Improve Competence to Complete the Requirements for International Welder

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Influence of Use Backing Ceramic to Value Yield Strength on ASTM A36 Steel Using SMAW Welding

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Abstract

Welding large structures often requires alternating welding on both sides, which is time-consuming and costly. To overcome this, the media backing ceramics are used as hot melt barriers to form better results, speed up the ship welding process and reduce budgets. This study aims to determine the effect of media use baking ceramics against tensile strength test on ASTM A36 steel by SMAW welding. The calculation results show a strong effect on ASTM A36 steel. MarkYield strength is the highest found in specimens that do not use baking ceramics, equal to 322.413Mpa, while the valueYield strength is the lowest found in testing that uses baking ceramics at 309.92 Mpa.

Keywords: SMAW;Yield Strength; ASTM A36 Steel; Tensile Test

1. Introduction

The development of science and technology is increasing, one of which is in the construction field involving metal. Technology is needed to join metals with other metals to get quality results, namely by using welding technology. Welding is a process used to join two or more metals by heating them until they melt, using a heat source from an electric arc [1]. Welding is not only used to join metals but also to patch or add thickness to the surface of the material. In the welding process, several stages need to be considered, from theoretical knowledge to the appropriate way to join one metal to another to get maximum results.

One of the most frequently used welding methods is SMAW welding. In this method, the base metal begins to be heated due to the heating that occurs from an electric arc that appears between the ends of the electrodes. This welding is done a lot to get maximum results. Although the welding process seems easy, it requires professional skills. Therefore, understanding the science of welding must be the main capital in welding. In the welding process, it is very necessary to have welding procedures, checks after welding, as well as materials and materials to be used [2].

Welding is a technology that continues to develop to produce better quality in construction involving metal. With the development of technology, the welding process becomes more efficient, and the results are even better as technology develops. One example of technological developments in welding is the use of media-backing ceramics.

Media backing ceramic is a barrier to hot melt to form better results. Media backing allows welding to be performed only on one side, making it more efficient in time and cost. Thus, using media-backing ceramics can help speed up the welding process on ships and reduce the budget. This shows that technological developments in welding continue to grow to produce better quality.

However, not all welding results will be good. Therefore, a solution is needed to minimize the results of not good welding. One way is to use media-backing ceramics. This study aims to determine the effect of value yield strength from media use backing ceramics against tensile strength test on ASTM A36 steel by SMAW welding.

By using media backing ceramics, better welding penetration and better welding results. This allows welding to be carried out only on one side, making it more time and cost-efficient. Thus, technological developments involving metal construction continue to develop to produce better quality.

2. Materials and Methods

This study collected data from various sources such as journals, books, the internet, articles, and direct studies using experimental methods to obtain factual and accountable data.

2.1 Backing ceramic

Backing *ceramic*, known as Ceramic Backing Material, is a media made of ceramic material which is formed into a mould. Its function is to form the welding results used at the bottom of the seam.

Figure 1. Backing ceramic

2.2 ASTM A36 Steel

The steel material used in this research is ASTM A36 steel. This material is often used in the shipbuilding industry because of its good characteristics and is suitable for various production processes such as grinding, punching, tapping, drilling and machining.

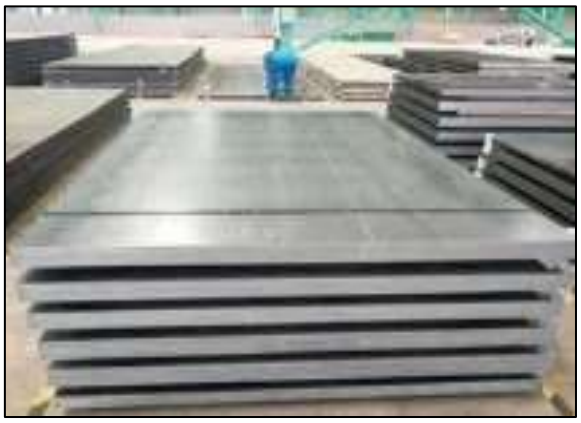

Figure 2. ASTM A36 Steel [3]

2.3 SMAW Welding Machine

Welding is a process of joining metals by heating them until they melt using a heat source from an electric arc [1].

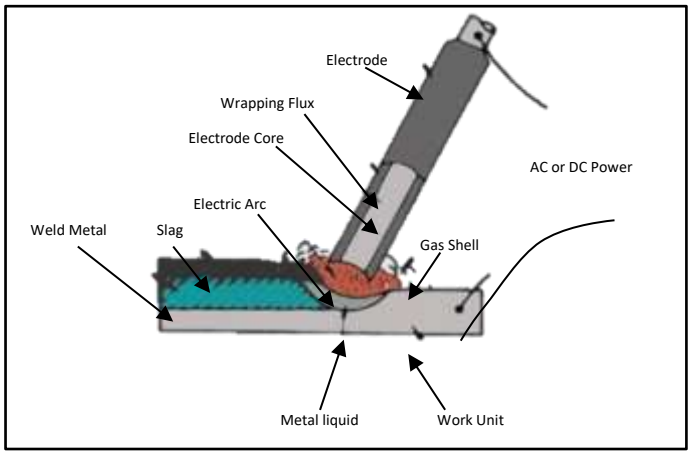

Figure 3. SMAW Welding [4]

SMAW welding, or welding with covered electrodes, combines two metals by using heat generated from electrodes at two different poles. The heat melts the metal and then uses additional materials called electrodes to wrap around the two types of melted metal to form a fixed connection.

2.4 Tensile Test Equipment

Tensile test equipment or tensile strength is a tool used to determine a material's strength or deformation behaviour until the material breaks.

Figure 4. Tensile Test Equipment

3. Results

In this test, the results obtained in the form of information will then be analyzed and processed to obtain the results of material testing both physically and mechanically from the SMAW welding process with modifications using baking ceramic and without baking ceramics. The information obtained includes the tensile test results to determine the value yield strength.

In this test, researchers will group them into two types, namely:

1. Welding using media backing ceramics
2. Welding without using the media backing ceramics

3.1 Tensile Test

The tensile test is a method used to test the strength of a material by providing a load force in the opposite direction. The results of this test are very important for product design and engineering because they can produce test material strength data.

This research is only focused on knowing the value of each specimen's creep strength (yield strength). To determine the creep strength value of the tensile test specimen, can use the following formula:

$$\sigma Ult = \frac{FUlt}{A_0} N / mm^2 \quad (1)$$

3.1.1 Strength Value (Yield strength)

Tensile test specimens after the tensile test, the creep strength value (yield strength) can be calculated from the results. The calculation results can be seen in the following table:

Table 1. Value Yield strength from the Tensile test

No	Variation	Code Material	CSA (mm^2)	F. *Yield* (N)	Yield strength (Mpa)
1	Non-Backing ceramics	A1	201.7	63.00	321.34
		A2	202.46	62.000	306.23
		A3	191.36	65.000	339.67
		Average	198.50	63.333	322.413
2	With Backing ceramics	B1	209.80	65.000	309.81
		B2	212.60	65.000	305.73
		B3	213.22	67.000	314.22
		Average	211.87	65.666	309.92

Table 1 above shows the average y-value yield strength for each table. The tensile test results on SMAW welding on ASTM A36 steel without baking ceramics obtained an average value of 322.413 MPa. At the same time, the tensile test on SMAW welding on ASTM A36 steel using backing ceramics obtained an average value of 309.92 MPa. Next, the value yield strength from Table 1 can be described in graphical form, shown in Figure 5.

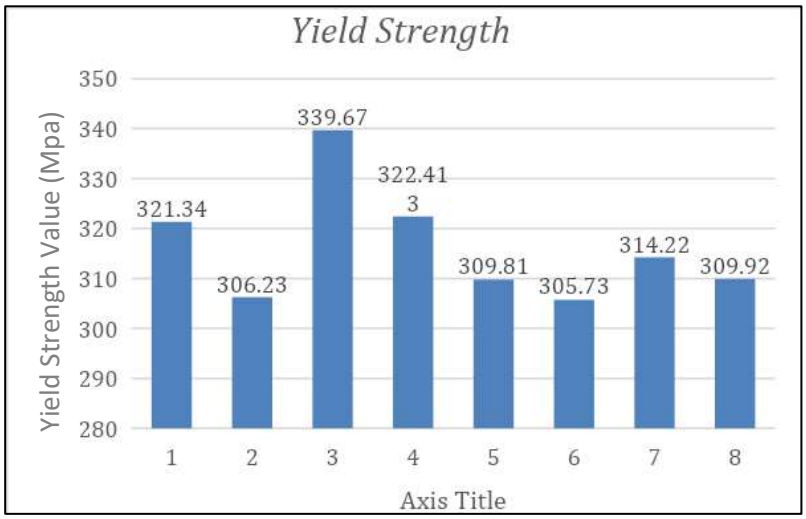

Figure 5. Test results yield strength

Based on the test results shown in Figure 5, it can be seen that the value yield strength the highest is found in specimens that do not use backing ceramics, which is equal to 322.413 MPa. While value yield strength is the lowest found in testing that uses baking ceramics, which equals 309.92 MPa.

4. Discussion

From the analysis above, this study aims to determine the value yield strength of the material tested by the SMAW welding method with and without baking ceramics. The tensile test is a method used to test the strength of a material by providing a load force in the opposite direction. The results of this test are very important for product design and engineering because they can produce test material strength data.

This research is only focused on knowing the value of each specimen's creep strength (yield

strength). A predetermined formula is used to determine the tensile test specimen's creep strength value. After carrying out the tensile test, the creep strength value (yield strength) can be calculated from the tensile test results.

The calculation results can be seen in Table 1, which shows the average value yield strength for each table. The tensile test results on SMAW welding on ASTM A36 steel without baking ceramics obtained an average value of 322.413 MPa. At the same time, the tensile test on SMAW welding on ASTM A36 steel using baking ceramics obtained an average value of 309.92 MPa.

Based on the test results shown in Figure 5, it can be seen that the value yield strength the highest is found in specimens that do not use baking ceramics, which is equal to 322.413 MPa. While value yield strength *is the* lowest found in testing that uses baking ceramics, which equals 309.92 MPa.

Thus, using backing ceramics affects the value yield strength of the material tested. However, it should be noted that these results apply only to the conditions and parameters used in this study and may differ if the conditions and parameters are different.

5. Conclusions

From the results of the analysis that has been done, it can be concluded that the use of backing ceramics affects the value yield strength of the material tested. Research shows that baking ceramics can increase value yield strength on ASTM A36 steel welded using SMAW welding. The test results show that the highest average value yield strength is found in specimens that do not use baking ceramics, which is equal to 322.413 MPa. In contrast, the lowest average value yield strength is found in specimens that use baking ceramics, which is equal to 309.92 MPa. However, it should be noted that these results apply only to the conditions and parameters used in this study and may differ if the conditions and parameters are different.

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