

*Analysis of Welding Groove Variations on Microstructure and Hardness of SMAW  
(Shield Metal Arc Welding) Welding on SS 400 Steel Plate*

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**Didik Rizki Hidayaturrohman**

*Automotive Machinery Study Program, Engineering Department  
The State Polytechnic of Jember*

**ABSTRACT**

*Welding technology is now widely used in various industrial applications. From simple applications to complex applications, in the development and development of technology in the increasingly advanced construction field, welding cannot be separated because it has an important role in metal engineering and repair. At present, construction with metal involves a lot of welding elements, especially in the field of design. At present, construction with metal involves a lot of welding elements, especially in the field of design. The research is to analyze the effect of variations in welding grooves using the SMAW welding method on the hardness of the welding results. This study aims to determine the effect of variations in welding groove techniques, namely spiral, triangular, and zigzag grooves on the strength of hardness and microstructure. For this reason, it is necessary to observe the microstructure of the specimen and test the hardness to obtain data on the mechanical properties of the hardness of the metal and the value of the hardness of the metal. The result of this research is that the welding groove technique has a significant effect on the hardness with the Vicker test on SS 400 steel material. The zig-ag groove has the largest value of 4.83 kgf, followed by the spiral groove with a hardness of 4.79 kgf, and the triangular groove has the lowest hardness value with a value of 3.32 kgf. This effect is because the zig-zag groove provides a greater heat input than the spiral groove and triangular groove, this is because the contact area from the tip of the electrode to the base metal is greater so that the hardness of the steel produced is higher. Observation of the microstructure of low carbon steel SS 400 with 500 X magnification in the form of ferrite (light color) and pearlite (dark color) this is because there is heat input from the welding process using the SMAW method, the structure of this low carbon steel will turn into bainite which has properties stronger than pearlite, harder, tougher and more ductile in the form of pillars formed in the weld area.*

*Key words: Analysis of Welding Groove Variations, SMAW (Shield Metal Arc Welding), SS 400 Steel Plate*