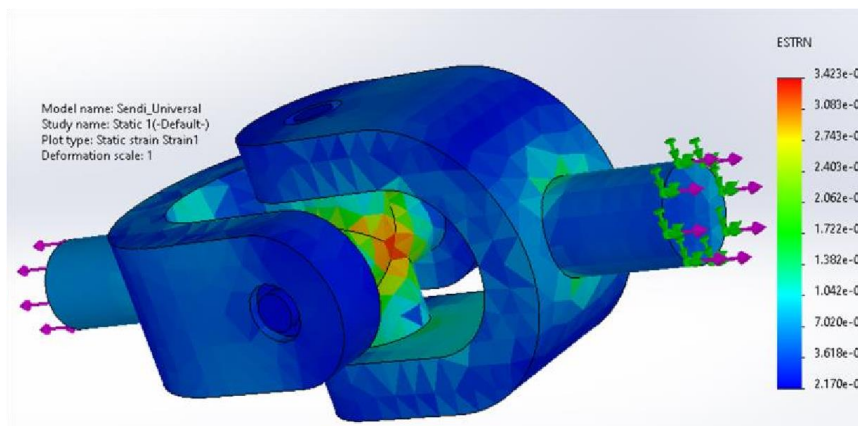
Figure 3 Universal Joint Strain Static Analysis

While the tensile test of the material is carried out by testing the strain of 12 N. The largest strain value is 3.423 N/m2which is located in the middle swivel. Meanwhile, the smallest strain value is 2.170 N/m2which is located in the yoke.[9]

Table 2 Universal Joint Tensile Test Analysis Results

Tensile Test	Force	Stress	Strain
Maximum Value	12 N	9.779 N/m^2	3.423 N/m^2
Minimum Value	12 N	3.045 N/m^2	2.170 N/m^2

The material used is Alloy Stainless Steel because it has the ability not to rust or corrode easily. The main alloying elements used in stainless steel are nickel and chromium. In addition, Alloy Stainless

Steel material is suitable for use if it is to withstand a very large force from the operation of the engine or vehicle propulsion system.[10]

4. Conclusion

It can be concluded that the Solidworks training for teachers of SMK Turen Malang, East Java, which was held by a service team from the "Veteran" National Development University in East Java, was a training that was able to hone the hard skills of SMK teachers. It is hoped that these SMK teachers will be able to analyze parts of the Solidworks software. During the training, the enthusiasm of the teachers was quite high, especially since they were still new to the Solidworks application. The teachers are pretty good in terms of their ability to create design drawings because before using Solidworks the teachers had already used the Autodesk Inventor software. And there needs to be a follow-up to this training, for example for other certified application programs.

5. References

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